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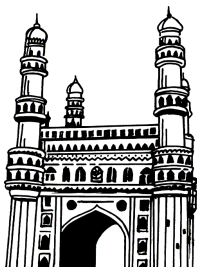

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MBA

II Year IV Semester

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II Year IV Semester

STRATEGIC INVESTMENT AND FINANCING DECISIONS

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UNIT I

INVESTMENT DECISIONS UNDER CONDITIONS OF RISK AND UNCERTAINTY:

Concepts of risk and uncertainty. Risk Analysis in Investment Decisions. Risk adjusted rate of return, certainty equivalents, Probability distribution of cash flows, decision trees, sensitivity analysis and Monte Carlo Approach to Simulation. Investment Decisions under capital constraints: Capital Rationing vs. Portfolio. Portfolio Risk and diversified projects

1.1 INVESTMENT DECISIONS

Q1. What are investment decisions? State the characteristics of investment decisions.

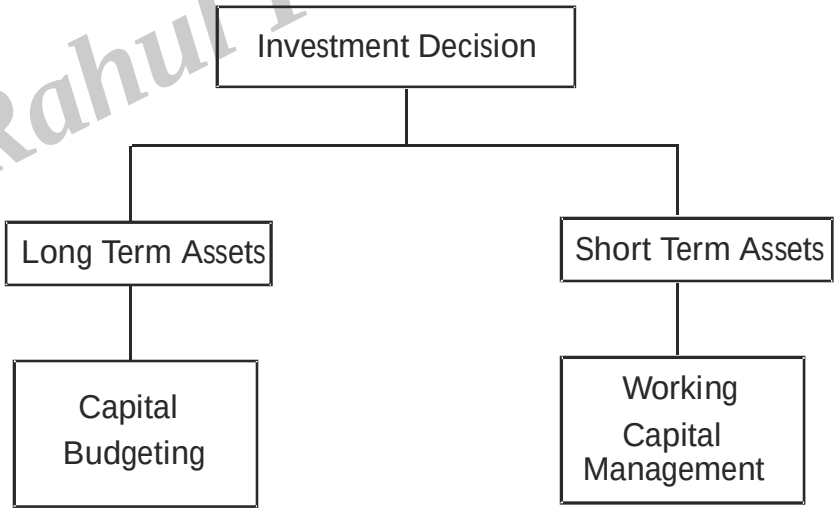
Ans :

Definition

The Investment Decision relates to the decision made by the investors or the top level management with respect to the amount of funds to be deployed in the investment opportunities.

Simply, selecting the type of assets in which the funds will be invested by the firm is termed as the investment decision. These assets fall into two categories:

1. Long Term Assets
2. Short-Term Assets



1. Long Term Assets

The decision of investing funds in the long term assets is known as Capital Budgeting. Thus, Capital Budgeting is the process of selecting the asset or an investment proposal that will yield returns over a long period.

The first step involved in Capital Budgeting is to select the asset, whether existing or new on the basis of benefits that will be derived from it in the future.

The next step is to analyze the proposal's uncertainty and risk involved in it. Since the benefits are to be accrued in the future, the uncertainty is high with respect to its returns.

Finally, the minimum rate of return is to be set against which the performance of the long-term project can be evaluated.

2. Short-Term Assets

The investment made in the current assets or short term assets is termed as Working Capital Management. The working capital management deals with the management of current assets that are highly liquid in nature.

The investment decision in short-term assets is crucial for an organization as a short term survival is necessary for the long-term success. Through working capital management, a firm tries to maintain a trade-off between the profitability and the liquidity.

In case a firm has an inadequate working capital i.e. less funds invested in the short term assets, then the firm may not be able to pay off its current liabilities and may result in bankruptcy. Or in case the firm has more current assets than required, it can have an adverse effect on the profitability of the firm

Thus, a firm must have an optimum working capital that is necessary for the smooth functioning of its day to day operations.

Characteristics

(i) Growth

The impact of investment decisions continue in future and must be go through for a long period than the effects of current operating expenditure. Firm may incur heavy operating costs due to useless or loss making expansion of assets. On the other side, insufficient investment in assets may cause difficulty for firm to face competition and continue its market share.

(ii) Risk

If there is long term contract of funds it may change the difficulty involved in the firm's risk. If there is fluctuations in the profit of investment, then it will make the firm more risky. Hence, investment decisions figure out the prime features of risk of the firm.

(iii) Funding

Usually investment decisions consist of huge amount of funds which make it essential for the firm to organize its investment programmes. Investment programmes must be planned very cautiously and arrangement for attaining finances internally or externally must made in advance.

(iv) Irreversibility

Most investment decisions are non-rectifiable or not changeable. Capital items that are obtained, usually do not have any resale market. The firm will experience huge losses if such assets are scrapped. Hence, investment decisions once made cannot be changed or if it is changed then it may cause considerable loss.

(v) Complexity

Another important characteristic feature of capital investment decision is that it is the most difficult decision to make. Investment decision helps in evaluating the future events which are hard to anticipate. It is truly a hard task to correctly determine the future cash flows of an investment. Economic, social, political and technological forces result in cash flow risk.

Q2. What are the constraints while making investments in new projects? Explain.

Ans : **(May-19)**

Investment in new project is effected by following constraints,

1. Liquidity

Investment plan must consider the liquidity constraint as investor may need some money to meet unexpected cash requirements in future. Some investments should be made in liquid assets so that they can be easily converted into cash without affecting portfolio value.

2. Time Horizon

Time horizon constraint is related to time periods for which returns are expected to meet future needs. Investor's time horizon is closely linked with liquidity needs and ability to handle risk. When investor has long investment horizons he/she requires less liquidity and can manage greater portfolio risk. Whereas, investor with shorter time horizons consider more liquidity and less risky investments.

3. Legal and Regulatory

There are various laws to regulate investment process and financial markets. Investment strategies of individuals and institutions are constrained by legal and regulatory factors. These constraints make specifications in asset classes in which investments are not permitted.

4. Tax Concerns

Tax constraint is based on when and how different types of returns are taxed. Policy statement must be drafted by considering tax environment. Capital gains and investment income are liable for differential tax treatments. Investment planning becomes difficult due to taxes and becomes more complicated if international investments become part of the portfolio.

5. Unique Needs and Preferences

These constraints are usually developed front preferences or special concerns of investors. Some investors restrict investments in companies causing harm to society. 'Such concerns and situations must be considered before formulating investment policy statement.

1.2 CONCEPT OF RISK AND UNCERTAINTY

Q3. Define the terms Risk and Uncertainty.

Ans :

Risk

Risk is uncertainty that a future event with a favourable outcome will occur. In other words, risk is the probability that an investment will not perform as expected and the investor will lose the money invested in the project. All business decisions and opportunities are based on this concept that future performance and returns are uncertain and rely on many uncontrollable variables.

Risk is inherent in any investment. Risk may relate to loss of capital, delay in repayment of capital, non-payment of return or variability of returns. The risk of an investment is determined by the investments, maturity period, repayment capacity, nature of return commitment and so on.

Risk implies future uncertainty about deviation from expected earnings or expected outcome. Risk measures the uncertainty that an investor is willing to take to realize a gain from an investment.

Total Risk

= General Risk + Specific Risk

= Market Risk + Issuer Risk

= Systematic Risk + Non Systematic Risk

Definitions

(a) **According to Emmett J. Vaughan** "Risk is condition in which there is a possibility of an adverse deviation from a desired outcome that is expected or hoped so far."

(b) **According to Irving Fisher** "Risk may be defined as combinations of hazards measured by probability."

(c) **According to Blomkvist** "The possible loss of something of value."

(d) **According to Douglas** "Risk is the probability of an event combined with the magnitude of the losses and gains that it will entail."

(e) **According to Merkhofer** "Risk allows for a number of possible outcomes, not all of which are bad."

Uncertainity

Uncertainy refers to a situation in which there is more than one possible outcome of a business decision and where the probability of each specific outcome is not known nor cannot be meaningfully estimated.

Q4. Explain the various sources and perspectives of risk.

Ans :

Risk is common in every business, it is the probability of happening something wrong in future. A project involves risk which emerge from different sources. Some of the important sources are explained below,

Sources

(i) Project Specific Risk

In project-specific risk, the earnings and cash flows are less than the estimated cash flows due to some specific drawback of project like poor management or inaccurate estimates.

(ii) Competitive Risk

In competitive risk, unexpected actions of competitors influence the earnings and cash flows of the project.

(iii) Industry Specific-Risk

If the industry to which the project belongs have unexpected trends in technological developments and any changes in authorities may influence earnings and cash flows.

(iv) Market Risk

In market risk, there is unexpected changes in macro-economic factors like the GDP growth rate, interest rate and inflation and all the projects are affected by this factors in different proportions.

(v) International Risk

International risk in foreign projects where earnings and cash flows are not the same as expected because of exchange rate risk or political risk.

Perspectives

A project can be observed from three different perspectives. They are,

(i) Stand-alone Risk

When a project is observed in isolation it is known as stand-alone risk.

(ii) Firm Risk

The share of a project in risk of the firm is known as firm risk which is also termed as corporate risk.

(iii) Market Risk

When risk of a project is observed by diversified investor is known as market risk. It is also termed as systematic risk.

Q5. Explain briefly about decision making under uncertainty, risk and certainty.

Ans :

1. Decision-making Under Uncertainty

Decision-making under uncertainty illustrates a situation where in more than two outcomes/ events may occur from one decision point and decision maker has no knowledge regarding the probabilities to be assigned to occurrence of each event or state of nature. The lack of information regarding the probabilities of occurrences of events make the decision making process very complicated. Under uncertainty situations, decision maker cannot compute expected pay offs for each course of action due to lack of probabilities. Launching of new product into the market, setting up of new plant etc., can be taken as examples of uncertainty situation. The selection of one best course of action relies upon the nature of decision-maker and rules of the organization. The various decision making criterias/techniques which can be used under uncertainty situation are listed down below,

(a) Criterion of pessimism or pessimism criterion

(b) Criterion of realism or realism criterion

(c) Criterion of optimism or optimism criterion

(d) Regret or opportunity loss criterion

(e) Equiprobable criterion.

2. Decision-making Under Risk

Often business decisions are taken under risk conditions. Like uncertainty, two or more outcomes/events may occur from one single

decision but decision maker possesses required knowledge regarding what probabilities can be assigned to each state of nature. The information regarding the probabilities of each state of nature can be acquired either from historical records or from personal judgements of the decision maker. As probabilities of each state of nature are known under conditions of risk, the course of action (or alternative strategy) with highest expected value is chosen as a best course of action.

The criterias used for selecting the best course of action under conditions of risk are,

(a) Expected Monetary Value (EMV)

(b) Expected Opportunity Loss (EOL).

(c) Expected value of Perfect Information (EVPI)

3. Decision-making Under Certainty

Decision making under certainty pertains to a situation wherein the decision maker knows with certainty the outcome of each course of action. Each decision has only one state of nature and decision maker chooses one best pay off among the available alternative strategies. The state of nature is arraigned with the probability equal to ' 1' as only one state of nature occurs from each course of action (alternative strategy). Even though stage of nature is only one, courses of action may be many. We rarely find managerial decision problems with complete information regarding future outcomes.

The methods used for decision making under certainty situations are,

(a) Linear programming method

(b) Integer programming method

(c) Transportation and assignment techniques

(d) Activity analysis

(e) Input output analysis

(f) EOQ (Economic Order Quantity) method

(g) Break-Even Analysis (BEA) etc.

1.2.1 Decision Making under Risk

Q6. Explain briefly about various criteria involved in the process of decision making under risk.

Ans : **(Imp.)**

Following are the techniques which are based on Expected Pay-off Criterion :

(i) Expected Monetary Value (EMV)

(ii) Expected Opportunity Loss (EOL) / Expected Regret

(iii) Expected Value of Perfect Information (EVPI)

(i) Expected Monetary Value (EMV)

The weighted average payoff for a given course of action is the Expected Monetary Value (EMV). The total of the payoffs for each course of action multiplied by the probabilities combined with each state of nature. This mathematical description of the EMV is as follows:

$$EMV(S_j) = \sum_{i=1}^{m} P_{ij} P_i$$

where,

m = Number of possible states of nature,

P_i = Probability of occurrence of i^{th} state of nature

P_{ij} = Payoff connected with state of nature N_i and course of action S_j

Steps

Step 1:

Building of the payoff matrix by enlisting all the possible courses of action and states of nature. Enter all the possible combination of course of action and state of nature that are linked with limited payoff values as well as the probabilities of the happening of each state of nature.

Step 2:

Calculate the value of EMV for each course of action by multiplying with the conditional payoffs of the combined probabilities which are added to the weighted values for each course of action.

Step 3:

Selection of that course of action which yield the optimum EMV.

(ii) Expected Opportunity Loss (EOL) / Expected Regret

An alternative approach that refers to maximization of Expected Monetary Value (EMV) and minimization of Expected Opportunity Loss (EOL) is also known as expected value of regret. The difference between the highest profit for a state of nature and the actual profit which is obtained for the specific course of action is defined as EOL.

Hence, the amount of payoff that is lost due to the rejection of a course of action, which is having the greatest payoff for the state of nature that has actually appeared, is referred as EOL. That course of action is recommended for which EOL is minimum.

Results obtained by EMV criterion and by EOL, which is an alternative decision criterion for making decision under risk area will always be the same. Hence, only one of the two methods should be applied for reaching a decision. The mathematical description is as follows:

$$EOL\ (N_j) = \sum_{i=1}^{m} 1_{ij} P_i$$

Where, 1_{ij} = opportunity loss due to state of nature, N_i and course of action, S_j

P_i = probability of occurrence of state of nature, N_i

Steps

Step 1:

Preparation of a conditional profit table depicting that course of action, state of nature as well as associated probabilities.

Step 2:

Calculate Conditional Opportunity Loss (COL) value for each state of nature and subtract by each payoff from the maximum payoff of each event.

Step 3:

Calculation of EOL for each course of action that is multiplied by the probability of each state of nature with the value of COL and then adding it up.

Step 4:

That course of action is selected for which the EOL value is minimum.

(iii) Expected Value of Perfect Information (EVPI)

The criterion for decision making under risk for each state of nature is combined with its probability of occurrence and some how, the decision maker is able to acquire perfect (complete and accurate) information regarding the occurrence of cixous states of nature. In such a case, only then he will be successful in selecting that course of action yielding the expected payoff for whatever may be the state of nature that actually takes place. The maximum amount of money which the decision maker has to pay in acquiring additional information about the occurrence of various states of nature prior reaching to a decision is represented by Expected Value of Perfect Information (EVPI). Mathematical description is as follows:

EVPI = Expected profit (or value) with perfect information under certainty - Expected profit without perfect information EVPI - EPPI - EMV *

Where,

EPPI = Expected profit (or value) with perfect information under certainty

EMV* = Maximum expected monetary value.

1.2.2 Decision Making under Uncertainity

Q7. Explain briefly about various criteria involved in the process of decision making under Uncertainity.

(OR)

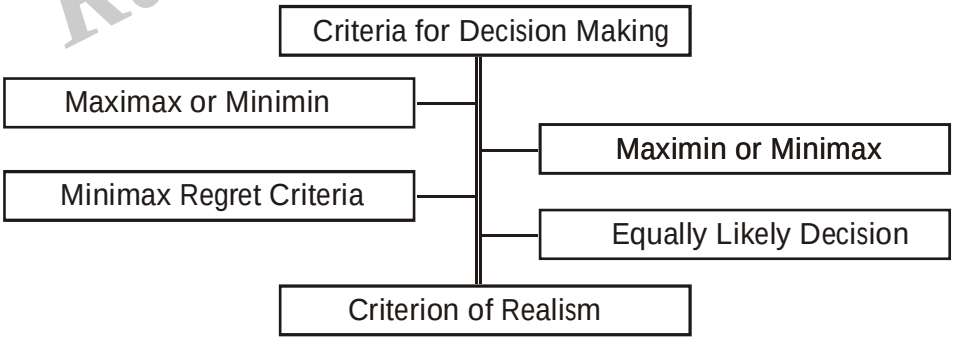
What are the types of investment decisions that can be adopted under uncertainity.

(OR)

Describe any two methods used for decision making under uncertainity.

Ans : **(Imp.)**

There are several rules and techniques to take decisions under uncertainty situation. Important ones are shown in figure below:



1. Maximum or Minimum (Criterion of Optimism)

According to this criterion, it is ensured by the decision maker to achieve maximum payoff or minimum cost without missing the opportunity. Thus, he chooses a different course of action represented by the maximum of the maxima or minimum of the minima payoffs. The summary of the working method is as follows:

(i) Locating the payoff value (maximum or minimum) that corresponds to each and every course of action.

(ii) Selection of an alternative, having the best expected payoff value which maximize the-profit and minimize the loss.

This is called an optimistic decision criterion, due to the selection of an alternative with highest lowest available payoff value by the decision maker.

2. Maximin or Minimax (Criterion of Pessimism)

According to this criterion, it is ensured by the decision maker that his earnings are not less than the specified amount. Therefore his selection of alternative is represented by the maximum of the minima payoffs in case of profit, or minimum of the maxima in case of loss.

Summary of the working method is as follows:

(i) Locate the payoff values (both minimum in case of loss and maximum in case of profit) that correspond to each alternative.

(ii) Select an option having best expected payoff value (maximum for profit and minimum for loss or cost).

According to this criterion, the decision maker being conservative regarding future and he anticipates worst possible outcome (minimum for profit or maximum for cost or loss). Hence, it is known to be pessimistic decision criterion. It is also called Wald's criterion.

3. Minimax Regret Criteria (Savage Principle)

This decision criterion was developed by L.J. Savage. According to this criterion he suggested, that due to the decision of the decision maker, he may have the feeling of regret and on the occurrence of event i.e. states of nature. Therefore, he should attempt to lessen the regret prior to the actual selection of a particular alternative.

The summary of the working method is as follows:

(i) The amount of regret that is equivalent to each alternative for every state of nature is determined.

The regret for j^{th} event that corresponds to the i^{th} alternative is given by the following formula:

j^{th} regret = (maximum payoff - i^{th} payoff) for the i^{th} event.

(ii) Maximum regret amount for each alternative is to be determined.

(iii) Choosing the alternative that corresponds to the minimum of the aforesaid maximum regrets.

4. Equally Likely Decision (Laplace Criterion)

On the assumption, that the occurrence of all states of nature having same probabilities as they have been assigned with equal probability is due to the reason that the probabilities of states of nature are unknown. Since these states of nature are mutually exclusive and collectively exhaustive therefore, each of these must have the probability equal to 1/number of states of nature.

Following is the summary of the working method:

(i) According to the formula: 1/number of states of nature, assigns equal probability to each state of nature.

(ii) Either by the application of the formula or by adding all the payoffs and then dividing them by the number of possible states of nature. Expected (average) payoff for each alternative is to be computed.

(Probability of state of nature j) × (Payoff (P_{ij}) implies value for the combination of alternative i and state of nature.

(iii) Selection of the best expected payoff value (maximum for profit and minimum for loss/cost).

Generally the decision maker is being totally unaware regarding various states of nature and their probability of occurrence. Anyhow, this criterion does not have much practical utility.

5. Criterion of Realism (Hurwicz Criterion)

Due to the assumption of both the maximax and maximun criterion, the decision maker is neither optimistic nor pessimistic. According to the Hurwicz Criterion, the measure of the decision makers confidence as the decision payoffs are weighted by the coefficient of optimism defined as "α", that lies between 0 and 1 ($0 < \alpha < 1$):

(i) If the value of $\alpha = 1.0$, the decision maker is totally optimistic;

(ii) If the value of $\alpha = 0$, the decision maker is totally pessimistic.

The Coefficient of Pessimism is $(1 - \alpha)$. This is an advantageous approach, as it allows the decision maker in building personal feelings regarding optimism and pessimism relatively.

The formula states:

H (Criterion of realism) = α (Maximum in column) + $(1 - \alpha)$ (Minimum in column)

The summary of the working method is as follows:

(i) To decide upon the coefficient of optimism, a followed by coefficient of pessimism $(1 - \alpha)$.

(ii) After selecting the largest and lowest payoff value for each alternative, multiply it with the values of a and $(1 - \alpha)$ respectively. Calculation of weighted average, H is done by applying the above formula.

(iii) Selection of an option having best expected weighted average payoff value.

PROBLEMS

1. A newspaper seller has the following probabilities when he/she sells newspapers:

Sold Copies	Probability
10	0.10
11	0.15
12	0.20
13	0.25
14	0.30
Total	1.00

The selling price a newspaper is 60 paisa and its cost is 40 paisa. The condition is that seller cannot return the copies of newspaper. Determine how many newspapers, the seller will order?

Sol :

The seller has 10, 11, 12, 13 or 14 numbers of copies for purchases and sales. This means that he/she buys more than 10 and less than 14.

Profit resulting from any combination of supply and demand is shown in following profit table (table (a). Irrespective of demand, the profit will be 200 paisa per day when there is a stock of 10 copies. For example, if seller sells 11 copies while the demand is 14 copies, then the conditional profit will be 220 paisa. If he stocks 12 copies, his profit is 240 paisa when the buyer orders 12, 13 or 14 copies. If he stocks 11 copies and the buyers buy 10 copies, then the profit decreases to 160 paisa (200 paisa profit on selling 10 copies minus 40 paisa of one unsold copy) because one copy of newspaper is unsold. When the seller stocks 12, 13 or 14 copies, then the same rule will be applicable. Thus conditional profit can be given by as follows:

Payoff = 20 × No of Copies Sold – 40 × No of Copies not Sold.

Table (a) : Conditional Profit Table (Paisa)

Possible Demand (No. of Copies)	Probability	Possible Stock Action				
		10 Copies	11 Copies	12 Copies	13 Copies	14 Copies
10	0.10	200	160	120	80	40
11	0.15	200	220	180	140	100
12	0.20	200	220	240	200	160
13	0.25	200	220	240	260	220
14	0.30	200	220	240	260	280

The average value of each alternative can be determined by multiplying the conditional profit by corresponding probability and then adding the resulting values as shown in table (b).

Table (b) : Conditional Profit Table (Paisa)

Possible Demand	Probability	Average Profit from Stocking (Paisa)				
		10 Copies	11 Copies	12 Copies	13 Copies	14 Copies
10	0.10	20	16	12	8	4
11	0.15	30	33	27	21	15
12	0.20	40	44	48	40	32
13	0.25	50	55	60	65	55
14	0.30	60	66	72	78	84
Total Average Profit (Paisa)		**200**	**214**	**219**	**212**	**190**

Therefore the seller must order 12 copies in order to earn maximum profit as its daily average profit is 219 paisa. This stock will provide highest profit over a period of time. The next day profit of 219 paisa is not guaranteed. In case he stocks 12 copies per day, then the average profit is 219 paisa per day under given constraints. This is the best choice for him, as others stocks will not provide so much daily profit.

2. Let consider the following payoff matrix :

State of Nature	Probability	Act		
		Do not Expand (`)	Expand 200 Unit (`)	Expand 400 Units (`)
High Demand	0.4	2,500	3,500	4,900
Medium Demand	0.4	2,500	3,500	2,500
Low Demand	0.2	2,500	1,500	1,000

Determine which act must be select using EMV criterion.

Sol :

The various decisions have the following EMV :

Decision	EMV (`)
Do not Expand	0.4 (2500) + 0.4 (2500) + 0.2 (2500) = 2,500
Expand 200 Units	0.4 (3500) + 0.4 (3500) + 0.2 (1500) = 3,100
Expand 400 Units	0.4 (4900) + 0.4 (2500) + 0.2 (1000) = 3,160

Since the highest EMV value is 3,160, hence it favours expansion of 400 units.

3. A seller has the following probabilities when he/she sells newspapers :

Copies Sold	10	11	12	13	14
Probability	0.10	0.15	0.20	0.25	0.30

The selling price is 60 paisa and its cost is 40 paisa. The condition is that seller cannot return the copies of newspaper. Using EOL criterion, determine how many newspapers, seller should order ?

Sol :

The conditional profit table is illustrated as shown in table

Table Conditional Profit Table (Paisa)

Possible Demand (No. of Copies)	Probability	Possible Stock Action (Alternative)				
		10 Copies	11 Copies	12 Copies	13 Copies	14 Copies
10	0.10	200	160	120	80	40
11	0.15	200	220	180	140	100
12	0.20	200	220	240	200	160
13	0.25	200	220	240	260	220
14	0.30	200	220	240	260	280

When there is demand of 10 copies then the best alternative is that seller will order 10 copies and this will give a profit of 200 paisa. The conditional opportunity loss for every stock can be obtained by subtracting the respective conditional profits from 200 paisa. Similarly, each value of the rows subtracted from the maximum of that row will provide conditional payoff values for demand of 11, 12, 13 and 14 copies. Therefore, we get the following Conditional Opportunity Loss (COL) table :

Table Conditional Loss Table (Paisa)

Possible Demand (no.of copies) (Event)	Probability	Possible Stock Action (Alternative)				
		10 Copies	11 Copies	12 Copies	13 Copies	14 Copies
10	0.10	0	40	80	120	160
11	0.15	20	0	40	80	120
12	0.20	40	20	0	40	80
13	0.25	60	40	20	0	40
14	0.30	80	60	40	20	0

Expected Opportunity Loss (EOL) can be determined by multiplying the probability of each state of nature with corresponding appropriate loss value and then adding them which provides resulting products. For example, for stocking 11 copies, we have :

Expected Opportunity Loss (EOL)

$$= 0.11 \times 40 + 0.15 \times 0 + 0.20 \times 20 + 0.25 \times 40 + 0.30 \times 60$$

$$= 4 + 0 + 4 + 10 + 18 = 36 \text{ paisa}$$

The EOL for different stocks can be calculated as shown in table :

Table Expected Loss Table (Paisa)

Possible Demand (no.of copies) (Event)	Probability	Possible Stock Action (Alternative)				
		10 Copies	11 Copies	12 Copies	13 Copies	14 Copies
10	0.10	0	4	8	12	16
11	0.15	3	0	6	12	18
12	0.20	8	4	0	8	16
13	0.25	15	10	5	0	10
14	0.30	24	18	12	6	0
	EOL (Paisa)	**50**	**36**	**31**	**38**	**60**

Since minimum expected opportunity loss will represent the optimum stock action, hence the seller will stock 12 copies per day as the minimum expected loss is 31 paisa.

4. Let consider the following payoff matrix :

Act	State of Nature	
	Cold Weather (`)	Warm Weather (`)
Seller Cold Drinks	40	90
Sell Ice Creme	70	40

From the previous experience, it is known that probability of happening of cold weather is 0.3.

1) Determine the opportunity loss table and then calculate the expected opportunity loss for each course of action.

2) Also illustrate that the EMV and EOL will be same when decisions under them are taken.

Sol :

The opportunity loss matrix is shown in table below :

Act	State of Nature	
	Cold Weather (`)	Warm Weather (`)
Sell Cold Drinks	70 – 40 = 30	90 – 90 = 0
Sell Ice Cream	70 – 70 = 0	90 – 40 = 50

For every alternative Couse of action, one can compute the EOL as shown below :

Act	State of Nature		
	Cold Weather (`)	Warm Weather (`)	Total
Sell Cold Drinks	0.3 × 30 = 9	0.7 × 0 = 0	9 + 0 = 9
Sell Ice Creams	0.3 × 0 = 0	0.7 × 50 = 35	0 + 35 = 35

Selling the cold drinks is the best act as EOL in such case is minimum.

The EML value of every course of action can be computed as follows :

Act	State of Nature		
	Cold Weather (`)	Warm Weather (`)	Total
Sell Cold Drinks	0.3 × 40 = 12	0.7 × 90 = 63	12 + 63 = 75
Sell Ice Creams	0.3 × 70 = 21	0.7 × 40 = 28	21 + 28 = 49

The selling cold drink is recommend as the EMV value is more, i.e., 75. Hence decision is same under EOL and EMV criteria.

5. Let consider the three acts A, B and C and states of nature X, Y and Z. The payoffs are shown in table below :

		Act		
		A	B	C
States of Nature	X	– 20	– 50	200
	Y	200	– 100	– 50
	Z	400	600	300

The probabilities of X,Y and Z are 0.3, 0.5 and 0.2 respectively. Compute the EMV for above data and also find the best act. Determine the expected value of perfect information (EVPI) also.

Sol :

The EMV for each act can be computed as following :

A = – 20 × 0.3 + 200 × 0.5 + 400 × 0.2 = – 6 + 100 + 80 = ` 174

B = – 50 × 0.3 – 100 × 0.5 + 600 × 0.2 = – 15 – 50 + 120 = ` 55

C = 200 × 0.3 – 50 × 0.5 + 300 × 0.2 = 60 – 25 + 60 = ` 95

		Acts				Max. for state of Nature	(Max. pay - off) × (prob.)
		Probability	A	B	C		
	X	0.3	–20	–50	200	200	200 × 0.3 = 60
State of	Y	0.5	200	–100	– 50	200	200 × 0.5 = 100
nature	Z	0.2	400	600	300	600	600 × 0.2 = 120
						Total	**280**

Now EVPI = EPPI – EMV = 280 – 174 = ` 106

6. An electrical manufacturing company has seen its business expanded to the point where it needs to increase production beyond its existing capacity. It has narrowed the alternatives to two approaches to increase the maximum production capacity, (a) Expansion, at a cost of Rs.8 million, or (b) Modernization at a cost of Rs. 5 million. Both approaches would require the same amount of time for implementation. Management believes that over the required payback period, demand will either be high or moderate. Since high demand is considered to be somewhat less likely than moderate demand, the probability of high demand has been setup at 0.35.

If the demand is high, expansion would gross an estimated additional Rs.12 million but modernization only an additional Rs.6 million, due to lower maximum production capability. On the other hand, if the demand is moderate, the comparable figures would be Rs. 7 million for expansion and Rs. 5 million for modernization.

a) Calculate conditional profit in relation to various action and outcome combinations and states of nature.

b) If company wishes to maximize its expected monetary value, then it should modernize or expand?

c) Calculate the EVPI.

d) Construct the conditional opportunity loss table and also calculate EOL.

Sol :

a) Defining the state of nature of outcome (over which the company has no control) and course of action (company's possible decision).

Let,

States of nature : O_1 = High demand, O_2 = Moderate demand

Courses of action : S_1 = Expand, S_2 = Modernize

Since the probability that the demand is high (outcome O_1) is estimated to 0.35, the probability of moderate demand (outcome O_2 must be (1 – 0.35) = 0.65. The calculations for conditional profit values are as follows,

	Course of Action	
State of Nature Oj	**S_1 (Expand)**	**S_2 (Modernize)**
O_1 (high demand)	12 – 8 = 4	6 – 5 = 1
O_2 (moderate demand)	7 – 8 = –1	5 – 5 = 0

Table (1): Conditional Profit (Million Rs.)

b) The payoff table (1) can be rewritten as follows along with the given probabilities of states of nature.

State of Nature Oj	Probability P(Oj)	Course of Action	
		S_1 (Expand)	S_2 (Modernize)
O_1 (high demand)	0.35	4	1
O_2 (moderate demand)	0.65	–1	0

Table (2): Conditional Profit (Million Rs.)

The calculation of EMVs for courses of action S, and S., are given below,

$EMV(S_1) = (0.35)(4) + (0.65)(–1) = 1.40 – 0.65 =$ Rs. 0.75 million

$EMV(S_2) = (0.35)(1) + (0.65)(0) = 0.35 =$ 0.35 million

To maximize EMV, the company must expand course of action. The EMV of the optimal course of action is generally denoted by EMV*. Therefore,

$EMV^* = EMV(S_1)$ Rs. 0.75 million

c) To compute EVPI, we shall first calculate EPPI. For calculating EPPI, we choose the optimal course of action for each state of nature, multiply its conditional profit by the given probability to get weighted profit and then sum these weights as shown in the table (3).

State of Nature Oj	Probability P(Oj)	Optimal Course of Action	Conditional Profit	Weighted Profits
O_1	0.35	S_1	4	4 × 0.35 = 1.40
O_2	0.65	S_2	0	0 × 0.65 = 0
			EPPI	1.40

Table (3): Profit of Optimal Course of Action

The optimal EMV* is Rs. 0.75 million corresponding to the course of action S_1. Then,

$EVPI = EPPI – EMV(S_1) = 1.40 – 0.75 =$ Rs. 0.65 million

Alternately, if the company could get a perfect information (for forecast) of demand (high or moderate) it should consider paying upto 0.65 million for an information.

The expected value of perfect information in business helps in getting and absolute upper bound on the amount that should be spent to get additional information on which a given decision is based.

d) The opportunity loss value are shown below.

State of Nature	Probability P(Oj)	Conditional Profit (Rs. million) Course of Action		Loss (Rs.million) Courses of Action	
O_j		S_1	S_2	S_1	S_2
O_1	0.35	4	1	0	3
O_2	0.65	–1	0	1	0

Table (4): Conditional Opportunity Loss Table

The conditional opportunity loss values may be explained as, if outcome O_1 occurred, then the maximum profit of Rs.4 million would be achieved by selecting course of action Thus, the choice of S_1 would result in zero opportunity loss, as it is the best decision if outcome O_1 occurs. If course of action S_2 were chosen with a payoff of one million, then this would result in a opportunity loss of 4 – 13 millions. If the outcome O_2 occurred, then the best course of action would be with zero loss. Thus, no opportunity loss would be associated with the choice of S_2. But, if S_1 were chosen, then the opportunity loss would be 0 – (–1) = Rs. 1 million. That is, the company would have Rs. 1 million worse off in that situation, if it had chosen course of action S_1.

Using the given forecast of probabilities associated with each state of nature $P(O_1) = 0.35$ and $P(O_2) = 0.65$, the expected opportunity losses for the two courses of action are,

$EOL(S_1) = 0.35(0) + 0.65(1) =$ Rs. 0.65 million

$EOL(S_2) = 0.35(3) + 0.65(0) =$ Rs. 0.05 million

Since decision maker seeks to minimize the expected opportunity loss, he must select course of action S_1 to produce the smallest expected opportunity loss.

7. A food product company is contemplating the introduction of a revolutionary new product with new packaging to replace the existing product at much price (S_1) or a moderate change in the composition of the existing product with a new packaging at a small increase in price (S_2) or a small change in the composition of the existing except the word 'new' with a negligible increase in price (S_3). The three possible states of nature of events are, (i) High increase in sales (N_2), (ii) No change in sales (N_2) and (iii) Decrease in sales (N_3). The marketing department of the company worked out the payoffs in terms of yearly net profits for each course of action for these events (expected sales). This is represented in the following table,

States of Nature	Courses of Action		
	S_1	S_2	S_3
N_1	7,00,000	5,00,000	3,00,000
N_2	3,00,000	4,50,000	3,00,000
N_3	1,50,000	0	3,00,000

Which strategy should the company choose on the basis of,

a) Maximin criterion

b) Maximax criterion

c) Minimax regret criterion

d) Laplace criterion.

Sol :

a) The given table is again reproduced as table (1) and includes an extra row indicating the worst or minimum outcome associated with each course of action (strategy).

States of Nature	Courses of Action		
	S_1	S_2	S_3
N_1	7,00,000	5,00,000	3,00,000
N_2	3,00,000	4,50,000	3,00,000
N_3	1,50,000	0	3,00,000
Minimum payoff	1,50,000	0	3,00,000

Table(1)

Since this is associated with the worst possible outcomes of decrease in sales worth Rs.3,00,000 the optimal course of action (or strategy) is obtained S_3 applying the maximin criterion.

b) Including an extra row representing the maximum payoff associated with each course of action and then applying the criterion of maximax, the optimal course of action is S_1, since this associates with it a maximum outcomes of Rs. 7,00,000 as shown in table (2).

c) The minimum value among the maximum regret as shown in table (3) is zero and this corresponds to course of action S_1.

States of Nature	Courses of Action		
	S_1	S_2	S_3
N_1	7,00,000	5,00,000	3,00,000
N_2	3,00,000	4,50,000	3,00,000
N_3	1,50,000	0	3,00,000
Maximum payoff	7,00,000	5,00,000	3,00,000

Table (2)

State of Nature	Courses of Action		
	S_1	S_2	S_3
N_1	7,00,000 – 7,00,000 = 0	7,00,000 – 5,00,000 = 2,00,000	7,00,000 – 3,00,000 = 4,00,000
N_2	4,50,000-3,00,000 = 1,50,000	4,50,000-4,50,000 = 0	4,50,000-3,00,000 = 1,50,000
N_3	3,00,000-1,50,000	3,00,000-0 = 3,00,000	3,00,000-3,00,000 = 0
Maximum regret	= 1,50,000		
	1,50,000	3,00,000	4,00,000

Table (3)

d) Here it is assumed that each course of action has a probability of occurrence equal to 1/3. Therefore, expected returns can be obtained as shown in table (4).

Course of Action	Expected Return
S_1	1/3 (7,00,000 + 3,00,000 + 1,50,000) = 3,83,333.33
S_2	1/3 (5,00,000 + 4,50,000 + 0) = 3,16,666.66
S_3	1/3 (3,00,000 + 3,00,000 + 3,00,000) = 3,00,000

Table (4)

Thus, Laplace criterion suggest that the executive should choose the strategy S_1

8. A manufacturer makes a product, of which the principle ingredient is a chemical X. At the moment, the manufacturer spends Rs.1000 per year on supply of X, but there is a possibility that the price may soon increase to four times its present figure because of worldwide shortage of the chemical. There is another chemical Y which the manufacturer could use in conjunction with a third chemical Z in order to give the same effect as chemical X. Chemicals Y and Z would together cost the manufacturer Rs. 3000 per year, but their prices are unlikely to rise what action should the manufacturer take? Apply the maximin and minimax criteria for decision making and give two sets of solutions. If the coefficient of optimism is 0.4, find the course of action that minimizes the cost.

Sol :

The data of the problem is given in the following table (negative numbers represent profits).

State of Nature	Courses of Action	
	S_1 (Use Y and Z)	S_2 (Use X)
N_1 (increase in price of X)	– 3,000	– 4,000
N_2 (no increase in price of X)	–3,000	–1,000

i) Maximum Criterion

State of Nature	Courses of Action	
	S_1 (Use Y and Z)	S_2 (Use X)
N_1	–3000	–4000
N_2	-3000	–1000
Column minimum	–3000 maximin	–4000

Here, maximum of column minima = – 3,000. Hence the manufacturer should adopt action S_1

ii) Minimax (or Opportunity loss) Criterion

State of Nature	Courses of Action	
	S_1	S_2
N_1	–3000 – (–3000)= 0	–3000 – (–4000) = 1000
N_2	–1000 – (–3000) = 2000	–1000 – (–1000) = 0
Maximum opportunity	2000	minimax 1000

Hence, manufacturer should adopt minimum opportunity loss course of action S_2.

iii) Hurwicz Criterion

Since the coefficient of optimism is given to be 0.4, the coefficient of pessimism will be 1 – 0 4 = 0 6. Therefore, select course of action that optimizes (maximum for profit and minimum for cost) the payoff value according to Hurwicz).

$H = \alpha$ (Best profit) + $(1 - \alpha)$ (Worst payoff)

= a (Maximum in column) + $(1 - \theta)$ (Minimum in column)

Course of Action	Best payoff	Worst payoff	H
S_1	-3,000	-3,000	-3,000
S_2	-1,000	-4,000	-2,800

Since courses action S_2, has the least cost maximum profit = 0.4 (1,000) + 0.6 (4,000) = 2,800, the manufacturer should adopt it.

1.3 Risk Analysis in Investment Decisions

Q8. Explain briefly about risk analysis in investment decisions.

Ans : **(Imp.)**

Introduction

Capital budgeting techniques, assumed that the proposed investment projects do not involve any risk. This assumption was made simply to facilitate the understanding of the capital budgeting techniques. In real world situation, however, the firm in general and its investment projects in particular are exposed to different of risk.

Nature of Risk

Risk exists because of the inability of the decision maker to make perfect forecasts. Forecasts cannot be made with perfection or certainty since the future events on which they depend are uncertain. An investment is not risky if, we can specify a unique sequence of cash flows for it. But whole trouble is that cash flows cannot be forecast accurately, and alternative sequences of cash flows can occur depending on the future events. Thus, risk arises in investment evaluation because we cannot anticipate the occurrence of the possible future events with certainty and consequently, cannot, make are correct prediction about the cash flow sequence.

To illustrate, let us suppose that a firm is considering a proposal to commit its funds in a machine, which will help to produce a new product. The demand for this product may be very sensitive to the general economic conditions. It may be very high under favourable economic conditions and very low under unfavourable economic conditions. Thus, the investment would be profitable in the former situation and unprofitable in the later case. But, it is quite difficult to predict the future state of economic conditions, uncertainty about the cash flows associated with the investment derives.

A large number of events influence forecasts. These events can be grouped in different ways. However, no particular grouping of events will be useful for all purposes. We may, for example, consider three broad categories of the events influencing the investment forecasts.

(i) General Economic Conditions: This category includes events which influence general level of business activity. The level of business activity might be affected by such events as internal and external economic and political situations, monetary and fiscal policies, social conditions etc.

(ii) Industry factors

This category of events may affect all companies in an industry. For example, companies in an industry would be affected by the industrial relations in the industry, by innovations, by change in material cost etc.

(iii) Company factors

This category of events may affect only a company. The change in management, strike in the company, a natural disaster such as flood or fire may affect directly a particular company.

1.3.1 Risk Adjusted Rate of Return

Q9. Discuss the concept of risk adjusted discount rate approach.

(OR)

What is Risk Adjusted Rate of Return?

(OR)

Explain Risk Adjusted discount method.

(OR)

Explain the relevance of Risk Adjusted rate of return in investment analysis.

Ans : **(Imp.)**

As Risk Adjusted Discount Rate (RADR) approach is very easy, it is widely used to incorporate risk into capital budgeting decision. The amount of risk which is already involved in a project is included in the discount rate used in calculations of present values. The projects which involves high risk have high discount rates and projects which are safe have low discount rates. Undoubtedly, the risk-adjusted discount rates display different risk in different types of investments.

In RADR approach, the minimum acceptable required rate of return is the cost of capital (k) or discount rate. In order to maximize the earnings of the shareholders and to increase market value of shares, the project must earn more than the rates earned in the economy for specified risk. A well accepted project is that in which required rate of return increases with increase in risk, increase in discount rate with increase in risk of the project. The discount rate which incorporate time and risk preference of investors is known as risk-adjusted discount rate.

Risk-adjusted discount = Risk free rate + Risk premium

$$k = k_f + k_r$$

In order to evaluate NPV under the RAD method following equation is used.

$$NPV = \sum_{t=1}^{h} \frac{CFAT}{(1+k_r)^t} - C_0$$

Where,

CFAT – Expected cash flow after tax in year t.

C_0 – Cash Outflows

k_r – Risk – adjusted rate

t – Time

When RADR approach is used with NPV, the project is accepted only if the value of NPV is positive. When IRR is used as decision criterion, IRR is compared with the risk-adjusted required rate of return. The project is accepted when *r* exceeds the risk adjusted rate.

Advantages

1. This technique is very simple and easy to evaluate and understand.
2. It is a consistent method because it is clear that a risky project involves higher expectations.

Disadvantages

1. It is difficult to find risk element, hence, it is taken randomly.
2. The cash flows must be adjusted in risky situation not the discount rate.
3. The assumption of constant increase in risk over the time is not suitable in all situations.

PROBLEM

9. Rahul Company Ltd. considers the purchase of a new investment. For which two alternatives investments are available (X and Y) each costing Rs. 1,00,000. Cash inflows are as follows,

Year	Cash Inflows	
	Investment 'X' (Rs.)	Investment 'Y' (Rs.)
1	50,000	45,000
2	45,000	25,000
3	35,000	20,000
4	25,000	40,000

The company has a target return on capital of 12%. Risk premium rates are 4% and 10% respectively for investments X and Y. Suggest which investment should be preferred.

Sol :

The profitability of the two investment are made depending upon net present values cash inflows adjusted for risk premium rates as follows.

	Investment 'X'			Investment 'y'		
Year	Discount Factor @ 12% + 4% = 16%	Cash Inflow (`)	Present Value (`)	Discount Factor @ 12% + 10% = 22%	Cash Inflows (`)	Present Value (`)
1	0.862	50,000	43,100	0.820	45,000	36,9000
2	0.743	45,000	33,435	0.672	25,000	16,800
3	0.641	35,000	22,435	0.551	20,000	11,020
4	0.552	25,000	13,800	0.451	40,000	18,040
			` 1,12,770			` 82,760

NPV = 'X' = 1,12,770
− 1,00,000
− 12,770

'Y' = 82,760
− 1,00,000
− 17,240

As investment 'X' gives higher net present value over investment 'X'. Hence, investment 'X' is to be preferred.

1.3.2 Certainty Equivalents

Q10. Explain briefly about certainty equivalent approach ?

(OR)

What is certainty equivalent approach ?

(OR)

What is certainty equivalent coefficient?

Ans : **(Dec.-19)**

The certainty-equivalent approach takes into account the risk factor in making estimations and appraisal of capital investment decisions. Under this technique, the estimated cashflows are adjusted by using risk-free rate to ascertain risk-free cashflows. The expected cashflows of the project are converted to equivalent riskless amounts. The smaller certainty equivalent will be used in case of an expected cash inflow and the larger certainty equivalent is used for payments.

The technique varies with the risk adjusted discount rate, which adjusts the risk by varying the discount rate. The certainty equivalent approach is theoretically a superior technique over the risk adjusted discount approach, because it can measure risk more accurately. The certainty equivalent factors will differ for different investment proposals. It is a conservative approach in making estimation of project cashflows, recognizing the risk factor in cashflows.

PROBLEMS

10. XYZ Ltd. is considering a project with the following expected cashflows. Initial investment Rs. 1,00,000 Expected cash inflows 1st year Rs. 70,000; 2nd year Rs. 60,000; 3rd year Rs.45,000. The cost of capital is 10%. Due to uncertainty of future cashflows, the management decides to reduce the cash inflows to certainty equivalents by taking only 80%, 70% and 60% respectively. Is it worth while to take up the project ?

Sol :

Calculation of Certainty Equivalents of Cash Inflows

1st year 70,000 × 80/100 = Rs. 56,000

2nd year 60,000 × 70/100 = Rs. 42,000

3rd year 45,000 × 60/100 = Rs. 27,000

Calculation of Risk Adjusted NPV of the Project

Year	Cashflow (Rs.)	P.V. factor (10%)	P.V. (Rs.)
0	(1,00,000)	1.000	(1,00,000)
1	56,000	0.909	50,904
2	42,000	0.826	34,692
3	27,000	0.751	20,277
			NPV = 5,873

NPV = EPV cashflow – EPV of cashoutlay = 1,05,873 – 1,00,000

NPV = 5,873

Decision : The NPV of the project is positive and, therefore, the project can be selected.

11. The Delta corporation is considering an investment in one of the two mutually exclusive proposals: project A which involves an initial outlay of 1,50,000. The certainty equivalent approach is employed in evaluating risky investments. The current yield on treasury bills is 0.05 and the company uses as the riskless rate.

The expected values of net cash flows with their respectively certainty-equivalents are :

Year	Project A		Project B	
	Cash flows (` Thousands)	Certainty-equivalent	Cash flows (` Thousands)	Certainty-equivalent
1	90	0.8	90	0.9
2	100	0.7	90	0.8
3	110	0.5	100	0.6

(a) Which project should be acceptable to the company?

(b) Which project is riskier ? How do you know?

(c) If the company was to use the risk-adjusted discount rate method, which project would analyzed with higher rate ?

Sol : **(May-19)**

(a) Calculation of NPV of Project A

Year	CFAT (` in 000's)	Certainty - Equivalent (CE)	Adjusted CFAT (CFAT × CE) (` in 000's)	PV factor (at 0.05)	Total PV
1	90	0.8	72	0.952	68,544
2	100	0.7	70	0.907	63,490
3	110	0.5	55	0.864	47,520
				Total PV	1,79,554
				Less : Initial Outlay	1,70,000
				NPV	**9,554**

Calculation of NPV of Project B

Year	CFAT (` in 000's)	Certainty - Equivalent (CE)	Adjusted CFAT (CFAT × CE) (` in 000's)	PV factor (at 0.05)	Total PV
1	90	0.9	81	0.952	77,112
2	90	0.8	72	0.907	65,304
3	100	0.6	60	0.864	51,840
				Total PV	1,94,256
				Less : Initial Outlay	1,50,000
				NPV	**44,256**

The NPV of Project B is higher than Project A. Thus the firm should accept Project B.

(b) Project A is riskier because its certainty-equivalent connected with expected CFAT is less.

(c) If the company was to use the risk adjusted discount rate method, then its should analyze the Project A with high discount rate because the Project A is more risky.

1.3.3 Probability Distribution of Cashflows

Q11. Explain briefly about probability distribution of cashflows ?

Ans :

The concept of probability for incorporating risk is already explained in evaluation process of capital budgeting proposals. The probability attribution approach used in evaluating risk in capital budgeting relies upon the performance of cash flows. Risk involved in capital budgeting can be determined by using a parameter of standard deviation.

The cash flows may be either independent or dependent cash flows.

1. Independent Cash Flows

The cash flows which are not affected by the previous years cash flows are known as independent cash flows. For example, cash flows in year 2 are not affected by the cash flows of first year. The dependent cash flows are completely opposite of independent cash flows.

The expected values of the probability distribution of NPV for any project can be mathematically expressed as,

$$NPV = \sum_{t=1}^{n} \frac{\overline{CF_t}}{(1+k_t)^t} - C_0$$

Where,

$\overline{CF_t}$ - Expected value of net cash flow

i - Risk free rate of interest

The standard deviation of the probability distribution of net present values are equal to,

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

Where, σ_t = Standard deviation of probability distribution of NPV for period *t.*

$$\sigma_t = \sqrt{\sum_{j=1}^{n} (\overline{CF}_{jt} - \overline{CF}_t)^2 \cdot P_{jt}}$$

➢ **Normal Probability Distribution**

In order to evaluate the component of risk in capital budgeting, normal probability distribution can be used. With the help of normal probability distribution, decision maker can have a clear perspective of expected values of NPV. The value of probability of NPV ≤ 0, then risk is very low and if value of probability of NPV > 0 there is considerable risk. Hence, normal probability distribution is very useful technique to analyze the risk involved in a project.

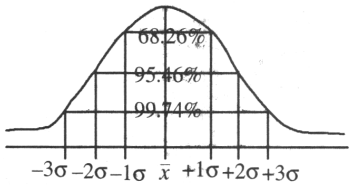


Fig.: Normal Curve

The complete area of normal probability distribution is equal to 1 (0.5 on each side). The distribution curve ranges between minus infinity to plus infinity.

2. Dependent Cash Flows

Most of the investment projects involves dependent cash flows. If the degree of correlation is high between cash flows, the standard deviation will also be large. But the expected values of NPV remains constant, irrespective of behaviour of cash flows.

➢ Perfect Correlation

Perfect correlation exists when standard deviation of cash flows in one period represents the same standard deviation of expected cash flow in the next period.

In case of perfect correlation, the standard deviation of cash flows can be expressed as,

$$\sigma = \sum_{t=1}^{n} \frac{\sigma_t}{(1+k_j)^t}$$

➢ Moderate Correlation

In moderate correlation, cash flows are neither perfectly correlated nor independent. The moderate cash flows can be controlled by using the concepts of decision tree and conditional probabilities.

The standard deviation of the projects when the cash flows are moderately correlated.

$$\sigma = \sqrt{\sum_{t=1}^{n} (NPV_j - ENPV)^2 P_j}$$

Where,

NPV_j – Net present value for series *j* of net cash flows

ENPV – Expected value of net present value

P_j – Probability of occurrence of the series.

PROBLEM

12. Two mutually exclusive investment proposals are considered. The following table gives the information.

Cost / Cash in flow / Year	Project P Rs. 5000		Project Q Rs. 5000	
	Rs.	Probability	Rs.	Probability
1	3,000	0.3	6,000	0.3
2	5,000	0.5	7,000	0.5
3	7,000	0.3	4,000	0.3
4	10,000	0.2	5,000	0.2

Cost of capital is 12% (Assumed). Suggest the selection of the project.

Sol :

Calculation of Net Present Values of the two Projects (P and Q)

Year	P.V Factor @ 12 % (1)	Project P Cash Inflow (2)	Probability (3)	Monetary Value 2 × 3 = (4)	Present Value 1 × 2 × 3 = (5)	Project Q Cash Inflows (6)	Probability (7)	Monetary Value 6 × 7 = (8)	Present Value 1 × 6 × 7 = (9)
1	0.893	3,000	0.3	900	804	6,000	0.3	1,800	1607.4
2	0.797	5,000	0.5	2,500	1992.5	7,000	0.5	3,500	2789.5
3	0.721	7,000	0.3	2,100	1495.2	4,000	0.3	1,200	854.4
4	0.635	10,000	0.2	2,000	1270	5,000	0.2	1,000	635
			Total present value		5562		Total present of value		5886.3

Project 'P'

= Total present value	=	5,562
(–) Cost of investment	=	5,000
		562

Project 'Q'

Total present value	=	5,886.3
(–) Cost of investment	=	5,000
		886.3

Conclusion

From the NPV table, it indicates that project 'Q' NPV is comparatively more over project 'P' after taking into consideration, the probabilities of cash inflows. Therefore, project 'Q' is more profitable.

1.3.4 Decision Tree

Q12. Define decision tree. Explain the steps involved in decision tree approach.

Ans : **(Imp.)**

Meaning

A decision tree is a branching diagram which is similar to a probability tree. It represents problems in a series of decisions to be made under conditions of uncertainty. Any one of the decisions may be dependent on the outcome of preceding or the outcomes of a trial.

A decision tree is a diagrammatic representation of the relationships among decisions states of nature and payoffs (or outcomes). The first step is to draw a diagram which shows the structure of the problem. Decision trees are constructed from left to right. The branches represent the possible alternative decisions which could be made and the various possible outcomes which might arise. It is helpful to distinguish between the two types of branch.

Steps

1. The investment proposal must be clearly explained such as which department is going to finance the proposal, marketing or production or any other department and whether investment proposal is to enter a new market or to introduce a new product.
2. After defining the project, alternatives of the decision must be identified. Each alternative will have different outcomes and probabilities.
3. The next step in decision tree approach is to draw a decision tree which represents the decision points, chance events and other data. The related information about probability distribution, projected cash flows, the expected present value, etc., are recorded on the branches of decision tree.
4. Final step is to evaluate all alternatives and choose the best one.

Q13. Explain the advantages and disadvantages of decision tree approach.

Ans :

Advantages

Are simple to understand and interpret. People are able to understand decision tree models after a brief explanation.

- Have value even with little hard data. Important insights can be generated based on experts describing a situation (its alternatives, probabilities, and costs) and their preferences for outcomes.
- Help determine worst, best and expected values for different scenarios.
- Use a white box model. If a given result is provided by a model.
- Can be combined with other decision techniques.

Disadvantages

They are unstable, meaning that a small change in the data can lead to a large change in the structure of the optimal decision tree.

- They are often relatively inaccurate. Many other predictors perform better with similar data. This can be remedied by replacing a single decision tree with a random forest of decision trees, but a random forest is not as easy to interpret as a single decision tree.
- For data including categorical variables with different number of levels, information gain in decision trees is biased in favor of those attributes with more levels.
- Calculations can get very complex, particularly if many values are uncertain and/or if many outcomes are linked.

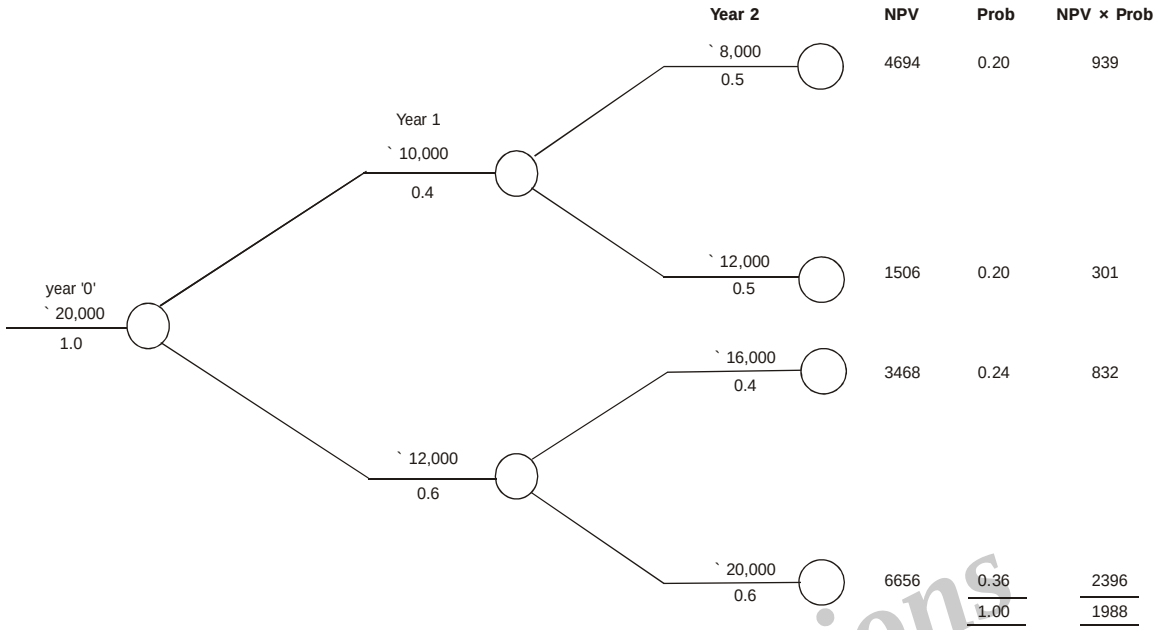
PROBLEMS

13. A company is considering new equipment. The net cash flows of the equipment have been estimated as given below. The equipment's life is estimated to be two years.

	Year 1	Probability	Year 2	Probability
NCF	10,000	0.4	8,000	0.5
			12,000	0.5
NCF	12,000	0.6	16,000	0.4
			20,000	0.6

The cost of equipment is ` 20,000 and the company's cost of capital is 12 per cent. Use the decision tree approach to recommend whether the equipment should be bought or not.

Sol :



The tree diagram shows four possible outcomes which are indicated by branch or path. The NPV's are computed by taking into consideration discount factor @ 12% (given).

1. (10000 x 0.893 + 8000 x 0.797) - (20000) = - 4694.
2. (10000 x 0.893 + 12000 x 0.797) - (20000) = - 1506.
3. (12000 x 0.893 + 16000 x 0.797) - (20000) = 3468.
4. (12000 x 0.893 + 20000 x 0.797) - (20000) = 6656.

As the NPV is positive it is advisable to bought the equipment.

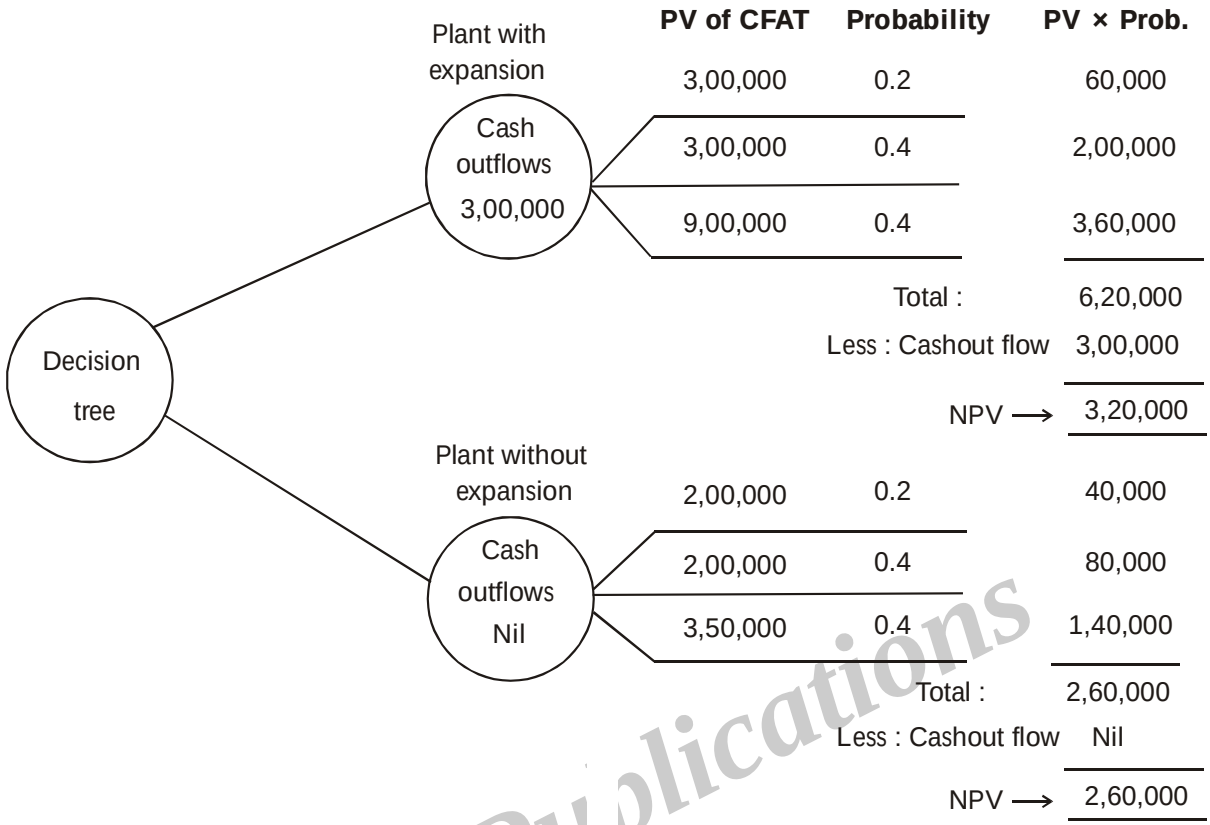
14. A company has the following estimates of the present values of the future cash flows after taxes associated with the investment proposal, concerned with expanding the plant capacity. it intends to use a decision approach to get a clear picture of the possible outcomes of this investment. The plant expansion a expected to cost ` 3,00,000. The respective PVS of future CDAT and probabilities are as follows,

With expansion (`)	Without expansion (`)	Probabilities
3,00,000	` 2,00,000	0.2
5,00,000	2,00,000	0.4
9,00,000	3,50,000	0.4

Advise the company regarding the financial feasibility of the project.

Sol:

The decision tree corresponding to given data is shown below,



From the above calculation, NPV is expected to be ` 3,20,000 with plant expansion and ` 2,60,000 without plant expansion.

Therefore, it is recommended that the company should expand the capacity of the plant.

1.3.5 Sensitivity Analysis

Q14. Explain briefly about sensitivity analysis.

(OR)

What is a sensitivity analysis? Explain its impact on project investment decisions.

Ans : **(May-19)**

In uncertainty and probability analysis the degree of confidence depend not only on the data available on the events, and the influences but also extent of sensitivity of influences on the events.

Sensitivity analysis can help to mitigate the impact of influences, depending upon the severity of damage occurring out of risks. To control the influence the sensitivities are analyzed. Sensitivity analysis is made along with uncertainty and probability analysis, to determine the extent of action to be taken. The higher the sensitivity of influences on event, higher the risk and the damage.

Sensitivity analysis is the study of the key assumptions or calculations on which a management decision is based in order to predict alternative outcomes of that decision if different assumptions are adopted. Sensitivity analysis is a modelling procedure used in forecasting whereby changes are made in the estimates of the variables to establish whether any will critically affect the outcome of the forecast.

It is a study to determine the responsiveness of the conclusions of an analysis to changes or errors in parameter values used in the analysis, seeks to test the responsiveness of outcomes from decision models

to different input values and constraints as a basis for appraising the relative risk of alternative courses of action. It is possible to use sensitivity analysis for helping to determine the value of information in addition to its role in strategic decision making. Sensitivity analysis seeks to determine the range of variations in the coefficients over which the solution will remain optimal.

Sensitivity analysis is used in determination of risk factor in capital budgeting decisions. It aids in identifying the most sensitive factor, that may cause the error in estimation. Sensitivity analysis tells about the responsiveness of each factor on the project's NPV or IRR.

For example, a 5% change in the selling price will cause 10% change on NPV, that means an increase of 5% in the selling price will increase 10% of the amount of NPV. Likewise, sensitivity analysis is done for all other factors like materials cost, labour cost, variable overhead, fixed overhead etc. Then, the most sensitive factor of all will be identified to evaluate the risk of that particular factor. Sensitivity analysis involves the following three steps:

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

ii) Definition of the underlying quantitative relationship among the variables.

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

Sensitivity analysis helps to prevent rash predictions about the outcome of plans by ensuring that the assumptions on which the plans are based are examined and that the effect of changes in these assumptions is gauged. This process may involve challenging the original assumptions and could result in a rethink about the project. Sensitivity analysis can indicate areas where improvements are likely to have the greatest impact on results. In presenting a range of possible outcomes, sensitivity analysis facilitates the development of alternative or contingency plans if the basic assumptions have to be changed.

PROBLEMS

15. Premier Industries Ltd. has prepared the following budgeted profitability statement for the current year operations:

Particulars		(Rs.)
Sales	**(2500 units × Rs. 4)**	**10,000**
Variable cost :		
Materials	**4,000**	
Labour	**3,000**	**7,000**
Contribution		**3,000**
Less : Fixed cost		**2,000**
Profit		**1,000**

Make a sensitivity analysis based on the above data.

Sol :

The changes in the sales revenue and costs on profit can be analyzed with the help of sensitivity analysis as follows:

(a) If selling price is reduced by more than 10% budgeted, the company would incur loss.

(b) If the sales are reduced by more than 10% of the budgeted sales of 2500 units, the company would incur loss.

(c) If labour costs increase by more than 33.33% above the budgeted, the company would make a loss.

(d) If material cost increases by 25% or more of the budgeted cost, the company would make a loss.

(e) If the fixed costs increase by more than 50% of budgeted fixed cost, the company would incur loss.

If we observe the sensitivity of the above data, sales units and selling price per units is more sensitive than other items of cost. Hence this area remain careful consideration.

16. X Ltd. is considering a project with the following cashflow:

Year	Purchase of plant	Running cost	Savings
0	70,000	–	
1	-	20,000	60,000
2	-	25,000	70,000

The cost of capital is 8%. Mea sure the sensitivity of the project to changes in the level of running cost, savings and plant cost. Which factor is the most sensitive ?

The present values of Re. 1 at 8% for year 1 and year 2 are respectively 0.9259 and 0.8573.

Sol :

Particulars			Amount
P V of Savings			
Year 1	(60,000 × 0.9259)		55,554
Year 2	(70,000 × 0.8573)		60,011
			1,15,565
Less : P.V. of Running Cost			
Year 1	(20,000 × 0.9259)	18,518	
Year 2	(25,000 × 0.8573)	21,432	39,950
Net savings			75,615
Less: Purchase cost of plant			70,000
Net present value			5,615

i) Sensitivity for Plant Cost

If the purchase cost of plant increases by Rs. 5,615, the NPV of the project will become zero. Therefore, the sensitivity for plant cost is :

$$= \frac{5,615}{70,000} \times 100$$

$$= 8.02\%$$

ii) Sensitivity for Running Cost

If the present value of running cost increases by Rs. 5,615, the NPV of the project will become zero. Therefore, the sensitivity for running cost is :

$$\frac{5,615}{39,950} \times 100$$

$$= 14.06\%$$

iii) Sensitivity for Savings

If the savings decrease by Rs. 5,615, the NPV becomes zero. Therefore, the sensitivity for savings is: 5,615

$$\frac{5,615}{1.15.565} \times 100 = 4.86\%$$

Analysis - Savings is most sensitive.

17. From the following project details calculate the sensitivity of the (i) Project cost, (ii) Annual cashflow, and (iii) Cost of capital. Which variable is the most sensitive?

Project cost	**Rs. 12,000**	**Annual cashflow**	**Rs. 4,500**
Life of the project	**4 years**	**Cost of capital**	**14%**

The annuity factor at 14% for 4 years is 2.9137 and at 18% for 4 years is 2.6667.

Sol :

Particulars		(Rs.)
Annual cash inflow	(4,500 × 2.9137)	13,112
Less : Project cost		12,000
Net present value		1,112

i) Sensitivity for Project Cost

If the project cost is increased by Rs. 1,112, the NPV of the project will become zero. Therefore, the sensitivity for project cost is :

$$\frac{1,112}{12,000} \times 100 = 9.27\%$$

ii) Sensitivity for Annual Cash Inflow

If the present value of annual cash inflow is lower by Rs. 1,112, the NPV of the project will become zero. Therefore, the sensitivity for annual cash flow is :

$$\frac{1,112}{13.112} \times 100 = 8.48\%$$

iii) Sensitivity for Cost of Capital

Let *'x'* be the annuity factor which gives a zero NPV i.e. *'x'* is the IRR

$-12,000 + 4,500x = 0$

$$4{,}500x = 12{,}000$$

$$x = 12{,}000/4{,}500 = 2.6667$$

Hence, x = 2.6667 and at 18% for 4 years, the annuity factor is 2.6667.

$$\text{Sensitivity \%} = \frac{18\% - 14\%}{14\%} = 20\%$$

Analysis - The cash inflow is more sensitive, since only 8.5% change in cash inflow will make the NPV of the project zero.

1.4 Monte Carlo Approach to Simulation

Q15. What is simulation ? Explain the nature of simulation.

Ans :

Meaning

In real life, many problem occur which cannot be defined by a mathematical representation because of their stochastic nature, complexity in problem formulation or conflicts in idea that describe the exact nature of the problem. For these types of problems, simulation is generally used to describe the problems when other processes fail.

Simulating the model means experimenting the model by trying alternate actions and then comparing the consequences of these actions. This provide answers to many questions arising during the experimentation. This technique is used in almost all fields limited by our imagination and the ability to translate these imagination in to computer directives or in a mathematical model. It is one of the easiest and probably the hardest tool to apply and most difficult to draw accurate solutions.

For example, in location of ambulances, it is hard to identify the location from where the demand for ambulance would arise. In this case, simulation is required for scheduling the ambulances, their location, their response to a particular demand, quality of service etc. Simulation is defined by various authors in various ways, which are stated as follows,

Definitions

(i) **According to Donald. G.Malcolm** A simulated model may be defined as one which depicts the working of a large scale system of men, machines, materials and information operating over a period of time in a simulated environment of the actual real world conditions.

(ii) **According to Shannon** Simulation is the process of designing a model of real system and conducting experiments with this model for the purpose of understanding the behaviour (within the limits imposed by a criterion or set of criteria) for the operation of the system.

(iii) **According to T.H.Naylor etal** Simulation is a numerical technique for conducting experiments on a digital computer, which involves certain types of mathematical and logical relationships necessary to describe the behaviour and structure of a complex real world system over extended periods of time.

Simulation is a process of designing and representing a life situation by using numbers and other symbols which can be easily changed. It is used as a decision making tool by corporate managers.

It is a quantitative technique used for constructing a model which represent the real life situation and project solution to the problems by conducting several experiments on the model.

Even though it is not an optimization technique, it is used widely in order to estimate the performance of a constructed model.

The results obtained from the simulation process are analyzed statistically because it is a statistical experiment.

Simulation can be used in different areas like reservation counters, bank counters, inspection departments, automobile industry, computers, communication networks, inventory control, economic forecasting, biomedical systems, war strategies etc.

Nature

Simulation is a statistical technique to simulate or imitate the given real world situations.

If the model and the relationship study of its elements are simple then even the basic mathematical techniques like algebra, probability, calculus etc., can be used to obtain the desired information. This is called analytical solution.

As, the real world models are highly complex, its very much difficult for anyone to evaluate them through analytical methods. Under such circumstances, simulation technique plays a vital role wherein model assessment, data collection is done by using computer.

Broadly speaking, it is a technique which conducts experiments on the models that have been constructed based on real life situations.

Simulation is of different forms like,

1. Digital simulation
2. Physical simulation and
3. Analog simulation.

But OR is basically concerned with digital simulations, whose task is manipulation of mathematical models.

Following are the different types of simulation models,

1. Deterministic versus stochastic simulation models
2. Static versus dynamic simulation models and
3. Continuous versus discrete simulation models.

Q16. What are the various types of Simulation ?

Ans :

1. Continuous Models

Such model consist of system whose behaviour is a function of time i.e., behaviour of the system changes with respect to time. In this models, various difference differential equations are used to describe the interface between the different system elements.

2. Discrete Models

In contract to the above model, here changes occurs only at specific points (usually referred to as discrete points) during a particular period of time.

This model is extensively used in waiting lines, where it helps in calculating average waiting line and length of queue changes in such activities are noticed on the arrival or departure of any customer.

3. Analog simulation (Environmental Simulation)

In this type of simulation the reality is represented in physical form.

Example : The game of snake and ladder is used to simulate the morality of the players, if he/she is moving up by using ladder, it indicates the goodness where as if he/she comes down by being swallowed up by the snake, shows their temptation indicating badness.

4. Computer Simulation (System Simulation)

Complicated managerial decision making problems cannot be resolved by using analog simulation and it may be uneconomical to carry out the actual experimentation with the system.

In this type, the problem is solved by using high speed electronic computers wherein a mathematical model is generated for a complex system based on this model a computer programme is developed, which helps in attaining the solution accurately.

5. Deterministic and Probabilistic Simulation

When the process under consideration is complicated and involves multiple stages with high degree of iterations then they can be resolved by using deterministic simulation. Deterministic simulation adopts fixed procedures for the determination of outcomes and performance. Probabilistic simulation is used when one or more of given variables are independent.

6. Time Dependent and Independent Simulation

In time dependent simulation, determining the time when the event is likely to happen is necessary.

For example: In order to ensure the smooth functioning of manufacturing activities, lead time for the required raw material should be determined.

In time independent simulation, it is not necessary to have the knowledge of when the event would likely to happen.

For example: If an item is processed four times a day it is not necessary to know exactly at what particular time it will be processed, but is needs to be processed at any point of time during a whole day.

7. Visual Interactive Simulation

When any real life situation has to be simulated then it must be done in the form of a computer algorithm by constructing a model which is an exact replica of real life situation. This type of simulation uses computer graphics to represent the simulation results that have been obtained due to the variations in the value of inputs.

8. Business Games

This simulation consists of many participants who are playing their respective roles and are simulating the real competition.

Like in real life, here also individuals or team compete with their competitors so as to attain their goals.

9. Corporate and Financial Simulations

It is used in corporate planning particularly in the financial planning of corporates.

When the financial risk is to be analyzed then several activities like production, marketing, finance etc., are integrated into a single model i.e., either deterministic or probabilistic model.

Q17. Explain the steps involved in the process of simulation by Monte-Carlo Simulation.

(OR)

Explain Monte Carlo Approach to Simulation.

Ans : **(Sep.-20)**

This technique involves conducting continuous experiments on the model with known probability distribution in order to draw random samples using random numbers. If the system cannot be described by a probability distribution, then an empirical probability distribution can be constructed. In general, the problem is solved by simulating the data with random number generators. This involves use of two things. One is the model that represents the system under consideration and two the mechanism to simulate the model. The basic steps involved in simulation by Monte-Carlo technique are as follows,

1. The probability distribution is set up for the variables to be analyzed.
2. For each random variable, cumulative probability distribution is build up.
3. Generating random numbers and then assigning set of random numbers to each random variable.
4. Conducting experiment using random sampling.
5. Step 4 is repeated until the required number of simulation runs has been generated.
6. A course of action is then designed and implemented.

Q18. What are random numbers ? Explain the generation of random numbers.

Ans :

A random number is a number obtained from sequential numbers whose probability is same as compared to the list of sequential numbers. When random numbers are generated from some deterministic process then they are called as "Pseudo-random numbers".

Generation of Random Numbers

Monte-Carlo simulation is widely used in generating random numbers. It is one of the most important aspect of simulation model. It is used to ascertain random observations from the probability distribution. Random numbers must be assigned in equal proportions in accordance with their probability distribution. Random numbers can be generated through computer random tables or manually.

The devices used for ascertaining random numbers are roulette wheels, dice rolling, card shuffling etc. Mostly, for generating random numbers computer program are used which lies between 0 and 1. If random numbers are generated in conjunction with the cumulative probability distribution of a random variable then they should be in multiples of 0 but not of 1.

The random numbers which have been selected from a table must not depend on the starting point of a table and can be randomly started with any row or column without deviating from the pattern. If random numbers are selected from more than one concerned variable than different list of numbers for each variables are considered.

Mid-square Method of Generating Pseudo - random Numbers

This method is most commonly used for generating sequences of pseudo-random numbers. This method have the following steps,

Step 1

Select any four digit integer so as to start the simulation process. The first random number can be obtained in the following manner,

Step 2

Selected four digit integer (say 2345) must be squared.

Step 3

The resulting number is (5499025). The resultant number should contain 8 digits if the resultant numbers have less than 8 digits, then insert zero at the beginning of the number (as 05499025).

Step 4

From the resultant number select middle four digits (4990) which may become the random number for the new process. In this procedure, pseudo-random numbers are generated.

Every time, the entire process needs to be repeated for getting the pseudo-random numbers.

Q19. Explain any two probability distributions applied to discrete random variables.

Ans :

In Monte Carlo simulation, it is necessary to develop a series of random numbers. This series of random numbers are useful in selecting random observations (samples) from the probability distribution.

(i) Arithmetic Computation

The multiplicative congruential method is used to generate N^{th} random number R_N which is a combination of d-digits. Mathematically, it can be computed as,

$$R_N = P.R_{N-1} \text{ (modulo M)}$$

Both P and M are positive integers, $P < M$, R_{N-1} is a d-digit number whereas modulo M indicates that when $P.R_{N-1}$ is divisible by 'M' it leaves R_N as remainder which represents that R_N and PR_{N-1} varies by an integer multiple of 'M'.

The process of generating random numbers when first random number R_0 is determined by the user. A series of d-digit random number with period $H < M$ is generated again by using recurrence relation.

For example, let P = 25, M = 100 and arbitrarily begin with $R_0 = 65$. Since M – 1 = 99 is a 2-digit number, so it will generate 2-digit random numbers.

$R_1 = P.R_0$ (modulo M)

$= 25 \times 65$ (Modulo 100)

$= \frac{1625}{100} = 25$, Remainder

$R_2 = P.R_1$ (modulo M)

$= 25 \times 25$ (Modulo 100)

$= \frac{625}{100} = 25$, Remainder

$R_3 = P.R_2$ (modulo M)

$= 25 \times 25$ (Modulo 100)

$= \frac{625}{100} = 75$, Remainder

The selection between R_0 and P for any given value of M must be done with great care as the technique used for generating the random numbers is not applying the random process instead they can be computed from the input data. Hence, the numbers generated by using this process are known as pseudo random numbers as they are reproducible and cannot be selected randomly. Random numbers can also be generated as decimal fraction between 0 and 1 with desired number of digits by using recurrence relation. In order to generate uniformly distributed decimal fraction between 0 and 1, the recurrence relation $U_N = R_N / M$ is used.

(ii) Computer Generator

Using computer software, the random numbers which are generated are uniformly distributed decimal fractions between 0 and 1. This software is based on the cumulative distribution function through which the random numbers could be generated. For instance, the negative exponential function, with density function $F(a) = \lambda e^{-\lambda a}$, $0 < a < \infty$, the cumulative distribution function is given by.

$$F(a) = \int_0^a \lambda e^{-\lambda a}\, da$$

$$= \lambda \left[\frac{e^{-\lambda a}}{-\lambda}\right]_0^a = [e^{-\lambda a} + e^{-0}] = [-e^{-\lambda a} + 1] = 1 - e^{-\lambda a}$$

or

$$e^{-\lambda a} = 1 - F(a)$$

Taking logarithm on both sides, we get,

$$-\lambda a = \log [1 - F(a)]$$

$$a = -\left(\frac{1}{\lambda}\right) \log [1 - F(a)]$$

Suppose R = F(a) which is uniformly distributed random decimal fraction between 0 and 1, then the exponential variable related with R is represented by.

$$a_N = -\left(\frac{1}{\lambda}\right) \log (1 - R) = -\left(\frac{1}{\lambda}\right) \log R.$$

It is exponential process generator as 1 – R is a random number which can be replaced by 'R'.

PROBLEMS

18. An investment corporation considers three independent factors namely,

i) Market demand in units

ii) Price per unit minus cost per unit and

iii) The investment required.

These factors are considered to carry out the investment project and to analyze new consumer product. The probability distribution of investment corporation related to new consumer product are as follows,

Annual Demand	Probability	(Price-cost) Per unit Rs.	Probability	Investment (Rs.)	Required Probability
30,000	0.03	2.00	0.09	29,80,000	0.30
35,000	0.07	6.00	0.19	40,00,000	0.40
40,000	0.15	8.00	0.20	45,00,000	0.30
45,000	0.20	11.00	0.25		
50,000	0.25	12.00	0.27		
55,000	0.10				
60,000	0.20				

By using simulation process, repeat the trial 10 times. Based on the data provided for each trial calculate return on investment and determine the most likely return. Use the following random numbers to determine annual demand, (Price-Cost) and the investment required,

i) 25, 30, 38, 52, 67, 72, 78, 80, 90, 95;

ii) 15, 18, 21, 42, 63, 74, 81, 87, 97, 16;

iii) 11, 20, 26, 37, 58, 49, 04, 90, 79, 90;

Sol :

Determination of Probabilities, Cumulative Probabilities and Random Numbers Assigned.

Probability	Cumulative Probabilities	Random Number Assigned	Probabilities	Cumulative Probabilities	Random numbers Assigned	Probability	Cumulative Probabilities	Random Number Assigned
0.03	0.03	00–02	0.09	0.09	00–08	0.30	0.30	00-29
0.07	0.10	03–09	0.19	0.28	09–27	0.40	0.70	30-69
0.15	0.25	10–24	0.20	0.48	28–47	0.30	1.00	70-99
0.20	0.45	25–44	0.25	0.73	48–72			
0.25	0.70	45–69	0.27	1.00	73–99			
0.10	0.80	70–79						
0.20	1.00	80–99						

The Results of the Simulation are as Follows

Trials	Random Number for Demand	Simulated Demand (000's)	Random Number for Profit (Price-cost) Per Unit	Simulated Profit (Rs.)	Simulated Number of Investment	Simulated Investment (000's) Rs.	Simulated Return(%) Demand × Profit per Investment
1	25	45	15	6	11	2980	9.06
2	30	45	18	6	20	2980	9.06
3	38	45	21	6	26	2980	9.06
4	52	50	42	8	37	4000	10.00
5	67	50	63	11	58	4000	13.75
6	72	55	74	12	49	4000	16.50
7	78	55	81	12	04	2980	22.15
8	80	60	87	12	90	4500	16.00
9	90	60	97	12	79	4500	16.00
10	95	60	16	6	90	4500	8.00

Working Notes

(i) Random number for demand i.e., trial (1) is 25.

The number 25 falls in the range of 25-44, hence stimulated demand 45,000 is taken similarly for other trials.

(ii) Random number for profit for trial (1) is 15.

The number 15 falls in the range of 09-27, hence simulated profit is 6 similarly for other trials.

(iii) Simulated number for investment for trial (1) is 11.

The number 11 falls in the range of 00-29, hence simulated investment 2980 is taken similarly for other trials.

(iv) Simulated return (%). Demand × Profit per investment is arrived by,

Trial (1) $\frac{45 \times 6}{2980} \times 100 = 9.06$

Trial (2) $\frac{45 \times 6}{2980} \times 100 = 9.06$

Trial (3) $\frac{45 \times 6}{2980} \times 100 = 9.06$

Trial (4) $\frac{50 \times 8}{4000} \times 100 = 10.00$

Trial (5) $\frac{50 \times 11}{4000} \times 100 = 13.75$

Trial (6) $\frac{55 \times 12}{4000} \times 100 = 16.50$

Trial (7) $\frac{55 \times 12}{2980} \times 100 = 22.15$

Trial (8) $\frac{60 \times 12}{4500} \times 100 = 16.00$

Trial (9) $\frac{60 \times 12}{4500} \times 100 = 16.00$

Trial (10) $\frac{60 \times 6}{4500} \times 100 = 8.00$

The yearly return is computed by the formula,

$$\text{Return (R)} = \frac{[\text{Price} - \text{Cost}] \times \text{Number of units demanded}}{\text{Investment}} \times 100$$

Conclusion

From the table it is observed that most likely return is 22.15% which is corresponding to the annual demand of 55,000 units yielding a profit of Rs. 12 per unit and the required investment will be Rs. 29,80,000.

19. The management of XYZ company is analyzing marketing of a new product. The fixed cost involved in the new project is estimated Rs. 5000. The factors which are uncertain are the selling price, variable cost and the annual sales volume. The shelf-life of a product is only one year. The management possess the data of these three factors as follows,

Selling Price Rs.	Probability	Variable Cost Rs.	Probability	Sales Volume (Units)	Probability
4	0.3	2	0.2	3000	0.4
5	0.5	3	0.7	4000	0.2
6	0.2	4	0.1	6000	0.4

The following is the sequence of thirty random numbers,

91 43, 70; 02 49 51; 78 14 21; 9 80 05; 49 63 84; 39 57 09; 18 53 74; 29 77 44; 94 21 70; 11 38 79.

Using the sequence (First 3 random numbers for the first trial etc). Simulate the average profit for the above project based on 10 trials.

Sol :

The random numbers 00-99 are assigned as per the probabilities related with each variable as follows,

Selling Price (Rs.)	Probabilities	Cumulative Probabilities	Random Numbers Assigned
4	0.3	0.3	00-29
5	0.5	0.8	30-79
6	0.2	1.0	80-99
Variable Cost (Rs.)			
2	0.2	0.2	00-19
3	0.7	0.9	20-89
4	0.1	1.0	90-99
Sales Volume (Units)			
3000	0.4	0.4	00-39
4000	0.2	0.6	40-59
6000	0.4	1.0	60-99

Based on the given random numbers, the output of 10 trials can be simulated to determine the average profit for the project.

S.No.	Random Number	Selling Price (Rs.)	Random Number	Variable Cost (Rs.)	Random Number	Sales Volume (000 Units)
1	91	6	43	3	70	6
2	02	4	49	3	51	4
3	78	5	14	2	21	3
4	9	4	80	3	05	3
5	49	5	63	3	84	6
6	39	5	57	3	09	3
7	18	4	53	3	74	6
8	29	4	77	3	44	4
9	94	6	21	3	70	6
10	11	4	38	3	79	6

Profit is given by the formula.

$$\text{Profit} = (\text{Selling Price} - \text{Variable cost}) \times \text{Sales Volume} - \text{Fixed Cost}$$

Simulated Profit in Ten Trials are as follows :

S.No.	Profit
1	(Rs. 6 – Rs. 3) × 6000 Units – Rs. 5000 = Rs. 13000
2	(Rs. 4 – Rs. 3) × 4000 Units – Rs. 5000 = Rs. (1000)
3	(Rs. 5 – Rs. 2) × 3000 Units – Rs. 5000 = Rs. 4000
4	(Rs. 4 – Rs. 3) × 3000 Units – Rs. 5000 = Rs. (2000)
5	(Rs. 5 – Rs. 3) × 6000 Units – Rs. 5000 = Rs. 7000
6	(Rs. 5 – Rs. 3) × 3000 Units – Rs. 5000 = Rs. 1000
7	(Rs. 4 – Rs. 3) × 6000 Units – Rs. 5000 = Rs. 1000
8	(Rs. 4 – Rs. 3) × 4000 Units – Rs. 5000 = Rs. (1000)
9	(Rs. 6 – Rs. 3) × 6000 Units – Rs. 5000 = Rs. 13000
10	(Rs. 4 – Rs. 3) × 6000 Units – Rs. 5000 = Rs. 1000

Therefore, average profit per trial is arrived by = $\frac{36,000}{10}$ = 3,600.

1.5 Investment Decisions under Capital Constraints

Q20. Explain the various investment decisions under capital constraints.

Ans :

Firms may have to choose among profitable investment opportunities because of the limited financial resources. Net present value (NPV) is the most valid section rule even under the capital rationing situations.

A firm should accept all investment projects with positive net present value (NPV) in order to maximize the wealth of shareholders. The net present value (NPV) rule tells us to spend funds in the projects until the net present value (NPV) of the last project is zero.

Capital rationing refers to a situation where the firm is constrained for external, or self imposed, reasons to obtain necessary funds to invest in all investment projects with positive net present value (NPV). Under capital rationing, the management has not simply to determine the profitable investment opportunities, but it has also to decide to obtain that combination of the profitable projects which yields highest net present value (NPV) within the available funds.

1.5.1 Capital Rationings

Q21. Define capital rationing.

Ans :

Meaning

Capital rationing is a technique of selecting the projects that maximizes the firm's value when the capital infusion is restricted. Two types of capital rationing are soft and hard capital rationing. The calculation and method prescribes arranging projects in descending order of their profitability based on IRR, NPV and PI and selecting the optimal combination.

Definition

It can be defined as a process of distributing available capital among the various investment proposals in such a manner that the firm achieves maximum increase in its value.

Reasons

1. Increase in cost of capital

Companies want to avoid the direct costs (i.e., flotation costs) and the indirect costs of issuing new capital. After a limit, cost of raising additional capital will increase because companies have limited assets to back secure loans.

2. Lack of managerial abilities and skillful employees

Companies don't have enough managerial, marketing, or engineering staff to implement all positive NPV projects.

3. Lack of reliable forecasts

Companies believe that the project's managers forecast unreasonably high cash flow estimates, so companies "filter" out the worst projects by limiting the total amount of projects that can be accepted.

Q22. Explain the different types of Capital Rationing.

Ans :

Based on the source of restriction imposed on the capital, the capital rationing is divided into two types viz. hard capital rationing and soft capital rationing.

i) Soft Capital Rationing

It is when the restriction is imposed by the management.

Reasons

Soft capital rationing, on the other hand, is a company-led capital restriction due to the following reasons :

- **Promoters' Decision:** The promoters of the company may decide to limit raising more capital too soon for the fear of losing control of the company's operations. They may prefer to raise funds slowly and over a longer period to ensure their control on the company. Moreover, this could also help in getting a better valuation while raising capital in the future.
- **Increase in Opportunity Cost of Capital:** Too much leverage in the capital structure makes the company a riskier investment. This leads to increase in the opportunity cost of capital. The companies aim to keep their solvency and liquidity ratios in control by limiting the amount of debt raised.
- **Future Scenarios:** The companies follow soft rationing to be ready for the opportunities available in the future, such as a project with a better rate of return or a decline in the cost of capital. There is prudence in conserving some capital for such future scenarios.

ii) Hard Capital Rationing

It is when the capital infusion is limited by external sources.

Reasons

Hard capital rationing is an external form of capital rationing. The company finds itself in a position where it is not able to generate external funds to finance its investments.

There could be several reasons for this scenario :

- **Start-up Firms:** Generally, young start-up firms are not able to raise the funds from equity markets. This may happen despite the high projected returns or the lucrative future of the company.
- **Poor Management / Track Record:** The external funds can also be affected by the bad track record of the company or the poor management team. The lenders can consider such companies as a risky asset and may shy away from investing in projects of these companies.
- **Lender's Restrictions:** Quite often, medium sized and large sized companies rely on institutional investors and banks for most of their debt requirements. There may be restrictions and debt covenants placed by these lenders which affect the company's fund-raising strategy.
- **Industry Specific Factors:** There could be a general downfall in the entire industry affecting the fund raising abilities of a company.

Q23. Explain the various methods of Capital Rationing Decisions.

(OR)

Explain the methods of Capital Rationing.

Ans : **(Dec.-19)**

Capital rationing decisions by managers are made to attain the optimum utilization of the available capital. It is not wrong to say that all the investments with positive NPV should be accepted but at the same time the ground reality prevails that the availability of capital is limited. The option of achieving the best is ruled out and therefore rational approach is to make most out of the on hand capital.

Capital Rationing Method

The method of capital rationing can be bifurcated in four steps. The steps are

1. Evaluation of all the investment proposals using the capital budgeting techniques of Net Present Value (NPV), Internal Rate of Return (IRR) and Profitability Index (PI)
2. Rank them based on various criterion viz. NPV, IRR, and Profitability Index
3. Select the projects in descending order of their profitability till the capital budget exhausts based on each capital budgeting technique.
4. Compare the result of each technique with respect to total NPV and select the best out of that.

Single Period and Multi Period Capital Rationing

Capital rationing can be distinguished on the basis of the period of rationing too. Single period rationing is when there is a capital shortage for one period only. Profitability Index (PI) is the most popular method used in this scenario. Multi period rationing occurs when the shortage is for more than one period. Linear programming technique is used to rank projects in multi period rationing

Capital rationing is caused by external or internal forces which are levied by the management. It is of two types,

(i) External capital rationing

(ii) Internal capital rationing.

(i) External Capital Rationing

External capital rationing has emerged due to deficiency in capital markets which are result of shortage in market information or fixed attitude that restricts free flow of capital.

(ii) Internal Capital Rationing

Internal capital rationing is developed due to restriction set up by the management. Management implement different distributions like not to acquire additional funds through debt, fix an arbitrary limit to amount of funds to be invested, etc. At times, it is impossible to evaluate capital rationing internally.

Q24. Explain the merits and demerits of capital rationing.

Ans :

Merits

Capital rationing is a very prevalent situation in companies. There are few advantages of practicing capital rationing :

- **Budget:** The first and an important advantage is that capital rationing introduces a sense of strict budgeting of corporate resources of a company. Whenever there is an injunction of capital in the form of more borrowings or stock issuance capital, the resources are properly handled and invested in profitable projects.
- **No Wastage:** Capital rationing prevents wastage of resources by not investing in each and every new project available for investment.
- **Fewer Projects:** Capital rationing ensures that less number of projects are selected by imposing capital restrictions. This helps in keeping the number of active projects to minimum and thus manage them well.
- **Higher Returns:** Through capital rationing, companies invest only in projects where the expected return is high, thus eliminating projects with lower returns on capital.

- **More Stability:** As the company is not investing in every project, the finances are not over-extended. This helps in having adequate finances for tough times and ensures more stability and increase in the stock price of the company.

Demerits

Capital rationing comes with its own set of disadvantages as well :

- **Efficient Capital Markets:** Under efficient capital markets theory, all the projects that add to company's value and increase shareholders' wealth should be invested in. However, by following capital rationing and investing in only certain projects, this theory is violated.
- **Cost of Capital:** In addition to limits on budget, capital rationing also places a selective criteria on the cost of capital of short listed projects. However, in order to follow this restriction, a firm has to be very accurate in calculating the cost of capital. Any miscalculation could result in selecting a less profitable project.
- **Un-Maximizing Value:** Capital rationing does not allow for maximizing the maximum value creation as all profitable projects are not accepted and thus, the NPV is not maximized.
- **Small Projects:** Capital rationing may lead to selection of small projects rather than larger scale investments.

Intermediate Cash Flows

Capital rationing does not add intermediate cash flows from a project while evaluating the projects. It bases its decision only the final returns from the project. Intermediate cash flows should be considered in keeping the time value of money in mind.

1.5.2 Capital Rationing Vs Portfolio

Q25. What are the differences between Capital Rationing and Portfolio?

Ans :

Capital Rationing

Capital rationing implies a situation where the firm is forced by the external or self-imposed factors to acquire essential amount of capital so that it can invest in all investment projects with positive NPV. Under capital rationing, management must not only ascertain the profitable investment opportunities but it must identify the combination of the profitable projects which can generate highest NPV within the funds available.

Portfolio

Investing in securities such as shares, debentures and bonds is profitable as well as exciting. It is indeed rewarding, but involves a great deal of risk and calls for scientific knowledge as well as artistic skills.

In such investments, both rational as well as emotional responses are involved. Investing in financial securities is now considered to be, one of the best avenues for investing one's savings while it is acknowledged to be one of the most risky avenues of investment. It is rare to find investors investing their entire savings in a single security. Instead, they tend to invest in a group of securities. Such a group of securities is called portfolio. Creation of a portfolio helps to reduce risk without sacrificing returns.

An investor invests his funds in a portfolio expecting to get a good return consistent with the risk bearing capacity. Hence, portfolio formation is the most important part of investment decision-making.

PROBLEMS

20. Diya Ltd. has Rs. 12,00,000 which is allocated for the purpose of capital budgeting. The following proposals and ascertained profitability indexes are as follows,

Project	Amount (Rs.)	Profitability Index
1	3,40,000	1.32
2	1,20,000	0.85
3	4,50,000	1.30
4	5,00,000	1.20
5	2,50,000	1.30
6	6,00,000	1.07

Suggest which investment should be preferred. Assume that projects are indivisible and these is no alternative use of the money allocated for capital budgeting.

Sol :

Project	Amount (Rs.)	Profitability Index (P.I)	Cash Inflows (Rs.)	Net Present Value (NPV)	Rank on the basis of P.I	Rank on the basis of NPV
1	2	3	2 x 3 = 4	4 - 2 = 5	6	7
1	3,40,000	1.32	4,48,800	1,08,800	1	2
2	1,20,000	0.85	1,02,000	– 18000	5	6
3	4,50,000	1.30	5,85,000	135000	2	1
4	5,00,000	1.20	6,00,000	1,00,000	3	3
5	2,50,000	1.30	3,25,000	75,000	2	4
6	6,00,000	1.07	6,42,000	42,000	4	5

Comments

(a) Diya Ltd. can undertake projects 1, 3 and 5 on the basis of profitability index ranking .In this case, unutilized budget is Rs. 120,000 and NPV is (108800 + 135000 + 75000) = Rs. 3,18,800.

The project '2' amount cannot be invested because profitability index is less than '1' for the amount 1,20,000. So, Rs. 1,20,000 remain unutilized because projects are indivisible in nature.

(b) Diya Ltd. can prefer projects 3, 4 and 5 on the basis of NPV ranking because in this case the cost of investment (12,00,000) is fully utilized and net present value is (1,35,000 + 1,00,000 + 75000) = Rs. 3,10,000.

(c) Hence, the company is advised to follow the ranking on the basis of profitability index and to invest in 1, 3 and 5 projects. This helps the company to raise profitability index by Rs. (3,18,800 – 3,10,000) = Rs.8,800.

By following this strategy the company can have no unutilized amount.

21. There are five projects A, B, C, D and E. Project A has an expect return of 12% with an standard deviation of 3%, project B has a return of 13%, with a standard deviation of 3.5% project C has a return of 15% with a standard deviation of 4%, project D has a return of 15.5% with a standard deviation of 4.5% and project E has a return of 17% with a standard deviation of 6% from the above information, you are required to compare the projects and say which is the most risky project and which is the least risky project.

Sol :

Calculation of Risk

Project A

Risk = Return × Standard deviation

= 0.12 × 0.03 = 0.0036 ≅ 0.36%

Project B

Risk = 0.13 × 0.035 = 0.00455 ≅ 0.455%

Project C

Risk = 0.15 × 0.04 = 0.006 ≅ 0.6%

Project D

Risk = 0.155 × 0.045 = 0.007 ≅ 0.7%

Project E

Risk = 0.17 × 0.06 = 0.0102 ≅ 1.02%

Among all projects, project E has more risk and project A has less risk.

22. The risk-free rate at a given period is 9 percent for XYZ limited. During this period the average market return is estimated to be 20 percent. For the following estimated values of beta, what would be the cost of equity for XYZ limited? The beta values are,

(i) 0.43 (ii) 0.87 (iii) 1.09 (iv) 1.48 (v) 1.88

What type of relationship you observe between risk (b) and the cost of equity for the firm ? Show the relationship graphically and present you observations.

Sol :

Given that,

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

Where,

K_e = Cost of equity capital

R_f = Risk free rate

β = The beta coefficient

R_m = The required rate of return on the market portfolio of assets.

(i) K_e = 9% + 0.43 (20% – 9%)

= 13.73%

(ii) K_e = 9% + 0.87 (20% – 9%)
= 18.57%

(iii) K_e = 9% + 1.09 (20% – 9%)
= 20.99%

(iv) K_e = 9% + 1.48 (20% – 9%)
= 25.28%

(v) K_e = 9% + 1.88 (20% – 9%)
= 29.68%

The cost of equity of the firm is directly related to systematic risk (β).

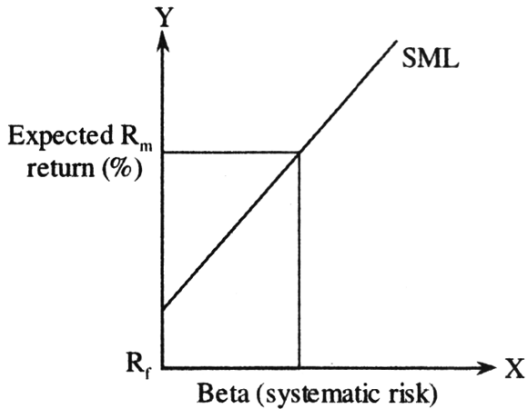


Fig. : Cost of equity of a firm

1.5.3 Portfolio Risk and Diversified Projects

Q26. Write a note on portfolio risk and return?

Ans :

Portfolio Risk

Risk is defined as variability of return from a portfolio. The variability of return is measured with variance and standard deviation.

The variance of returns for a portfolio of assets can be calculated with the following general formula,

$$\sigma_p^2 = \sum_{i=1}^{n} \sigma_{ii} W_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} \sigma_{ij} W_i W_j$$

Where, W_i and W_j are the weights for assets i and j, σ_{ii} is the variance for the i^{th} asset, σ_{ij} is the co-variance of assets i and j and n denote number of assets.

The square root of the variance is the portfolio's standard deviation of returns (σ_p).

The portfolio standard deviation of X and Y is,

$$= \sqrt{\sigma_X^2 W_X^2 + \sigma_Y^2 W_Y^2 + 2\rho_{XY}\sigma_X\sigma_Y W_X W_Y}$$

Portfolio Return

The return on a portfolio is simply the weighted average return, a portfolio return can be calculated with the following equation,

$$r_p = \sum_{i=1}^{n} W_i r_i$$

Where,

W_i is the weight of asset i and

r_i is the return for asset i.

Markowitz Model

Harry M Markowitz is credited by introducing new concept of risk measurement and their application to the selection of portfolios. He started with the idea of risk aversion of investors and their desire is to maximize expected return with the least risk.

Markowitz model is a theoretical framework for analysis of risk and return and their relationships. He used statistical analysis for the measurement of risk and mathematical programming for selection of assets in a portfolio in an efficient manner. His framework led to the concept of efficient portfolios, which are expected to yield the highest return for a given level of risk or lowest risk for a given level of return.

Risk and return are two aspects of investment considered by investors. The expected return may vary depending on the assumptions. Risk index is measured by the variance or the distribution around the mean, its range etc., and traditionally the choice of securities depends on lower variability whereas, Markowitz emphasizes on the need for maximization of returns through a combination of securities whose total variability is low.

The risk of each security is different from that of others and by proper combination of securities, called diversification, one can form a portfolio wherein the risk of one is offset partly or fully by that of the other. In other words, the variability of each security and covariance for their returns reflected through their interrelationship should be taken into account.

Thus, expected returns and the covariance of the returns of the securities within the portfolio are to be considered for the choice of a portfolio.

A set of efficient portfolios can be generated by using the above process of combining various securities, whose combined risk is lowest for a given level of return for the same amount of investment, that the investor is capable of. The theory of Markowitz, as stated above, is based on the number of assumptions.

Assumptions

(i) The investor seeks to maximize the expected utility of total wealth.

(ii) All investors have the same expected single period investment horizon.

(iii) Investors are risk averse.

(iv) Investors base their investment decisions on the expected return and standard deviation of returns from a possible investment.

(v) Perfect markets are assumed (E.g., no taxes and no transaction costs).

A portfolio of assets under the above assumptions is considered efficient, if no other asset or portfolio of assets offers a higher expected return with the same or lower risk and with the same or higher expected return.

Diversification of securities is one method by which the above objectives can be secured. The unsystematic and company related risk can be reduced by diversification into various securities and assets whose variability is different and offsetting is put in different words which are negatively correlated or not correlated at all.

Markowitz Diversification

Markowitz postulated that diversification should not only aim at reducing the risk of a security by reducing its variability or standard deviation, but by reducing the covariance or interactive risk of two or more securities in a portfolio.

As by combination of different securities, it is theoretically possible to have a range of risk varying from zero to infinity. Markowitz theory of portfolio diversification attaches importance to standard deviation to reduce it to zero, if possible.

PROBLEMS

23. A portfolio consist of 40% of security X and 60% of security Y. It has the following probability distribution of returns. Calculate portfolio return and risk.

State	Probability	Return X(%)	Return Y(%)
Boom	0.1	14	20
Recession	0.2	-5	-2
Normal	0.4	10	9
Recovery	0.1	9	14
Slow growth	0.2	12	18

Sol :

Calculation of Portfolio Return

P_s	r_x	$r_x P_s$	r_y	$r_y P_s$
0.1	14	1.4	20	2.0
0.2	– 5	– 1.0	– 2	– 0.4
0.4	10	4.0	9	3.6
0.1	9	0.9	14	1.4
0.2	12	2.4	18	3.6
		7.7		10.2

Return on X (r_x) = $\Sigma [r_x P_s]$ = 7.7%

Given that Weights, W_x = 40% = 0.40

W_y = 60% = 0.60

Portfolio Return (r_p) or r_{xy}

$r_{xy} = (7.7 \times 0.4) + (10.2 \times 0.6)$

$= 3.08 + 6.12 = 9.2\%$

Determination of Portfolio Risk

P_s	r_x	r_y	$(r_x - \bar{r}_x)$	$P_s(r_x - \bar{r}_x)^2$	$(r_y - \bar{r}_y)^2$	$P_s(r_y - \bar{r}_y)^2$	$P_s(r_x - \bar{r}_x)(r_y - \bar{r}_y)$
0.1	14	20	6	3.6	8.2	6.724	4.92
0.2	– 5	– 2	– 13	33.8	– 13.8	38.088	35.88
0.4	10	9	2	1.6	– 2.8	3.136	– 2.24
0.1	9	14	1	0.1	2.2	0.484	0.22
0.2	12	18	4	3.2	6.2	7.688	4.96
	40	59		42.3		56.12	43.74

Risk on (X) (σ_y)

$$\sigma_y = \sqrt{\Sigma[P_s(r_y - \bar{r}_y)^2]}$$

$$= \sqrt{56.12}$$

$$= 7.49\%$$

Risk on X (σ_x)

$$\sigma_x = \sqrt{\Sigma[P_s(r_x - \bar{r}_x)^2]}$$

$$= \sqrt{42.3}$$

$$= 6.5\%$$

Covariance of X and Y

$$COV_{xy} = \Sigma P_s (r_x - \bar{r}_x)(r_y - \bar{r}_y)$$

$$= 43.74$$

Coefficient of Correlation

$$\rho_{xy} = \frac{COV_{xy}}{\sigma_x \sigma_y}$$

$$= \frac{43.74}{6.5 \times 7.49} = 0.8987\%$$

Portfolio Risk (σ_p)

$$\sigma_{xy} = \sqrt{\sigma_1^2 w_1^2 + \sigma_2^2 w_2^2 + 2\rho_{xy} w_x w_y \sigma_1 \sigma_2}$$

$$\sigma_{xy} = \sqrt{(42.3 \times 0.16) + (56.10 \times 0.36) + (2 \times 0.8987) \times 6.5 \times 7.49 \times 0.4 \times 0.6)}$$

$$= \sqrt{6.768 + 20.196 + 21.00}$$

$$= 6.926\%$$

24. Rahul Ltd. has a portfolio of five stocks with the following expected market values and returns.

Stocks	Market value (Rs.)	Return (%)
Ace	40,000	8
Bell	50,000	20
Crown	20,000	15
Dell	1,00,000	9
Egan	30,000	12
	2,40,000	

Determine Rahul Ltd's expected portfolio return.

Sol :

Calculation of Portfolio Return

Stock	Market value (Rs.)	Weights (W_i)	r_i(%)	$w_i \times r_i$
Ace	40,000	$\frac{40,000}{2,40,000} = 0.167$	8	1.34
Bell	50,000	$\frac{50,000}{2,40,000} = 0.208$	20	4.16
Crown	20,000	$\frac{20,000}{2,40,000} = 0.083$	15	1.25
Dell	1,00,000	$\frac{1,00,000}{2,40,000} = 0.417$	9	3.75
Egam	30,000	$\frac{30,000}{2,40,000} = 0.125$	12	1.50
	2,40,000			12.00

Portfolio Return

$$r_p = \sum_{t=1}^{N=5} w_i r_i = 12.00\%$$

25. Following data relates to two securities i and j

Security	Expected return (%)	Risk in (%)
i	9%	7.56
j	8%	3.75

If ρ (I , j) is – 0.5 and the proportion of investment 28% and 72% in i and j securities find out

(a) Return on port folio

(b) Risk on port folio

Sol:

Given

$\overline{R}_i = 9\%$ $\Sigma_i = 7.56$

$\overline{R}_j = 8\%$ $\Sigma_j = 3.75$

$\rho (i, j) = -0.5$

$W_i = 28\%$ or .028

$W_j = 72\%$ or 0.72

Calculating Return Portfolio

$\overline{R}_P$ = 9 (0.28) + 8 (0.72)

= 2.52 + 5.76

$\overline{R}_P$ = 8.28%

Calculating Risk on Portfolio when coefficient of correlation is given

$$\sigma_P = \sqrt{\sigma_i^2 w_i^2 + \sigma_j^2 w_j^2 + 2\rho(i, j)\,\sigma_i \sigma_j w_i w_j}$$

$$\sigma_P = \sqrt{(7.56)^2 (0.28)^2 + (3.75)^2 (0.72)^2 + 2(-0.50)\,(7.56 \times 3.75)\,(0.28 \times 0.72)}$$

$$\sigma_P = \sqrt{(57.1536)\,(0.0784) + (14.0625)\,(0.5184) + 2(-0.50)\,(28.35)\,(0.2016)}$$

$$\sigma_P = \sqrt{4.48 + 7.29 + (-1)\,(5.72)}$$

$$\sigma_P = \sqrt{4.48 + 7.29 - 5.72}$$

$$\sigma_P = \sqrt{11.77 - 5.72}$$

$$\sigma_P = \sqrt{6.05}$$

σ_P = 2.46%

26. Calculate portfolio return and risk form the following information. The portfolio consists of equal weights of security X and Y.

Rx **(%)**	13	15	13	17	14
Ry **(%)**	21	23	26	19	24

Sol : **(Dec-19)**

Determination of Portfolio Return and Risk

r_x(%)	r_y(%)	$(r_x - \overline{r}_x)$	$(r_y - \overline{r}_y)$	$(r_x - \overline{r}_x)^2$	$(r_y - \overline{r}_y)^2$	$(r_x - \overline{r}_x)(r_y - \overline{r}_y)$
13	21	– 1.4	– 1.6	1.96	2.56	2.24
15	23	0.6	0.4	0.36	0.16	0.24
13	26	– 1.4	3.4	1.96	11.56	– 4.76
17	19	2.6	– 3.6	6.76	12.96	– 9.36
14	24	– 0.4	1.4	0.16	1.96	– 0.56
72	113	0	0	11.2	29.2	– 12.2

Return on X

$$\bar{r}_x = \frac{\Sigma r_x}{n} = \frac{72}{5} = 14.4\%$$

Return on Y

$$\bar{r}_y = \frac{\Sigma r_y}{n} = \frac{113}{5} = 22.6\%$$

Risk, $\sigma_x = \sqrt{\frac{\Sigma(r_x - \bar{r}_x)^2}{n}}$

$$= \sqrt{\frac{11.20}{5}}$$

$$= \sqrt{2.24} = 1.50$$

$$\sigma_y = \sqrt{\frac{\Sigma(r_y - \bar{r}_y)^2}{n}}$$

$$= \sqrt{\frac{29.2}{5}}$$

$$= \sqrt{5.84} = 2.42$$

Covariance of X and Y

$$Cov_{xy} = \frac{\Sigma[(r_x - \bar{r}_x)(r_y - \bar{r}_y)]}{5}$$

$$= \frac{-12.2}{5}$$

$$= -2.44$$

Coefficient of Correlation

$$P_{xy} = \frac{cov_{xy}}{\sigma_x \sigma_y} = \frac{-2.44}{1.50 \times 2.42}$$

$$= \frac{-2.44}{3.63} = -0.67$$

Portfolio is equally weighted and hence,

W_x = 50% or 0.5 and

W_y = 50% or 0.5

Portfolio Return (r_p)

$$r_{xy} = (\bar{r}_x\ w_x) + (\bar{r}_y\ w_y)$$

$$= (14.4 \times 0.5) + (22.6 \times 0.5)$$

$$= 7.2 + 11.3$$

$$= 18.5\%$$

Portfolio Risk (σ_p)

$$\sigma_{xy} = \sqrt{\sigma_x^2 w_x^2 + \sigma_y^2 w_y^2 + 2\ pxy\ \sigma_x \sigma_y\ w_x w_y}$$

$$= [(1.5)^2\ (0.5)^2 + (2.42)^2\ (0.5)^2 + 2(-0.67)\ (1.5)\ (2.42)\ (0.5)^2]^{1/2}$$

$$= \sqrt{0.5625 + 1.4651.2161} = \sqrt{0.8114} = 0.90\%$$

Q27. Explain the concept of diversification of projects.

Ans :

Diversification is a method which helps in reducing the risks involved in investment and portfolio management. It reduces the risk of those returns which are not perfectly positively correlated.

When number of securities increases in the portfolio, the variance of portfolio, reaches average covariance. Hence, diversification facilitates in reducing the risk. Traditionally, diversification is explained as "Not Putting all eggs in one basket". Diversification can be done in any of the four ways explained below,

(i) Different assets like gold, real estate etc..

(ii) Different Instruments like shares, bonds etc.

(iii) Different Industries like IT, Textiles etc.

(iv) Different Companies like New Companies, new product company's etc.

Diversification is a much-used and much-talked about set of strategies. These strategies involve all the dimensions of strategic alternatives. It may involve internal or external, related or unrelated, horizontal or vertical and active or passive dimensions either singly or collectively.

The firms opts for diversification for providing flexibility to the business portfolio in order to contradict vulnerability. The firms following single product approach feels unprotected or vulnerable to the changing conditions of environment. In order to overcome these problems firms are choosing diversification by maintaining flexibility in the portfolio.

Short Question and Answers

1. What is certainty equivalent approach ?

Ans :

The certainty-equivalent approach takes into account the risk factor in making estimations and appraisal of capital investment decisions. Under this technique, the estimated cashflows are adjusted by using risk-free rate to ascertain risk-free cashflows. The expected cashflows of the project are converted to equivalent riskless amounts. The smaller certainty equivalent will be used in case of an expected cash inflow and the larger certainty equivalent is used for payments.

The technique varies with the risk adjusted discount rate, which adjusts the risk by varying the discount rate. The certainty equivalent approach is theoretically a superior technique over the risk adjusted discount approach, because it can measure risk more accurately. The certainty equivalent factors will differ for different investment proposals. It is a conservative approach in making estimation of project cashflows, recognizing the risk factor in cashflows.

2. What is a sensitivity analysis? Explain its impact on project investment decisions.

Ans :

In uncertainty and probability analysis the degree of confidence depend not only on the data available on the events, and the influences but also extent of sensitivity of influences on the events.

Sensitivity analysis can help to mitigate the impact of influences, depending upon the severity of damage occurring out of risks. To control the influence the sensitivities are analyzed. Sensitivity analysis is made along with uncertainty and probability analysis, to determine the extent of action to be taken. The higher the sensitivity of influences on event, higher the risk and the damage.

Sensitivity analysis is the study of the key assumptions or calculations on which a management decision is based in order to predict alternative outcomes of that decision if different assumptions are adopted. Sensitivity analysis is a modelling procedure used in forecasting whereby changes are made in the estimates of the variables to establish whether any will critically affect the outcome of the forecast.

It is a study to determine the responsiveness of the conclusions of an analysis to changes or errors in parameter values used in the analysis, seeks to test the responsiveness of outcomes from decision models to different input values and constraints as a basis for appraising the relative risk of alternative courses of action. It is possible to use sensitivity analysis for helping to determine the value of information in addition to its role in strategic decision making. Sensitivity analysis seeks to determine the range of variations in the coefficients over which the solution will remain optimal.

Sensitivity analysis is used in determination of risk factor in capital budgeting decisions. It aids in identifying the most sensitive factor, that may cause the error in estimation. Sensitivity analysis tells about the responsiveness of each factor on the project's NPV or IRR.

For example, a 5% change in the selling price will cause 10% change on NPV, that means an increase of 5% in the selling price will increase 10% of the amount of NPV. Likewise, sensitivity analysis is done for all other factors like materials cost, labour cost, variable overhead, fixed overhead etc. Then, the most sensitive factor of all will be identified to evaluate the risk of that particular factor. Sensitivity analysis involves the following three steps:

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

ii) Definition of the underlying quantitative relationship among the variables.

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

Sensitivity analysis helps to prevent rash predictions about the outcome of plans by ensuring that the assumptions on which the plans are based are examined and that the effect of changes in these assumptions is gauged. This process may involve

challenging the original assumptions and could result in a rethink about the project. Sensitivity analysis can indicate areas where improvements are likely to have the greatest impact on results. In presenting a range of possible outcomes, sensitivity analysis facilitates the development of alternative or contingency plans if the basic assumptions have to be changed.

3. Describe any two methods used for decision making under uncertainity.

Ans :

1. Maximum or Minimum (Criterion of Optimism)

According to this criterion, it is ensured by the decision maker to achieve maximum payoff or minimum cost without missing the opportunity. Thus, he chooses a different course of action represented by the maximum of the maxima or minimum of the minima payoffs. The summary of the working method is as follows:

(i) Locating the payoff value (maximum or minimum) that corresponds to each and every course of action.

(ii) Selection of an alternative, having the best expected payoff value which maximize the-profit and minimize the loss.

This is called an optimistic decision criterion, due to the selection of an alternative with highest lowest available payoff value by the decision maker.

2. Maximin or Minimax (Criterion of Pessimism)

According to this criterion, it is ensured by the decision maker that his earnings are not less than the specified amount. Therefore his selection of alternative is represented by the maximum of the minima payoffs in case of profit, or minimum of the maxima in case of loss.

Summary of the working method is as follows:

(i) Locate the payoff values (both minimum in case of loss and maximum in case of profit) that correspond to each alternative.

(ii) Select an option having best expected payoff value (maximum for profit and minimum for loss or cost).

According to this criterion, the decision maker being conservative regarding future and he anticipates worst possible outcome (minimum for profit or maximum for cost or loss). Hence, it is known to be pessimistic decision criterion. It is also called Wald's criterion.

4. Explain briefly about various criteria involved in the process of decision making under risk..

Ans :

(i) Expected Monetary Value (EMV)

The weighted average payoff for a given course of action is the Expected Monetary Value (EMV). The total of the payoffs for each course of action multiplied by the probabilities combined with each state of nature. This mathematical description of the EMV is as follows:

$$EMV(S_j) = \sum_{i=1}^{m} P_{ij} P_i$$

where,

m = Number of possible states of nature,

P_i = Probability of occurrence of i^{th} state of nature

P_{ij} = Payoff connected with state of nature N_i and course of action S_j

(ii) Expected Opportunity Loss (EOL) / Expected Regret

An alternative approach that refers to maximization of Expected Monetary Value (EMV) and minimization of Expected Opportunity Loss (EOL) is also known as expected value of regret. The difference between the highest profit for a state of nature and the actual profit which is obtained for the specific course of action is defined as EOL.

Hence, the amount of payoff that is lost due to the rejection of a course of action, which is having the greatest payoff for the state of nature that has actually appeared, is referred as EOL. That course of action is recommended for which EOL is minimum.

Results obtained by EMV criterion and by EOL, which is an alternative decision criterion for making decision under risk area will always be the same. Hence, only one of the two methods should be applied for reaching a decision. The mathematical description is as follows:

$$EOL\ (N_j) = \sum_{i=1}^{m} 1_{ij} P_i$$

Where, 1_{ij} = opportunity loss due to state of nature, N_i and course of action, S_j

P_i = probability of occurrence of state of nature, N_i

(iii) Expected Value of Perfect Information (EVPI)

The criterion for decision making under risk for each state of nature is combined with its probability of occurrence and some how, the decision maker is able to acquire perfect (complete and accurate) information regarding the occurrence of cixous states of nature. In such a case, only then he will be successful in selecting that course of action yielding the expected payoff for whatever may be the state of nature that actually takes place. The maximum amount of money which the decision maker has to pay in acquiring additional information about the occurrence of various states of nature prior reaching to a decision is represented by Expected Value of Perfect Information (EVPI). Mathematical description is as follows:

EVPI = Expected profit (or value) with perfect information under certainty - Expected profit without perfect information EVPI - EPPI - EMV *

Where,

EPPI = Expected profit (or value) with perfect information under certainty

EMV* = Maximum expected monetary value.

5. Explain briefly about risk analysis in investment decisions.

Ans :

Risk exists because of the inability of the decision maker to make perfect forecasts. Forecasts cannot be made with perfection or certainty since the future events on which they depend are uncertain. An investment is not risky if, we can specify a unique sequence of cash flows for it. But whole trouble is that cash flows cannot be forecast accurately, and alternative sequences of cash flows can occur depending on the future events. Thus, risk arises in investment evaluation because we cannot anticipate the occurrence of the possible future events with certainty and consequently, cannot, make are correct prediction about the cash flow sequence.

To illustrate, let us suppose that a firm is considering a proposal to commit its funds in a machine, which will help to produce a new product. The demand for this product may be very sensitive to the general economic conditions. It may be very high under favourable economic conditions and very low under unfavourable economic conditions. Thus, the investment would be profitable in the former situation and unprofitable in the later case. But, it is quite difficult to predict the future state of economic conditions, uncertainty about the cash flows associated with the investment derives.

A large number of events influence forecasts. These events can be grouped in different ways. However, no particular grouping of events will be useful for all purposes. We may, for example, consider three broad categories of the events influencing the investment forecasts.

(i) General Economic Conditions: This category includes events which influence general level of business activity. The level of business activity might be affected by such events as internal and external economic and political situations, monetary and fiscal policies, social conditions etc.

(ii) Industry factors

This category of events may affect all companies in an industry. For example, companies in an industry would be affected by the industrial relations in the industry, by innovations, by change in material cost etc.

(iii) Company factors

This category of events may affect only a company. The change in management, strike in the company, a natural disaster such as flood or fire may affect directly a particular company.

6. What is Risk Adjusted Rate of Return?

Ans :

As Risk Adjusted Discount Rate (RADR) approach is very easy, it is widely used to incorporate risk into capital budgeting decision. The amount of risk which is already involved in a project is included in the discount rate used in calculations of present values. The projects which involves high risk have high discount rates and projects which are safe have low discount rates. Undoubtedly, the risk-adjusted discount rates display different risk in different types of investments.

In RADR approach, the minimum acceptable required rate of return is the cost of capital (k) or discount rate. In order to maximize the earnings of the shareholders and to increase market value of shares, the project must earn more than the rates earned in the economy for specified risk. A well accepted project is that in which required rate of return increases with increase in risk, increase in discount rate with increase in risk of the project. The discount rate which incorporate time and risk preference of investors is known as risk-adjusted discount rate.

Risk-adjusted discount = Risk free rate + Risk premium

$$k = k_f + k_r$$

In order to evaluate NPV under the RAD method following equation is used.

$$NPV = \sum_{t=1}^{h} \frac{CFAT}{(1+k_r)^t} - C_0$$

Where,

CFAT – Expected cash flow after tax in year t.

C_0 – Cash Outflows

k_r – Risk – adjusted rate

t – Time

When RADR approach is used with NPV, the project is accepted only if the value of NPV is positive. When IRR is used as decision criterion, IRR is compared with the risk-adjusted required rate of return. The project is accepted when *r* exceeds the risk adjusted rate.

7. Define decision tree.

Ans :

A decision tree is a branching diagram which is similar to a probability tree. It represents problems in a series of decisions to be made under conditions of uncertainty. Any one of the decisions may be dependent on the outcome of preceding or the outcomes of a trial.

A decision tree is a diagrammatic representation of the relationships among decisions states of nature and payoffs (or outcomes). The first step is to draw a diagram which shows the structure of the problem. Decision trees are constructed from left to right. The branches represent the possible alternative decisions which could be made and the various possible outcomes which might arise. It is helpful to distinguish between the two types of branch.

8. Explain the advantages and disadvantages of decision tree approach.

Ans :

Advantages

Are simple to understand and interpret. People are able to understand decision tree models after a brief explanation.

- Have value even with little hard data. Important insights can be generated based on experts describing a situation (its alternatives, probabilities, and costs) and their preferences for outcomes.
- Help determine worst, best and expected values for different scenarios.
- Use a white box model. If a given result is provided by a model.
- Can be combined with other decision techniques.

Disadvantages

They are unstable, meaning that a small change in the data can lead to a large change in the structure of the optimal decision tree.

- They are often relatively inaccurate. Many other predictors perform better with similar data. This can be remedied by replacing a single decision tree with a random forest of decision trees, but a random forest is not as easy to interpret as a single decision tree.
- For data including categorical variables with different number of levels, information gain in decision trees is biased in favor of those attributes with more levels.
- Calculations can get very complex, particularly if many values are uncertain and/or if many outcomes are linked.

9. What is simulation ?

Ans :

Meaning

In real life, many problem occur which cannot be defined by a mathematical representation because of their stochastic nature, complexity in problem formulation or conflicts in idea that describe the exact nature of the problem. For these types of problems, simulation is generally used to describe the problems when other processes fail.

Simulating the model means experimenting the model by trying alternate actions and then comparing the consequences of these actions. This provide answers to many questions arising during the experimentation. This technique is used in almost all fields limited by our imagination and the ability to translate these imagination in to computer directives or in a mathematical model. It is one of the easiest and probably the hardest tool to apply and most difficult to draw accurate solutions.

For example, in location of ambulances, it is hard to identify the location from where the demand for ambulance would arise. In this case, simulation is required for scheduling the ambulances, their location, their response to a particular demand, quality of service etc. Simulation is defined by various authors in various ways, which are stated as follows,

Definitions

(i) **According to Donald. G.Malcolm** A simulated model may be defined as one which depicts the working of a large scale system of men, machines, materials and information operating over a period of time in a simulated environment of the actual real world conditions.

(ii) **According to Shannon** Simulation is the process of designing a model of real system and conducting experiments with this model for the purpose of understanding the behaviour (within the limits imposed by a criterion or set of criteria) for the operation of the system.

(iii) **According to T.H.Naylor etal** Simulation is a numerical technique for conducting experiments on a digital computer, which involves certain types of mathematical and logical relationships necessary to describe the behaviour and structure of a complex real world system over extended periods of time.

10. Define capital rationing.

Ans :

Meaning

Capital rationing is a technique of selecting the projects that maximizes the firm's value when the capital infusion is restricted. Two types of capital rationing are soft and hard capital rationing. The calculation and method prescribes arranging projects in descending order of their profitability based on IRR, NPV and PI and selecting the optimal combination.

Definition

It can be defined as a process of distributing available capital among the various investment proposals in such a manner that the firm achieves maximum increase in its value.

11. What are the differences between Capital Rationing and Portfolio?

Ans :

Capital Rationing

Capital rationing implies a situation where the firm is forced by the external or self-imposed factors to acquire essential amount of capital so that it can invest in all investment projects with positive NPV. Under capital rationing, management must not only ascertain the profitable investment opportunities but it must identify the combination of the profitable projects which can generate highest NPV within the funds available.

Portfolio

Investing in securities such as shares, debentures and bonds is profitable as well as exciting. It is indeed rewarding, but involves a great deal of risk and calls for scientific knowledge as well as artistic skills.

In such investments, both rational as well as emotional responses are involved. Investing in financial securities is now considered to be, one of the best avenues for investing one's savings while it is acknowledged to be one of the most risky avenues of investment. It is rare to find investors investing their entire savings in a single security. Instead, they tend to invest in a group of securities. Such a group of securities is called portfolio. Creation of a portfolio helps to reduce risk without sacrificing returns.

An investor invests his funds in a portfolio expecting to get a good return consistent with the risk bearing capacity. Hence, portfolio formation is the most important part of investment decision-making.

Exercise Problems

1. A company is examining two mutually exclusive investment proposals. The management of the company uses Certainty Equivalents (CE) to evaluate new investment proposals. From the following information pertaining to these projects advise the company which project should be taken up by the company.

	Proposal A		Proposal B	
Year	CRAT (`)	CE	Creat (`)	CE
0	–25,000	1.0	–25,000	1.0
1	15,000	0.8	9,000	0.9
2	15,000	0.7	18,000	0.8
3	15,000	0.6	12,000	0.7
4	15,000	0.5	16,000	0.4

The firm's cost of capital is 12%.

[Ans : 4610, 3761]

2. Determine CE for the following information,

Year	Cash Flows(`)	CE Facctor Project X
0	(5,00,000)	0.90
1	3,00,000	0.80
2	2,00,000	0.68
3	5,00,000	0.55
4	5,50,000	0.42
5	1,50,000	0.30

[Ans : 4,77,000]

3. An oil drilling company is considering the purchase of mineral rights on a property for 100 lakhs. The price includes tests to indicate whether the property has type A geological formation or type B geological formation. The company will be unable to tell the type of geological formation until the purchase is made. It is known however that 40% of the land in this area has type A formation and 60% type B formation. If the company decides to drill on the land it will costs ` 200 lakhs. If the company does drill it may decides to drill on the land it will cost ` 200 lakhs. If the company drill, it may hit an oil well, gas well or a dry hole. Drilling experience indicates that the probability of striking an oil well is 0.4 on type A and 0.1 on type B formation. Probability of hitting gas is 0.2 on type A and 0.3 on type B formation. The estimated discounted cash value from an oil well is ` 1,000 lakhs and from a gas well is ` 500 lakhs. This includes everything except cost of mineral rights and cost of drilling. Use decision tree approach and recommend whether the company should purchase the mineral right or not.

4. A company is considering two mutually exclusive projects. The company uses the certainty equivalent approach. The estimated cash flow and certainty equivalents for each project are as follows:

	Project 1		Project 2	
	Certainty		Certainty	
Year	Cash Flow	Equivalents	Cash Flow	Equivalents
0	– 30,000	1.00	– 40,000	1.00
1	15,000	0.95	25,000	0.90
2	15,000	0.85	20,000	0.80
3	10,000	0.70	15,000	0.70
4	10,000	0.65	10,000	0.60

Which project should be accepted, if the risk-free discount rate is 5 per cent ?

[Ans : 6528, 9942]

5. KC company is considering two mutually exclusive projects. The initial cost of both projects is Rs 5,000, and each has an expected life of five years. Under three possible states of economy, their annual cash flows and associated probabilities are as follows :

		NCF (Rs.)	
Economic State	Probability	Project A	Project B
Good	0.3	6,000	5,000
Normal	0.4	4,000	4,000
Bad	0.3	2,000	3,000

If the discount rate is 7 per cent, which project should the company accept ?

[Ans : 11400]

6. A company is considering Projects X and Y with the following information which project will you recommend? Will your answer change if you use coefficient of variation as a measure of risk instead of standard deviation? Which measure is more appropriate in this situation? Give reasons.

	Project	
	X	Y
Expected NPV	60,000	227,000
Standard deviation	40,000	135,000

[Ans : 0.67, 0.59]

UNIT II

TYPES OF INVESTMENTS AND DISINVESTMENTS:

Project abandonment decisions, Evidence of IRR. Multiple IRR, Modified IRR, Pure, simple and mixed investments. Lorie Savage Paradox. Adjusted NPV and impact of inflation on capital budgeting decisions

2.1 TYPES OF INVESTMENTS

Q1. Explain briefly about different types of investments.

(OR)

What are the different types of investments ? What is the rationale behind choosing each?

Ans : **(May-19)**

Meaning

Investment acts as a key element in a business because based on the investment firms can ascertain the volume of output, purchase requirements etc. Investor/Firm should be very careful in taking investment decisions by analyzing the risk return trade-off of each alternative that is available in the market using number of capital budgeting techniques. The selected investment should yield maximum returns to the firm. While taking investment decisions, one should consider the type of investment, characteristics of alternatives and the effect of other factors such as inflation on investment. After investing in a project, a firm has to assess the performance of the project for reviewing their decisions whether to continue or terminate or divest the project.

Types

The investment decision can be known as capital budgeting decision i.e., comparison of costs against benefits over a long period of time. These investment decisions involve careful consideration of various factors i.e., profitability, safety, liquidity and solvency etc.

Capital investment refers to the investment in projects whose results would be available only after a year or after a considerably longer period of time. The investment in these projects are quite heavy but the returns will be available only after a period of time.

There are many ways to classify investments. One classification is as follows :

i) Expansion of existing business

ii) Expansion of new business

iii) Replacement and modernization.

i) Expansion of Existing Business

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

Rationale

The main reason behind choosing expansion is to expand its business operations.

ii) Expansion of New Business

Expansion of a new business requires investment in new products and a new kind of production activity within the firm.

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

iii) Replacement and Modernizations

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

Rationale

The main reason behind choosing replacement and modernization is to enhance the operating efficiency and reduce costs.

Yet another useful way to classify investments is as follows:

(a) Mutually exclusive investments

(b) Independent investments

(c) Contingent investments.

(a) Mutually Exclusive Investments

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

(b) Independent Investments

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

(c) Contingent Investments

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

Q2. Classify the investments companies in detail.

Ans :

Investment companies or mutual funds as they are often known are financial institutions which obtain funds from a large number of investors through the sale of shares. These funds are then placed in a pool under professional management, and securities (financial assets) are purchased for the benefit of all shareholders.

Concept

Investment companies or mutual funds as they are often known are financial institutions which obtain funds from a large number of investors through the sale of shares. These funds are then placed in a pool under professional management, and securities (financial assets) are purchased for the benefit of all shareholders.

While investments in the fund may be made by either large or small savers, the investment company exists primarily to offer the small saver a means to diversify asset portfolio in a manner not attainable except with a very large portfolio.

The purpose of any investment company is to diversify the small outlays of its shareholders or unit holders, as the case may be, by operating the collective fund so accumulated through the medium of a large portfolio.

Types

Investment companies are categorized into two brand categories by investment companies act, 1940.

i) Unit Investment Trusts (UITs)

A unit investment trust, or UIT, is a company established under an indenture or similar agreement. It has the following characteristics:

- The management of the trust is supervised by a trustee.
- Unit investment trusts sell a fixed number of shares to unit holders, who receive a proportionate share of net income from the underlying trust.
- The UIT security is redeemable and represents an undivided interest in a specific portfolio of securities.
- The portfolio is merely supervised, not managed, as it remains fixed for the life of the trust. In other words, there is no day-to-day management of the portfolio.

ii) Management Investment Companies

The most common type of investment company is the management investment company, which actively manages a portfolio of securities to achieve its investment objective. There are two types of management investment company: closed-end and opened. The primary differences between the two come down to where investors buy and sell their shares - in the primary or secondary markets - and the type of securities they sell.

a) Closed-End Investment Companies : A closed-end investment company issues shares in a one-time public offering. It does not continually offer new shares, nor does it redeem its shares like an open-end investment company. Once shares are issued, an investor may purchase them on the open market and sell them in the same way. The market value of the closed-end fund's shares will be based on supply and demand, much like other securities. Instead of selling at net asset value, the shares can sell at a premium or at a discount to the net asset value.

b) Open-End Investment Companies: Open-end investment companies, also known as mutual funds, continuously issue new shares. These shares may only be purchased from the investment company and sold back to the investment company. Mutual funds are discussed in more detail in the Variable Contracts section.

Q3. Explain briefly about mutual funds.

Ans :

A Mutual Fund is a financial intermediary that pools the savings of investors for collective investments in a diversified portfolio of securities. According to SEBI (Mutual Funds) Regulations, 1996, a mutual fund is "a fund established in the form of a trust to raise money through the sale' of units to the public or a section of the public under one or more schemes for investing in securities including money market instruments."

Mutual funds raise money by selling shares / units of funds to the public. Mutual funds use this money to purchase various assets such as stocks, bonds and money market instruments. The mutual fund industry in India has been witnessing an annual growth rate of 9% for past five years and is expected to grow better.

Role of Mutual Funds

Mutual funds plays an important role in promoting a healthy capital market. They provide active support to secondary market and increase liquidity of capital market and bring stability in financial market. Role of mutual fund can be explained with the help of following points :

i) Mobilizes Savings

Mutual funds play an important role in mobilizing savings of millions of investors across the country. In mutual funds, savings of small investors are mobilized, invested and returns are distributed in the same proportion to the unit holders.

ii) Instrument of Investing Money

Now-a-days bank rates have become very low so, keeping large amount of money in bank does not give higher returns. People can invest in stock market. But a common investor is not well informed about the complexities involved in stock market movements. Here mutual funds play an important role in helping common public to get higher returns.

iii) Protection to Small Investors

A small investor is not safe in share market. In mutual industry there is no such risk. Mutual funds help to reduce the risk of investing in stocks by spreading or diversifying investments. Small investors enjoy the benefit of diversification.

iv) Tax Benefit

Investors in mutual funds enjoy tax benefits. Dividend received by investors is tax free. Tax exemption is allowed on income received on units of mutual funds and UTI. Investment in mutual funds enjoy wealth tax exemption within the overall limit of Rs. 5 lakhs. No tax shall be charged on gifts of mutual fund units upto Rs. 30,000.

v) Diversification

Investment in mutual funds enable investors to spread out and minimize the risks upto certain extent. Mutual fund invests in a diversified portfolio of securities. This diversification helps to reduce risk since all the stocks do not fall at same time. Thus investors are assured of average income which is not possible in other sources.

vi) Multi - Purpose Service

Mutual funds introduces variety of innovative schemes containing various benefits. Innovative schemes are designed to meet the needs of different types of investors in terms of investment, dividend distribution, liquidity etc.

vii) Boost to Capital Market

Mutual fund has become a capital market intermediary. It bridges the gap between retail investors and capital market. The rapid growth of mutual fund industry leads to increased vibrancy of capital market.

viii) Arrival of Foreign Capital

Mutual funds attract foreign capital. Indian Mutual Fund Industries open offshore funds in various foreign countries and secure safe investment avenues abroad to domestic savings. These funds enable NRI's and foreign investors to participate in Indian Capital Market.

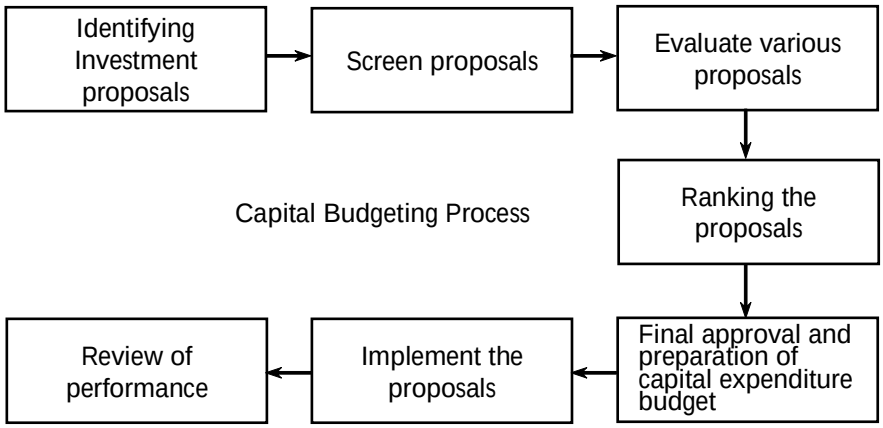
ix) Savings for Retirement and Education

Various schemes of funds with their tax benefits can help the households to save for the retirements and education of their children.

Q4. Discuss the various steps involved in investment process ?

Ans :

Capital budgeting is a complicated process that deals with the decisions which are associated to investment of current earnings in order to yield benefits in future. The process of capital budgeting involves the following steps,



i) Identifying investment proposals

Identification of proposal is the first step in capital budgeting process. Usually proposal for investment opportunities is developed from top management or any officials of the company.

In case of large organizations, the head of the department evaluates the different proposals and produce selected proposals to the capital expenditure planning committee and sometimes to officials who are held responsible for long-term investment decisions.

ii) Screen Proposals

After identifying the proposals, the expenditure planning committee examine all the proposals, make sure that they are suitable with the corporate strategies from all directions.

iii) Evaluate Various Proposals

The proposals which are examined and that are suitable are now evaluated in terms of profitability. In order to evaluate the profitability of capital investment proposals the firm uses different methods such as, payback period method, rate of return method, net present value method, internal rate of return method etc., the proposals which are evaluated must be classified into independent, contingent and mutually exclusive proposals.

iv) Ranking the Proposals

The next step after evaluation is ranking the proposals. The proposals which are not profitable can be rejected, but those which are profitable cannot be accepted immediately due to lack of funds. Hence, after considering urgency, risk and profitability of the proposals firm must give suitable ranks to them.

v) Final Approval and Preparation of Capital Expenditure Budget

The proposals that are suitable after evaluation are accepted and recorded in the capital expenditure budget. The proposals of less investments are decided at the lower levels. The capital expenditure budget shows the estimated amount of expenditure to be incurred on fixed assets during the budget period.

vi) Implement the Proposals

The proposal can be implemented only after approval of capital expenditure committee to spend specified amount on proposal. At the time of implementation of project, time to complete the project and cost limit must be decided to avoid delays and over costs. In order to control and monitor the implementation of projects, firm can use network techniques like PERT and CPM.

vii) Review of Performance

The process of capital budgeting ends with the evaluation of the performance of the project. In order to evaluate the performance a post completion audit is done by comparing actual expenditure with budgeted expenditure and actual returns with expected returns. If any unfavourable variances are found during auditing source for their existence must be identified and corrective measure must be taken to avoid them in future.

2.2 DISINVESTMENT

Q5. What do you meant by disinvestment ?

Ans :

Investment refers to conversion of money or cash into securities, debentures, bonds or any other claims on money. At the same time, disinvestment involves the conversion of money claims or securities into money or cash.

Reasons

The public sector in India at present is at cross roads. The new economic policy initiated in July - 1991, clearly indicated that the public sector undertakings have shown a very negative rate of return on capital employed. On account of this phenomenon many public sector undertakings have become burden to the government. They are infact turning out to be liabilities to the government rather than being assets.

This is a sector which the government clearly wants to get rid off. In this direction the government has adopted a new approach to reform and improve the public sector undertakings performance i.e. 'Disinvestment policy'. This has gained lot of importance especially in latter part of 90s. At present the government seriously perceives the disinvestment policy as an active tool to reduce the burden to financing the public sector undertakings.

Objectives

The following are the main objectives of disinvestment policy of the government.

i. To reduce the financial burden on government.

ii. To improve public finances.

iii. To introduce, competition and market discipline.

iv. To find growth.

v. To encourage wider share of ownership.

vi. To depoliticise essential services.

Q6. Discuss the Procedure of Disinvestment.

Ans :

The government of India laid down some rules and procedure for carrying out the disinvestment. They are as follows,

i) For considering the cabinet committee on disinvestment if the proposals for disinvestment in any PSU's are placed.

ii) Appointment of an advisor is to invite expressions of interest from parties.

iii) To arrive at the reserve price of a PSU, through the adoption of 3 methods which are, discounted cash flow method, balance sheet method and asset valuation method.

iv) For accepting the final ownership which cannot be legally avoided offers, the share agreement and shareholder's agreement are sent to the prospective persons who are offering more money for it.

v) For the final approval the receiving bids must be submitted before the CCD. Then, the CCD permit the final buyer. After the transaction is completed, all papers and documents must be sent to the controller and Auditor General of India (CAG) to undertake an evaluation of the disinvestment for its submission in the parliament to make it available to the general public.

Q7. Explain briefly about various disinvestment methods.

Ans :

The following are the three methods adopted by the Government of India for dis-investing the Public sector undertakings. There are three broad methods involved, which are used in valuation of shares.

i) **Net Asset Method:** This will indicate the net assets of the enterprise as shown in the books of accounts. It shows the historical value of the assets. It is the cost price less depreciation provided so far on assets. It does not reflect the true position of profitability of the firm as it overlooks the value of intangibles such as goodwill, brands, distribution network and customer relationships which are important to determine the intrinsic value of the enterprise. This model is more suitable in case of liquidation than in case of disinvestment.

ii) **Profit Earning Capacity Value Method :** The profit earning capacity is generally based on the profits actually earned or anticipated. It values a company on the basis of the underlying assets. This method does not consider or project the future cash flow.

iii) **Discounted Cash Flow Method :** In this method the future incremental cash flows are forecasted and discounted into present value by applying cost of capital rate. The method indicates the intrinsic value of the firm and this method is considered as superior than other methods as it projects future cash flows and the earning potential of the firm, takes into account intangibles such as brand equity, marketing & distribution network, the level of competition likely to be faced in future, risk factors to which enterprises are exposed as well as value of its core assets. Out of these three methods the Discounted cash flow method is used widely though it is the most difficult.

2.3 PROJECT ABANDONMENT DECISIONS

Q8. Explain briefly about abandonment decision of a capital budgeting process ?

Ans :

Management of investment is a dynamic process which cannot be maintained consistently during the whole life of the project, i.e., there exists number of changes during the life of the project. These changes may lead to changes in the attractiveness of the project in terms of cash flows, profit, relevance. Thus, it is necessary to periodically review the project during the life of the project to update the capital budgeting decisions such as continuation of the project or terminate the project or divestment of the project.

A firm can make use of the techniques of new project analysis for the review of existing project performance in order to supplement the capital budgeting decisions. But the existing project some how differ from the new project in the following ways,

(i) The cash outflows of a new project results in relevant cash flows whereas for existing project the returns considers the sunk costs which are irrelevant.

(ii) The cash flows of a new project are uncertain whereas for existing project they are precise.

(iii) The discount rate of existing project should differ from that of new project i.e., an appropriate discount rate need to be determined after estimating the incremental cash flows of existing project based on which one can take the decision whether to continue or abandon the project.

Assume the life of existing project 'X' is 7 years and it has been in use for past 3 years.

Initial analysis of project X (Estimated cash flows)	C_0 C_1 C_2 C_3	C_4 C_5 C_6 C_7
Post analysis	A_0 A_1 A_2 A_3	NC_4 NC_5 NC_6 NC_7
	Actual cash flows	Future cash flows

The information that is necessary to take capital budgeting decisions regarding existing project include,

i) Present value of estimated cash flows in initial stages,

$$PVCF = \sum_{n=1}^{B} \frac{NC_n}{(1+F)^n} \text{ or } \sum_{n=1}^{B} NC_n \left[(1+r)^{-n} \text{ or } (PV @ r\%, n)\right]$$

B = Balance life of project

r = Appropriate discount rate.

ii) Salvage Value of Project

The expected amount that can be realized by terminating the project is called salvage value.

iii) Divestment Value (DV)

The price of the project offered by the third party to buy the project from the existing owner. The following relation helps the manager to take appropriate decisions.

a) If PVCF > SV > DV, then the project can be continued

b) If PVCF > DV > SV, then continue the project

c) If DV > SV > PVCF, then divest the project

d) If DV > PVCF > SV, then divest the project

e) If SV > DV > PVCF then terminate the project

f) If SV > PVCF > DV, then terminate the project.

Example 1

The project 'X' has three options,

i) Present value of cash flows as ,10,000/-.

ii) Can gain profits of 2,00,000 through divestment of project.

iii) The firm can realize a salvage value of ? 1,80,000/- which one is the best option for the firm.

Given, PVCF = 1,10,000

DV = 2,00,000

SV = 1,80,000

i.e., DV > SV > PVCF, the firm is recommended to divest the project as the disinvestment value is higher than the salvage value and PVCF.

Issues Associated with Abandonment Analysis

NPV should be used for analyzing the existing project performance and to take further investment decisions. The firm needs to continue the project if NPV of abandonment < NPV of continuation of project.

If NPV of abandonment > NPV of project continue then the firm is required to abandon the project.

Most of the managers are often ignored to implement the NPV for taking investment decisions for existing project, which results in wastage of firm's resources, loss of profitable projects etc.

The reason for this is,

- Firms are considering the sunk costs in mental accounting and ignoring them in economic accounting.

Example 2

Assume a firm lost Rs. 20,000 and have two alternative A and B of which A can produce profits of Rs. 10,000 and B has two payoffs '0' and 20,000/-. For economic accounting first firm need to account the Rs.20,000/- loss and then required to select an alternative A or B. If he choose 'A' he can gain profits of Rs.10,000/-. If the firm adopted mental accounting the firm is required to maintain one account for loss of 20,000 i.e., it considers the sunk costs.

i) Firm can gain 10,000 profits to compensate the loss of Rs. 20,000 and the net loss will be 10,000 only.

ii) If the payoff is '0' then the loss will be 20,000 if the payoff is 20,000 then the loss will be '0'.

The firms which select alternative B are risk lovers. Mostly, the firms adopting mental accounting used to continue to project by adopting asset position after realising and differentiating the losses as unrealised paper and realised. This behaviour has both positive and negative effects.

- The positive effect enable the employees to work with utmost commitment, to face the risks and to achieve the goals.
- Negative effects include negative NPV, worst utilization of capital resources and non- profitable decisions.

Resolving the Issue

1. Overcoming Resistance

The major problem in use of NPV technique for exiting project is self control. The following measures need to be adopted in order to overcome the self control problem.

i) The two rules that should be followed for self control are,

   a) Use of economic accounting principles for project evaluation and

   b) Use of NPV techniques for analyzing the performance of existing project.

ii) The commitment of the managers need to be reinforced by using proper reward and penalty systems i.e., rewards for best performance and penalty for worst. For this performance evaluation system of a firm should announce the rewards based on delay in disclose of bad news and the ability of managers in reducing the normal losses in advance.

iii) Conducting periodical reviews by outside professionals based on the principles of economic accounting. The formal and independent reviews are more objective and without any bias.

2. Managing Divestments

Most of the firms are moving towards disinvestment of their funds. It is necessary to manage the divestments for which they need to follow the guidelines below,

i) Considering the divestments as a part of business.

ii) Treat the divestment as a responses to a condition i.e., as an alternative for enhancing the performance of the project.

iii) Consider the divestment as an opportunity rather than a catastrophe.

PROBLEMS

1. XYZ Ltd., had set up a project 4 years ago. The project has a remaining life of 6 years. The cash flow forecast for the balance life is as follows,

Year	1	2	3	4	5	6
Cash flow forecast (millions)	30	35	45	50	30	25

The salvage value of the project if terminated immediately is Rs.120 million. A third party has offered to buy the project for Rs.175 million. The discount rate is 12%, what should XYZ do ?

Sol :

Given that

Salvage value = Rs.120 million

Divestment value = Rs.175 million

Discount rate = 12%

Calculation of PVCF of the Cash flows @ 12%

Year	Forecasted	PV@12%	PVCF cash flows
1	30	0.893	26.790
2	35	0.797	27.895
3	45	0.712	32.040
4	50	0.636	31.8
5	30	0.567	17.01
6	25	0.507	12.675
	Total	**PVCF**	**148.21**

$\therefore$ PVCF at the end of 6^{th} year = 148.21 million

Salvage Value (SV) at the end of 6^{th} year = 120 million

Divestment Value (DV) at the end of 6^{th} year = 175 million

Since DV > PVCF > SV, the XYZ ltd., needs to divest the project to the third party.

2. PQR company has started a project 5 years ago which has a remaining life of 5 years. The forecasted cash flows (in millions) for the balance life is as follows:

Year	1	2	3	4	5
Forecasted cashflows	70	60	76	50	45

The salvage value at the end of 5th year is Rs.200 million. A third party has offered to buy the project for Rs.210 million. The discount rate is 10%, what should PQR company do ?

Sol :

Given that,

Salvage value = Rs.200 million

Disinvestment value = Rs.210 million

Discount rate = 10%

Calculation of PVCF@ 10% of the cashflows

Year	Forecasted cash flows	PV@10%	PVCF
1	70	0.909	63.63
2	60	0.826	49.56
3	76	0.751	57.076
4	50	0.683	34.15
5	45	0.621	27.945
	Total	**PVCF**	**232.361**

PVCF at the end of 5lh year = 232.61 million

Salvage value at the end of 5th year = 200 million

Divestment value at the end of 5lh year = 210 million

Since PVCF > DV > SV, the company has been recommended to continue the project.

3. A plastic manufacturer has under consideration the proposal of production of high quality plastic glasses. The necessary equipment to manufacture the glasses would cost `1 lakh and would last 5 years. The tax relevant rate of depreciation is 25 per cent on written down value. There is no other asset in this block. The expected salvage value is ` 10,000. The glasses canbe sold at ` 4 each. Regardless of the level of production, the manufacturer will incurcash cost of ` 25,000 each year if the project is undertaken. The overhead costs allocatedto this new line would be ` 5,000. The variable costs are estimated at ` 2 per glass. The manufacturer estimates it will sell about 75,000 glasses per year; the tax rate is 35 per cent. Should the proposed equipment be purchased? Assume 20 per cent cost of capital and additional working requirement, ` 50,000.

Sol : **(May-19)**

Calculation of Cash Outflow

Particulars	Amount (`)
Cost of Production equipment	1,00,000
Additional working capital requirement	50,000
Total	**1,50,000**

Calculation of CFAT and NPV

Particulars	Years				
	1	2	3	4	5
Sales revenue (75,000 x 4)	3,00,000	3,00,000	3,00,000	3,00,000	3,00,000
Less: Costs					
Variable cost (75,000 x 12)	1,50,000	1,50,000	1,50,000	1,50,000	1,50,000
Additional fixed cost	25,000	25,000	25,000	25,000	25,000
Depreciation (D)	25,000	18,750	14,063	10,547	–
Earnings before taxes	1,00,000	1,06,250	1,10,937	1,14,453	1,25,000
Less: Taxes	35,000	37,188	38,828	40,059	43,750
Earnings after taxes (EAT)	65,000	69,062	72,109	74,394	81,250
CFAT (EAT + D)	90,000	87,812	86,172	84,941	81,250
Add: Recovery of working capital (WC)					50,000
Add: Salvage value (sv)					10,000
Add: Tax benefit on short term capital loss					7,574
					1,48,824
Multiply by PV factor @20%	0.833	0.694	0.579	0.482	0.402
PV (CFATxPV factor)	74,970	60,942	49,894	40,942	59,827
Total PV	-				2,86,575
Less: Cash outflows					1,50,000
NPV					**1,36,575**

Comment

The proposed equipment should be purchased by the firm.

Note

(i) The block includes only one asset, depreciation is not charged at the end of the year because the asset has been sold in the year.

(ii) ` 7,574 = ` 1,00,000 – ` 68,359 (accumulated depreciation) - ` 10,000 (SV).

2.4 INTERNAL RATE OF RETURN

Q9. Define IRR ? Explain the merits and demerits of IRR.

Ans :

The internal rate of return is also one of the capital budgeting technique that identifies the time value of money. This method is also known as yield method, discounted rate of return and trial and error yield method. It is that rate of return which equates the present value of cash inflows to the present value of cash outflows. The hit and trial method is used in internal rate of return method to discount the cash flows of the project as discount rate is not known. The internal rate of return is calculated with the help of the following formula.

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

Where,

C – Initial outlay at time zero

r – Rate of discount of internal rate of return

A, A_2, .. A – Future net cash flows at different periods

n – Number of years.

The internal rate of return method involves following steps,

1. Calculate the future cash inflows before depreciation but after tax.
2. Calculate fake payback period by dividing the initial investment by average cash flows.

$$\text{Fake payback period} = \frac{\text{Initial investment}}{\text{Average cash flows}}$$

3. Identify the discounting factor from present value annuity table and calculate NPV with that percentage.
4. If NPV is positive take a higher rate and if NPV is negative take a lower rate and once again calculate NPV.
5. After getting one positive NPV and one negative NPV, use interpolation to calculate actual IRR. Actual IRR can be calculated by using the following formula,

$$\text{Lower rate} + \frac{\text{Present value at lower rate -Cash outflow}}{\text{PV at lower rate-PV at higher rate}}$$

A particular project is accepted when IRR is more than cost of capital and if IRR of the project is less than cost of capital it is rejected.

Merits

1. Like the NPV method, it considers the time value of money.
2. It takes into account all the cash proceeds during the life of the projects.
3. The percentage figure calculated in this method is more meaningful to the management than the NPV as it satisfies them in terms of return of capital.
4. The percentage figure generally allows a sound, uniform ranking of projects.
5. This method is consistent with the firm's objective of maximizing owner's welfare.

Demerits

1. It is not easy to understand and calculate the IRR as it involves complicated and tedious computational problems.
2. This method assumes that the net cash inflows are immediately reinvested so as to yield a rate equal to IRR, whereas in NPV method, it is assumed that cash inflows are reinvested at the firm's cost of capital. The assumption made in the NPV method shows the timing of cash inflows. Moreover, all cash flows may not be entirely reinvested. Dividend may be paid out of the same or a part may be locked up in cash, debtors, inventories of finished products, etc.
3. The result shown by the NPV and the IRR method may be different if the projects are different in the following respects:
   (a) Expected life of the project; and
   (b) Cash outlays.
4. There may be some investment project on which no real value of IRR can be computed, e.g. social projects.
5. It may not give a unique answer in all situations. Such a situation arises when all set cash outflows do not follow all the net cash outflows for a project.
6. The use of multiple rates might create confusion.
7. It is rather difficult to assess the estimated life of the project, since the machine life can be highly increased, if appropriate preventive maintenance is implemented.

2.4.1 Evidence of IRR

Q10. Explain briefly about evidence of IRR.

Ans :

Though net present value is theoretically strong and accepted by most of the firms, in practice they are interested to use "internal rate of return" for evaluating their capital budgeting decisions. The reasons for the increase in the importance of IRR in the firms are,

i) The shift in the firm's view towards the rate of return from the actual return on rupees.

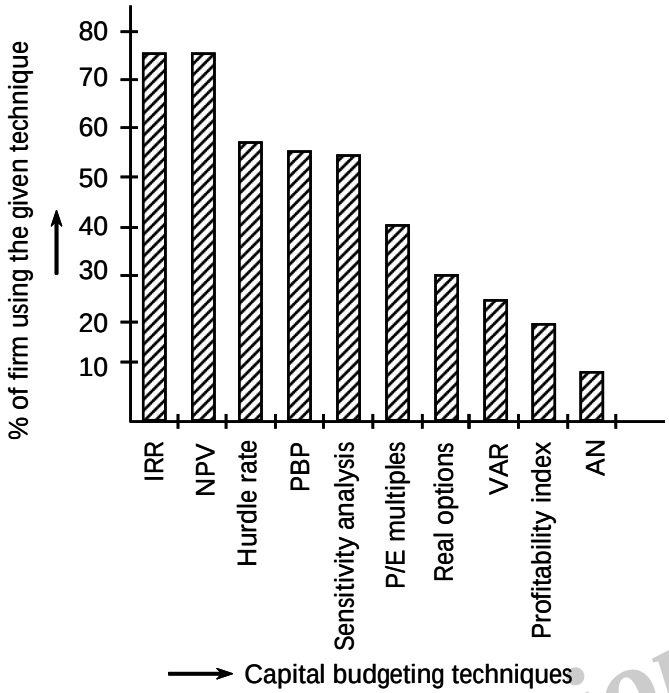
ii) The interest rates, profitability and other factors can be expressed easily in terms of annual rates of returns.

iii) The benefits of NPV does not related to the invested amount.

Though IRR has number of pitfalls number of advanced techniques are available to avoid them and it is the responsibility of the financial analyst to recognize and resolve the IRR problems to make it a best technique to facilitate effective investment decisions. While selecting the project, the firm should also consider the non-financial aspects along with the financial aspects.

Results of Different Surveys Conducted by Analysts

According to a survey conducted by Graham and Harvey most of the firms are using NPV or IRR whereas only 27% of the firms are using real rate options for taking investment decisions. In a research, the real options or NPV/IRR may not reach a rate close to the market price of the project. It is evident that most of firms are using comparative analysis of both IRR/NPV and real options where the results of both were highly correlated. But the value of real options are very close to the market price than NPV/IRR.



The results of the survey of Graham and Harvey on different firms states that most of the firms nearly 75.7% are using IRR followed by NPV (74.9%). Now most of the large firms are tend to NPV than smaller firms. The firms with high debt and dividend ratios are using IRR than the firms with low debt ratio.

Along with NPV and IRR, the next popularly used method is payback period (56.7%). Firms with CEO's having professional degree in management and public companies mostly choose IRR or NPV. Thus, it is evident that IRR is popular in practice than NPV. The following graph shows the percentage of the firms using different capital budgeting evaluation techniques.

PROBLEMS

4. A project requires an investment of `11,11,111 and is expected to generate cash in flows of `3,33,333, `4,44,444, `5,55,555, ` 4,44,444 and ` 3,33,333 for the next five years. The risk free cost of capital is 11 percent. Evaluate the project using IRR method. If a risk premium of 9 percent is considered how do you evaluate the project and do you observe any change in your earlier decision ?

Sol :

Step-1

Calculation of fake pay back period.

$$FPBP = \frac{\text{Investment}}{\text{Average yearly inflow}} = \frac{21,11,109}{5} = 4,22,221.8$$

$$= \frac{11,11,111}{4,22,221.8}$$

$$= 2.632$$

Step-2: Present value annuity table indicates that, IRR lies between 25% and 26%.

Step-3: Calculation of present values at different rates.

Year	CFAT in flow	PV @ 25%	P.V. of cash	P.V. @ 26%	P.V. of cash
1.	3,33,333	0.800	2,66666	0.794	2,64,666
2.	4,44,444	0.640	2,84,444	0.630	2,80,000
3.	5,55,555	0.512	2,84,444	0.500	2,77,778
4.	4,44,444	0.410	1,82,222	0.397	1,76,444
5.	3,33,333	0.328	1,09,333	0.315	1,05,000
			11,27,109		11,03,888

Step-4. Interpretation

$$\text{IRR} = \text{Lower rate} + \frac{\text{NPV@LR}}{\Delta\Sigma\text{PVs}} \times \Delta\text{R}$$

$$= 25 + \frac{11,27,109 - 11,11,111}{11,27,109 - 11,03,888} \times 1$$

$$= 25 + \frac{15998}{23221} = 25 + 0.69 = 25.69\%$$

Comment : The project can be accepted. If a risk premium of 9% is considered, there will be no change in earlier decision i.e., the project will be acceptable.

5. A project requires an investment of `1,44,000 and is expected to generate cash in flows of `54,000, `63,000, `72,000, `63,000 and `54,000 per annum for the next five years. The risk free rate is 10%.

Evaluate the project using IRR method. If the following certainty equivalents are to be considered, how would you evaluate and interpret the project?

Year	1	2	3	4	5
C.E	0.96	0.92	0.88	0.82	0.79

Sol :

Step-1

Calculation of FPBP (Fake Pay Back Period)

$$\text{FPBP} = \frac{\text{Initial investment}}{\text{Average CFAT's}}$$

$$\text{Average CFAT's} = \frac{3,06,000}{5} = 61,200$$

$$\text{Initial investment} = 1,44,000$$

$$\text{FPBP} = \frac{1,44,000}{61,200} = 2,3529$$

Step-2 : Present value annuity table indicates that, IRR lies between 31% and 32%.

Step-3 : Calculation of present values.

Year	CFAT	PV @ 32%	PV of cash	PV @ 31 %	PV of cash
1.	54,000	0.758	40,932	0.763	41,202
2.	63,000	0.574	36,162	0.583	36,729
3.	72,000	0.435	31,320	0.445	32,040
4.	63,000	0.329	20,727	0.340	21,420
5.	54,000	0.250	13,500	0.259	13,986
			1,42,641		1,45,377

Step-4

The exact rate will be obtained by the method of interpolation as given below.

$$IRR = L.R + \frac{NPV@LR}{\Delta\Sigma PVs} \times \Delta R$$

$$= 31 + \frac{1,45,377 - 1,44,000}{1,45,377 - 1,42,641} \times (32 - 31)$$

$$= 31 + \frac{1377}{2736} \times 1$$

$$= 31 + 0.5 = 31.5\%$$

CE Approach

Year	CFAT	CE	Adjusted CFAT	PVF @10%	Total P.V.
0.	– 1,44,000	1.0	– 1,44,000	1.00	– 1,44,000
1.	54,000	0.96	51,840	0.909	47,123
2.	63,000	0.92	57,960	0.826	47,875
3.	72,000	0.88	63,360	0.751	47,583
4.	63,000	0.82	51,660	0.683	35,284
5.	54,000	0.79	42,660	0.621	26,492
					60,357

Comment. The project is profitable on the basis of a higher IRR and on the basis of CE approach also.

6. Calculate IRR if the project requires an initial outlay of Rs. 6,000/- and expected to generate equal cash inflows of Rs. 2,000/- Pa. The project is having a life of 5 years. Advice the management if the co's cost of capital is 15%.

Sol:

In the given problem the cash inflows are equal.

Step 1 : Calculate PBP

$$PBP = \frac{\text{Initial Investment}}{\text{Annual cash inflow}} = \frac{6,000}{2,000} = 3 \text{ years}$$

Step 2 :

Search for 2 discount factor nearest to PBP in annuity Re 1 table.

$\therefore$ 19% and 20% are two discounting factor.

(3.058) (9.991)

Step 3 :

Use IRR formulae

$$\boxed{IRR = r_L + \frac{Df_{rL} - PBP}{Df_{rL} - Df_{rh}} \times \Delta r}$$

$$\Rightarrow \quad 19\% + \frac{3.058 - 3}{3.058 - 2.991} \times (20 - 19)$$

$$\Rightarrow \quad 19\% + \frac{0.058}{0.067} \times 1 \quad \Rightarrow \quad 19\% + 0.865$$

$\therefore$ 19.865%

Step 4 :

Decision Rule

In the given problem IRR > K i.e., 19.865 > 15 % let so, accept the project.

7. Calculate IRR if the project requires an Initial cash outflow of Rs. 1,00,000/- and expected to generate an equal cash inflows of Rs. 30,000/- each life of the project is 5 years. Advice the Management if the cost of the capital is 10%.

Sol:

In the given problem cash inflows are equal.

Step 1 : Calculate PBP

$$\boxed{PBP = \frac{\text{Initial investment}}{\text{Annual cash Inflow}}} = \frac{1,00,000}{30,000} = 3.33 \text{ years}$$

Step 2 : Search for 2 discount factor nearest to PBP in Annuity Re 1 table.

$\therefore$ 15% and 16% are two discounting factor (3.352) (3.274)

Step 3 : Use IRR formulae

$$\boxed{IRR = r_L + \frac{DF_{rL} - PBP}{DF_{rL} - DF_{rn}} \times \Delta r}$$

$$\Rightarrow \quad 15\% + \frac{3.352 - 3.33}{3.352 - 3.274} \times (16 - 15)$$

$$\Rightarrow \quad 15 + \frac{0.022}{0.078} \times 1 \quad \Rightarrow \quad 15 + 0.282$$

= 15.282

Step 4 : Decision Rule. In the given problem IRR > K i.e., 15.282 > 10%. So accept the project.

8. Equipment A has a cost of Rs. 80000, and net cas flows of Rs. 25000 per year for six years. A substitute equipment B would cost Rs. 50000 and generate net cash flows of Rs. 14000 year for six year. The required rate of return of both equipments is 11%. Calculate the IRR and NPV for the equipments. Which equipment should be and why ?

Sol :

Particulars	Equipment A	Equipment B
Cost of equipment	80,000	50,000
Annual cash inflows	25,000	14,000
Life of equipment	6 years	6 years
Required rate of return	11%	11%

a) NPV

Equipment - A

NPV = [Annual cash flow × PV @ 11%] – Cash outflow

= [25,000 × 4.231] – 80,000

= 1,05,775 – 80,000

= 25,775

Equipment - B

NPV = [14,000 × PV @ 11%] – cash outflow

= [14,000 × 4.231] – 50,000

NPV_B = 59,234 – 50,000

= 9,234

b) IRR

Equipment A

Fake pay back period = $\frac{\text{Initial investment}}{\text{Annual cash flows}} = \frac{80,000}{25,000} = 3.2$

The two interest rates are 21% and 23%.

The PV values at these rates are,

Years	Annual Cash in flows	PV @ 21%	PVCI @ 21%	PV @ 23%	PVCI @ 23%
1 - 6	25,000	3.245	81,125	3,092	77,300

$$IRR = \text{Lower Rate} + \left[\frac{\text{NPV @ lower rate}}{\text{PVCI @ LR} = \text{PVCI @ HR}}\right] \times \Delta R$$

$$= 21 + \left[\frac{81,125 - 80,000}{81,125 - 77,300}\right] \times 2 = 21 + \left[\frac{1,125}{3,825}\right] \times 2$$

= 21 + 0.588 = 21,588%

Equipment B

$$FPBP = \frac{\text{Initial investment}}{\text{Annual cash flows}} = \frac{50,000}{14,000} = 3.57$$

The 2 interest rates are 17% and 19%

Years	Annual Cash in flows	PV @ 17%	PVCI @ 17%	PV @ 19%	PVCI @ 19%
1.6	14,000	1,889	50,246	3,410	47,740

$$IRR = 17 + \left[\frac{50.246 - 50,000}{50,246 - 47,740}\right] \times 2 = 17 + \left[\frac{246}{2506}\right] \times 2$$

$$= 17 + 0.196$$

$$= 17.196\%$$

	Equipment A	Equipment B
NPV	25,775	9,234
IRR	21,588%	17,196%

Interpretation

Equipment 'A' is profitable. As it has a higher NPV and IRR than equipment 'B'. Since firm needs to select the equipment 'A' in order to maximize profits.

2.4.2 Multiple IRR

Q11. Explain the concept of Multiple IRR with an example.

(OR)

Discuss the multiple IRR.

Ans : **(Dec.-19)**

There is another instance in which the IRR approach may not be reliable - when projects have non normal cash flows. A project has normal cash flows if it has one or more cash outflows (costs) followed by a series of cash inflows. Notice that normal cash flows have only one change in sign - they begin as negative cash flows, change to positive cash flows, and then remain positive.

Non-normal cash flows occur when there is more than one change in sign. For example, a project may begin with negative cash flows, switch to positive cash flows, and then switch back to negative cash flows. This cash flow stream has two sign changes – negative to positive and then positive to negative – so it is a Non-normal cash flow. Projects with normal cash flows can actually have two or more IRRs, or multiple IRRs.

To see this, consider the equation that one solves to find a project's IRR:

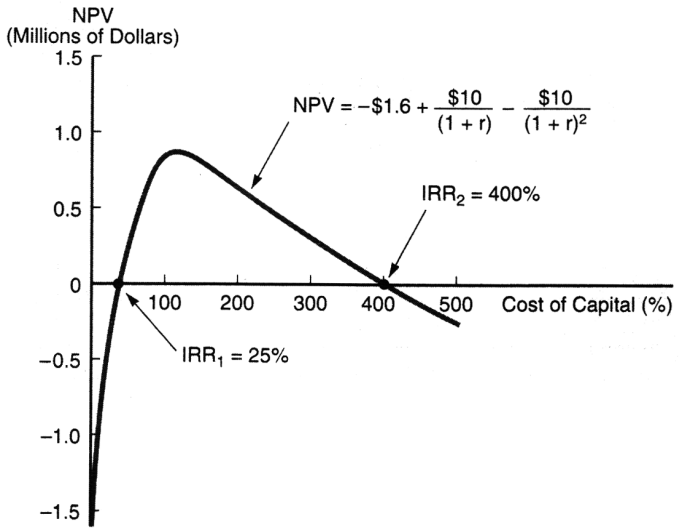
$$\sum_{t=0}^{N} \frac{CF_t}{(1+IRR)^t} = 0$$

Notice that the above Equation is a polynomial of degree N, so it may have as many as N different roots, or solutions. All except one of the roots are imaginary numbers when investments have normal cash flows (one or more cash outflows followed by cash inflows), so in the normal case, only one value of

IRR appears. However, the possibility of multiple real roots, hence multiple IRRs, arises when the project has non normal cash flows (negative net cash flows occur during some year after the project has been placed in operation).

Example

Suppose a firm is considering the expenditure of $1.6 million to develop a strip mine (Project M). The mine will produce a cash flow of $10 million at the end of Year 1. Then, at the end of Year 2, $10 million must be expended to restore the land to its original condition. Therefore, the project's expected net cash flows are as follows (in millions of dollars):



Expected Net Cash Flow

Year 0	End of Year 1	End of Year 2
– $ 1.6	+ $10	– $10

These values can be substituted into above equation to derive the IRR for the investment:

$$NPV = \frac{-\$1.6 \text{ million}}{(1+IRR)^0} + \frac{\$10 \text{ million}}{(1+IRR)^1} + \frac{-\$10 \text{ million}}{(1+IRR)^2} = 0$$

When solved, we find that NPV = 0 when IRR = 25% and also when IRR = 400%. Therefore, the IRR of the investment is both 25% and 400%. This relationship is depicted graphically in Figure. Note that no dilemma would arise if the NPV method were used. If Project M's cost of capital were 10%, then its NPV would be - $0.77 million, and the project should be rejected. If r were between 25 and 400%, the NPV would be positive.

2.4.3 Modified IRR

Q12. Define modified IRR. Explain the procedure for calculating the modified IRR.

(OR)

Discuss the modified IRR.

(OR)

How is modified IRR calculated?

Ans : **(Sep.-20, Dec.-19)**

In terms of concept net present value is the most preferable choice than IRR but in practice most of the firms are interested to use (IRR) internal rate of return instead of NPV for evaluating capital budgeting decisions. However, the regular IRR have some limitations. Thus, percentage measure called modified IRR needs to be introduced which can modify the regular IRR to increase its efficiency in evaluating profitability of a firm and capital budgeting decisions.

[MIRR] modified IRR is defined as the compound average annual rate based on the rate of reinvestment that differs with the regular IRR.

Procedure

The procedure for calculating MIRR consists of three steps,

i) Calculation of (PV of costs) present value of the costs of a project discounted at cost of capital.

$$PVC = \sum_{t=0}^{n} \frac{(\text{Cash outflows})_t}{(1+r)^t}$$

ii) Calculation of terminal value of cash inflows i.e., the future value of cash inflows that are compounded at cost of capital.

$$TV - \sum_{t=1,n}^{n} \text{cash inflows}_t [1+r]^{n-1}$$

Where, r = Cost of capital.

iii) Calculation of MIRR using the following formula,

$$PVC = \frac{TB}{(1+r^*)^n}$$

Where, r* = Modified IRR (or)

$$(1+r^*) = \frac{TV}{PVC}$$

$$\Rightarrow \quad 1+r^* = \left[\frac{TV}{PVC}\right]^{\frac{1}{n}}$$

$$\Rightarrow \quad 1+r^* = \left[\frac{TV}{PVC}\right]^{\frac{1}{n}}$$

MIRR yields several benefits to a finance manager than regular IRR.

i) According to MIRR, the project cash flows are to be reinvested at cost of capital whereas the IRR principle states that the project's cash flows are to be reinvested at their own IRR's. In general, a firm can gain high returns by reinvesting the cash flows at cost of capital.

ii) MIRR serves the best indicator of the real profitability of the firm.

iii) It avoids the existence of multiple IRRS in a project.

In case of mutually exclusive projects both NPV and MIRR results will be same. If the NPV of a project 'A' is higher than NPV of the project 'B'. (Where A and B are mutually exclusive projects) i.e., $NPV_A > NPV_B$ then the $MIRR_A > MIRR_,$,. There does not exist any issues between NPV and MIRR as that in case of NPV and regular IRR. If both projects are same except in the life of the projects then also MIRR results will be same with that of NPV provided MIRR calculated using the terminal year of the project with longer duration. However, there exists conflicts between NPV and MRR in case of projects with different sizes. For instance, a capital budgeting decision in case of two projects of which ne is large project (L) and other one is small, mutually exclusive project (S) is based on the following conditions,

i) $NPV_L > NPV_S$ and

ii) $MIRR_S > MIRR_L$

Though the MIRR serves best in representing the true profitability of the firms than the regular IRR most of the firms are adopting NPV as it depicts the contribution of each project to the firm's value.

PROBLEMS

9. Company is considering two mutually exclusive projects A and B, whose costs and cash flows are shown below.

Year	A	B
0	(1,000)	(1,000)
1	100	1,000
2	300	100
3	400	50
4	700	50

Calculate,

(a) MIRR at a rate of 12%

(b) Calculate NPV for both projects whose cost of capital is 12% which project is accepted.

Sol :

(a) MIRR at a rate of 12%

Project - A

(i) Calculation of PVC

$$PVC = \sum_{t=0}^{n} \frac{\text{cash outflows}}{(1+r)^t}$$

$$= \frac{1,000}{(1+0.12)^0} = 1,000$$

(ii) Calculation of Terminal Value

$$TV = \sum_{t=1..n}^{n} \text{Cash inflows}\,(1+r)^{n-1}$$

$= 100\ (1.12)^{4-1} + 300\ (1.12)^{4-2} + 400\ (1.12)^{4-3} + 700\ (1.12)^{4-4}$

$= 140.5 + 376.32 + 448 + 700$

$= 1664.82$

(iii) Calculation of MIRR (r*)

$$(1 + r^*)^4 = \frac{TV}{PVC}$$

$$(1 + r^*)^4 = \frac{TV}{PVC}$$

$$= \frac{1664.82}{1000} \Rightarrow 1.665$$

$r^* = (1.665)^{1/4} - 1$

$= 1.136 - 1$

$r^* = 0.136$ or 13.6%

$\therefore$ MIRR of project X = 13.6%

Project B

(i) Calculation of PVC

$$PVC = \frac{1,000}{(1+0.12)^0} \qquad (\because t = 0)$$

$= 1,000$

(ii) Calculation of TV

$TV = 1000\ (1.12)^{4-1} + 100\ (1.12)^{4-2} + 50(1.12)^{4-3} + 50(1.12)^{4-4}$

$r^* = 1405 + 125.44 + 56 + 50$

$= 1636.44$

(iii) Calculation of MIRR (r*)

$$(1+r^*)^4 = \frac{TV}{PVC}$$

$$= \frac{1636.44}{1000} = 1.636$$

$1 + r^* = (1.636)^{1/4}$

$r^* = 1.1310 - 1$

$= 0.1310$ or 13.10%

$\therefore$ MIRR of project Y = 13.10%

(b) NPV @ 12%

Project A

Year	Cash in flow	Discounting factor	Present value of cash flows
1	100	0.893	89.3
2	300	0.797	239.1
3	400	0.7117	284.68
4	700	0.6355	444.85
Total PV of cash flows			1057.93
(–) Cash outflows			1000
Net present value			57.93

Project B

Year	Cash in flow	Discounting factor	Present value of cash flows
1	1000	0.893	893
2	100	0.797	79.7
3	50	0.7117	35.6
4	50	0.6355	31.8
Total PV of cash flows			1040.1
(–) Cash outflows			1000
Net present value			40.1

Parameters	Project A	Project B
(i) Modified IRR (r*)	13.6%	13.10%
(ii) NPV	57.93	40.1

Based on both MIRR and NPV, the project X is recommended as project 'X' has higher NPV and MIRR than project 'Y'.

10. Cummings products company is considering two mutually exclusive investment. The project expected net cash flows are as follows,

Year	A	B
0	**(300)**	**(405)**
1	**(387)**	**134**
2	**(193)**	**134**
3	**000)**	**134**
4	**600**	**134**
5	**600**	**134**
6	**850**	**134**
7	**(180)**	**0**

(a) Construct NPV profiles for A and B projects discounted at 10%.

(b) What is each projects MIRR at a cost of capital 10%?

Sol :

(a) NPV @ 10%

Given cash outflows = 300

Cost of capital = 10%

Project A

Year	Cash inflows	PV@10%	PVCF
1	– 387	0.909	– 351.783
2	– 193	0.826	– 159.418
3	– 100	0.751	– 75.1
4	600	0.683	409.8
5	600	0.621	372.6
6	850	0.564	479.4
7	– 180	0.513	– 92.34
	Total PV of cash inflows		583.16
	(–) Cash outflows		300
	Net present value		283.16

Project B

Year	Annual cash inflows	PV@10%	PVCF
1 – 6	134	7.716	1033.94
7	0	9.487	0
		Total PV cash inflows	1033.94
		(–) Cash outflows	405.00
		Net present value	628.94

(b) MIRR : Project A

(i) Calculation of PVC

$$PVC = \sum_{t=1..n}^{n} \frac{\text{Cash outflows}_t}{(1+r)^t}$$

$$PVC = \frac{300}{(1.10)^0} + \frac{387}{(1.10)^1} + \frac{193}{(1.10)^2} + \frac{100}{(1.10)^3} + \frac{180}{(1.10)^7}$$

$$= 300 + 351.82 + 159.50 + 75.131 + 92.37$$

$$= 978.821$$

(ii) Calculation of TV

$$TV = \sum_{t=1,\,2.n}^{n} \text{cash inflows} \times (1 + r)^{n-1}$$

$$= 600\ (1.10)^{7-4} + 600(1.10)^{7-5} + 850(1.10)^{7-6}$$

$$= 798.6 + 726 + 935$$

$$= 2460$$

(iii) Calculation of MIRR

$$(1 + r^*)^7 = \frac{TV}{PVC}$$

$$= \frac{2,460}{978.821}$$

$$= 2.513$$

$$r^* = (2.513)^{1/7} - 1 = 1.141 - 1$$

$$r^* = 0.141 \text{ or } 14.1\%$$

Project B

(i) Calculation of PVC

$$PVC = \sum_{t=0}^{n} \frac{\text{cash outflows}_t}{(1+r)^t}$$

$$= \frac{405}{(1.10)^0}$$

$$= 405$$

(ii) Calculation of TV

$$TV = \sum_{t=0}^{n} \text{cash inf lows}\,[1+r]^{n-1}$$

$$= 134\ (1.10)^{7-1} + 134\ (1.10)^{7-2} + 134\ (1.10)^{7-3} + 134\ (1.10)^{7-4} + 134\ (1.10)^{7-5} + 134\ (1.10)^{7-6} + 0\ (1.10)^{7-7}$$

$$= 237.4 + 215.8 + 196.2 + 178.35 + 162.14 + 147.4 + 0$$

$$= 1137.29$$

(iii) Calculation of MIRR

$$(1 + r^*)^7 = \frac{TV}{PVC} = \frac{1137.29}{405}$$

$$(1 + r^*) = (2.808)^{1/7} = 1.16$$

$$r^* = 1.16 - 1 = 0.16 \text{ or } 16\%.$$

2.5 Differences between IRR, MIRR and Multiple IRR

Q13. Compare and contrast between IRR, MIRR and multiple IRR.

Ans : **(Imp.)**

Sl.No.	Nature	IRR	Modified IRR	Multiple IRR
1	**Definition**	IRR is the discount rate at which the net present value of a project will be zero.	MIRR is a compound average annual rate.	A project with multiple IRR consists of more than one IRR. It is a problem of IRR.
2.	**Basis for Calculation**	It is based on the discount rate.	MIRR is based on compound rate.	It is also based on discount rate.
3.	**Effect on Capital Budgeting Decisions**	IRR does not serve best indicator of the firm's profitability	MIRR serves a better indicator of real profitability of firm.	It misleads the capital budgeting decisions of a manager.
4.	**Similarity with NPV in Results**	In case of mutually exclusive projects IRR results differ with that of NPV.	For mutual exclusive projects both NPV and MIRR yields similar results.	Multiple IRR is entirely differ with NPV results. Thus, NPV is better suggested than multiple IRR.
5.	**Basis for Reinvestment**	In IRR reinvestment of returns occur at the project's IRR.	In MIRR reinvestments occur at the cost of capital which can yield high returns that reinvesting at IRR.	There is no such case of reinvestment.
6.	**Ability to Resolve Multiple IRRs**	It fails to eliminate the problem of multiple IRRs.	Multiple IRR problem can be better solved by MIRR.	

2.6 Pure, Simple and Mixed Investments

Q14. Explain the different types of investments.

(OR)

Define Pure, Simple and Mixed Investments.

Ans : **(Dec.-19, May-19)**

The investments are generally categorized into three groups,

a) Simple investment

b) Pure investment

c) Mixed investment.

a) Simple Investment

An investment is said to be simple if it has only one sign change or consists of initial capital outflows followed by cash inflows. The series of cashflows for a simple investment is (–, +, +). Simple investments are always pure investments. In simple investments, the rate of return should maintain the NPV as '0', i.e., present value of cash outflows should be equal to present value of cash inflows at that rate at 1%.

PV of cash outflows – PV of cash inflows = NPV (0)

Example

Year	0	1	2	3	4	5
Cash Flows	(1100)	400	400	400	400	400

Sign change – to + i.e., one

In simple conventional investment the rate of return can be determined using trail and error approach. For a single project the rate of return at which NPV will become "zero" is to be determined whereas for mutually exclusive projects or independent projects the rate of return for all the project alternatives need to be determined of which highest rate of return should be considered as the profitable alternative for the firm.

In the above example, the initial investment is 1,100 and the annual cash flows are 400.

i = 10% NPV = 400 (PVF @ 10%, 5) – Initial investment

= 400(3.7908) – 1100 = 1516.32 – 1100 = 416.32

i = 20% NPV = 400 (PVF @ 20%, 5) – Initial investment

= 400 (2.991) – 1100 = 1196.4 – 1100 = 96.4

i = 32% NPV = 400 (PVF @ 32%, 5) – Initial investment

= 400 (2.345) – 1100

= 938 – 1100 = – 162

$$IRR = 20 + \frac{96.4}{1196.4 - 938} \times 12$$

= 20 + 4.477 = 24.477%

The rate of return for new simple business = 24.47%.

b) Pure Investment

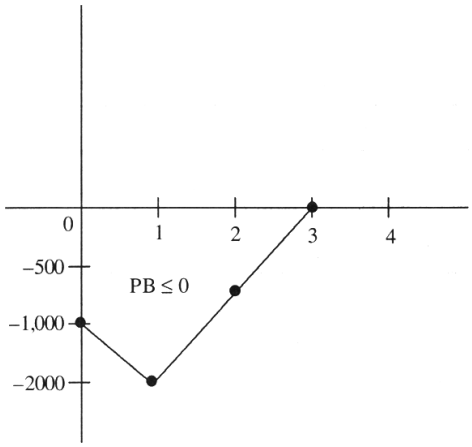
An investment is said to be pure investments if it is either simple or non-simple, conventional or non-conventional and does not borrow the returns of the project. Pure investments are said to have unique rate of returns. In pure investment, the project balances during the whole life of a project should be less than or equal to zero i.e., -ve project balanced otherwise i.e., if the project balances are +ve it will represents that firm has borrowed the returns of the project.

Example

Year	Cashflows	PV@ 33.64	PVCF	Project Balances
0	(1,000)	1.00	-1000	-1000
1	(1,000)	0.748.279	-748.279	-1748.279
2	2,000	0.559	1129.84	-628.466
3	1500	0.48977	628.466	0

Where IRR = 33.64%

All project balances are < 0. Hence it is a pure investment.



c) Mixed investment

An investment is said to be mixed if it is non simple and non conventional investments. In mixed investment the project balances of a project are positive i.e., PB > 0. The IRR at these project balances cannot be considered as a true IRR. In the mixed investments the following aspects need to be considered while determining the project balances.

i) The initial investment of money in a project will yield an interest rate of i^*.

ii) The external investment such as cash borrowings from the projects also yield same interest of i^*. The borrowings from the project returns are required to reinvest in the project either at a rate of return (i^*) or at an external rate which is less than i in order to gain the same rate of returns.

Calculation of True IRR for Mixed Investment

In case of mixed investments the true IRR can be determined using the following procedure :

i) Assume that the cash borrowings from the project are again reinvested in the firm.

ii) Use present value method to invest the investments at MARR.

iii) True IRR can be calculated as a function of MARR by considering the project balances of the last year equal to zero i.e., $PB\ (i, \text{MARR})_D = 0$.

iv) The true IRR then determined is referred to as Return on Invested Capital (RoIC).

Example

Year	Cash flow	Sign of Change
0	-1,00,000	– to +
1	+2,30,000	1 to –
2	-1,32,000	

$$\text{NPV @ } i^* = -1,00,000 + \frac{2,30,000}{(1+i^*)^1} - \frac{1,32,000}{(1+i^*)} = 0$$

$$i = 10\% = -1,00,000 + \frac{2,30,000}{(1.1)^1} - \frac{1,32,000}{(1.1)^2} = -1,00,000 + 2,09,090.9 - 1,09,090.9 = 0$$

$$i = 20\% = -1,00,000 + \frac{2,30,000}{(1.2)^1} - \frac{1,32,000}{(1.2)^2}$$

$$= -1,00,000 + 1,91,666.67 - 91,666.67 = 0$$

The PB is +ve at 1st year thus there is a necessity to use external rate of investment i.e., MARR = 14%.

Year	Cashflows	PV@20%	PVCF	Project Balances
0	–1,00,000	1.00	–1,00,000	–1,00,000
1	+2,30,000	0.833	1,91,590	91,590
2	–1,32,000	0.6939	–91,590	0

$PB\ (i, 14)_0 = -1,00,000$

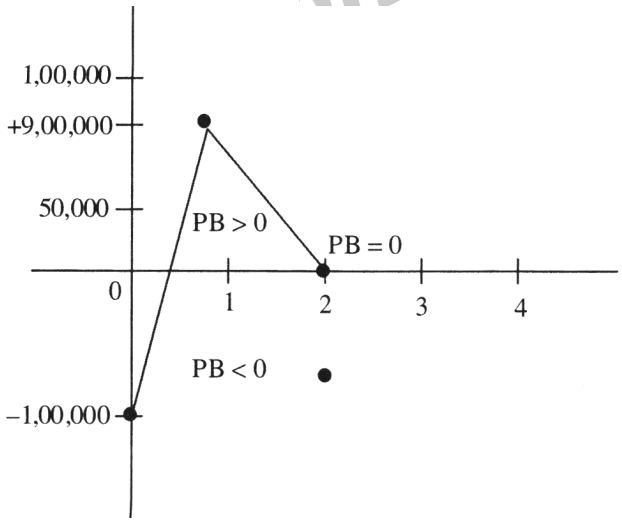
$PB\ (i, 14)_t = -1,00,000\ (i + 1) + 2,30,000 \Rightarrow 1,00,000\ (1.3 - i)$

$PB\ (i, 14)_2 \Rightarrow 1,00,000\ (1.3 - i)\ (1.14) - 1,32,000 = 0$

$\Rightarrow 16,200 - 1,14,000i = 0$

$$i = \frac{16,200}{114,000} \times 100 = 14.2\%$$

$\therefore$ True IRR = 14.2%



In case of independent projects the total investment of company is 1,00,000.

Project X 50,000 30% 15%

Project Y 85,000 20%

Rate of return,

$$X = \frac{50,000 \times 0.3 + 50,000 \times 0.15}{1,00,000} = 22.5\%$$

Rate of return,

$$Y = \frac{85,000 \times 0.20 + 15,000 \times 0.15}{1,00,000} = 19.3\%$$

In case of mutually exclusive projects,

Years	X	Y	
0	–20	–40	10%
1	30	56	

PV of outflows = + 20 × 1 = 20

PV of inflows = 30 × PV (10%, 1) $\Rightarrow$ 30 × 0.909

= 27.270

NPV = 27.270 – 20 = 7.270

$$i_X = \frac{\text{Incremental cash flows (inflows} - \text{outflows)}}{\text{Initial investment}}$$

$$= \frac{30-20}{20} = \frac{10}{20} = 50\%$$

For Y

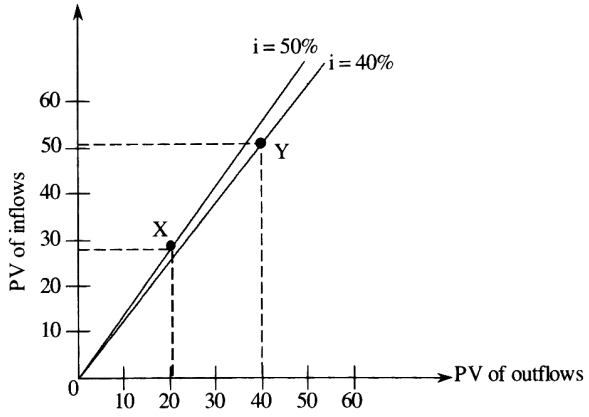
PV of outflows = 40 × 1 = 40

PV of inflows = 56 × (PV@ 10%, 1) = 56 × 0.909 = 50.904

NPV = 50.904 – 40 = 10.904

$$i_Y = \frac{56-40}{40} = \frac{16}{40}$$

= 40%



Q15. Differentiate among simple, pure and mixed investments.

Ans : **(Dec.-19)**

Sl. No.	Basis	Simple Investment	Pure Investment	Mixed Investment
1.	**Net investment Test**	A project which passes net investment test becomes simple investment.	A project which passes net investment test becomes pure investment.	A project which fails net investment test becomes mixed investment.
2.	**Borrowing**	In simple investment, firm never borrows money from the project.	In pure investment, firm never borrows money from the project.	In mixed investment, firm borrows money from project in investment period.
3.	**Relationship**	Simple investment is always a pure investment.	Pure investment is always a simple investment.	Mixed investment is a non simple investment.

2.7 LORIE SAVAGE PARADOX

Q16. Explain briefly about Lorie Savage Paradox.

(OR)

Write short notes on Lorie Savage Paradox.

(OR)

What is Lorie Savage Paradox? Explain in detail.

Ans : **(Imp.)**

Introduction

In general capital budgeting is an analytical economic approach which applies analytical principles for project analysis in order to maximize the value of the project through cashflow modelling and risk analysis.

Number of analysts have been proposed various mathematical programming models based on analytical rules to facilitate effective investment decisions of managers, since many years. Earlier to these models, the first model was developed using Lagrange's multiplier methods by the analysts which provided allowance for capital constraints for future periods but these models were inappropriate for effective investment decisions. Later, Lorie and Savage developed a project selection paradox using linear programming models which were successful in identifying the areas of complexities that effects the optimal investment decision making. However, this paradox also has certain limitations.

Lorie and Savage applied linear programming model for resolving capital rationing problem. The formulation of a linear programming model for a capital rationing problem is as follows:

$$\text{Maximize } Z = \sum_{i=1}^{n} NPV_i . X_i \quad \ldots (1)$$

$$\text{Subject to constraints } \sum_{i=1}^{n} CF_{it} . X_i \leq K_t$$

$$(t = 0, 1, n) \quad \ldots (2)$$

$$0 \leq x_i \leq 1$$

x_i = Proportion of the project x accepted by the firm.

i = Project

k_t = Capital budget at period t.

The following 9-project 2-period problem is given by Lorie and Savage in the "Three problems in rationing capital" paper to illustrate the use of linear programming model for resolving capital budgeting problems.

Project	NPV_1	Cash Outflows (CF_{i1}) in 1st Period	Cash Outflows in 2nd Period (CF_{i2})
1	14	12	3
2	17	54	7
3	17	6	6
4	15	6	2
5	40	30	35
6	12	6	6
7	14	48	4
8	10	36	3
9	12	18	3

The formulation of linear programming model for this "9-project 2-period problem" is:

Maximize $Z = 14x_1 + I7x_2 + 17x_3, + 15x_4 + 40x_5 + 12x_6 + 14x_7 + 10x_8 + 12x_9$

STC

(i) Fund Constraint for 1st Period

$12x_1 + 54x_2 + 6x_3 + 6x_4 + 30x_5 + 6x_6 + 48x_7 + 36x_8 + 18x_9 \leq 50$

(ii) Funds Constraint for 2nd Period

$3x_1 + 7x_2 + 6x_3 + 2x_4 + 35x_5 + 6x_6 + 4x_7 + 3x_8 + 3x_9 \leq 20$

STC: Use of Slack Variables

(i) $12x_1 + 54x_2 + 6x_3 + 6x_4 + 30x_5 + 6x_6 + 48x_7 + 36x_8 + 18x_9 \leq 50$

(ii) $3x_1 + 7x_2 + 6x_3 + 2x_4 + 35x_5 + 6x_6 + 4x_7 + 3x_8 + 3x_9 + s_2 = 20$

$x_i \geq 0$ (i = 1, 2, 3 ..... 9).

$s_i \geq 0$ (i = 1, 2, 3 ..... 11).

Upper limit on project acceptance,

$x_1 + s_3 = 1$ $x_4 + s_6 = 1$ $x_7 + s_9 = 1$

$x_2 + s_4 = 1$ $x_5 + s_7 = 1$ $x_8 + s_{10} = 1$

$x_3 + s_5 = 1$ $x_6 + s_8 = 1$ $x_9 + s_{11} = 1$

In this problem, s_1 and s_2 are slack variables for the funds constraints of period 1 and period 2 whereas, s_3 to 8_{11} are the slack variables for all the projects from 1 to 9.

The feasible solution for the linear programming problem is given in the table.

Basic variables = $x_1, x_3, x_4, x_6, x_7, x_9, s_4, s_7, s_8, s_9, s_{10}$

Non-basic variables = $x_2, x_5, x_8, s_1, s_2, s_3, s_5, s_6, s_{11}$

The values of s_1 and s_2 are zero which represses the complete utilization of the funds of 6 accepted projects (1, 4, 3, 6, 7, 9).

Basic Variables	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_{10}	s_{11}	
x_1	1											1.0									1
x_3			1											1.0							1
x_4				1											1.0						1
x_6		0.455			5.91	1				– 0.15	–0.1818	–0.364			–0.273		1.0			–0.273	0.9696
x_7		1.068	1		–0.114		1	0.75		–0.23	–0.23	–0.205		1.0	–0.91					–0.341	0.4545
x_9									1.0											1.0	1
s_4		1.0											1.0								1
s_7					1.0											1.0					1
s_8		–4.55			5.91												1.0			0.273	0.3030
s_9		–1.068			0.114		1.0		0.75	–0.23	0.23	0.205		0.091				1.0		0.341	0.9545
s_{10}	0							1.0											1.0		1
Z	0	3.41	0	0	29.32	0	0	50	0	0.1364	1.864	6.77		0	5.0	10.45	0	0	0	3.94	70.273

Table : Feasible Solution of the above Linear Programming Problem or Lorie-Savage Problems

Extensions of the Model

Lorie and Savage have introduced number of other constraints in the line are programming model in addition to the funds constraints. Most commonly the two constraints that are included are :

(a) Carry forward of cash and

(b) Non-financial constraints,

(a) Carry Forward of Cash

It is difficult to solve the constraints of equation (2). In general, the firms used to carry the funds from one year to next year for optimum utilization of funds. This funds constraint of two years can be given as,

$$-\sum_{i=1}^{n} CF_{i_1}.x_i \le k_1 \qquad (t = 1)$$

$$-\sum_{i=1}^{n} CF_{i_1}.x_i \le k_1 \qquad (t = 1)$$

A firm can gain a return of r % by shifting the funds from 1st year to 2nd then by adjusting the above equation, we get,

$$\sum_{i=1}^{n} CF_{i_2}.x_i + SF1 = k_1$$

$$\sum_{i=1}^{n} CF_{i_2}.x_i + SF1 = k_1$$

SF_1 = Surplus funds of 1st year

SF_1 = 0

r = Percentage of returns on surplus.

(b) Nonfinancial constraints

A firm can also include another constraints which are non-financial in addition to cash transfer such as labour, material and demand. The constraints for material is $\Sigma m_i . x_i \leq M$.

Where,

m_i = Material required for project i

x_i = Proportion of project accepted by firm

M = Total material of the firm.

PROBLEMS

11. A firm is evaluating 6 investment opportunities:

Project	NPV_1	CF_{i1}	CF_{i2}
1	10,000	15,000	5,000
2	15,000	12,000	13,000
3	25,000	8,000	40,000
4	40,000	35,000	25,000
5	60,000	1,00,000	10,000
6	1,00,000	50,000	1,10,000

The budget available is limited to `1,50,000 in year 1 and `2,00,000 in year 2. There are two additional constraints, working capital constraint and managerial constraint. The requirement and constraints applicable in this respect are below.

Develop a linear programming formulation of the above capital budgeting problem.

Project	Power Requirement W_i	Managerial Requirement M_i
1	5,000	15
2	6,000	20
3	5,000	30
4	10,000	35
5	12,000	40
6	40,000	60
	$\Sigma x_i.w_i \leq 60,000$	$\Sigma x_i.M_i \leq 120$

Sol :

Given that,

Project (i)	NPV_i (` 000)	CF_{i1} (` 000)	CF_{i2} (` 000)
1	10	15	5
2	15	12	13
3	25	8	40
4	40	35	25
5	60	100	10
6	100	50	110
		$\Sigma CF_{i1}.x_i \leq 150$	$\Sigma CF_{i2}.x_i \leq 200$

The linear programming model formulated for the problem is,

Maximize $z = 10x_1 + 15x_2 + 25x_3 + 40x_4 + 60x_5 + 100x_6$

Subject to constraints,

(i) Fund Constraint for Period 1

$15x_1 + 12x_2 + 8x_3 + 35x_4 + 100x_5 + 50x_6 + s_1 = 150$

(ii) Fund Constraint for Period 2

$5x_1 + 13x_2 + 40x_3 + 25x_4 + 10x_5 + 110x_6 + s_2 = 200$

(iii) Power Requirement Constraint

$5x_1 + 6x_2 + 5x_3 + 10x_4 + 12x_5 + 40x_6 + s_3 = 60$

(iv) Managerial Requirement Constraint

$15x_1 + 20x_2 + 30x_3 + 35x_4 + 40x_5 + 60x_6 + s_4 = 120$

s_1, s_2 are slack variables for unallocated amount in year 1 and year 2 respectively. s_3 slack variable for surplus power and s is slack variable for surplus managerial requirement.

s_5 to s_{10} for projects from 1 to 6.

$$\left.\begin{array}{l} x_1+s_5 \\ x_2+s_6 \\ x_3+s_7 \\ x_4+s_8 \\ x_5+s_9 \\ x_6+s_{10} \end{array}\right\} \text{Upper limits on project acceptance}$$

2.8 NET PRESENT VALUE

Q17. Define NPV ? Explain the advantages and disadvantages of NPV ?

Ans :

Net present value method is one of the modern method which comes under the category of discounted cash flow methods. This method is very useful in evaluating investment proposals. Under this method the cash inflows and outflows associated with each project are first determined.

The cash inflows and outflows are then converted to the present values using a discounting factor. This rate of return or discounting factor is considered as the cutoff rate and is generally determined on the basis of the cost of capital for risk element.

The net present value of each project is obtained by deducting the present value of cash inflows from the present value of cash outflow for each project. The proposal is accepted if NPV of the project is positive or zero in case of the NPV of the project is negative then it is rejected. If more than one projects have positive NPV then project with maximum net present value must be accepted.

The equation for calculating NPV in case of conventional cash flows can be put as follows,

$$NPV = \left[\frac{A_1}{(1+K)^1} + \frac{A_2}{(1+K)^2} + \frac{A_3}{(1+K)^3} + ... + \frac{A_n}{(1+K)^n}\right] - C_0$$

where

A_1, A_2, ..., A_n – The CFATs upto time periods.

K – Discounting factor

n – Time period

C_0 – Initial investment or cash outflows.

In case of non-conventional cash flows (where there is a series of cash inflows and outflows), the above equation may be modified as,

$$NPV = \left[\frac{A_1}{(1+K)^1} + \frac{A_2}{(1+K)^2} + ... + \frac{A_n}{(1+K)^n}\right] - \left[C_0 + \frac{C_1}{(1+K)^1} + \frac{C_2}{(1+K)^2} + ... + \frac{C_n}{(1+K)^n}\right]$$

where

A_1, A_2, ..., A_n = Cash inflow at different time periods

K = Discounting factor

n = Time period

C_0 = Initial cash outflow

C_1, C_2, ... C_n = Cash outflows at different time periods.

Advantages

1. The most significant advantage of this method is that it recognizes the time value of money.
2. While evaluating the projects, it takes into account the entire cash flows generated in the project and not only net cash flows.
3. The market value of a firm's share is expected to increase, if projects with positive NPV are accepted. This will be so because the positive NPV is displayed by those projects which generate cash inflows at a rate higher than the minimum required by investors. Thus, this method is consistent with the firm's objective of maximizing the welfare of the owners, i.e. maximization of profits and net worth.

4. It is highly useful in case of mutually exclusive projects, since the expected economic contribution of every project is expressed in absolute terms. It is more scientific compared to other conventional methods.
5. Under this method, if the denominator is changed, it is possible to use changing discount rate of NPV calculations.

Disadvantages

1. It involves many calculations and is difficult to use as compared to payback or ARR methods. Again, there are different opinions with respect to the exact method of its calculations.
2. The cost of capital of firm is assumed and used as a discount rate. But in practice, it is very difficult to understand the concept of cost of capital and to measure it.
3. It does not help satisfactorily to evaluate projects involving different amounts of investment. The project with higher NPV may not be preferable if it also involves huge investments.
4. Under this method, NPV based on a predetermined discount rate is considered for the ranking of investment proposals. But, some other important factors are completely ignored, e.g. availability of manpower, loans or funds, the political or strategic factors, etc.

PROBLEMS

12. A firm whose cost of capital is 10% considering two mutually exclusive projects X and Y. The details of which are:

Particulars	Project A Rs.	Project B Rs.
Investment	Rs. 50,000	Rs. 50,000
Life	5 years	5 years
Cost of Capital 10%		
Tax Rate 50%		

Cash flows before depreciation and taxes (CFBT) are as follows:

Year	Rs.	Rs.
1	20,000	30,000
2	22,000	27,000
3	28,000	22,000
4	25,000	25,000
5	30,000	20,000

Which Project should be accepted under NPV method ?

Sol :

Project : A

Calculation of Net Cash Flows (CFAT)

Year	CFBT	–	DEP	=	NP	–	TAX @50%	=	PAT	+	DEP	=	CFAT
1.	20,000	–	10,000	=	10,000	–	5,000	=	5,000	+	10,000	=	15.000
2.	22,000	–	10,000	=	12,000	–	6,000	=	6,000	+	10,000	=	16.000
3.	28,000	–	10,000	=	18,000	–	9,000	=	9,000	+	10.000	=	9.000
4.	25,000	–	10,000	=	15,000	–	7,500	=	7,500	+	10.000	=	17,500
5.	30,000	–	10,000	=	20,000	–	10,000	=	10,000	+	10,000	=	20.000

$$\text{Depreciation} = \frac{50,000 - 0}{5} = \text{Rs. } 10,000$$

Calculation of net present value

Year	CFAT Rs.	Discount * Factor @ 10%	Total Present Value
1	15,000	.909	13,635.00
2	16,000	.826	13,216.00
3	19,000	.751	14,269.00
4	17,500	.683	11,952.50
5	20,000	.621	12,420.00
		Total present value	65,492.50
		Investment	50,000.00
		Net Present Value Rs.	15,492.00

Project : B

1) Calculation of CFAT

Year	CFBT	–	DEP	=	NP	–	TAX @50%	=	PAT	+	DEP	=	CFAT
1.	30,000	–	10,000	=	20,000	–	10,000	=	10,000	+	10,000	=	20,000
2.	27,000	–	10,000	=	17,000	–	8,500	=	8,500	+	10,000	=	18,500
3.	22,000	–	10,000	=	12,000	–	6,000	=	6,000	+	10.000	=	16,000
4.	25,000	–	10,000	=	15,000	–	7,500	=	7,500	+	10.000	=	17,500
5.	20,000	–	10,000	=	10,000	–	5,000	=	5,000	+	10,000	=	15,000

$$\text{Depreciation} = \frac{50,000 - 0}{5}$$

= Rs. 10,000

2) Calculation of Net Present Value

Year	CFAT Rs.	Discount * Factor @ 10%	Total Present Value
1	20,000	.909	18,180.00
2	18,500	.826	15,281.00
3	16,000	.751	12,016.00
4	17,500	.683	11,952.50
5	15,000	.621	9,315.00
		Total present value	66,774.50
		- Initial Investment	50,000.00
		Net Present Value Rs.	16,744.50

Since NPV of project B is higher than that of project A , it is advisable to select project B.

2.8.1 Adjusted NPV

Q18. Explain briefly about Adjusted Net Present Value.

(OR)

What is risk Adjusted NPV?

Ans : **(Dec.-19)**

Adjusted Net Present Value

The net present value that is adjusted with the NPV of financial side effects such as issue costs, tax shields of debt, subsidies, incentives etc., is referred to as adjusted NPV.

The adjusted cost of capital forms the base for the evolution of adjusted NPV. The main aim of adjusting the base NPV is to eliminate the adverse financing effects on the project. Adjusted NPV is based on base NPV which is further adjusted with the NPV of financing side effects.

Adjusted NPV = Base NPV ± NPV of financing side effects.

Calculation of a NPV

The procedure for calculating adjusted NPV include two stages,

(i) Calculation of base case NPV and then evaluating the project to determine whether it is completely funded by the equity of the firm.

$$\text{Base NPV} = -\text{Initial investment} + \sum_{t=1,\ldots,n}^{n} \text{cash inflows (PV@ } r_t\%, t)$$

If the answer for the evaluation is yes then proceed to next stage.

(ii) Adjusting the base NPV with the adverse impact on the financing of the project.

Adjusted NPV = Base NPV ± PV of side effects of financing

Most commonly the factors considered for adjustments are issue costs and tax shields on debt.

(i) Issue cost can be calculated using the following formula,

$$\text{Issue costs} = \frac{\text{Equity capital}}{\text{1-Percent allocated for issue costs absorption}} - \text{Equity capital}$$

(ii) PV of tax shields on debt finance can be calculated as,

Year	Particulars	Amt
(i)	Outstanding debt at the beginning of year	xxx
(ii)	Interest @ x% on outstanding debt	xxx
(iii)	Tax shield @ t% on interest	xxx
(iv)	PV factor @ x%	xxx
(v)	PV of tax shield (iii) × (iv) @ x%	xxx

Evaluation Criteria

If the project has a positive APV then the project is said to be a worthwhile one. If it is negative it is better for the firm to reject that project.

Q19. Explain the merits and demerits of Adjusted NPV.

Ans :

Merits of APV

(i) By calculating Adjusted NPV, a firm can track the impact of financing side effects on the project and the basis for Adjusted NPV for which it involves a series of computations. Based on this Adjusted NPV, a firm can redesign the project plan.

(ii) If the Adjusted NPV is negative for a project then the firm can take certain measures to reduce the impact of side effects such as reducing the issue costs or increasing the subsidies etc.

(iii) Adjusted NPV helps a firm in identifying the projects with highly profitable capital structure and have special incentives, subsidies etc.

(iv) Adjusted NPV is more suitable for infrastructure projects which have a significant impact of financing side effects and LBO (Leveraged Buyouts) which is a take over and possess complete temporary debts in capital structure. WACC can also be used to evaluate and LBO.

(v) Adjusted NPV helps in reducing the debt structure of the projects.

Demerits

Though Adjusted NPV is more beneficial to firms it also has certain demerits,

(i) Adjusted NPV is a complex process as it consists of a series of adjustments.

(ii) Adjusted NPV is not widely used in practice as it need advanced techniques to evaluate the impact of the financing side effects on the project.

PROBLEMS

13. ABC company is considering a project requiring ` 4,00,000 of investment. It is expected to generate a net cash flows of `1,00,000 every year for 6 years. The opportunity cost of capital is 12%. The cost of issuing equity is 6%. The project enables the firm to raise ? 2,00,000 of debt at a rate of 12% interest and will be repaid in equal annual instalment over the eight year period. The first instalment will be paid at the end of first year. The tax rate is 40%. Calculate the adjusted NPV for the project and suggest the firm whether to accept the project or not ?

Sol :

Given that,

Initial investment = Rs. 4,00,000/-

Annual cash inflows = Rs. 1,00,000/-

Life of project = 6 years

Opportunity cost of capital = 12%

(i) Calculate Base NPV

$$\text{Base NPV} = \sum_{t=1-6}^{6} 1,00,000 \times (\text{PV annuity factor @ 12\%, 6}) - \text{Initial investment}$$

$$= 1,00,000 \times 4.11141 - 4,00,000 = 4,11,141 - 4,00,000$$

$$= 11,141$$

(ii) The two factors that need to be adjusted are,

(a) Issue costs

(b) Tax shields of debt,

(a) Issue Costs

The capital structure of the firm consists of Rs. 2,00,000 from debt and 2,00,000 from equity. The issue costs absorb 6% on gross proceeds of issue.

PV of issue costs of equity $= \frac{2,00,000}{(1-0.06)} - 2,00,000 = 2,12,766 - 2,00,000$

Issue costs = 12,766

Adjustments with issue costs,

APV = Base NPV – Issue costs = 11,141 – 12,766 = – 1625

(b) Tax Shields of Debt

Present value of tax shields on debt is calculated as below,

Year	Outstanding debt	Interest @ 12%	Tax shield @ 40%	PV@12%	PV of tax shields
1	2	3 = 2 x 0.12	4 = 3x 0.4	5	6 = 4 x 5
1.	2,00,000	24,000	9,600	0.893	8572.8
2.	1,66,666.67	20,000	8,000	0.797	6,376
3.	1,33,333.34	16,000	6,400	0.712	4,557
4.	1,00,000.07	12,000	4,800	0.636	3,053
5.	66,667.66	8,000	3,200	0.567	1814.4
6.	33,333.33	4,000	1,600	0.5066	810.56
				Total	25183.76

Base NPV – Issue costs + PV of tax shields

Adjusted NPV = 11,141 – 12,766 + 25183.76

= 23,558.76

Since the NPV is positive the project can be accepted.

Working Notes

Outstanding debt

Equal installment per year $= \frac{2,00,000}{6}$ = Rs. 33,333.33/-

For 1st year = 2,00,000

For 2nd year = 2,00,000 – 33,333.33 = 1,66,666.67

For 3rd year = 1,66,666.67 – 33,333.33 = 1,33,333.34

For 4th year = 1,33,333.34 – 33,333.33 = 1,00,000.01

For 5th year = 1,00,000.01 – 33,333.33 = 66,666.67

For 6th year = 66,666.67 – 33,333.33 = 33,333.33.

14. XYZ electricals limited is evaluating a capital project requiring outlay of ` 12 million and is expected to generate an annual cash flow of ` 3 million for 6 years. The opportunity cost of capital is 20%. XYZ electricals can raise a term of 8 million for the project. It will carry an interest rate of 18% and will be repayable in 8 equal annual installments, the first instalment failing due at the end of 2nd year the balance amount required for the capital can be raised by issuing external equity. The issue cost i.e., expected to be 12% and tax rate is 30%,

(a) What is base NPV?

(b) What is the adjusted NPV?

Sol :

Given that,

Initial investment = 12 million

Annual cash inflows = 3 million

Life of project = 6 years

Opportunity cost of capital = 20%

(i) Calculate Base NPV

Base NPV = 3 × (PV annuity factor @ 20%, 6) – Initial investment

= (3 × 3.325) – 12 = – 2.025

(ii) Two Factors

(a) Issue costs and

(b) Tax shields of debt need to be adjusted.

(a) Issue Cost

The capital structure of the firms consists of 8 million debt finance and 4 million equity finance. Issue costs absorb 12% on gross proceeds of issue,

$$\text{Issue costs} = \frac{4}{1-0.12} - 4 = 4.545 - 4 = 0.545$$

Adjustment with issue costs,

APV = – 2.025 – 0.545 = – 2.57

(b) Tax Shields of Debt

Present value of tax Shield on debt is calculated as follows,

Year	Outstanding debt	Interest @ 18%	Tax @ 30%	PV @ 18%	PV of tax shields
1	**2**	**3 = 2 x 0.18**	**4 = 3 x 0.3**	**5**	**6 = 4 x 5**
1.	8	1.44	0.432	0.847	0.366
2.	8	1.44	0.432	0.718	0.310
3.	6	1.08	0.324	0.609	0.197
4.	5	0.90	0.27	0.516	0.139
5.	4	0.72	0.216	0.437	0.094
6.	3	0.54	0.162	0.370	0.059
				Total PV of tax shields	1.166

Adjustment with PV of tax shield,

APV = Base NPV – Issue costs + PV of tax shield

= – 2.025 -0.545 + 1.166

= – 1.404

Since, the APV is negative, the project has been rejected.

Working Notes

Annual instalment = $\frac{8}{8}$ = 1 million

For 1st year – Instalment is due for second year outstanding debt in first and beginning of second year is 8

For 3rd year - Outstanding debt = 6 [$\Rightarrow$ 8 – 2 (1 + 1) at the end of 2nd year)

For 4th year = 6 – 1 = 5

For 5th year = 5 – 1 = 4

For 6th year = 4 – 1 = 3

15. Nikhil electricals limited is evaluating a capital project requiring an outlay of ` 8 million. It is expected to generate a net cash inflow of ` 2 million annually for 6 years. The opportunity cost of capital is 18%. Nikhil electronics Ltd., can raise a term loan of ` 5 million for the project. The term loan will carry an interest rate of 15% and would be repayable in 5 equal annual installments, assume the first year installment is due for second year. The balance amount required for the project can be raised by issuing external equity. The issue cost is expected to be 10%. The tax rate for the company is 40%.

(i) What is the base NPV?

(ii) What is adjusted NPV?

Sol :

Given that,

Initial investment = 8 million

Annual cash inflows = 2 million

Life of project = 6 years

Opportunity cost of capital = 18%

(i) Calculate Base NPV

Base NPV = $\sum_{t=1...n}^{n}$ annual cash flows × (PV annuity @18%, 6)– Initial investment

= (2 × 3.497) – 8

= – 1.006 million

(ii) Two factors need to be adjusted,

(a) Issue costs and

(b) PV of tax shield.

(a) Issue Costs

The capital structure of the project consists of 5 million debt finance and 3 million from equity capital. Issue costs are absorbed at 15%.

$$\text{Issue costs} = \frac{3}{1-0.15} - 3$$

$$= 3.529 - 3$$

$$= 0.529$$

Adjustment with issue costs,

APV = Base NPV – Issue costs

= – 1.006 – 0.529

= – 1.535 million

(b) PV of Tax Shield

Present value of tax shield on debt can be calculated as follows:

Year	Outstanding debt	Interest @ 15%	Tax @ 40%	PV @ 15%	PV of tax shields
1	2	3 = 2 x 0.15	4 = 3 x 0.4	5	6 = 4 x 5
1.	5	0.75	0.3	0.870	0.261
2.	5	0.75	0.3	0.756	0.227
3.	3	0.45	0.18	0.657	0.118
4.	2	0.3	0.12	0.572	0.069
5.	1	0.15	0.06	0.497	0.030
6.	0	0	0	0.432	0
Total PV of tax shields					0.705

Adjustment with PV of tax shield,

APV = Base NPV – Issue costs + PV of tax shield

= – 1.006 – 0.529 + 0.705

= – 0.830

Since APV is negative the project has been rejected.

Working Notes

$$\text{Annual instalment} = \frac{5}{5} = 1 \text{ million}$$

For 1st year = outstanding debt = 5

For 2nd year = outstanding debt

= 5 as first year's instalment is due for 2nd year.

For 3rd year = 5 – 2

= 3 [∵ 5 – (1 for 2nd year + 1 for 1st year]

For 4th year = 3 – 1 = 2

For 5th year = 2 – 1 = 1

For 6th year = 1 – 1 = 0.

Q20. How is modified NPV calculated?

Ans :

The basic assumption underlying the standard net present value is reinvesting the intermediate cash flows at the cost of capital instead of project and IRR. If there arise any necessity to define the reinvestment rates, firms need to determine the modified NPV. The procedure to calculate modified net present value consists of the following steps.

(i) Calculation of Terminal Value of Cash Inflows

The terminal value of the cash flows of a project need to be calculated based on the reinvestment rates. This represents the profitability of the various investment alternatives available to the firm.

$$TV = \sum_{t=1,-n}^{n} \text{cash inflows } t(1+r^i)^{n-1}$$

r^i = Reinvestment rates.

(ii) Calculation of Modified NPV

The modified NPV can be calculated based on the terminal values.

$$NPV^* = \frac{TV}{(1+r)^n} - 1$$

Where, r = Cost of capital

NPV* = Modified NPV

2.9 Impact of Inflation on Capital Budgeting Decisions

Q21. Discuss the effect of Inflation on Capital Budgeting Decisions.

(OR)

Explain the Impact of Inflation on Capital Budgeting Decisions.

(OR)

What is the impact of Inflation on Capital Budgeting Decisions?

(OR)

How can inflation influence on Capital Budgeting Decisions?

Ans : **(Sep-20, Imp.)**

Inflation as a significant effect on capital budgeting decisions of a firm,

i) **Effect of Inflation on Cash Flows:** It effects the decision of the analysts under the rate which is either nominal or real. Nominal cash flows consider the inflation effect whereas real cash flows are calculated after deducting the effect of inflation.

ii) **Effect of Inflation on Discount Rates:** The nominal discount rate should be used for discounting the nominal cash flows. Similarly, the real rate should be used for discounting the real cash flows otherwise there exists a bias in investing long-term projects. The real and nominal rates are related as follows,

$$1 + M = (1 + r)(1 + 0) \quad \ldots (1)$$

Where,

M – Nominal rate of return

r – Real rate of return

i = Inflation rate

Nominal rate can be calculated from equation (1) as,

$$M = (1 + r)(1 + 0 - 1) \quad \ldots (2)$$

Real rate can be calculated from equation (1) as,

$$f = \frac{(1+M)}{(1+i)} - 1$$

iii) Effect of Inflation on Depreciation Deductions

The value of depreciation on tax savings can be decreased by the effect of inflation. If an actual inflation is higher than expected inflation rates then there will be a substantial decrease in the firm's expected profitability. As the increase in inflation leads to an increase in the real taxes by reducing the value of depreciation on real tax savings.

The inflation effects on depreciation deductions of historical costs. The allowance for depreciation reduces the effect of tax on income to some extent. NPV will get reduced if there is an increase in income as it is included under tax bracket. During inflation there will be a decrease in the investment as these allowances are based on historical costs. The value of depreciation allowances will be reduced if the tax write-off is further deferred.

Effective tax write-off

$$= \frac{\sum^{PV} \text{ of depreciation deductions at different inflation rates}}{\text{cost of assets}}$$

Effective tax rate write-off reduces with the increase in inflation rates which represents that they are in line with the life of assets.

Generally, lower inflation rate enhances the capital investment. However according to nominal approach there exists no change/increase in value of allowances for depreciation with the inflation rates.

iv) Effect of Inflation on Bond Holders Value

Inflation also affects the bond holders value of reducing their fixed payments. The price paid by bond holders include the expected inflation rates. If actual inflation > expected then there will be a substantial decrease in the value of fixed payments to bond holders, which leads to an increase in the profitability of the firm.

v) Effect of Inflation on Output of Firm

Inflation effects the sales or output of a firm which leads to substantial effect on the after tax cash flows of a firm.

vi) Effect of Inflation on Firm's Relations with Stakeholders

Increase in inflation rates also adversely affects the relations of a firm with their stakeholders such as customers, suppliers, employees etc.

PROBLEMS

16. Project A requires an initial outflow of 4,00,000 with no salvage value and will be depreciated on a straight line basis for tax purposes. The EBDT during the 5 year life are,

Year	EBDT (' 000)
1	140
2	152
3	160
4	120
5	104

The corporate tax is 35% and the company evaluate its capital budgeting project at 10% cost of capital. Advise the company whether the project should be accepted,

i) If there is no inflation and

ii) Under inflation at a rate of 12% per annum.

Sol :

i) Calculate NPV Without Considering Inflation

Given that,

Cost of capita] = 10%

Depreciation = $\frac{400-0}{5}$ = 80

Year	EBDT	Depreciation	EBT	EAT	CFAT (EAT + Dep.)	PV@ 10%	NVCF
	(1)	(2)	(3) = (1) – (2)	(4)=3×0.65	(5)=(4)+(2)	(6)	(7)
1	140	80	60	39	119	0.909	108.171
2	152	80	72	48.75	128.75	0.826	106.348
3	160	80	80	52	132	0.751	99.132
4	120	80	40	26	106	0.683	72.398
5	104	80	24	15.6	95.6	0.621	59.368
						Total PV of cashflows	445.417
						(–) Cash outflow	400
						Net present value	45.417

Since NPV is positive project can be accepted without inflation.

ii) Calculation NPV Considering inflation Rate @ 12%

Year	EBDT	Compounded factor @ 12% (Inflation Rates)	Compounded EBT = 1 × 2	Depreciation	Taxable Income 4 – 3	EAT 5 × 0.65	Nominal Cash flows 6 + 4	Real cash Discounted @ 12% Deflated	Discounted @10%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	140	1.120	158.8	80	76.8	49.92	129.920	116.019	105.461
2	152	1.254	190.608	80	116.608	75.795	155.795	124.169	102.564
3	160	1.405	224.80	80	114.80	94.120	174.120	123.973	93.104
4	120	1.574	188.88	80	108.88	70.772	150.772	95.891	65.494
5	104	1.685	175.24	80	95.24	61.906	141.906	80.461	49.96
								Total PV of cash flows	416.583
								(–) cash outflows	400.000
								Net present value	16.583

Column 8

Nominal cash flows i.e., earnings before depreciation and after tax are discounted at 12% to deflate the effect of inflation.

The discounted cash flows are now called real cash flows which can be used to calculate NPV @ 10% (column (9)). The NPV calculated considering the inflation is less than the NPV before inflation. Hence, it is profitable for the firm to ignore the inflation. The firm can operate the project under inflation as it does not resulted in negative NPV. However, it yields NPV less than the other alternative.

Thus, it is evident that NPV has been considerably effected by the inflation.

17. A machine costs ` 10,00,000 and is expected to yield the following net cash returns estimated in current prices.

Year	`
1	5,00,000
2	8,00,000
3	6,00,000

the expected rate of inflation is 5% p.a. and cost of capital is 15.5% per annum. Check whether the investment is acceptable.

Sol :

Calculation of Real CFAT

Year 7	Cash Flows `	Deflation Factor @ 5%	Real CFAT
1	5,00,000	0.952	4,76,000
2	8,00,000	0.907	7,25,600
3	6,00,000	0.864	5,12,400

Calculation of NPV using real rate of discount

Year	Real CFM	Discount Factor @15.5%	PVCF
1	4,76,000	0.952	4,12,216
2	7,25,600	0.750	5,44,200
3	5,18,400	0.649	3,36,442
		Total Present Value	12,92,858
		Less: Cash Outflow	10,00,000
		Net Present Value	2,92,858

∴ As NPV is positive, investment is acceptable.

Short Question and Answers

1. What is risk Adjusted NPV?

Ans :

Adjusted Net Present Value

The net present value that is adjusted with the NPV of financial side effects such as issue costs, tax shields of debt, subsidies, incentives etc., is referred to as adjusted NPV.

The adjusted cost of capital forms the base for the evolution of adjusted NPV. The main aim of adjusting the base NPV is to eliminate the adverse financing effects on the project. Adjusted NPV is based on base NPV which is further adjusted with the NPV of financing side effects.

Adjusted NPV = Base NPV ± NPV of financing side effects.

Calculation of a NPV

The procedure for calculating adjusted NPV include two stages,

(i) Calculation of base case NPV and then evaluating the project to determine whether it is completely funded by the equity of the firm.

$$\text{Base NPV} = -\text{Initial investment} + \sum_{t=1,\ldots,n}^{n} \text{cash inflows (PV@ } r_t\%, t)$$

If the answer for the evaluation is yes then proceed to next stage.

(ii) Adjusting the base NPV with the adverse impact on the financing of the project.

Adjusted NPV = Base NPV ± PV of side effects of financing

Most commonly the factors considered for adjustments are issue costs and tax shields on debt.

(i) Issue cost can be calculated using the following formula,

$$\text{Issue costs} = \frac{\text{Equity capital}}{\text{1-Percent allocated for issue costs absorption}} - \text{Equity capital}$$

(ii) PV of tax shields on debt finance can be calculated as,

Year	Particulars	Amt
(i)	Outstanding debt at the beginning of year	xxx
(ii)	Interest @ x% on outstanding debt	xxx
(iii)	Tax shield @ t% on interest	xxx
(iv)	PV factor @ x%	xxx
(v)	PV of tax shield (iii) × (iv) @ x%	xxx

Evaluation Criteria

If the project has a positive APV then the project is said to be a worthwhile one. If it is negative it is better for the firm to reject that project.

2. Define Pure, Simple and Mixed Investments.

Ans :

The investments are generally categorized into three groups,

a) Simple investment

b) Pure investment

c) Mixed investment.

a) Simple Investment

An investment is said to be simple if it has only one sign change or consists of initial capital outflows followed by cash inflows. The series of cashflows for a simple investment is (–, +, +). Simple investments are always pure investments. In simple investments, the rate of return should maintain the NPV as '0', i.e., present value of cash outflows should be equal to present value of cash inflows at that rate at 1%.

PV of cash outflows – PV of cash inflows = NPV (0).

b) Pure Investment

An investment is said to be pure investments if it is either simple or non-simple, conventional or non-conventional and does not borrow the returns of the project. Pure investments are said to have unique rate of returns. In pure investment, the project balances during the whole life of a project should be less than or equal to zero i.e., -ve project balanced otherwise i.e., if the project balances are +ve it will represents that firm has borrowed the returns of the project.

c) Mixed investment

An investment is said to be mixed if it is non simple and non conventional investments. In mixed investment the project balances of a project are positive i.e., PB > 0. The IRR at these project balances cannot be considered as a true IRR. In the mixed investments the following aspects need to be considered while determining the project balances.

i) The initial investment of money in a project will yield an interest rate of i^*.

ii) The external investment such as cash borrowings from the projects also yield same interest of i^*. The borrowings from the project returns are required to reinvest in the project either at a rate of return (i^*) or at an external rate which is less than i in order to gain the same rate of returns.

3. How is modified IRR calculated?

Ans :

In terms of concept net present value is the most preferable choice than IRR but in practice most of the firms are interested to use (IRR) internal rate of return instead of NPV for evaluating capital budgeting decisions. However, the regular IRR have some limitations. Thus, percentage measure called modified IRR needs to be introduced which can modify the regular IRR to increase its efficiency in evaluating profitability of a firm and capital budgeting decisions.

[MIRR] modified IRR is defined as the compound average annual rate based on the rate of reinvestment that differs with the regular IRR.

Procedure

The procedure for calculating MIRR consists of three steps,

i) Calculation of (PV of costs) present value of the costs of a project discounted at cost of capital.

$$PVC = \sum_{t=0}^{n} \frac{(\text{Cash outflows})_t}{(1+r)^t}$$

ii) Calculation of terminal value of cash inflows i.e., the future value of cash inflows that are compounded at cost of capital.

$$TV - \sum_{t=1,n}^{n} \text{cash inflows}_t [1+r]^{n-1}$$

Where, r = Cost of capital.

iii) Calculation of MIRR using the following formula,

$$PVC = \frac{TB}{(1+r^*)^n}$$

Where, r* = Modified IRR (or)

$$(1+r^*) = \frac{TV}{PVC}$$

$$\Rightarrow \quad 1+r^* = \left[\frac{TV}{PVC}\right]^{\frac{1}{n}}$$

$$\Rightarrow \quad 1+r^* = \left[\frac{TV}{PVC}\right]^{\frac{1}{n}}$$

4. What do you meant by disinvestment ?

Ans :

Investment refers to conversion of money or cash into securities, debentures, bonds or any other claims on money. At the same time, disinvestment involves the conversion of money claims or securities into money or cash.

Reasons

The public sector in India at present is at cross roads. The new economic policy initiated in July - 1991, clearly indicated that the public sector undertakings have shown a very negative rate of return on capital employed. On account of this phenomenon many public sector undertakings have become burden to the government. They are infact turning out to be liabilities to the government rather than being assets.

This is a sector which the government clearly wants to get rid off. In this direction the government has adopted a new approach to reform and improve the public sector undertakings performance i.e. 'Disinvestment policy'. This has gained lot of importance especially in latter part of 90s. At present the government seriously perceives the disinvestment policy as an active tool to reduce the burden to financing the public sector undertakings.

5. Define IRR

Ans :

The internal rate of return is also one of the capital budgeting technique that identifies the time value of money. This method is also known as yield method, discounted rate of return and trial and error yield method. It is that rate of return which equates the present value of cash inflows to the present value of cash outflows. The hit and trial method is used in internal rate of return method to discount the cash flows of the project as discount rate is not known. The internal rate of return is calculated with the help of the following formula.

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

Where,

C – Initial outlay at time zero

r – Rate of discount of internal rate of return

A, A_2, .. A – Future net cash flows at different periods

n – Number of years.

The internal rate of return method involves following steps,

1. Calculate the future cash inflows before depreciation but after tax.
2. Calculate fake payback period by dividing the initial investment by average cash flows.

$$\text{Fake payback period} = \frac{\text{Initial investment}}{\text{Average cash flows}}$$

3. Identify the discounting factor from present value annuity table and calculate NPV with that percentage.
4. If NPV is positive take a higher rate and if NPV is negative take a lower rate and once again calculate NPV.
5. After getting one positive NPV and one negative NPV, use interpolation to calculate actual IRR. Actual IRR can be calculated by using the following formula,

$$\text{Lower rate} + \frac{\text{Present value at lower rate -Cash outflow}}{\text{PV at lower rate-PV at higher rate}}$$

A particular project is accepted when IRR is more than cost of capital and if IRR of the project is less than cost of capital it is rejected.

6. Differentiate among simple, pure and mixed investments.

Ans :

Sl. No.	Basis	Simple Investment	Pure Investment	Mixed Investment
1.	**Net investment Test**	A project which passes net investment test becomes simple investment.	A project which passes net investment test becomes pure investment.	A project which fails net investment test becomes mixed investment.
2.	**Borrowing**	In simple investment, firm never borrows money from the project.	In pure investment, firm never borrows money from the project.	In mixed investment, firm borrows money from project in investment period.
3.	**Relationship**	Simple investment is always a pure investment.	Pure investment is always a simple investment.	Mixed investment is a non simple investment.

7. Discuss the multiple IRR.

Ans :

There is another instance in which the IRR approach may not be reliable - when projects have non normal cash flows. A project has normal cash flows if it has one or more cash outflows (costs) followed by a series of cash inflows. Notice that normal cash flows have only one change in sign - they begin as negative cash flows, change to positive cash flows, and then remain positive.

Non-normal cash flows occur when there is more than one change in sign. For example, a project may begin with negative cash flows, switch to positive cash flows, and then switch back to negative cash flows. This cash flow stream has two sign changes – negative to positive and then positive to negative – so it is a Non-normal cash flow. Projects with normal cash flows can actually have two or more IRRs, or multiple IRRs.

To see this, consider the equation that one solves to find a project's IRR:

$$\sum_{t=0}^{N} \frac{CF_t}{(1+IRR)^t} = 0$$

Notice that the above Equation is a polynomial of degree N, so it may have as many as N different roots, or solutions. All except one of the roots are imaginary numbers when investments have normal cash flows (one or more cash outflows followed by cash inflows), so in the normal case, only one value of IRR appears. However, the possibility of multiple real roots, hence multiple IRRs, arises when the project has non normal cash flows (negative net cash flows occur during some year after the project has been placed in operation).

8. Define NPV

Ans :

Net present value method is one of the modern method which comes under the category of discounted cash flow methods. This method is very useful in evaluating investment proposals. Under this method the cash inflows and outflows associated with each project are first determined.

The cash inflows and outflows are then converted to the present values using a discounting factor. This rate of return or discounting factor is considered as the cutoff rate and is generally determined on the basis of the cost of capital for risk element.

The net present value of each project is obtained by deducting the present value of cash inflows from the present value of cash outflow for each project. The proposal is accepted if NPV of the project is positive or zero in case of the NPV of the project is negative then it is rejected. If more than one projects have positive NPV then project with maximum net present value must be accepted.

The equation for calculating NPV in case of conventional cash flows can be put as follows,

$$NPV = \left[\frac{A_1}{(1+K)^1} + \frac{A_2}{(1+K)^2} + \frac{A_3}{(1+K)^3} + ... + \frac{A_n}{(1+K)^n}\right] - C_0$$

where

$A_1, A_2, ..., A_n$ – The CFATs upto time periods.

K – Discounting factor

n – Time period

C_0 – Initial investment or cash outflows.

In case of non-conventional cash flows (where there is a series of cash inflows and outflows), the above equation may be modified as,

$$NPV = \left[\frac{A_1}{(1+K)^1} + \frac{A_2}{(1+K)^2} + ... + \frac{A_n}{(1+K)^n}\right] - \left[C_0 + \frac{C_1}{(1+K)^1} + \frac{C_2}{(1+K)^2} + ... + \frac{C_n}{(1+K)^n}\right]$$

where

$A_1, A_2, ..., A_n$ = Cash inflow at different time periods

K = Discounting factor

n = Time period

C_0 = Initial cash outflow

$C_1, C_2, ... C_n$ = Cash outflows at different time periods.

9. Explain the merits and demerits of Adjusted NPV.

Ans :

Merits

(i) By calculating Adjusted NPV, a firm can track the impact of financing side effects on the project and the basis for Adjusted NPV for which it involves a series of computations. Based on this Adjusted NPV, a firm can redesign the project plan.

(ii) If the Adjusted NPV is negative for a project then the firm can take certain measures to reduce the impact of side effects such as reducing the issue costs or increasing the subsidies etc.

(iii) Adjusted NPV helps a firm in identifying the projects with highly profitable capital structure and have special incentives, subsidies etc.

(iv) Adjusted NPV is more suitable for infrastructure projects which have a significant impact of financing side effects and LBO (Leveraged Buyouts) which is a take over and possess complete temporary debts in capital structure. WACC can also be used to evaluate and LBO.

(v) Adjusted NPV helps in reducing the debt structure of the projects.

Demerits

Though Adjusted NPV is more beneficial to firms it also has certain demerits,

(i) Adjusted NPV is a complex process as it consists of a series of adjustments.

(ii) Adjusted NPV is not widely used in practice as it need advanced techniques to evaluate the impact of the financing side effects on the project.

10. How is modified NPV calculated?

Ans :

The basic assumption underlying the standard net present value is reinvesting the intermediate cash flows at the cost of capital instead of project and IRR. If there arise any necessity to define the reinvestment rates, firms need to determine the modified NPV. The procedure to calculate modified net present value consists of the following steps.

(i) Calculation of Terminal Value of Cash Inflows

The terminal value of the cash flows of a project need to be calculated based on the reinvestment rates. This represents the profitability of the various investment alternatives available to the firm.

$$TV = \sum_{t=1,-n}^{n} \text{cash inflows } t(1+r^i)^{n-1}$$

r^i = Reinvestment rates.

(ii) Calculation of Modified NPV

The modified NPV can be calculated based on the terminal values.

$$NPV^* = \frac{TV}{(1+r)^n} - 1$$

Where, r = Cost of capital

NPV* = Modified NPV

Exercise Problems

1. PTN Company is considering an investment project requiring an outlay of Rs 15,00,000. The project would have a useful life of 5 years after which its salvage value would be nil. Asume that the depreciation charge would be Rs 3,00,000 for year. The expected revenues and costs (excluding depreciation) ignoring inflation would be as follows.

Year	Revenues (Rs)	Costs (Rs)
1	12 lakhs	7 lakhs
2	13 lakhs	7.5 lakhs
3	14 lakhs	8.0 lakhs
4	14 lakhs	8.0 lakhs
5	12 lakhs	7.0 lakhs

The tax rate for the company is 60% and the cost of capital is 10%. Calculate the net present value of the project under the assumption that the inflation rates for revenues and costs would be as follows:

Year	Revenues (%)	Costs (%)
1	8%	8%
2	6%	7%
3	6%	8%
4	5%	6%
5	5%	6%

[Ans : Rs. 3,79,234]

2. Discuss briefly the shortcomings of the IRR method. Calculate the NPV and MNPV for the following project using 10% as the cost of capital and 12% as the re-investment rate.

Year	Cash flows
0	1,00,000
1	50,000
2	60,000
3	70,000
4	80,000
5	90,000

[Ans : Rs. 1,58,110, Rs. 83,957]

3. Equipment A has a cost of Rs. 75,000 and net cash flow of Rs.20,000 per yhear for six years. A substitute equipment B would cost Rs. 50,000 and generate net cash flow of Rs. 14,000 per year for six years. The required rate of return of both equipments is 11 per cent. Calculate the IRR and NPV for the equipments . Which equipment should be accepted and why ?

[Ans : 0.172 or 17.20%]

4. X Company is considering 2 projects A and B each of which require an initial outlay of ` 50 lakhs. The expected cash inflows from these projects are :

Year	Project A	Project B
1	12	37
2	18	24
3	33	19
4	36	12

Calculate :

a) If the 2 projects are mutually exclusive and the cost of capital is 15%, which project should the firm invest in

b) If cost of capital is 14%, what is the modified IRR of each project ?

[Ans : a) Project A = 16.354, Project B = 21.416,

b) Project A = 23.08%, Project B = 24.37%]

UNIT III

CRITICAL ANALYSIS OF APPRAISAL TECHNIQUES:

Discounted pay back, post pay back, surplus life and surplus pay back, Bail-out pay back, Return on Investment, Equivalent Annual Cost, Terminal Value, single period constraints, multi-period capital constraint and an unresolved problem, NPV mean variance analysis, Hertz Simulation and Hillier approaches. Significance of information and data bank in project selections.

3.1 CAPITAL BUDGETING

Q1. What is Capital budgeting ?

(OR)

Define capital budgeting.

Ans :

Meaning

Capital budgeting is an important issue in corporate finance, hence it is referred as strategic asset allocation. As capital budgeting decisions are very important, firms must ensure that sufficient time is spent in planning these decisions and also see that all the top executives from the field of production, engineering, marketing etc., are involved in carefully weighing up the capital expenditure proposals.

Capital budgeting is the planning process used to determine whether an organization's long term investments such as new machinery, replacement machinery, new plants, new products, and research development projects are worth pursuing. It is budget for major capital, or investment, expenditures.

The term 'Capital Budgeting' is used interchangeably with capital expenditure management, capital expenditure decision, long term investment decision, management of fixed assets, etc. It may be defined as "planning, evaluation and selection of capital expenditure proposals." Capital budgeting involves a current outlay or serves as outlays of cash resources in return for an anticipated flow of future benefits.

Definitions

i) **According to G. C. Philippalys,** "Capital budgeting is concerned with the allocation of firm's scarce financial resources among the available market opportunities. The consideration of investment opportunities involves comparison of expected future streams of earnings from a project with immediate and subsequent streams of expenditure for it."

ii) **According Lynch,** "Cash budgeting consists in planning, development of available capital for the purpose of maximizing the long term profitability in the concern."

iii) **According to Prof. I. M. Pandey,** "capital budgeting decisions may be defined as the firm's decision to invest its current funds most efficiently in long-term activities in anticipation of an expected flow of future benefits over a series of years."

Q2. Explain the principles of Capital Budgeting.

Ans :

Capital expenditure decisions should be taken on the basis of the following factors:

i) **Creative Search for Profitable Opportunities**

The first stage is conception of the profit making idea. Profitable investment opportunities should be sought to supplement existing proposals.

ii) **Long – Range Capital Planning**

A flexible programme of a company's expected future development over a long period of time should be prepared.

iii) **Short – Range Capital Planning**

This is for a short period. It indicates its sectoral demand for funds to stimulate alternative proposals before the aggregate demand for funds is finalized.

iv) Measurement of Project Works

The economic worth of a project to a company is evaluated at this stage. The project is ranked with other projects.

v) Screening and Selection

The project is examined on the basis of selection criteria, such as the supply and cost of capital, expected returns, alternative investment opportunities, etc.

vi) Control of Authorized Outlays

Outlay should be controlled in order to avoid costly delays and cost over-runs.

vii) Post Mortem

The ex-post routines of a completed investment project should be re-evaluated in order to verify that their exact conformity with exact projections.

viii) Retirement and Disposal

The expiry of the cycle in the life of a project is marked at this stage.

ix) Forms and Procedures

These involve the preparation of reports necessary for any capital expenditure programme.

x) Economics of Capital Budgeting

It includes estimating the rate of return on capital expenditures. A knowledge of economic theory underlying investment decisions is needed for this purpose. This broad field of decision – making for capital investment is one of the most difficult, one of the most recurrent and one of the most controversial of management areas; and it is also an area where there are tremendous opportunities for basic improvements in operations and policies.

It may be emphasizes here that the use of a model or of any of the mathematical techniques of the operations researcher does not imply management by computers. The mathematical model itself is a tool of management rather than replacement for management.

xi) Authorization

Since capital expenditure budget does not contain detailed expenditure, it is essential that before any individual projects relating to capital items are started, the expenditure should be specially authorized.

Q3. State the importance of capital budgeting.

Ans :

Investment decisions require special attention because of the following reasons :

(a) Growth

The effects of investment decisions extend into the future and have to be endured for a longer period than the consequences of the current operating expenditure. A firm's decision to invest in long-term assets has a decisive influence on the rate and direction of its growth. A wrong decision can prove disastrous for the continued survival of the firm; unwanted or unprofitable expansion of assets will result in heavy operating costs to the firm. Inadequate investment in assets would make it difficult for the firm to compete successfully and maintain its market share.

(b) Risk

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

(c) Funding

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

(d) Irreversibility

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

(e) Complexity

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

Q4. Explain the various kinds of capital budgeting decisions ?

Ans :

A number of capital budgeting decisions may be taken because every capital budgeting decision is a specific decision in the given situation. Even if the same decision is considered by the same firm at two different points of time, the decision may change due to change any of the variables. Therefore, in general, the capital budgeting decisions may be classified from the point of view of the decision situation as follows :

i) Accept-reject Decisions

Accept-reject decisions relate to independent projects. Independent projects are those which do not compete with one another i.e. the acceptance of one dose not prevent the acceptance of others. Such decisions are generally taken on the basis of minimum rate of return on investment. All those proposals which yield a rate of return higher than the minimum required rate of return or the cost of capital are accepted and other are rejected. For example, if the minimum acceptable return from a project is say 10% after tax and an investment proposal which gives a return of 12.5% may be accepted and another project which gives a return of 8% only may be rejected.

ii) Mutually Exclusive Decisions

Such decisions relate to two or more alternatives proposals, which are said to be mutually exclusive, when acceptance of one alternative proposal returns in automatic rejection of all another proposals. Thus, one proposal is accepted at the cost of other. For example, a firm may have the option of buying a new machine or a second hand machine or taking an old machine on hire.

In such a case the firm may select one best alternative out of three options by adopting some suitable method of capital budgeting, once one alternative is selected, the others are automatically rejected.)

iii) Capital Rationing Decisions

Capital rationing means distribution of capital in favour of some acceptable proposals. A firm cannot afford to undertaken all profitable proposals because it has limited funds to invest. In such a case, these various investment proposals compete for limited funds and the firm has to ration them. Thus, the situation where the firm is not able to finance all the profitable investment opportunities due to limited resources is known as capital rationing. At this point, the firm ranks the proposals from the highest to lower priority and as such a cut-off point is considered. Now, those proposals which are above the cut-off point will be accepted and those which are below the cut-off point will be rejected.

Q5. Explain the various reasons for the importance of capital budgeting Decisions.

Ans :

The capital budgeting decisions are important, crucial and critical business decisions due to following reasons :

i) Substantial expenditure

Capital budgeting decisions involves the investment of substantial amount of funds. It is therefore necessary for a firm to make such decisions after a thoughtful consideration so as to result in the profitable use of its scarce resources. The hasty and incorrect decisions would not only result into huge losses but may also account for the failure of the firm.

ii) Long time period

The capital budgeting decision has its effect over a long period of time. These decisions

not only affects the future benefits and costs of the firm but also influences the rate and direction of growth of the firm.

iii) Irreversibility

Most of the investment decisions are irreversible. Once they are taken, the firm may not be in a position to reverse them back. This is because, as it is difficult to find a buyer for the second-hand capital items.

iv) Complex Decision

The capital investment decisions involves an assessment of future events, which in fact is difficult to predict. Further it is quite difficult to estimate in quantitative terms all the benefits or the costs relating to a particular investment decision.

Q6. Explain the basic factors which influence the capital budgeting decisions.

Ans :

Capital expenditure decisions are influenced by both financial and non-financial factors. The capital expenditure decision is mainly influenced by profitability factor of the proposal. There are many factors that must be considered at the time of capital expenditure decision. Some of them are as follows,

i) Urgency

When firm is in great need the proposals are not properly evaluated due to urgency. In times of urgency, investments are made for survival of the firm or to avoid huge losses.

ii) Degree of Certainty

The project which involves huge profits also involves higher risk. Profitability and degree of risk are directly related to each other. Occasionally, firms select project with low profitability to have constant flow of income rather projects with uncertain flow of income.

iii) Intangible Factors

Some emotional and intangible factors also affect the capital expenditure such as goodwill of the firm, social welfare, safety of employees etc.

iv) Legal Factors

There are some legal factors which influence capital expenditure decisions. Firm must invest in those projects which may not be profitable but required by the provisions of law.

v) Availability of Funds

As capital expenditure involves large amount of funds, the availability of funds also influence the capital budgeting decisions. Firm accept projects which have less payback period to have liquidity.

vi) Future Earnings

Some projects are not so profitable at present conditions, but they yield high earnings in future. These projects are accepted to increase earnings.

vii) Research and Development Projects

It is necessary for the firm to get information about its business, though it may not be a profitable project but firm need to invest in research and development projects.

viii) Cost Considerations

Capital budgeting decision is also influenced by some cost considerations like cost of production, opportunity cost of capital, cost of capital project etc.

3.2 TECHNIQUES OF CAPITAL BUDGETING

Q7. What are the various methods of capital budgeting.

Ans :

In present conditions, various capital budgeting techniques are used. They are classified into two groups,

1. Traditional/Non-discounted Methods

a) Payback period method

b) Accounting rate of return method

c) Discounted Payback Period

d) Post-payback: Surplus life and surplus payback and

e) Bail-out pay back method.

2. Time-adjusted/Discounted Methods

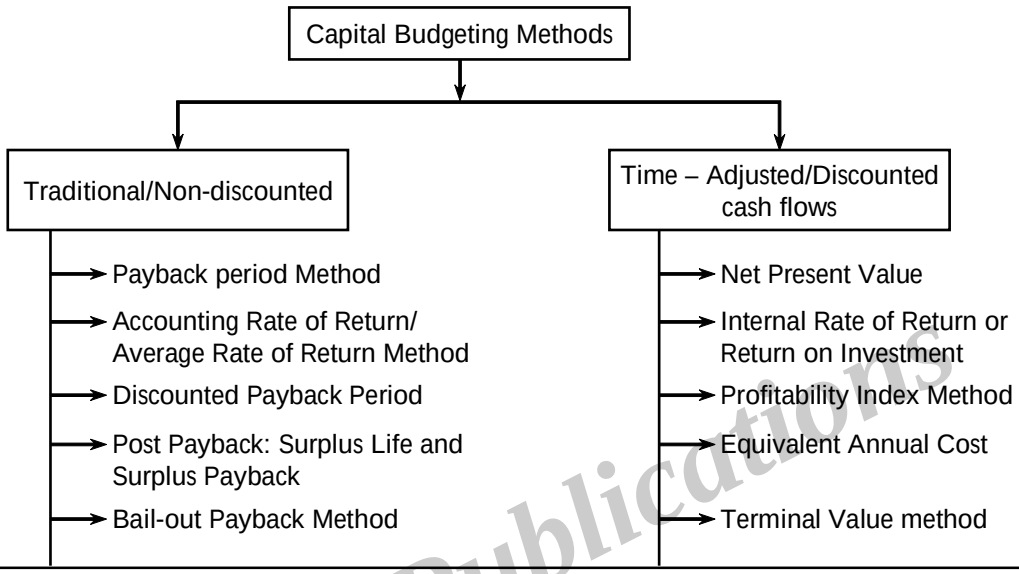
a) Net present value method

b) Internal rate of return method/Return on investment

c) Profitability index method

d) Equivalent Annual Cost and

e) Terminal value Method.



3.2.1 Pay Back Method

Q8. Explain briefly about payback method.

Ans :

Payback period method is a traditional method of capital budgeting. It is the simple and widely used quantitative method of investment evaluation. Payback period is also termed as payout or pay off period method, with the help of payback period method firm can evaluate the number of years to recoup the initial investment from cash flow after tax. The formula to calculate payback period is,

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Annual cash flows}}$$

Example 1

If a project requires Rs. 50,000 as initial investment and will generate cash flow of Rs. 10,000. Calculate the payback period.

Sol :

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Annual cash flows}} = \frac{50,000}{10,000} = 5 \text{ years.}$$

In the above example, we assume annual cash flow to be constant. However, it is not always possible cash flows may be different for different years. In such a case a different method is to be followed. In this method, cumulative cash flows are calculated and by using interpolation the exact period may be calculated.

Example 2

If a project requires 50,000 as initial investment and the annual cash flows for the next 5 years are 10,000, 15,000, 12,000, 10,000, 16,000. Then payback period may be calculated as follows :

Year	Cash flow	Cumulative Cashflow
1	10,000	10,000
2	15,000	25,000
3	12,000	37,000
4	10,000	47,000
5	16,000	63,000

Sol :

The above table shows that in the first 4 years Rs. 47,000 is recovered and Rs. 300 be recovered in the fifth year. This means that the payback period is between 4 and 5 years. By using interpolation the exact period can be arrived at,

$$\therefore \quad \text{Payback period} = 4 \text{ years} + \frac{3,000}{16,000}$$

$$= 4 + 0.1875 = 4.18 \text{ years}$$

Accept / Reject Criterion

Payback period is used as a measuring tool to accept or reject investment proposal. A proposal whose actual payback period is more than what has been predetermined by the management has to be rejected. In case of comparison between two projects a project with less payback period is preferred to a project with high payback period. Payback period can also be used as a method of ranking in case of mutually exclusive projects. The project can be arranged in an ascending order according to the lengths of the payback periods.

Q9. Explain briefly about merits and demerits of payback period ?

Ans :

The merits and demerits of payback period are explained below,

Merits

1. This method is simple to understand and easy to calculate
2. The cost incurred to adopt this method is less than methods. In other sophisticated techniques, the cost of the analyst's time and use of computers are required.
3. During the period of tight money conditions, a quick payback project is preferable to one which yields a higher rate of return but ties up funds for a much longer period of time.
4. This method favours a short-term project than the long-term projects, which may turn out to be risky projects with higher risk in the future.
5. The emphasis in the payback method is on the early recovery of the investment. Thus, it gives preference to liquidity of the project as the funds so released earlier can be used in some other projects.

Demerits

1. It fails to take into account the cash inflows earned after the payback period.
2. It fails to consider the total return on investment and thus it is not an appropriate method to measure the profitability of an investment project.
3. It gives equal values to return of amount though they occur in different periods. Thus, it fails to consider the magnitude and timing of cash inflows. The two different projects may have payback return in the equal period, but the project giving large cash inflows in the early years is preferable than the project giving larger cash inflows in the later years of the project.
4. There is no clear cut procedure for setting the maximum payback period, and, thus there are administrative difficulties in determining the maximum acceptable payback period.

3.2.1.1 Discounted Pay Back Period

Q10. Write a short note on discounted payback method.

Ans : **(May-19)**

Discount rate analyses the present values of all cash outflows and inflows and these values are computed at an appropriate discount rate. Generally, the present values of all inflows are cumulated in order of time.

The time period at which,

Cumulated present value = Value of cash outflows of cash inflows

This phenomena is usually referred as "Discounted payback period method".

Even Cashflows

Discounted payback under even cashflows uses the formula,

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

Where,

P = Annual savings

a = Accepted interest rate per rupee per annum

n = Number of years over which the investment is likely to recovered etc.

Uneven Cashflows

In case of uneven cashflows, each years savings are to be discounted individually and this is done through present value factors using the formula,

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

Where,

P = Present value

i = Interest

After determining present value of each year's savings, cumulative is done based on the cumulative totals for the discounted pay period.

Accept / Reject Criteria

Accept

The project having lesser discounted payback is accepted.

Reject

The project with more discounted payback period is rejected.

PROBLEMS

1. The expected cashflows of a project are as follows

Year	0	1	2	3	4	5
Cashflow	-100,000	20,000	30,000	40,000	50,000	30,000

The cost of capital is 12%. Calculate discounted payback period.

Sol :

Discounted Payback Period

Years	Inflows Rs.	PV Factor @12%	PV of CFAT	Cumulative PV of CFAT
1	20,000	0.893	17,860	17,860
2	30,000	0.797	23,910	41,770
3	40,000	0.712	28,480	70,250
4	50,000	0.636	31,800	1,02,050
5	30,000	0.567	17,010	1,19,060

The above table shows that in the first 3 years Rs. 70,250 is recovered and rest of the amount in 4th year. This means, payback period is between 3 and 4 years. By using interpolation the exact period can be arrived at,

$$\text{Discounted payback period} = 3 \text{ years} + \frac{29.750}{31,800}$$

$$= 3 \text{ years} + 0.9$$

$$= 3.9 \text{ years}$$

Working Notes

3rd year value = Cash outflow – Cumulative CFAT

= 100,000 – 70,250

= 29,750

2. Calculate discounted payback period from the information given below,

Cost of project 5,00,000

Life of the project 4 years

Annual cash inflow 2,50,000

Cut-off rate 18%

Sol :

Calculation of Discounted Payback Period

Years	Inflow Rs.	PV at 18%	PV of CFAT Rs.	Cumulative PV of CFAT Rs.
1	2,50,000	0.847	2,11,750	2,11,750
2	2,50,000	0.718	1,79,500	3,91,250
3	2,50,000	0.609	1,52,250	5,43,500
4	2,50,000	0.516	1,29,000	6,72,500

From the above table, cumulative present value of cash inflows at the end of 2nd year is Rs. 3,91,250 and Rs. 5,43,500 at the end of 3rd year. Hence, discounted payback period falls in between 2 and 3 years.

$$\text{Discounted payback period} = 2 \text{ year} + \frac{5,00,000 - 3,91,250}{1,52,250}$$

$$= 2 \text{ years} + \frac{1,08,750}{1,52,250}$$

$$= 2 \text{ year} + 0.7 = 2.7 \text{ year (approx).}$$

3. Calculate discounted pay-back period from the information given below :

Cost of project	**Rs. 6,00,000**
Life of the project	**5 years**
Cut off rate 10%	**Rs. 2,00,000**

Sol :

Calculation of Present Value of Cash Inflows

Years	Inflows Rs.	PV at 10 Discount Factor	Present Value of CFAT	Cumulative Present Value of CFAT
1	2,00,000	0.909	1,81,800	1,81,800
2	2,00,000	0.826	1,65,200	3,47,000
3	2,00,000	0.751	1,50,200	4,97,200
4	2,00,000	0.683	1,36,600	6,33,800
5	2,00,000	0.621	1,24,200	7,58,000

Cumulative present value of cash inflows at the end of the third year is Rs. 4,97,200 and it is Rs. 6,33,800 at the end of fourth year. Hence, discounted pay-back period falls in between 3 and 4 years. To be exact,

$$\text{Discounted pay-back period} = 3 \text{ yeas} + \frac{1,02,800}{1,36,600}$$

$$= 3 + 0.75$$

$$= 3.7 \text{ years approx.}$$

3.2.1.2 Post Pay Back, Surplus Life and Surplus Pay Back

Q11. Discuss briefly about surplus life and surplus pay back period.

(OR)

Write a short note on post pay back and surplus pay back.

(OR)

Discuss the importance of post pay back in project selection.

Ans : **(May-19, Imp.)**

Post-payback method is an improvement over payback period method. Post payback method considers the returns receivables beyond the payback period. These returns are usually referred as post-payback profits.

This method helps in determining the true profitability of the project. The critical aspect of this method are post-payback profits. The project yielding highest post-payback period are selected. The following steps are considered to compute such profits.

i) To determine the surplus life in years which is the difference between total economic life and payback period.

ii) For even cashflows for the entire period, cashflows are multiplied by the surplus life i.e., Cashflows × Surplus economic life.

Total surplus = Savings Surplus economic life

or

Post - payback = Annual cash profitability inflows (estimated economic life - payback period)

Cumulative totals of savings related to each year of surplus economic life is equal to post-payback period profits under uneven Cashflows.

iii) The third step deals with summing-up estimated value of scrap in each case to the surplus savings' or Cashflows and

iv) Surplus savings or post-payback profits are converted into index number which indicates relative significance of each project correctly.

Index of post – payback profits (or surplus saving

$$= \frac{\text{Post} - \text{payback period profit} \times 100}{\text{Net investment}}$$

Symbolically,

$$\text{Index of PPBP} = \frac{\text{PPBP Pr.}}{\text{NI}} \times 100$$

Where,

PPBP = Post-payback period

PPBP Pr. = Post-payback period profit

NI = Net investment.

Post-payback period is also referred as "Surplus life over payback method". This method is suitable for those projects which do not differ significantly in terms of their size, even cashflows during the execution of the project.

Accept/Reject Criteria

Accept. Projects with highest post-payback period are accepted.

Reject. Projects with lowest post-payback period are rejected.

PROBLEMS

4. A company is considering three projects X, Y and Z. Following are the particulars in respect of these :

Particulars	X	Y	z
Cost (`)	3,00,000	3,75,000	3,40,000
Expected Life (In Years)	12	12	12
Scrap Value (In `)	20,000	30,000	25,000
Annual Savings	42,000	60,000	50,000

Suggest the best of these projects :

i) Using payback period

ii) Post-payback period and

iii) Index of post-payback period profit Ignore income tax.

Sol :

Particulars	Project 'X'	Project 'Y'	Project 'Z'
Cost of investment (N1)	` 3,00,000	` 3,75,000	` 3,40,000
Operating savings or cash Inflows (`)	42,000	60,000	50,000
Payback period	$\frac{3,00,000}{42,000}$ = 7.14 years	$\frac{3,75,000}{60,000}$ = 6.25 years	$\frac{3,40,000}{50,000}$ = 6.8 years
Ranking	III	I	II
Expected life in years	12	12	12
Surplus life in years	(12-7.14 = 4.86 years)	(12-6.25 = 5.75 years)	(12-6.8 = 5.2 years)
Post-payback (operating savings × surplus life in years)	42,000 × 4.86 = 2,04,120	60,000 × 5.75 = 3,45,000	50,000 × 5.2 = 2,60,000
Ranking	II	I	III
Index of post-payback profit	$\frac{2,04,120}{3,00,000} \times 100$ = 68.04%	$\frac{3,45,000}{3,75,000} \times 100$ = 92%	$\frac{2,60,000}{3,40,000} \times 100$ = 76.47%
Ranking	II	I	III

Interpretation

From the table, it can be suggested that project 'y' is acceptable because of high ranking when compared to project and project *'y'*. Thus, project *'y'* maximizes the return for the company. Hence, project 'y' is selected over other projects.

5. For each of the following projects. Compute,

i) Payback period

ii) Post-payback profitability and

iii) Post-payback profitability index.

A)	**Initial outlay**	**Rs. 60,000**
	Annual cash inflow	**Rs. 12,000**
	(after tax but before depreciation)	
	Estimated life	**8 years**
B)	**Initial outlay**	**Rs. 60,000**
	Annual cash inflow	
	(After tax but before depreciation)	
	First three years	**Rs. 18,000**
	Next five years	**Rs. 6,000**
	Estimated life	**8 years**
	Salvage	**Rs. 9000**

Sol :

A) i) Payback Period

$$= \frac{\text{Investment}}{\text{Annual cash inflow}} = \frac{60,000}{12,000} = 5 \text{ years}$$

ii) Post-payback Profitability

= Annual cash inflow (Estimated life – Payback period)

= 12,000 (8 – 5)

= 12,000 × 3 = Rs. 36,000

iii) Post back Profitability index

$$= \frac{\text{Post payback profitability}}{\text{Net investment}} \times 100$$

$$= \frac{36,000}{60,000} \times 100 = 60\%$$

B) i) Payback Period

For unequal cashflow, the payback period is calculated as follows:

Cash Inflows	Rs.
1st year's cash inflow	18,000
2nd year's cash inflow	18,000
3rd year's cash inflow	18,000
4th year's cash inflow	6,000
	Rs. 60,000

Therefore, the payback period is 4 years.

ii) Post-payback Profitability

= Annual cash inflow × Remaining life after payback period

= Rs. 6000 × 4 = Rs. 24,000

iii) Post-payback Profitability Index

$$= \frac{24,000}{60,000} \times 100 = 0.4 \times 100 = 40\%.$$

3.2.1.3 Bail-out Pay Back

Q12. Explain about Bailout payback method.

(OR)

Write a short note on Bail-out Pay Back

Ans : **(Sep.-20)**

Bail-out payback method is one of the improved methods over payback method. The bail-out payback system takes into consideration the salvage value of a capital investment. This method gives due weightage to the salvage value of the projects because of its existence in capital expenditure decisions where risk is a key factor.

The salvage value of the asset during the life of the project is determined, each year's saving is accumulated in a cumulative form. Each year's cumulative total of savings increases every year due to the salvage value. When cumulative savings plus salvage value becomes equal to the total cost of investment then such period is called as bail-out payback period.

PROBLEMS

6. Determine bail-out payback with the help of following information in respect of an investment decision regarding acquisition of following two mutually exclusive projects. If initial cost of investment, cash inflows and salvage values is as follows,

Description	Investment at Year-0 (in Rs.)	Year-1	Year-2	Year-3	Year-4	Year-5
Project-A	20000	5000	6000	4000	3000	2500
Salvage value of A	-------	6000	4000	3000	2000	1000
Project-B	25000	7000	4000	5000	3000	2500
Salvage value of B	—	6000	4000	3000	2000	100

Sol :

Bail-out Payback Method for Project 'A'

Years	Cash inflows	Salvage value	Cumulative value
(1)	(2)	(3)	(4=2+3)
1.	5,000	6,000	11,000
2.	6,000	4,000	10,000
3.	4,000	3,000	7,000
4.	3,000	2,000	5,000
5.	2,500	1,000	3,500

The cumulative value at the end of 2nd year is Rs. 21,000 (11,000 + 10,000) and it is more than the original investment i.e., Rs. 20,000 (year-0 investment). Hence, the bail-out payback time is 2 years. After the completion of bail-out payback period, the capital investment becomes totally scrapped.

The bail-out payback for project-B is as follows,

Bail-out Payback Method for Project 'B'

Years	Cash inflows	Salvage value	Cumulative value
(1)	(2)	(3)	(4=2+3)
1.	7,000	6,000	13,000
2.	4,000	4,000	8,000
3.	5,000	3,000	8,000
4.	3,000	2,000	5,000
5.	2,500	1,000	3,500

The cumulative value at the end of 3rd year is Rs. 29,000 (13,000 + 8,000 + 8,000) and it is more than the original investment i.e., Rs. 25,000 (year-0 investment). Hence, in project 'B' the bail-out payback time is 3 years. After the completion of bail-out payback period, the capital investment becomes totally scrapped.

Conclusion

Project 'A' has 2 year bail-out payback time.

Project 'B' has 3 year bail-out payback time.

Thus project 'A' is preferred due to low bail-out payback time when compared to project 'B.

3.2.2 Accounting Rate of Return / Return on Investment

Q13. Explain the term accounting rate of return with its merits and demerits.

(OR)

Discuss the importance of return on investment in project appraisal.

Ans :

Accounting Rate of Return (ARR) is a traditional method of capital budget evaluation and it is also known as average rate of return method. According to this method the capital investment proposals are judged on the basis of accounting information rather than cash flows.

Accounting rate of return can be calculated as,

(i) $ARR = \frac{\text{Annual average net earnings}}{\text{Original investment}} \times 100$

(ii) $ARR = \frac{\text{Annul average net earnings}}{\text{Average investment}} \times 100$

The term average annual net earnings is the average of the earnings after depreciation and tax over the whole of the economic life of the project. The amount of average investment is calculated as:

$$\text{Average investment} = \frac{\text{Original investment}}{2}$$

$$\text{Average investment} = \frac{\text{Original investment} - \text{Scrap value}}{2}$$

OR

$$\text{Average investment} = \left(\frac{\text{Original investment} - \text{Scrap value}}{2}\right) + \text{Net working capital} + \text{Salvage value}$$

It is assumed that depreciation is charged on straight line basis method. So, average investment is 50% of original cost less scrap value.

Merits

(i) Accounting rate of return can be easily understood and implemented.

(ii) It provides a better view of profitability as it uses entire profits of the project in evaluating rate of return.

(iii) As it requires accounting data, it can be easily obtained from financial data.

Demerits

(i) ARR also ignores the time value of money like payback period.

(iii) ARR focuses on accounting profits rather than cash flows which are more significant.

(iii) The firm cannot depend on this method to maximize the market value of shares.

(iv) This method is not suitable for investment proposal in which investment are made in installments.

7. A Project cost ` 28,000 and has a scrap value of ` 5,000 after 5 years. The net profit before depreciation and taxes for the five years period are expected to be ` 4,000, ` 6,000, ` 7000, ` 9,000, ` 12,000. Calculate the ARR assuming 35% rate of tax and depreciation on straight line method.

Sol : **(Dec.-19)**

Determination of EAT and ARR

Year	EBDIT	Depreciation	EBIT	Taxes @ 35%	EAT
1	4,000	4,600	– 600	– 210	– 390
2	6,000	4,600	1,400	490	910
3	7,000	4,600	2,400	840	1560
4	9,000	4,600	4,400	1,540	2,860
5	12,000	4,600	7,400	2,590	4,810
Total EAT					**9,750**

$$\text{Average EAT} = [\text{Total EAT} \div 5] = \frac{9750}{5} = 1950$$

Calculation of Depreciation

$$\text{Depreciation} = \frac{\text{Cost} - \text{Salvage value}}{\text{Life}} = \frac{28,000 - 5,000}{5}$$

$$= \frac{23,000}{5}$$

$$= 4,600$$

$$\text{ARR} = \frac{\text{Average EAT}}{\text{Average Investment}} \times 100$$

$$= \frac{1,950}{14,000} \times 100$$

$$= 13.93\%$$

$$\text{Average Investment} = \frac{28,000}{2}$$

$$= 14,000.$$

3.2.3 Net Present Value (NPV)

Q14. Define NPV ? Explain the advantages and disadvantages of NPV ?

Ans :

For answer refer, Unit - II, Q.No. 17.

3.2.4 Internal Rate of Return (IRR)

Q15. Define IRR ? Explain the merits and demerits of IRR.

Ans :

For answer refer, Unit - II, Q.No. 9.

3.2.5 Profitability Index

Q16. What is profitability index.

Ans :

The profitability index method is one of the discounted cash flow method for evaluating the investment proposals. As profitability index is an alteration of net present value method it explains the relationship between present value of cash inflows and present" value of cash outflows. It is also termed as Benefit - Cost ratio (B/C) or 'Desirability factor'. Profitability index can be calculated as,

$$\text{Profitability index} = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$$

$$\text{P.I} = \frac{\text{Present value of cash inflows}}{\text{Initial cash outlay}}$$

When profitability index for net present values of inflows is calculated,

$$\text{P.I (net)} = \frac{\text{NPV (Net Present Value)}}{\text{Initial cash outlay}}$$

When profitability index is more than one then the proposal is accepted and in case profitability index is less than one then the proposal is rejected. The mutually exclusive projects under this method are ranked based on their profitability index, project with high profitability index are ranked first.

PROBLEMS

8. Calculate the profitability index from the information given below

Cost of project	**Rs. 6,00,000**
Life of the project	**5 years**
Annual cash Inflow	**Rs. 2,00,000**
Cut off rate	**10%**

Sol :

Calculation of Profitability Index

Year	CFAT	PV factor	Total PV
1-5	2,00,000	3.791	7,58,200

$$\text{Profitability index} = \frac{7,58,200}{6,00,000} = 1.263$$

Since the calculated PI is more than 1, it is advisable to accept the project.

9. Calculate the Profitability Index for the project Y which requires investment of Rs.25,000 and estimated cash inflows from the project are Rs.9,000, Rs.8,000, Rs.7,000, Rs.6,000 and Rs.5,000 respectively, for 5 years. The required rate of return on investment is 10%.

Sol :

Net Present Value of Project Y

Year	Cash inflow	Discount factor @ 10%	Present value of cash inflow
1	9,000	0.909	8,181
2	8,000	0.826	6,608
3	7,000	0.751	5,257
4	6,000	0.683	4,098
5	5,000	0.621	3,105
		Total	Rs. 27,249

$$\text{Profitability Index} = \frac{\text{Cash inflow}}{\text{Cash outflow}}$$

$$= \frac{27,249}{25,000} = 1.09$$

3.2.6 Equivalent Annual Cost

Q17. What is equivalent annual cost method?

Ans : **(Dec.-19)**

Equivalent annual costs is also one of the methods of 'Time adjusted methods' or 'Discounted methods' or 'Present value methods'. This method is used for both even and uneven cash flows. For even cashflows this method is used for comparing projects having equivalent annual costs. For uneven cashflows this method is an alternative approach for analyzing the project.

Equivalent annual cost technique helps in solving the problem of time discrepancies. Equivalent annual cost method helps in selecting the projects which are more profitable to the business in the long-run and facilitates decision-making during the implementation of the project.

PROBLEMS

10. Determine equivalent annual cost of each machine @ 10% PV factor, with the help of following information in respect of cash outflow of two machines X and Y. Quote your rank in investing in that machine if PV of annuity in 5th year is 3.791.

Description	Investment at	Year-1	Year-2	Year-3	Year-4	Year-5
Project-X	30000	5000	6000	4000	3000	2500
Project-Y	40000	7000	4000	5000	3000	2500
Discounting factor @ 10%	–	0.909	0.826	0.751	0.683	0.621

Sol :

The following steps are considered for determining equivalent annual cost,

Step 1

Step 1 deals with computing net present value of each machine over its original expected economic life.

For Project X

$$\text{Given, } NPV_{(X)} = \text{Cash outflow}$$

$$= 30,000$$

Discount factor @ 10% for 5 years.

Annuity in 5th year is 3.791

$$NPV_{(x)} = \text{Rs. } 30,000 + (5,000 + 6.000 + 4,000 + 3000 + 2500)\ PVIF_{0.10.5}$$

$$= \text{Rs. } 30,000 + 20,500\ (PVIFA_{0.10.5})$$

$$= \text{Rs. } 30,000 + 20,500\ (3.791)$$

$$= \text{Rs. } 30,000 + 77,715.5$$

$$= \text{Rs. } 1,07,715.5$$

For Project 'Y'

Given, cash outflow = Rs. 40,000

Discount factor @ 10% for 5 years.

Annuity in 5th year = 3.791

$NPV_{(y)}$ = Rs. 40,000 + (7,000 + 4,000 + 5,000 + 3,000 + 2,500) PVIFA 0,10.5

= Rs. 40,000 + 21,500 (PVIFA 0.10.5)

= Rs. 40,000 + 21500(3.791)

= Rs. 40.000 + 81,506.5

= Rs. 1,21,506.5

Project 'Y' is a better alternative over project 'X' because of its higher net present value.

Step 2

The next step is to divide the net present value for each project by the PVIFA for the project's original life. This gives the equivalent annual annuity.

$$\text{Equivalent annual annuity}_{(x)} = \frac{\text{Net present value}}{PVIFA_{0,10.5}}$$

$$= \frac{\text{Rs. 1,07,715.5}}{3.791}$$

= 28,413.47

$$\text{Equivalent annual annuity} = \frac{\text{Net present value}}{PVIFA_{0.10.5}}$$

$$= \frac{\text{Rs. 1,21,506.5}}{3.791}$$

= Rs. 32,051.30

Step 3

The equivalent annual annuity method assumes replacement of project for infinite times in the future because of this assumption it considers annual annuities in perpetuity. For perpetuities, these equivalent annual annuities are valued, by dividing the annuity amount by the cost of capital.

NPV_x (assuming infinite replacement)

$$= \frac{\text{Rs. 28,413.47}}{0.10} = \text{Rs. 2,84,134.7}$$

NPV_y (assuming infinite replacement)

$$= \frac{\text{Rs. 33,051.30}}{0.10} = \text{Rs. 3,20,513}$$

Conclusion

Project 'Y' should be acquired because it has the higher net present value when evaluated over an infinite replacement horizon.

3.2.7 Terminal Value

Q18. Define Terminal Value Method.

(OR)

Discuss the importance of Terminal Value in project selection.

Ans : **(Imp.)**

The terminal value method is an advanced technique of evaluating investment proposals. In this method future cash flow are reinvested in some other project at a specified rate of return this continues till the end of the project. Unlike net present value method, the net cash flows and outlays are compounded and forward. If the present value of sum of compounded reinvested cash inflows is more than present value of the outlays the project is accepted. The project with higher present value of the total of the compounded cash flows is preferred in mutually exclusive projects.

The terminal value method also ascertain the terminal rate of return which is also known as modified internal rate of return to control the drawback of the internal rate of return method.

PROBLEMS

11. A project involves initial investment of Rs. 25,000 life of the project is 4 years and cash inflows are Rs. 12,000 p.a for 4 years cost of capital is 12%. The expected rate at which cash inflows will be reinvested at the end of the year.

Year	1	2	3	4
Percentage	5%	5%	10%	10%

You are required to analyses the feasibility of the project using terminal value method.

Sol :

Calculation of Compounded Value of Cash Inflows

Year	Cash in flows	Rate of interest	Years of investment	Compounding factor	Compound value
1.	12,000	5%	3	1.158	13,896
2.	12,000	5%	2	1.102	13,224
3.	12,000	10%	1	1.100	13,200
4.	12,000	10%	0	1.000	12,000
					52,320

$$PV = \frac{\text{Compound value of cash inflow}}{(1+K)^4}$$

$$= \frac{52,320}{(1+0.12)^4}$$

$$= 52,320 \times 0.636 = \text{Rs. } 33,276.$$

As the present value of the compounded reinvested cash inflows Rs. 33,276 is greater than the original cash outlay of Rs. 25.000 (terminal value is positive i.e., Rs. 8276) project is accepted.

12. The following information relates to a project :

Initial Outlay	**Rs. 20,000**
Life of the project	**4 years**
Cash inflows	**Rs. 10,000 p.a. for 4 years**
Cost of capital (K)	**12%**

Expected interest (hurdle) rates at which cash inflows will be reinvested:

End of the year	Percent
1	7%
2	7%
3	9%
4	9%

Sol :

You are required to analyse the feasibility of the project using terminal value method.

Year	Cash Inflows (Rs.)	Rate of Interest (%)	Years for Investment (No.)	Compounding Factor (C.F.)	Compounded Value (Rs.)
1	10,000	7%	3	1.225	12,250
2	10,000	7%	2	1.145	11,450
3	10,000	9%	1	1.090	10,900
4	10,000	9%	0	1.000	10,000
				Total	44,600

Present value of the total of the compounded reinvested cash inflows

$$PV = \frac{\text{Compounded Value of Cash Inflows}}{(1+k)^4}$$

$$= \frac{44,600}{(1+0.12)^4}$$

= 44,600 $\times$ 0.636 (Using Present Value Tables)

= Rs. 28,366

As the present value of the compounded reinvested cash inflows Rs. 28,366 is greater than the original cash outlay of Rs. 20,000 (or terminal value is positive, i.e., Rs. 8,366), the project can be accepted.

3.3 Single Period Constraints, Multi-Period Capital Constraint, and An Unresolved Problem

Q19. Explain the concept of single period constraints.

(OR)

Discuss on single period constraints.

Ans :

Most of the firms are using profitability index technique for evaluating the projects in order to take capital budgeting decisions regarding that project. Profitability index is relevant for the simple and divisible projects with single period capital constraints rather than the mutually exclusive projects with capital constraints in more than one period. Profitability index represents the ability of the project in generating value of the funds invested in that project.

$$\text{Profitability index} = \frac{\text{NPV}}{\text{Initial investment}}$$

A profitability index value higher than 1 depicts that the project will yield positive and profitable NPV, whereas the projects with PI less than 1 will yield only negative NPV and loss to the firm. The primary objective of firm in using PI is to select the set of projects which can yield high profits and value to the shareholders.

PROBLEMS

13. A firm has a set of projects P, Q, R, S and T whose cashflows are as follows,

	0	1	2	3	4
P	-200	40	80	120	160
Q	-300	100	200	100	280
R	-120	-40	80	80	-
S	-200	120	120	200	80
T	-100	-140	80	120	60

Under non rationing situation, the selection of project is based on NPV of the projects. The NPV of the projects can be determined by discounting the cashflows at a rate of 10%.

Sol :

Year	P	PV@10%	$PVCF_P$	Q	$PVCF_Q$	R	$PVCF_R$	S	$PVCF_S$	T	PVCF
1.	40	0.909	36.36	100	90.9	-40	-36.36	120	109.08	140	127.26
2.	80	0.826	66.08	200	165.2	80	66.08	120	99.12	80	66.08
3.	120	0.751	90.12	100	75.1	80	60.08	200	150.2	120	90.12
4.	160	0.683	109.28	280	191.24	—	—	80	54.64	60	40.98
Total PVCF			301.84		522.44		89.8		413.04		324.44
(–) cash out flows			–200		–300		–120		–200		–100
			101.84		222.44		–30.2		213.04		224.44
NPV			IV		II		V		III		I

Project R has been rejected as the NPV is negative.

Assume if a capital rationing arise at '0' year such as the available capital is only 600. With the capital restrictions the firm cannot complete all the 4 projects P, Q, S and T. The firm needs to determine the appropriate project based on the profitability index. The following table represents the ranking of the projects based on PI.

Project	PV of Cashflow /Outlay	PI	Rank
P	$\frac{101.84}{200}$	0.509	IV
Q	$\frac{222.44}{300}$	0.741	III
R	$\frac{-30.2}{120}$	–0.251	V
S	$\frac{213.04}{200}$	1.0652	II
T	$\frac{224.44}{100}$	2.24	I

The order of the projects based on the decreasing order of ranks and their investments requirements.

Project	Rank	Year '0'
T	1	100
S	2	200
Q	3	300
P	4	200
R	–	120

The firm can accept the three projects T, S and Q by utilizing the capital resources available.

Total NPV = 224.44 + 213.04 + 222.44 = 659.92

Firm should first invest the available funds in T, S and Q which will yield a total NPV of 659.92 at a single period capital expenditure constraint. This increases the wealth of shareholder by 659.92. As there is a restriction on the availability of capital sources, the wealth of shareholders has been decreased by Rs. 101.84.

Q20. Explain briefly about multi period capital constraints an unresolved problem.

(OR)

Discuss on multi period capital constraints.

Ans :

The investment decision-making for multi-period constraint is usually considered as complex and not completely resolved under capital rationing because of differing assumptions which consists of both explicitly and implicitly and also because of failure to isolate the problem from general capital market theory. Therefore, to avoid such problems, companies should follow strategies which are helpful in the long-run.

Under multi-period capital rationing, profitability index is not used to rank projects especially when projects are divisible and the firm is subject to capital rationing for a multi-period. The profitability index is used for ranking projects only for a single period constraints. In multi-period capital rationing linear programming is used to determine the combination of projects which maximises NPV subject to the capital constraints in each period.

Q21. Compare single period and multi period capital constraint.

Ans : **(May-19)**

S.No.	Single Period Constraint	Multi-Period Capital Constraint
1.	Single period constraint takes place when there is a shortage of funds for only one period.	Multi-period constraint takes place when there is a shortage of funds for more than one period
2.	It deals with divisible, indivisible and mutually exclusive projects.	It deals with linear programming and dual values
3.	Profitable index is used in single period constraint.	Profitable index is not used in multi-period constraint.
4.	Single period easy compared to multi-period constraint.	Multi-period is usually considered as complex compared to single period constraint

PROBLEM

14. A company has determined the following probabilities for net cash flows for three years generated by a project.

Year 1		Year 2		Year 3	
Cash Flows (Rs)	Probability	Cash Flow (Rs)	Probability	Cash Flow (Rs)	Probability
2,000	0.2	2,000	0.4	2,000	0.1
3,000	0.3	3,000	0.2	3,000	0.5
4,000	0.4	4,000	0.1	4,000	0.2
5,000	0.1	5,000	0.3	5,000	0.2

Calculate the expected net cash flows of multi-period. Also calculate the present value of the expected cash flow using 12% discount rate.

Sol :

The present value of the expected value of cash flows at 12% discount rate are as follows,

$$1^{st} \text{ year} = \frac{1}{1.12} = 0.893\ 1.12$$

$$2^{nd} \text{ year} = \frac{0.893}{1.12} = 0.797$$

$$3^{rd} \text{ year} = \frac{0.797}{1.12} = 0.712$$

ENCF = Expected Net Cash Flows

$$PV(ENCF) = \frac{ENCF_1}{(1+k)^1} + \frac{ENCF_2}{(1+k)^2} + \frac{ENCF_3}{(1+k)^3}$$

Year-1

$$ENCF_1 = (2000 \times 0.2) + (3000 \times 0.3) + (4000 \times 0.4) + (5000 \times 0.1)$$
$$= 400 + 900 + 1600 + 500 = \text{Rs. } 3400$$

Year-2

$$ENCF_2 = (2000 \times 0.4) + (3000 \times 0.2) + (4000 \times 0.1) + (5000 \times 0.3)$$
$$= 800 + 600 + 400 + 1500 = \text{Rs. } 3300$$

Year-3

$$ENCF_3 = (2000 \times 0.1) + (3000 \times 0.5) + (4000 \times 0.2) + (5000 \times 0.2)$$
$$= 200 + 1500 + 800 + 1000 = \text{Rs. } 3,500$$

$$PV(ENCF) = \frac{3400}{(1+0.12)^1} + \frac{3300}{(1+0.12)^2} + \frac{3500}{(1+0.12)^3}$$

$$= \frac{3400}{(1+12)^1} + \frac{3300}{(1+12)^2} + \frac{3500}{(1+12)^3}$$

$$= 3400 \times 0.893 + 3300 \times 0.797 + 3500 \times 0.712$$

$$= 3036.2 + 2630.1 + 2492 = \text{Rs. } 8158.3.$$

3.4 HERTZ SIMULATION

Q22. Explain briefly about Hertz simulation ? Elaborate the process of Hertz simulation.

(OR)

Explain the model of Hertz Simulation.

(OR)

Briefly discuss the Hertz Simulation.

(OR)

What is Hertz Simulation? Explain its importance.

(OR)

Write a brief note on Hertz Simulation as the tool of critical appraisal techniques in the investment decisions.

Ans : **(Sep.-20, Dec.-19, Imp.)**

For various business processes such as expansion, increasing efficiency of production processes to reduce the costs etc., lot of capital should be invested and these investments involve various degrees of risk. To avoid the risks associated with the investment, firms are required to gather the information regarding the factors effecting the investment and analyse each available alternative to select the best one. For this simulation analysis serves as best tool as it can maximize the NPV and returns. It helps in drawing and analysing the samples based on the probability distribution of each factor to determine the rate of return.

Hertz introduced the use of simulation model for evaluating the risks associated with investments by determining the expected rate of return and standard deviation of investment. The procedure of Hertz simulation model consists of,

Step 1

Hertz identified the important factors that are uncertain and has a significant effect on the investment. He developed the probability distribution for each factor based on the historical data assessment of the outcomes or knowledge of the decision makers of the firm. The factors include,

a) Market Analysis: The following factors should be considered while analysing the market,

i) Market size
ii) Selling price
iii) Growth rate
iv) Market share.

b) Investment Cost Analysis: The factors that should be considered for this are,

i) Investment required
ii) Residual value of investment.

c) Operational and Fixed Costs: The firm needs to analyse the following factors under this category,

i) Operational costs
ii) Fixed costs
iii) Useful life of facilities.

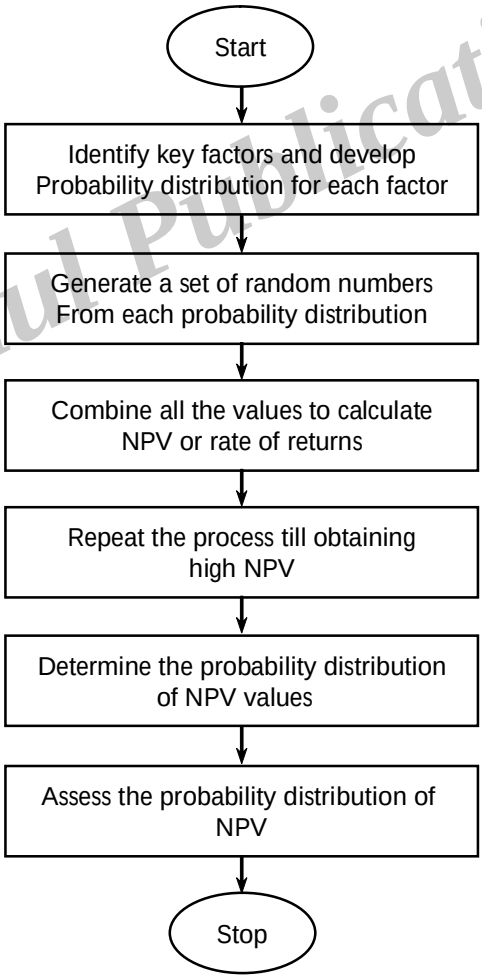


Fig.: Steps in Hertz Simulation Model

Step 2

Select a value for each factor randomly or develop a set of random numbers of the distributed values of the factors in order to calculate rate of return for each factor. Simulate these values in order to determine the rate of return or NPV.

Step 3

The process needs to be repeated for number of times to determine the risks associated with the investment.

It is necessary to restrict the variations in the factors affecting the market while determining the expected return from the simulated set of random numbers. Simulation of the random numbers can also be done using computers which yields favourable and adequate results.

For every time, a set of values of each of nine factors need to be simulated to calculate the respective returns for each factor. After conducting adequate trials of simulation, a firm can plot the results on a graph to determine the rate of return and the frequency distribution which helps in determining the probability of favourable returns of investment under various degrees of risk. The list of the profitable investments with less risks can be determined by comparing the frequency distribution of the rates of return on investment. Simulation models are also used for budgeting or profit planning. These models help in reducing the effect of wide variability in different factors that affects the firm's profitability.

PROBLEMS

15. ABC company wants to assess the different projects on 3 factors such as demand in units, profits (price cost) per unit and investment required for the project. These factors are independent of each other. The probability distributions of the 3 factors are as follows,

Annual Demand		Profit (Rs.)		Investment	
Units ('000)	Probability	Units	Probability	Rs.	Probability
40	0.05	6.00	0.20	3000	0.25
45	0.20	10.00	0.10	4000	0.50
50	0.10	14.00	0.20	5000	0.25
55	0.30	18.00	0.40		
60	0.10	20.00	0.10		
65	0.20				
70	0.05				

Using simulation process for 10 times compute the return on investment for each trials based on the 3 factors. Suggest the appropriate return and project.

Sol :

i) Calculate the cumulative probability tables for each factor based on which random numbers can be assigned to the factors.

Random Numbers for Annual Demand

Annual Demand	Probability	Cumulative Probability	Random Numbers
40	0.05	0.05	00-04
45	0.20	0.25	05 - 24
50	0.10	0.35	25 - 34
55	0.30	0.65	35 - 64
60	0.10	0.75	65 - 74
65	0.20	0.95	75 - 94
70	0.05	1.00	95-99

Random Numbers for Profit

Profit	Probability	Cumulative Probability	Random Numbers
6	0.20	0.20	00 - 19
10	0.10	0.30	20-29
14	0.20	0.50	30-49
18	0.40	0.90	50-89
20	0.10	1.00	90-99

Random Numbers for Investment

Investment required	Probability	Cumulative Probability	Random Numbers
3000	0.25	0.25	00-24
4000	0.50	0.75	25 - 74
5000	0.25	1.00	75 - 99

ii) The simulation worksheet consists of 10 trials by selecting random numbers from the above sets. The return for every project can be calculated using the following formula.

$$R\% = \frac{\text{Profit} \times \text{Demand}}{\text{Investment}} \times 100$$

Trial	Random	Simulated	Random	Simulated	Random	Simulated	Simulated
1	14	45	10	6	5	3,000	$\frac{45\times 6}{3,000}\times 100 = 9\%$
2	30	50	40	14	24	4,000	$\frac{50\times 14}{4,000}\times 100 = 17.5\%$
3	40	55	25	10	16	3,000	$\frac{55\times 10}{3,000}\times 100 = 18.33\%$
4	50	55	36	14	47	4,000	$\frac{55\times 14}{4,000}\times 100 = 19.25\%$
5	20	45	99	20	86	5,000	$\frac{45\times 20}{5,000}\times 100 = 18\%$
6	45	55	58	18	94	5,000	$\frac{55\times 18}{5,000}\times 100 = 19.8\%$
7	28	50	47	14	35	4,000	$\frac{50\times 14}{4,000}\times 100 = 17.5$
8	90	65	75	18	48	4,000	$\frac{65\times 18}{4,000}\times 100 = 29.25\%$
9	80	65	86	18	19	3,000	$\frac{65\times 18}{3,000}\times 100 = 39\%$
10	72	60	64	18	78	5,000	$\frac{60\times 18}{5,000}\times 100 = 21.6\%$

of all the returns in the above table, the returns are highest (39%) at trial 9. It represents that the demand of 65,000 units yields a profit of 18/- per unit and require an investment of Rs. 30,00,000.

3.5 HILLIER APPROACHES: NPV MEAN VARIANCE ANALYSIS

Q23. Briefly discuss the Hillier approaches.

(OR)

Discuss the Hillier Approach in analysis and appraisal of project.

(OR)

How is the standard deviation of NPV defined by Hillier model if the cashflows different years perfectly correlated.

(OR)

Write a brief note on Hillier Approaches as the tool of critical appraisal techniques in the investment decisions.

Ans : **(May-19)**

According to Hiller, expected NPV and standard deviation of NPV can be determined using analytical derivation. Hiller explained |c(NPV)] standard deviation of NPV in three different cases,

i) Independent cash flows

ii) Perfect correlated cash flows

iii) Mixed condition.

Hiller's approach is limited only to positive correlation of cash flows as it is not possible for perfect negative correlation of cash flows in case of multiple periods.

i) Independent Cash Flows

If the cash flows are independent there does not exist any relation between the cash flows. In this case, it is very difficult to determine the variance of NPV as there will be an increase in the possible outcomes with the increase in the degree of independence among the cash flows. If a project has a life of 3 years and 5 cash flows in each year as the cash flows are independent the possible outcomes will be 5 × 5 × 5 = 125.

The probability of each combination can be determined by the product of the probabilities of the cash flows of those combinations. The expected values and variance of NPV can be determined based on the present value of the cash flows.

$$\sigma\,(NPV) = \left[\sum_{t=0}^{n} \frac{\sigma_t^2}{(1+i)^{2t}}\right]^{1/2}$$

$$= \sigma_0^2 + \frac{\sigma_1^2}{(1+i)^2} + \frac{\sigma_2^2}{(1+i)^{2\times 2}} + \frac{\sigma_3^2}{(1+i)^6} + ... + \frac{\sigma_n^2}{(1+i)^{2t}}$$

$$\overline{NPV} \text{ or } E(NPV) = \sum_{t=1}^{n} \frac{C_t}{(1+i)^t} - I$$

$$\bar{C}_t \text{ for a year} = \frac{c_1 + c_2 + c_3 + ...c_n}{n}$$

Where,

$\overline{NPV}$ = Expected NPV

s (NPV) = Standard deviation

I = Initial of NPV investment

σ_t = Standard deviation of cash flow for year 't'.

ii) Perfectly Correlated Cash Flows

If the cash flows are perfectly correlated there exists a definite relationship between the cash flows. If there is a deviation in the cash flows of one year due to some factors i.e., c_i then there will be a similar effect of these factors on the cash flows of j^{th} year i.e., c_j. The expected value and standard deviation of NPV cart be calculated using the following formula,

$$E(NPV) = \sum_{t=1}^{n} \frac{\bar{C}_t}{(1+i)^t} - I$$

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

iii) Mixed Condition

In some cases the cash flows are partly independent and partly correlated with others. For instance, the acceptability of a product by the target market customers may be unsatisfactory, satisfactory or excellent. The acceptability of the product in the present year determine the forecasts for next year is the cash flows in this aspect are dependent. Whereas, the effect of economic conditions on the sales in one year may not determine the effect of economic conditions in the next year i.e., independent nature.

In this case one should generate all combinations and need to compute the joint probabilities for each. Determine the PV of cash flows and then calculate mean and standard deviation based on PVCF. In mixed case, the cash flows are categorized into two parts,

c_j = Independent cash flows

c^*_i = Dependent cash flows.

The variance can be calculated as,

$$V(NPV) = s^2 = \left[\sum_{t=0}^{n} \frac{v(c_t)}{(1+i)^{2t}}\right] + \left[\sum_{t=0}^{n} \frac{\sqrt{vc_t^*}}{(1+i)^t}\right]^2$$

$$s = \sqrt{V(NPV)}$$

Risk associated with the project can be determined based on the standard deviation and NPV as standard deviation is a measure of project risk and serves a base for evaluation of risk of only one project but not for comparative analysis of projects. In that case of comparative analysis of risk it is necessary to calculate coefficient of variance for each.

$$\text{Coefficient of variance} = \frac{\sigma}{E(NPV)} \times 100$$

If the coefficient of variance is high it represents that the project is associated with high degree of risk.

PROBLEMS

16. From the following information, ascertain which project is more risky on the basis of standard deviation.

Project A		Project B	
Cash Inflow Rs.	Probability	Cash Inflow Rs.	Probability
2,000	0.2	2,000	0.1
4,000	0.3	4,000	0.4
6,000	0.3	6,000	0.4
8,000	0.2	8,000	0.1

Sol :

Calculation of Standard Deviation

Project A

Cash Inflows Rs.	Deviation from Mean (d) [5,000]	Square of Deviation (d^2)	Probability	Weighted Sq. Deviation (fd^2)
1	2	3	4	5
2,000	–3,000	90,00,000	0.2	18,00,000
4,000	–1,000	10,00,000	0.3	3,00,000
6,000	+1,000	10,00,000	0.3	3,00,000
8,000	+3,000	90,00,000	0.2	18,00,000
			n = 1	$\Sigma(fd^2)$ = 42,00,000

Standard Deviation (s), $= \sqrt{\frac{\Sigma fd^2}{n}} = \sqrt{\frac{42,00,000}{1}} = 2,050$

Project B

Cash Inflows Rs.	Deviation from Mean (d) [5,000]	Square of Deviation (d^2)	Probability	Weighted Sq. Deviation (fd^2)
1	2	3	4	5
2,000	–3,000	90,00,000	0.1	9,00,000
4,000	–1,000	10,00,000	0.4	4,00,000
6,000	+1,000	10,00,000	0.4	4,00,000
8,000	+3,000	90,00,000	0.1	9,00,000
			n = 1	Σdf^2 = 26,00,000

Standard Deviation (s), $= \sqrt{\frac{\Sigma fd^2}{n}} = \sqrt{\frac{26,00,000}{1}} = 1,612$

17. A company is considering two mutually exclusive projects X and Y Project X costs Rs. 30,000 and Project Y Rs. 36,000. You have been given below the net present value probability distribution for each project :

Project X		Project Y	
NPV Estimate Rs.	Probability	NPV Estimate Rs.	Probability
3,000	0.1	3,000	0.2
6,000	0.4	6,000	0.3
12,000	0.4	12,000	0.3
15,000	0.1	15,000	0.2

(i) Compute the expected net present value of projects X and Y.

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

(iii) Which project do you consider more risky and why ?

(iv) Compute the profitability index of each project.

Sol :

(i) Computation of Expected Net Present Value of Projects X and Y

Project 'X'			Project 'Y'		
NPV Estimate (Rs.)	Probability	Expected NPV (Rs.)	NPV Estimate (Rs.)	Probability (Rs.)	Expected NPV
3,000	0.1	300	3,000	0.2	600
6,000	0.4	2,400	6,000	0.3	1,800
12,000	0.4	4,800	12,000	0.3	3,000
15,000	0.1	1,500	15,000	0.2	3,000
		9,000			9,000

(ii) Computation of Standard Deviation of Projects X and Y

Project X				
NPV Estimate (Cash Inflows Rs.)	Deviation from Mean (d) [9,000]	Square of Deviations $(d)^2$	Probability (f)	Weighted Square Deviation $(fd)^2$
3,000	–6,000	3,60,00,000	0.1	36,00,000
6,000	–3,000	90,00,000	0.4	36,00,000
12,000	+3,000	90,00,000	0.4	36,00,000
15,000	+6,000	3,60,000	0.1	36,00,000
			n = 1	Σfd^2 = 1,44,00,000

Standard Deviation (s), $= \sqrt{\frac{\Sigma fd^2}{n}} = \sqrt{\frac{1,44,00,000}{1}} = 3,795$

Project 'Y'				
NPV Estimate (Rs.)	Deviation from Mean (d) [9,000]	Square of Deviations $(d)^2$	Probability (f)	Weighted Square Deviation $(fd)^2$
3,000	–6,000	3,60,00,000	0.2	72,00,000
6,000	–3,000	90,00,000	0.3	27,00,000
12,000	+3,000	90,00,000	0.3	27,00,000
15,000	+6,000	3,60,00,000	0.2	72,00,000
			n = 1	Σfd^2 = 1,98,00,000

Standard Deviation (s), $= \sqrt{\frac{\Sigma fd^2}{n}}$

$= \sqrt{\frac{1,98,00,000}{1}}$

$= 4,450$

(iii) As the standard deviation of project Y is more than that of Project X, Project Y is more risky.

(iv) Computation of profitability index :

Expected NPV = Total of present value cash inflows – Project Cost

Present Value of Cash Inflows = Expected NPV + Project Cost

Project X = 9,000 + 30,000 [Expected NPV is calculated in (i) above] = Rs. 39,000

Project Y = 9,000 + 36,000 = Rs. 45,000

Profitability Index ; Project X $= \frac{39,000}{30,000} = 1.3$

Profitability Index ; Project Y $= \frac{45,000}{36,000} = 1.25$

18. The Rajeev Company is considering to make investment in a proposal which requires an outlay of Rs.1,20,000. The project has a life of three years over which the following cash inflows are likely to be generated.

Year 1		Year 2		Year 3	
Cash Flow	Probability	Cash Flow	Probability	Cash Flow	Probability
30,000	0.2	30,000	0.1	40,000	0.3
40,000	0.4	50,000	0.4	60,000	0.3
50,000	0.3	80,000	0.4	80,000	0.2
60,000	0.1	90,000	0.1	1,00,000	0.2

The management feels that the expected cash flows in the various periods may be considered to base its decision about acceptance or rejection of the project. If the discount rate is 10%, should the proposal be accepted?

Sol :

We shall obtain the expected cash inflow for each of the years. This is calculated as follows:

Calculation of Expected Cash Flows

Year	Cash Flow C_{ti}	Probability P_{ti}	Expected Value	Expected Cash Flow $C = S C_{ti} P_{ti}$
1	30,000	0.2	6,000	
	40,000	0.4	16,000	
	50,000	0.3	15,000	
	60,000	0.1	6,000	43,000
2	30,000	0.1	3,000	
	50,000	0.4	20,000	
	80,000	0.4	32,000	
	90,000	0.1	9,000	64,000
3.	40,000	0.3	12,000	
	60,000	0.3	18,000	
	80,000	0.2	16,000	
	1,00,000	0.2	20,000	66,000

Now the expected NPV can be calculated as :

Year	Expected Cash Flow	PV Factor @ 10%	Present Value
0	–120000	1.0000	–120000
1	43000	0.9091	39091.3
2	64000	0.8264	52889.6
3	66000	0.7513	46585.8
		Expected NPV	= 21566.8

Since the expected NPV of the proposal is greater than zero, it is an acceptable one.

3.6 Significance of Information and Data Bank in Project Selections

Q24. Define project selection ? Discuss the significance of information and data bank in project selections.

(OR)

Explain scope and importance of information and data bank in project sections.

(OR)

Explain the significance of information and data bank in project selections.

(OR)

Describe the significance of information and data bank in project selections.

Ans : **(Sep.-20, Imp.)**

Project selection deals with evaluating various needs or opportunities and based on that evaluation it decides the implementation of the project. Evaluation of project is a wider concept because it considers consequences, advantages, disadvantages, critical resources to the project etc. Every project has quantitative, qualitative, tangible and intangible aspects.

The benefits of quantitative aspects include, increase in sales or reduction in costs. Whereas intangible benefits include, company's reputation or employee morale. The quantitative consequences of the project are cost involved in the implementation of the project and also consist of those aspects which led to interruption during the implementation of the project.

The following are the significance of information and data bank in the project selection.

i) The information and data bank in project selections help to achieve:
   a) Alignment with company goals
   b) Anticipate sales volume
   c) Increase in market share
   d) Maximize return on investment and technology development etc.

ii) It helps in listing assumptions and are used as the basis for each opportunity.

iii) It facilitates data gathering and information for each opportunity in the project to ensure an intelligent decision regarding project selection.

iv) Data bank and information related to project also helps the decision maker in making appropriate choices at the right time.

v) The other elements which are focused in the project with the help of information and data bank are public reaction, competitor's reaction, investment required, estimated manufacturing cost per unit, regulatory approval etc.

vi) Depending upon the project requirement financial or economic models are used to calculate discounted cash flow, net present value, internal rate of return, life cycle costs associated with each opportunity etc.

vii) Proper utilization of information and data bank helps in completion of the project at the set time.

viii) The various methods through which required information is gathered through surveys, focus groups, interviews, analysis of available reports etc.

ix) The information and data bank collected for project selection facilitates establishment of new products, anticipated retail price and the expected time frame for future projects also.

Short Question and Answers

1. Define capital budgeting.

Ans :

Meaning

Capital budgeting is an important issue in corporate finance, hence it is referred as strategic asset allocation. As capital budgeting decisions are very important, firms must ensure that sufficient time is spent in planning these decisions and also see that all the top executives from the field of production, engineering, marketing etc., are involved in carefully weighing up the capital expenditure proposals.

Capital budgeting is the planning process used to determine whether an organization's long term investments such as new machinery, replacement machinery, new plants, new products, and research development projects are worth pursuing. It is budget for major capital, or investment, expenditures.

The term 'Capital Budgeting' is used interchangeably with capital expenditure management, capital expenditure decision, long term investment decision, management of fixed assets, etc. It may be defined as "planning, evaluation and selection of capital expenditure proposals." Capital budgeting involves a current outlay or serves as outlays of cash resources in return for an anticipated flow of future benefits.

Definitions

i) **According to G. C. Philippalys,** "Capital budgeting is concerned with the allocation of firm's scarce financial resources among the available market opportunities. The consideration of investment opportunities involves comparison of expected future streams of earnings from a project with immediate and subsequent streams of expenditure for it."

ii) **According Lynch,** "Cash budgeting consists in planning, development of available capital for the purpose of maximizing the long term profitability in the concern."

iii) **According to Prof. I. M. Pandey,** "capital budgeting decisions may be defined as the firm's decision to invest its current funds most efficiently in long-term activities in anticipation of an expected flow of future benefits over a series of years."

2. Principles of Capital Budgeting.

Ans :

Capital expenditure decisions should be taken on the basis of the following factors:

i) Creative Search for Profitable Opportunities

The first stage is conception of the profit making idea. Profitable investment opportunities should be sought to supplement existing proposals.

ii) Long – Range Capital Planning

A flexible programme of a company's expected future development over a long period of time should be prepared.

iii) Short – Range Capital Planning

This is for a short period. It indicates its sectoral demand for funds to stimulate alternative proposals before the aggregate demand for funds is finalized.

iv) Measurement of Project Works

The economic worth of a project to a company is evaluated at this stage. The project is ranked with other projects.

v) Screening and Selection

The project is examined on the basis of selection criteria, such as the supply and cost of capital, expected returns, alternative investment opportunities, etc.

vi) Control of Authorized Outlays

Outlay should be controlled in order to avoid costly delays and cost over-runs.

vii) Post Mortem

The ex-post routines of a completed investment project should be re-evaluated in order to verify that their exact conformity with exact projections.

3. Payback method.

Ans :

Payback period method is a traditional method of capital budgeting. It is the simple and widely used quantitative method of investment evaluation. Payback period is also termed as payout or pay off period method, with the help of payback period method firm can evaluate the number of years to recoup the initial investment from cash flow after tax. The formula to calculate payback period is,

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Annual cash flows}}$$

Accept / Reject Criterion

Payback period is used as a measuring tool to accept or reject investment proposal. A proposal whose actual payback period is more than what has been predetermined by the management has to be rejected. In case of comparison between two projects a project with less payback period is preferred to a project with high payback period. Payback period can also be used as a method of ranking in case of mutually exclusive projects. The project can be arranged in an ascending order according to the lengths of the payback periods.

4. Merits and demerits of payback period?

Ans :

Merits

1. This method is simple to understand and easy to calculate
2. The cost incurred to adopt this method is less than methods. In other sophisticated techniques, the cost of the analyst's time and use of computers are required.
3. During the period of tight money conditions, a quick payback project is preferable to one which yields a higher rate of return but ties up funds for a much longer period of time.
4. This method favours a short-term project than the long-term projects, which may turn out to be risky projects with higher risk in the future.
5. The emphasis in the payback method is on the early recovery of the investment. Thus, it gives preference to liquidity of the project as the funds so released earlier can be used in some other projects.

Demerits

1. It fails to take into account the cash inflows earned after the payback period.
2. It fails to consider the total return on investment and thus it is not an appropriate method to measure the profitability of an investment project.
3. It gives equal values to return of amount though they occur in different periods. Thus, it fails to consider the magnitude and timing of cash inflows. The two different projects may have payback return in the equal period, but the project giving large cash inflows in the early years is preferable than the project giving larger cash inflows in the later years of the project.

5. Write a short note on discounted payback method.

Ans :

Discount rate analyses the present values of all cash outflows and inflows and these values are computed at an appropriate discount rate. Generally, the present values of all inflows are cumulated in order of time.

The time period at which,

Cumulated present value = Value of cash outflows of cash inflows

This phenomena is usually referred as "Discounted payback period method".

Even Cashflows

Discounted payback under even cashflows uses the formula,

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

Where,

P = Annual savings

a = Accepted interest rate per rupee per annum

n = Number of years over which the investment is likely to recovered etc.

Uneven Cashflows

In case of uneven cashflows, each years savings are to be discounted individually and this is done through present value factors using the formula,

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

Where,

P = Present value

i = Interest

After determining present value of each year's savings, cumulative is done based on the cumulative totals for the discounted pay period.

Accept / Reject Criteria

Accept

The project having lesser discounted payback is accepted.

Reject

The project with more discounted payback period is rejected.

6. Discuss briefly about surplus life and surplus pay back period.

Ans :

Post-payback method is an improvement over payback period method. Post payback method considers the returns receivables beyond the payback period. These returns are usually referred as post-payback profits.

This method helps in determining the true profitability of the project. The critical aspect of this method are post-payback profits. The project yielding highest post-payback period are selected. The following steps are considered to compute such profits.

i) To determine the surplus life in years which is the difference between total economic life and payback period.

ii) For even cashflows for the entire period, cashflows are multiplied by the surplus life i.e., Cashflows × Surplus economic life.

Total surplus = Savings Surplus economic life

or

Post - payback = Annual cash profitability inflows (estimated economic life - payback period)

Cumulative totals of savings related to each year of surplus economic life is equal to post-payback period profits under uneven Cashflows.

iii) The third step deals with summing-up estimated value of scrap in each case to the surplus savings' or Cashflows and

iv) Surplus savings or post-payback profits are converted into index number which indicates relative significance of each project correctly.

Index of post – payback profits or surplus saving

$$= \frac{\text{Post} - \text{payback period profit} \times 100}{\text{Net investment}}$$

Symbolically,

$$\text{Index of PPBP} = \frac{\text{PPBP Pr.}}{\text{NI}} \times 100$$

Where,

PPBP = Post-payback period

PPBP Pr. = Post-payback period profit

NI = Net investment.

Post-payback period is also referred as "Surplus life over payback method". This method is suitable for those projects which do not differ significantly in terms of their size, even cashflows during the execution of the project.

Accept/Reject Criteria

Accept: Projects with highest post-payback period are accepted.

Reject: Projects with lowest post-payback period are rejected.

7. Write a short note on Bail-out Pay Back

Ans :

Bail-out payback method is one of the improved methods over payback method. The bail-out payback system takes into consideration the salvage value of a capital investment. This method gives due weightage to the salvage value of the projects because of its existence in capital expenditure decisions where risk is a key factor.

The salvage value of the asset during the life of the project is determined, each year's saving is accumulated in a cumulative form. Each year's cumulative total of savings increases every year due to the salvage value. When cumulative savings plus salvage value becomes equal to the total cost of investment then such period is called as bail-out payback period.

8. Explain the term accounting rate of return.

Ans :

Accounting Rate of Return (ARR) is a traditional method of capital budget evaluation and it is also known as average rate of return method. According to this method the capital investment proposals are judged on the basis of accounting information rather than cash flows.

Accounting rate of return can be calculated as,

(i) $ARR = \frac{\text{Annual average net earnings}}{\text{Original investment}} \times 100$

(ii) $ARR = \frac{\text{Annul average net earnings}}{\text{Average investment}} \times 100$

9. What is equivalent annual cost method?

Ans :

Equivalent annual costs is also one of the methods of 'Time adjusted methods' or 'Discounted methods' or 'Present value methods'. This method is used for both even and uneven cash flows. For even cashflows this method is used for comparing projects having equivalent annual costs. For uneven cashflows this method is an alternative approach for analyzing the project.

Equivalent annual cost technique helps in solving the problem of time discrepancies. Equivalent annual cost method helps in selecting the projects which are more profitable to the business in the long-run and facilitates decision-making during the implementation of the project.

10. Define Terminal Value Method.

Ans :

The terminal value method is an advanced technique of evaluating investment proposals. In this method future cash flow are reinvested in some other project at a specified rate of return this continues till the end of the project. Unlike net present value method, the net cash flows and outlays are compounded and forward. If the present value of sum of compounded reinvested cash inflows is more than present value of the outlays the project is accepted. The project with higher present value of the total of the compounded cash flows is preferred in mutually exclusive projects.

11. Single period constraints.

Ans :

Most of the firms are using profitability index technique for evaluating the projects in order to take capital budgeting decisions regarding that project. Profitability index is relevant for the simple and divisible projects with single period capital constraints rather than the mutually exclusive projects with capital constraints in more than one period. Profitability index represents the ability of the project in generating value of the funds invested in that project.

$$\text{Profitability index} = \frac{\text{NPV}}{\text{Initial investment}}$$

12. Significance of information and data bank in project selections.

Ans :

Project selection deals with evaluating various needs or opportunities and based on that evaluation it decides the implementation of the project. Evaluation of project is a wider concept because it considers consequences, advantages, disadvantages, critical resources to the project etc. Every project has quantitative, qualitative, tangible and intangible aspects.

The benefits of quantitative aspects include, increase in sales or reduction in costs. Whereas intangible benefits include, company's reputation or employee morale. The quantitative consequences of the project are cost involved in the implementation of the project and also consist of those aspects which led to interruption during the implementation of the project.

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   d) Maximize return on investment and technology development etc.

ii) It helps in listing assumptions and are used as the basis for each opportunity.

iii) It facilitates data gathering and information for each opportunity in the project to ensure an intelligent decision regarding project selection.

13. Compare single period and multi period capital constraint.

Ans :

S.No.	Single Period Constraint	Multi-Period Capital Constraint
1.	Single period constraint takes place when there is a shortage of funds for only one period.	Multi-period constraint takes place when there is a shortage of funds for more than one period
2.	It deals with divisible, indivisible and mutually exclusive projects.	It deals with linear programming and dual values
3.	Profitable index is used in single period constraint.	Profitable index is not used in multi-period constraint.
4.	Single period easy compared to multi-period constraint.	Multi-period is usually considered as complex compared to single period constraint

Exercise Problems

1. A firm is contemplating the following project which one is better according to you ?

Year	Project A	Project B
0	–100,000	–100,000
1	25,000	35,000
2	24,000	20,000
3	23,000	24,000
4	20,000	23,000
5	15,000	18,000

Closing NPV, PI and payback period evaluate the projects assuming a 10% discount rate.

[Ans : A = 4.53 years, B = 3.91 years, NPV A = –18,397, PI = 0.816, NPV B = – 6,706, PI = 0.933]

2. A Firm is considering a proposal to buy a machine for Rs. 30,000. The expected cash flows after taxes from the machine for a period of 3 years are 20,000. After the expiry of the useful life of the machine, the seller has guaranteed its repurchase at Rs. 2,000. The firm cost of capital is 10% and risk adjusted discount rate is 18%. Should the company accept the proposal ?

[Ans : 12456]

3. Following are the details of a project :

Initial outlay	Rs. 80,000
Initial working capital	Rs. 20,000
Cash flows before deprection and taxes :	
1st year	Rs. 35,000
2nd year	Rs. 35,000
3rd year	Rs. 30,000
4th year	Rs. 30,000
Salvage value	Rs. 20,000

The project is depreciable on straight-line basis. If the required rate of return is 10% which is the project acceptable under the NPV and IRR criteria? Tax rate is 50%.

[Ans : NPV = – 5267, IRR = 8.29%.]

4. An industry is contemplating to purchase a machine. Two machines A and B are available, each costing Rs. 5,00,000. In comparing the profitability of machines a discount rate of 10% is used earnings after taxation are expected as follows :

Year	Machine A	Rs. in 000's Machine B
1	150	50
2	200	150
3	250	200
4	150	300
5	100	200

Rank the investment proposals using

a) Pay-back period

b) NPV @ 10%

c) IRR method.

[Ans : a) Payback period A = 3.09 years

B = 3,88 years

b) NPV A = 1,54,000

B = 1,48,000

c) IRR A = 22.98

B = 19%]

5. A company is considering two mutually exclusive projects. Both require an initial outlay of ` 2,00,000 each and have a life of 5 years. The company's required rate of return is 10 percent. The expected cash flows are as follows :

Year	Project-x	Project-Y
1	` 80,000	` 1,20,000
2	` 80,000	` 60,000
3	` 80,000	` 40,000
4	` 80,000	` 1,00,000
5	` 80,000	` 1,00,000

Determine the next present value and internal rate of return of each project and indicate which project should be selected and why ?

[Ans : NPV X = 1,03,200

Y = 1,19,080

IRR X = 28.66%

Y = 32.16%]

UNIT IV

STRATEGIC ANALYSIS OF SELECTED INVESTMENT DECISIONS:

Lease Financing, Operating Risk, borrowing vs. procuring. Hire purchase and Installment decisions. Lease Risk Management, Leasing as a Financing Decision, Advantages of Leasing, and Leasing Decision in practice.

4.1 LEASE FINANCING

Q1. Define the term lease.

(OR)

What do you understand by leasing?

(OR)

What is lease financing?

Ans : **(Dec.-19, May-19)**

Meaning

A lease is a contractual agreement whereby, the owner of an asset grants the right of the asset to the other party, in return for a periodic payment. Basically, it refers to renting of an asset for a specific period.

- **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.

The lease is divided into two categories namely, finance lease and operating lease. The financial lease covers the full useful economic life of the asset. It is also known as a capital lease. Whereas, in operating lease is an agreement in which the lessee acquires the use of an asset on a period to period basis. This agreement is shorter than the life of an asset.

A leasing company intends to recover the full or the major part of the outlay on a leased asset. The lesser must ensure that the lessee is reliable and capable of paying rent for the primary lease period and during the due period. The inherent risks of ownership, default claims, collateral and interest and tax assumptions increase the amount of risk in financial leasing.

Definition

(i) According to James C. Van Horne lease is a contract whereby the owner of an asset (lessor) grants to mother party (lessee) the exclusive right to use the asset usually for an agreed period of time in return for the payment of rent.

(ii) Lease is a form of contract transferring the user or occupancy of land, space, structure or equipment in consideration of a payment, usually in the form of a rent.

(iii) Lease is a contract whereby the owner of an asset grants to another party the exclusive right to use the asset usually for an agreed period of time in return for the payment of rent.

Q2. What are the characteristics of leasing?

Ans :

The following are the characteristics of a lease:

1. The Parties

Lease agreement involves two parties i.e., the lessor and the lessee. Lessor is the person who transfers the right to use an asset in consideration of a periodical rental payment whereas lessee is the person who acquires the right to use an asset from the lessor for periodical rental payment for an agreed period (pre-determined) of time.

2. The Asset

Leasing is mostly used to finance the use of fixed assets of high value. The asset is the

property which is to be leased out such as automobile, an aircraft, plant and machinery, building, and so on. In leasing the ownership of an asset is segregated from the use of the asset. During the lease period, ownership lies with the lesser where as it use is being transferred to the lesser.

3. The Term

The term of lease agreement is known as lease period. It considered as illegal to have a lease without a specified period of term. In case of a perpetual lease, lease period is for an infinite period of time and in case of financial lease, lease period is in connection with the economic life of the asset. Quite a few times the lease period is being divided into primary lease period and secondary lease period.

4. The Lease Rentals

Lease rentals forms the consideration which is payable by the lessee as being mentioned in the lease transaction. Rentals are ascertained in order to cover up such cost i.e., interest on the less or's investment, any repairs and maintenance costs which forms the part of the lease package, depreciation on the leased asset and any other service charges in relation to the lease.

Q3. Explain the essential elements of leasing ?

Ans :

1. Parties to the Contract

There are essentially two parties to a contract of lease financing, namely, the owner and the user, called the lessor and the lessee respectively. Lessors as well as lessees may be individuals, partnerships, joint stock companies, corporations or financial institutions. Sometimes there may be joint lessors or joint lessees, particularly where the properties or the amount of finance involved is enormous.

2. Asset

The asset, property or equipment to be leased is the subject-matter of a contract of lease financing. The asset may be an automobile, plant and machinery, equipment, land and building, factory, a running business, aircraft and so on. The asset must, however, be of the lessee's choice suitable for his business needs.

3. Ownership Separated from User

The essence of a lease financing contract is that during the lease-tenure, ownership of the asset vests with the lessor and its use is allowed to the lessee. On the expiry of the lease tenure, the asset reverts to the lessor.

4. Term of Lease

The term of lease is the period for which the agreement of lease remains in operation. Every lease should have a definite period otherwise it will be legally inoperative. The lease period may sometimes stretch over the entire economic life of the asset (i.e., financial lease) or a period shorter than the useful life of the asset (i.e., operating lease). The lease may be perpetual, that is, with an option at the end of lease period to renew the lease for the further specific period.

5. Lease Rentals

The consideration which the lessee pays to the lessor for the lease transaction is the lease rental. The lease rentals are so structured as to compensate the lessor for the investment made in the asset (in the form of depreciation), the to rest on the investment, repairs and so forth-borne by the lessor and servicing charges over the lease period.

6. Modes of Terminating Lease

The lease is terminated at the end of the lease period and various courses are possible, namely,

(i) The lease is renewed on a perpetual basis or for a definite period or

(ii) The asset reverts to the lessor or

(iii) The asset reverts to the lessor and the lessor sells it to a third party or

(iv) The lessor sells the asset to the lessee.

The parties may mutually agree to and choose, any of the aforesaid alternatives at the beginning of the lease term.

Q4. Describe the various types of leasing.

Ans :

The lease is broadly classified into two types:

1. Financial lease
2. Operating lease
3. Other types of lease

1. Financial Lease

The financial lease, usually covers the complete economic life of the asset. During the lease period the lessor receives the lease rental in order to not only recover the full cost of the asset, but also the reasonable return on the funds which are being to buy the asset. Infact finance lease in also known as capital lease.

Finance lease is generally noncancellable in nature and the lesser provides for the proper asset maintenance. The asset would be returned to the lesser (or) managed as per the lease contract at the end of the period. Lease rental is usually considered as a payment for the usage of the asset only and a responsibility of repairing and maintain-ing the asset usually lies with the lessee.

2. Operating Lease

An operating lease is an agreement where in the lessee obtains the use of an asset on a periodical basis. It is a lease arrangement for a period which is usually shorter than the life of an asset. An asset may be leased by the lesser to the different lessees one after the other. During the lease period the lease rental payable by one lessee is insufficient to completely cover the asset cost plus return. Therefore the present value of lease payment is usually lower than the actual price of the asset.

3. Other types of lease

(a) Cross Border lease

A cross border lease refers to the situation when a lessor leases an equipment to a lessee who does not come under the jurisdiction of the lessors territory. The important reasons behind the recourse to cross border leasing is that in greater number of cases like the operation which provides finance to an international commercial transaction, where the user not only procures 100% financing, but also includes the finance which includes a longer time period than government export credit. Under the cross border lease on the basis of the circumstances in the international capital market the attitude of the parties changes.

(b) Direct Lease

Direct lease is one of the type of finance lease where in lessor purchases the asset and transfers it to the lessee. Under the lease agreement, a manufacturer can also act as lessor and deliver the assets to the lesser.

(c) Leveraged Lease

When the lessor borrows a part of the purchase price from any leading institution then such a lease is known as leveraged lease. Under this lease, with the help of assets and the lease rentals the loan is being secured. The lessee (or) the lessor directly repay the loan out of the lease rentals.

In this leveraged lease the lender finances the as-set. Initially the lease rentals are distributed for payment to the lender in order to satisfy the debt obligation and any surplus and the remaining amount would be sent back to the lessor.

For costly assets the leveraged lease may be more useful.

(d) Sales and Lease Back

Under sale and lease back the lessee is already considered as the owner of the asset. In this type of lease agreement, lessee sells the asset to the lessor, who further a leases back the asset to the owner i.e., the lessee.

The lessee not only retains the use of the asset, but also receives the funds from the sale of the asset to the lessor. This lease is usually opted by those firms

having fixed assets, but shortage of funds. This agreement helps greatly the lessee as they can create the funds to enhance-the liquidity position.

(e) Negotiation of Lease Rental

The degree of acceptable level of rentals is represented by the break even rental of the lessor and the lessee. The lower limit is fixed by the break even lease rental of the lessor whereas the upper limit is fixed by the break even lease rental of the lessee.

The real rental needs to be negotiated within the range. A rental within the range for both the lessor and the lessee would refer to a positive benefit of leasing. The range between the break even lease rental for both the lessor and the lessee shows the bargaining power for the negotiation of the actual lease rental for a lease proposal.

Q5. What are the characteristic features of financial and operating lease?

Ans :

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.

Q6. Define cross border leasing. What are the objectives of cross border leasing?

Ans :

Meaning

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

- 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.

Q7. What is a leveraged lease? Explain the characteristics of leveraged lease?

Ans : **(Imp.)**

Meaning

When the lessor borrows a part of the purchase price from any leading institution then such a lease is known as leveraged lease. Under this lease, with the help of assets and the lease rentals the loan is being secured. The lessee (or) the lessor directly repay the loan out of the lease rentals.

In this leveraged lease the lender finances the as-set. Initially the lease rentals are distributed for payment to the lender in order to satisfy the debt obligation and any surplus and the remaining amount would be sent back to the lessor.

Characteristics

- In the leveraged lease, the finance provider which is lender is without recourse to the lessor.
- The lender holds the asset since it carries the payment obligation.
- The lessor will be free from the obligation of the payments to the lender the payment is directly done to the lender by the lessee but in case of default, the lessor will be obliged to pay the dues.
- The small portion of the fund is arranged by the lessor and the majority portion of the fund which is required to obtain the asset is borrowed by the lender.
- The lender will have more rights in regard to the sale or resale of the asset in comparison to the lessor.
- One of the typical characteristics of this type of vehicle is that the lender can check the financial position of the lessee that whether the lessee will be in a position to pay the rentals or not and if not the lenders will opt for recourse loan payment where the lessor will be obliged to make the payments.
- The leveraged lease is generally used when any company wants to purchase some high-value assets.
- In this type of method of leasing the lessor will be the one who will get benefitted by tax also. It will receive some tax-related benefit of ownership of the asset. Although the rights are also lying with the lender of the asset according to lessee agreement.

Q8. What are the differences between financial lease and operating lease.

(OR)

Compare and contrast financial lease and operating lease.

Ans : **(Imp.)**

S.No.	Financial Lease	S.No.	Operating Lease
1.	It is like an installment loan. It is legal commitment to pay for the entire cost of the equipment plus interest over a specified period of time. The lessee commits to a series of payment which in total exceed the cost of the equipment.	1.	It is rental agrement. The lessee is not committed to paying more than the original cost of equipment during contractual period.
2.	It excludes provisions for maintenance or taxes which are paid separately by the lessee.	2.	Operating lease provides for maintenance expenses and taxes of the lessor.
3.	The risk of obsolescence is assumed by the lessee.	3.	Leasing company assumes risk of obsolescence.

4.	Contract period ranges form medium to long them.	4.	Contract period ranges from intermeriate to short-term.
5.	Contracts are usually non concealable.	5.	Contracts are usually cancellable either by the lessee or the lessor.
6.	Air crafts, land and building, heavy, machinery are leased.	6.	Computers, office equipments, automobiles, trucks etc., are leased.
7.	The lease involves a financial commitment similar to a loan by a leasing company. It places the lease in a position of borrow.	7.	The financial commitment is restricted to regular rental payment. The rentals find a place in the profit and loss account of the lessee.
8.	The lessor fulfills financial function.	8.	The lessor fulfills service function.

Q9. What are the important aspects of lease documentation and contract ?

Ans :

The transactions of lease generally include many formalities and different documents. In order to formalize the deal between the concerned parties an to bind them, the lease agreements have needs to be documented in a proper way. The following are the essential aspects of lease documentation and agreement:

1. Purpose and Essential Requirements

It is quite essential to document the lease agreements as it provides the proof of indebtedness, the availability enforceability of security, greatly emphasizes on the terms and conditions of advance agreed between the borrower and the lender and helps to take some adequate/suitable legal measures in any case of default.

Some important requirements of documentation of lease agreement are as follows,

(a) Any person executing the document must have the legal capacity to do it.

(b) The documents must be in the specified format which needs to be stamped properly and witnessed.

(c) The duly executed and stamped documents needs to be registered, if essential, with the proper authorities.

2. Lease Approval Process

The leasing company after appraising the lease proposal and negotiating funding programme with the lessee would try to complete the other formalities. The approval decision of the leasing facility is expressed to the lesser with the help of a offer letter, which is usually in the form of commitment defining the key terms of the lease facility. The lease offer is usually kept open for a particular period of time.

The leasing transaction needs several commercial documents like purchase order, invoice, bill of sale from the supplier or manufacturer, delivery note, copies of audited balance sheet and profit and loss account for the last 3 years, a letter of delegation of powers by the board of directors authorized to sign the agreement on behalf of the company and so on. The lessor should secure all these documents from the lesser. These documents are known as “attendant” lease documents as they facilitates in decision making of a leasing proposal.

Any equipment/asset which is generally leased must be adequately insured without giving more importance as to who pays the premium. The insurance policies must be made in the name of the lessor account lessee and all the insurance policies must be kept in the custody of the lessor. They should be renewed before the date of expiry.

3. Master Lease and Supplemental Lease Agreements

The legal rights and obligations of the lessor and lessee are clearly mentioned in the lease agreement. A master lease agreement which is signed usually contains all the essential conditions which would be essential to manage the lease. This further specifies certain qualitative terms in the main part of the document whereas the attached schedules includes the equipment details, credit limits, rental profile and other details.

After the additional lease facilities are finalized they are then documented in the supplemental lease agreements along with the agreements of the master lease agreement, inclusive of the particulars of the certain leased equipment during the time of the lease of the particular equipment. This document of the particular lease is the real lease agreement.

4. Clauses in Lease Agreement

There is no standardized lease agreement and also the contents varies from one case to another case. Any typical lease agreement would include the following clauses :

(a) Nature of the Lease : This clause mentions the nature of lease as to whether the lease is an operating lease a financial lease or a leverage lease. Further it mentions that the lessor gives acceptance to lease the equipment to the lessee and lessee also gives acceptance to take on lease from the lessor in relation to the terms of the lease agreement, the leased equipment.

(b) Description : This clause the includes and mentions the comprehensive particulars of equipment its actual condition, size, components, expected useful life and so on.

(c) Delivery and Re-delivery : This clause mentions about the delivery details of equipment and also about the re-delivery of the equipment to the lessor or expiry of the lease contract.

(d) Period : This clause states that the lessee needs to possess the equipment for only his own use on lease on the terms mentioned in the schedule of the agreement. It even includes an option clause to the lessee for the purpose for renewing the lease of the equipment. The renewal period is nothing but the secondary lease period.

(e) Lease Rentals : This clause mentions about the process for paying lease rentals by the lessee to the lessor at the rates mentioned in the schedule to the agreement. It further involves the mobilization of advance which is actually needed and any guarantee which can be applicable. This clause even has to explicitly mention that the lessee would pay on demand a late payment charge, a percentage per month of each installment of lease rent.

(f) Use : For appropriate and lawful applicability this clause levies upon the responsibility on the lessee.

(g) Title : This clause includes the recognition and ownership of equipment.

(h) Repairs and Maintenance : This clause mentions about the responsibility for repairs and maintenance, insurance and so on.

(i) Alteration : This clause mentions that change cannot be made to the leased equipment without any written consent of the lessor.

(j) Peaceful Possession : This clause gives the guarantees to the lessee about the peaceful possession of the leased equipment clear of any charges, liens or any other encumbrances.

(k) Charges : This clause clearly mentions about as to which party to the agreement would bear the delivery, re-delivery, customs, transport income tax, sales tax and clearance charges.

(*l*) Indemnity Clause : This clause indemnifies the lessor from any sort of consequential losses resulting out due to non-performance of the leased equipment.

(m) Inspection : This clause provides with the right to the lessor or his representative to enter into the lessee's premises in order to make sure about the existence, circumstances and proper maintenance of the equipment.

(n) Prohibition of Sub-leasing : This clause avoids the lessee from the activity of sub-leasing or selling the equipment to the third parties.

(o) Events of Default and Remedies : This clause mentions about the outcomes of defaults by the lessee and even the recourse available to the lessor.

(p) Applicable Law : This clause mentions about the country whose laws would be applied during the time of any dispute. It may also offer the arbitration process.

Q10. Explain the legal aspects of leasing ?

Ans :

In India, separate law for equipment leasing does not exists. The provisions relating to bailment in the Indian Contract Act are treated as same for equipment leasing agreements. Section 48 of the Indian Contract Act defines bailment as,

The delivery of goods by one person to another, for some purpose, upon a contact that they shall, when the purpose is accomplished, be returned or otherwise disposed off according to the directions of the person delivering them. The person delivering the goods is called the 'bailor' and the person to whom they are delivered is called the 'bailee'. Provisions of Section 150 and 168 of the Indian Contract Act defined that as equipment lease transaction is treated same as contract of bailment. Hence obligations of the lessor and the lessee will be similar to those of the bailor and the bailee.

The following implications are given by the provisions for the lessor and the lessee,

1. It is the duty of lessor to deliver the asset to the lessee for giving legal authorisation to lessee to use the asset and the asset should be left in possession of the lessee during the currency of the agreement.
2. The lessee has the obligation to pay the lease rentals as mentioned in lease agreement, to protect the lessors title, to take reasonable care protect the lessors title, to take reasonable care of the asset and to return the leased asset on the expiry of the lease period.

Q11. Explain the process of leasing.

Ans :

Leasing is a financial arrangement between the two parties which provides an opportunity to a lessor to avail the benefits of using an asset without owning or purchasing it. The process of leasing involves the following steps :

1. Lease Selection

In a lease transaction, the first step is to select an asset which has to be taken on lease. The lessee select an asset after considering various requirements like lease payments, duration of leasing period, its terms and conditions and so on. After finalizing the nature and type of asset, the lessee then approaches the leasing company or the lease broking company with the objective of finalizing the lease deal. A lease agreement is negotiated broadly.

2. Order and Delivery

Depending on the selection made by the lessee, the lessor places an order with the manufacture of the asset which is to be leased. The asset must be delivered by the manufacturer to the concerned site of a lessee. After the receipt of the asset, the lessee is required to issue an acceptance notice to the lessor.

3. Lease Contract

A lease agreement is signed by both the parties after deciding the terms of the lease contract. Generally, leases are full payout with different terms and conditions. Usually, lease period ranges between 3 to 5 years.

4. Lease Period

During lease period, the lessee make regular payment of lease on which both the parties have to agree. The lessee ensures the lessor by run on the leased asset would be properly maintained.

In addition, the lessee must get warranties and after- sales services from the lessor. The lessee may either renews or terminates the leasing contract at the end of the lease period. The lessee is not provided with the purchase option in the lease agreement itself.

Q12. Explain the factors affecting growth of Indian Leasing.

Ans :

The following factors have been responsible for the growth of Indian leasing, in no particular order:

1. No Entry Barriers

Any one could float a leasing entity, and even an existing company not in leasing business can write a lease purely for tax shelters.

2. Buoyant Growth in Capital Expenditure by Companies

The post- liberalization era saw a spate of new ventures and fresh investments by existing ventures. Though primarily funded by the capital markets, these ventures relied upon leasing as a source of additional or stand-by funding. Most leasing companies, who were also merchant bankers, would have funded their clients who hired them for issue management services.

3. Fast Growth in Car Market

Needless to state with facts, the growth in car leasing volume has been the highest over these years - the spurt in car sales with the entry of several new models was funded largely by leasing plans.

4. Tax Motivations

India continues to have unclear distinction between a lease that will qualify for tax purposes, and one which would not. In retrospect, this is being realized as an unfortunate legislative mistake, but the absence of any clear rules to distinguish between true leases and financing transactions, and no bars placed on deduction of lease tax breaks against non-leasing income, propelled tax-motivated lease transactions. There was a growing market in sale and leaseback transactions, which, if tested on principles of technical perfection or financial prudence, would appear to be a shame on everyone's face.

5. Optimistic Capital Markets

Data would establish a clear connection between bullish stock markets and the growth in both number of leasing entities and lease volumes. Year 1994-1995 saw the peak of primary market activity where a company, even if a new entrant in business, could price itself on unexplainable premium and walk out with pride.

6. Access to Public Deposits

Most leasing companies in India have relied, some heavily, on retail public funds in the form of deposits. Most of these deposits were raised for a one year tenure, and on premise of high rates of interest, at times even more than the regulated rate (which was lifted in 1996 to be re-introduced in 1998).

7. Generally Go-Go Business Environment

At the backdrop of all this was a general euphoria created by liberalization and the economic policies of Dr. Manmohan Singh.

4.2 Operating Risk

Q13. Explain the concept of Operating Risk.

Ans :

The inability of the firm to recover its operating costs is known as operating risk. In other words, operating risk may also be defined as the instability of EBIT. The EBIT is instable due to various internal and external environmental factors. The operating risk is an unavoidable risk.

The EBIT of a company varies due to two factors,

1. Volatility of sales
2. Volatility of expenses.

1. Volatility of Sales

The regular fluctuations or changes in sales revenue is a major factor that determines the operating risk. There are three reasons behind fluctuations in sales of a company.

Firstly, the level of business activity is affected due to change in general economic conditions. Since, business cycle is an economical phenomenon it has an impact on the sales of a companies.

Secondly, certain events organized by companies of specific industry also have an impact on the sales of a company. For example, a company may face problems for scarcity of resources, technological backwardness, stiff competition etc.

Lastly, the internal factors of a company also have an impact on the company's sales volume or level. For example, changes in the company's management, production and marketing decisions or investment policy.

2. Volatility of Expenses

The various combinations of fixed and variable expenses further impact the instability of EBIT. High level of fixed expenses ensure higher degree of operating leverage. During increase in sales, high operating leverage results in quick increase in EBIT.

4.3 Borrowing vs Procuring

Q14. Define the terms :

(i) Borrowing

(ii) Procuring

Ans :

(i) Borrowing

Borrowing is an act of receiving money from another party with an agreement to repay it back after specified period. Mostly borrower need to pay interest i.e., a percentage of principal amount to lender as compensation for borrowing.

(ii) Procuring

Procurement is the act of obtaining goods or services, typically for business purposes. Procurement is most commonly associated with businesses because companies need to solicit services or purchase goods, usually on a relatively large scale.

Procurement generally refers to the final act of purchasing but it can also include the procurement process overall which can be critically important for companies leading up to their final purchasing decision. Companies can be on both sides of the procurement process as buyers or sellers though here we mainly focus on the side of the soliciting company.

Q15. Explain the factors affecting the Decisions of Leasing or Buying.

Ans :

The following are the different factors that affect the leasing or buying decisions,

1. Cost of Purchasing

The asset's purchasing cost cannot be deducted from taxable profits, as it is a capital expenditure and results in increase in cash outflow.

On the other hand, leasing cost is deductible in calculation of taxable profit and is a revenue expenditure. It also reduces cash outflow.

2. Risk of Wearing-off

The asset also has a risk of wear-off. When the purchased asset becomes obsolete, it has to be replaced and thus results in increased ash outflow.

Leasing overcomes the problem of license and under leasing the asset that wears-off can be replaced.

3. Depreciation of Asset

The asset that is purchased can be depreciated. The depreciation is deductible from taxable income. Whereas, a leased asset cannot be depreciated as it is not owned. But in case of huge investments that have small amount of depreciation leasing proves to be beneficial.

4. Non-depreciable Asset

The asset that are not depreciable are usually leased in order to ensure reduction in both cash outflow and taxable income.

5. Special Tax Benefits

Sec. 801 A (4) or sec. 801 B (3) to (11) (11 A) and (11 B) provide tax benefits to owners having 80% of new plant and machinery. However, assets taken on lease do not get these benefits. But the firm that gets tax holiday benefits sec 10 A or 10 B prefer leasing as the profit is exempted from tax for 10 years.

6. Gestation Period

Leasing is also preferred by firms having a gestation period of 5 or 6 years. Special tax benefits prove to be useless since, there is no profit during the gestation period.

7. Fund Position

(i) The companies having huge funds prefer taking buying decision

(ii) The companies having low funds but better loan options go on taking buying decisions

(iii) The companies having low funds and no loan options prefer leasing decisions.

8. Residual Value

The owner is entitled to the residual value and high residual value is beneficial for owner of the asset.

9. Future Returns

In case of low future returns, firms usually take buying decisions to overcome problems of lease rent / interest etc.

Q16. What are the differences between borrowing and procuring?

(OR)

Distinguish between borrowing and procuring.

Ans :

S.No.	Basis	Borrowing	Procuring
1.	**Meaning**	Leasing is a form of borrowing an asset from its owner to use it in return of some rent amount.	Buying is a form of procuring an,asset by paying the price for it.
2.	**Parties**	Lessor and lessee are involved in leasing.	Buyer and seller are involved in buying.
3.	**Cost**	It involves cost of using the asset.	It involves cost of owning the asset.

4.	**Transfer**	Lessee is not eligible to sell or transfer the asset to any other party.	Buyer is eligible to sell or transfer the asset.
5.	**Consideration**	It is paid in the form of lease rentals.	It is paid in lumpsum or in equal installments.
6.	**Tenure**	Leasing is for specific time period.	Buying is for whole life of an asset.
7.	**Ownership Option**	At the end of lease term, asset can be purchased or return back to lessor.	After clearing all dues, asset belongs to the buyer.

PROBLEMS

1. Tapro Ltd can purchase an asset for Rs. 2,500. The asset has a salvage value of Rs. 500 at the end of its life of 5 years. The firm charges depreciation on straight line method. If the asset is purchased, the firm's revenues will increase by Rs. 1,500 per year and will raise its operating expenses and interest by Rs. 700 per year. The company is taxed at 50% and has a cost of capital of 10%.

Alternatively the firm can lease the asset for an annual rental of Rs. 650. The incremental revenue will be the same at Rs. 1,500 per year and the increase in firm's expected non-depreciation expenses is Rs. 600 per year. Evaluate the proposal.

Sol :

Computation of NPV of Leasing Option

Year	Profit (Rs.)	Expenses	Rental	PBT	PAT	C.F	PVF 10%	PV (Rs.)
1	1,500	600	650	250	125	125	0.909	114
2	1,500	600	650	250	125	125	0.826	103
3	1,500	600	650	250	125	125	0.751	94
4	1,500	600	650	250	125	125	0.683	85
5	1,500	600	650	250	125	125	0.621	77
							NPV	473

Computation of NPV of Buying Option

Year	Profit (Rs.)	Expenses	Dep.	PBT	PAT	C.F	PVF 10%	PV (Rs.)
1	1,500	700	400	400	200	600	0.909	545
2	1,500	700	400	400	200	600	0.826	496
3	1,500	700	400	400	200	600	0.751	457
4	1,500	700	400	400	200	600	0.683	410
5	1,500	700	400	400	200	600	0.621	373
Salvage Value						500	0.621	310
							Total	2591

EPV of cash in flows	=	2,591
(–) Cashout flow	=	2,500
Net Present Value	=	91

Conclusion

As the NPV of the leasing option is higher than the NPV of the buying option, the firm should lease the asset.

2. 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 installments of ` 1,78,858 each, at the beginning of the year. In case of leasing, the company would be required to pay a 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.

Sol :

Calculation of Cost of the Machine

Beginning of Year	Cl. Balance at the beginning	Installment	Interest component	Principal
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	1,78,858	5,21,140
1	1,78,858	72,960	1,05,898	4,15,242
2	1,78,858	58,134	1,20,724	2,94,518
3	1,78,858	41,233	1,37,625	1,56,893
4	1,78,858	21,965	1.56.893	0
Total			6.99.998	

Buying Option

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

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

3. 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 and installments, the equipment can be sold at the and 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.

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

Sol :

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	—

Schedule of Cash Outflows : Debt Alternative

(Amount in `)

(1) End of year	(2) Debt Payment	(3) Interest	(4) Dep.	(3) + (4)	(5) Tax Shield [(3)+(4)]0.35	(6) Cash outflows (2)–(5)	(7) PV factors @ 12%	(8) 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	87,289	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	1,39,183
								7,66,207
Less : PV of Salvage Value								(56,700)
								7,09,507

Total present value of Outflows = ` 7,09,507

Option B

Lease Rent	3,30,000
Tax Shield	(115,500)
Outflow	2,14,500
	x 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.

4. Welsh Limited is faced with a decision to purchase or acquire on lease a mini car. The cost of the mini car is ` 1,26,965. It has a life of 5 years. The mini car can be obtained on lease by paying in advance equal lease rentals annually. The leasing company desires a return of 10 per cent on the gross value of the asset. Welsh Limited can also obtain 100 per cent finance from its regular banking channel. The annual rate of interest will be 15 percent and the loan will be paid in 5 annual equal installments, inclusive of interest, each installment becoming due at the beginning of the year. The effective tax rate of the company is 40 percent. For the purpose of taxation, it is to be assumed that the asset will be written off over a period of 5 years on a straight line basis.

(a) Advice welsh Limited about the method of acquiring the car.

(b) What should be the annual lease rental to be charged by the leasing company to match the loan option?

Sol : **(May-19)**

$$\text{Annual Loan Repayment} = \frac{\text{Loan Amount}}{\text{Amount Factor of 15\% + 1}}$$

$$= \frac{1,26,965}{2.855 + 1}$$

$$= \frac{1,26,965}{3.86}$$

$$= 32,892.487 \simeq 32,892$$

[**Note :** PV factor value at the begining of year, 1.00 is added to annuity factor value 2.855 (15% for 4 years) as loan installment is repaid at the begining of the year]

Computation of Interest In Debt Payments

Year	0	1	2	3	4
Opening Balance of Principal	1,26,965	94,073	75,292	53,694	28,856
Interest @ 15%	–	14,111	11,294	8,054	4,328
Total	1,26,965	1,08,184	86,586	61,748	33,184
Repayment of Installment	32,892	32,892	32,892	32,892	32,892
Closing Balance	94,073	75,292	53,694	28,856	–

[There is a different in total of 4th year and installment amount because values are rounded off to nearest value]

Schedule of Cash Outflows in Debt Financing

End of year	Loan Repayment	Interest @ 15%	Depreciation 20% on 1,26,965	Tax Shield	Net Cash Outflows	PV factor @ 9%	PV Cash Outflows
(1)	(2)	(3)	(4)	(5) = (3) + (4) × 40%	(6) = (2) – (5)	(7)	(8) = (6)×((7)
0	32,892	–	–	–	32,892	1.00	32,892
1	32,892	14,294	25,393	15,802	17,090	0.92	15,723
2	32,892	11,294	25,393	14,675	18,217	0.84	15,302
3	32,892	8,054	25,393	13,379	19,513	0.77	15,025
4	32,892	4,328	25,393	11,888	21,004	0.71	14,913
5	–	–	25,393	10,157	(10,157)	0.65	(6,602)
							87,253

Lease Option

(a) Annual Rentals $= \frac{\text{Cost of Assets}}{\text{Annuity factors of 10\% + 1}}$

$= \frac{1,26965}{3.170+1}$

$= \frac{1,26,965}{4.17}$

$= 30,447$

[**Note :** Annuity value = 3.170 (10% of 4 years) 1.000 is added because loan is repaid at the beginning of the year]

Schedule of Cash Outflows – Leasing Alternative

End of the year	Lease Payment	Tax Shield	After Tax cash Outflows	PV factor @ 9%	Present Value Cash Outflows
(1)	(2)	(3) = (1) × 40%	(4) = (2) – (3)	(5)	(6) = (4) × (5)
0	30,447	–	30,447	1.00	30,447
1 – 4	30,447	12,179	18,268	3.24	59,188
5	–	12,179	(12,179)	0.65	(7,916)
					81,719

Decision

The present value of cash outflow in lease financing is less than debt financing. So, it is advisable of Welsh Ltd. To acquire the car on lease financing.

(b) Let the Annual rental be 'x'

Therefore, after tax cost of lease rentals will be 0.60x × 4.17 = 2.50x

Equating 2.50 x = ` 87,253

The value of $x = \frac{87,253}{2.50}$

$= 34,901$

Therefore, the lease rentals should be ` 34,901 to match the loan option.

5. JLB corporation is attempting to determine whether to lease or purchase research equipment. The firm is in the 40 percent tax bracket, and its after-tax cost of debt is currently 8 percent. The terms of the lease and of the purchase are as follows:

Lease: Annual end-of-year lease payments of Rs.25,200 are required over the 3-year life of the lease. All maintenance costs will be paid by the lessor insurance and other costs will be borne by the lessee. The lessee will exercise its option to purchase the asset for Rs. 5,000 at termination of the lease.

Purchase: The research equipment, costing Rs.60,000 can be financed entirely with a 14 percent loan requiring annual end-of-year payments of Rs. 25,844 for 3 years. The firm in this case will depreciate the equipment using a 3-year recovery period. The firm will pay Rs.800 per year for a service contract that covers all maintenance costs; insurance and other costs will be borne by the firm. The firm plans to keep the equipment and use it beyond its 3-year recovery period.

(a) Calculate the after-tax cash outflows associated with each alternative.

(b) Calculate the present value of each cash outflow stream, using the after-tax cost of debt.

(c) Which alternative - lease or purchase - would you recommend? Why?

Sol :

(a) Step 1

The cash flow after cash is calculated by multiplying before tax payment by 1 minus the tax rate.

$\therefore$ After tax cash flow lease = Rs. $-25,200 \times (1 - T)$

= Rs. $25,200 \times (1 - 0.40)$

= Rs. 15,120

Therefore, cash outflows over the three year period of lease is Rs. 15,120. In the last year Rs. 5000 will be added for exercising purchase option and outflow will be (15,120 + 5,000) Rs. 20,120.

Step 2

Calculation of interest and principal components in each loan payment amount.

End of Year	Loan Payments	Beginning of year principal	Payments		End-of-year principal [(2) – (4)]
			Interest [0.14×(2)]	Principal [(1) – (3)]	
	(1)	(2)	(3)	(4)	(5)
1	25,844	60,000	8,400	17,444	42,556
2	25,844	42,556	5,958	19,886	22,670
3	25,844	22,670	3,174	22,670	-

In the above table the principal amount and amount of interest are shown.

The after tax cash outflows associated are as follows :

End of year	Loan payments	Maintenance cost	Depreciation	Interest	Total of deductions [(2)+(3)+(4)]	Tax shields [0.40 x (5)]	After cash outflows [(1) + (2) - (6)]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	25,844	1800	19,998	8,400	30,198	12,079	15,565
2	25,844	1800	26,670	5,958	34,428	13,771	13,933
3	25,844	1800	8,886	3,174	13,860	55,544	22,100

(b) Calculation of present value of each cash outflow @ 8% cost of debt.

End of year	After-tax cash outflows	Leasing Present value Factor @8%	Present value of outflows [(1) × (2)]	After-tax cash outflows	Purchasing Present values factors @8%	Present value of outflows [(4) × (5)]
	(1)	(2)	(3)	(4)	(5)	(6)
1	15,120	0.926	14,001	15,565	0.926	14,413
2	15,120	0.857	12,958	13,933	0.857	11,941
3	20,120	0.794	15,975	22,100	0.794	17,547
P.V of cash outflows			42,934	P.V of cash outflows		43,901

(c) Since, the present value of cash outflows is lower in case of leasing i.e., 42,934 as compared to purchasing i.e.. 43,901, therefore the leasing alternative should be selected.

Note : The depreciation rate for recovery period for 3 years is taken from the following table attached.

Under MACRS, trade-in value is ignored. The following table lists the depreciation rates that a business typically may use for tax purposes.

Depreciation for Recovery Period

Year	3-year	5-year	7-year	10-year
1	33.33%	20.00%	14.29%	10.00%
2	44.45%	32.00%	24.49%	18.00%
3	14.81%	19.20%	17.49%	14.40%
4	7.11%	11.52%	12.49%	11.52%
5		11.52%	8.93%	9.22%
6		5.76%	8.92%	7.37%
7			8.93%	6.55%
8			4.46	6.55%
9				6.56%
10				6.55%
11				3.28%

6. PQR has an option to either purchase a machinery for Rs. 70,000 or take it on a lease for five years at Rs. 16,000 after which the PQR will own it. The discount rate is 6%. Find whether the lease or purchase is economical.

Sol :

Present value of lease (PV) = $L(PVAF_{i, n})$

= Rs. 16,000 × 4.212

= Rs. 67,392

The purchase price = Rs. 70,000

∴ The lease is more economical than purchasing by Rs. 2,608 (70,000 – 67,392).

7. Northwest company needs to expand its facilities. To do so, the firm must acquire a machine costing Rs. 80,000. The machine can be leased or purchased. The firm is in the 40 percent tax bracket and its after-tax cost or debt is 9 percent. The terms of the lease and purchase plans are as follows :

Lease: The leasing arrangement requires end-of-year payments of Rs. 19,800 over 5 years. All maintenance costs will be paid by the lessor; insurance and other costs will be borne by the lessee. The lessee will exercise its option to purchase the asset for Rs. 24,000 at termination of the lease.

Purchase: If the firm purchases the machine, its cost of Rs. 80,000 will be financed with a 5-year, 14 percent loan requiring equal end-of-year payments of Rs. 23,302. The machine will be depreciated. The firm will pay Rs. 2,000 per year for a service contract that covers all maintenance costs; insurance and other costs will be borne by the firm. The firm plans to keep the equipment and use it beyond its 5-year recovery period.

(a) Determine the after-tax cash outflows of Northwest under each alternative.

(b) Find the present value of each after-tax cash outflow stream, using the after-tax cost of debt.

(c) Which alternative - lease or purchase - would you recommend ? Why ?

Sol :

Step 1

Calculation of after-tax cash outflow from lease,

After-tax cash outflow from lease = 19,800 (1 – 0.4)

= Rs. 11,880

The final cash outflow for purchase of asset is Rs. 35,880 (11,880 + 24,000)

Step 2

Calculation of interest and principal component in loan payments.

End of Year	Loan Payments	Beginning of year principal	Payments		End-of-year principal [(2) – (4)]
			Interest [0.14×(2)]	Principal [(1) – (3)]	
	(1)	(2)	(3)	(4)	(5)
1	23,302	80,000	11,200	12,102	67,898
2	23,302	67,898	9,506	13,796	54,102
3	23,302	54,102	7,574	15,728	38,374
4	23,302	38,374	5,372	17,930	20,444
5	23,302	20,444	2,862	20,440	-

Note

The 5 year recovery depreciation rates are taken from the table 20% for Ist year, 32% for IInd year, 19% for IIIrd year and 12% for IVth and Vth year.

Calculation of after-tax cash outflow for northwest.

End of year	Loan payments	Maintenance cost	Depreciation	Interest	Total of deductions [(2)+(3)+(4)]	Tax shields [0.4 x (5)]	After cash outflows [(1) + (2) – (6)]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	23,302	2,000	16,000	11,200	29,200	11,680	13,622
2	23,302	2,000	25,600	9,506	37,106	14,842	10,460
3	23,302	2,000	15,200	7,574	24,774	9,910	15,392
4	23,302	2,000	9,600	5,372	16,972	6,789	18,513
5	23,302	2,000	9,600	2,862	14,462	5,785	19,517

(b) Calculation of present value of cash outflow @ cost of debt of 9%

End of year	After-tax cash outflows	Leasing Present value Factor	Present value of outflows [(1) × (2)]	After-tax cash outflows	Purchasing Present values factors	Present value cash of outflows [(4) × (5)]
	(1)	(2)	(3)	(4)	(5)	(6)
1	11,880	0.917	10,894	13,622	0.917	12,491
2	11,880	0.842	10,003	10,460	0.842	8,807
3	11,880	0.772	9,171	15,392	0.772	11,883
4	11,880	0.708	8,411	18,513	0.708	13,107
5	35880	0.650	23,322	19,517	0.650	12,686
P. V of cash outflows			61,801	P.V of cash outflows		58,974

(c) Since, the purchase option has a lower present value of cash outflow i.e., 58.974 than leasing option, i.e., 61,801, therefore the company should go for the purchasing option.

4.4 Hire Purchase and Instalment Decisions

Q17. Define hire purchase ? Explain the characteristics of hire purchase.

Ans : **(Sep.-20, Dec.-19)**

Meaning

Hire Purchase is one of the most commonly used modes of financing for acquiring various assets. It aids by spreading huge cost of an asset over a longer period of time. Thus it frees a lot of capital to be directed to other important purposes.

Definition

Hire Purchase is defined as an agreement in which the owner of the assets lets them on hire for regular installments paid by the hirer. The hirer has the option to purchase and own the asset once all the agreed payments have been made. These periodic payments also include an interest component paid towards the use of the asset apart from the price of the asset.

The term 'Hire-Purchase' is a UK term and is synonymous to 'rent-to-own' or 'installment plan' in various other countries. Owning goods through hire purchase lets companies improve their earnings performance. Not just beneficial to the hirer, this system is also the most effective and secured form of credit sales for the current owner of the asset.

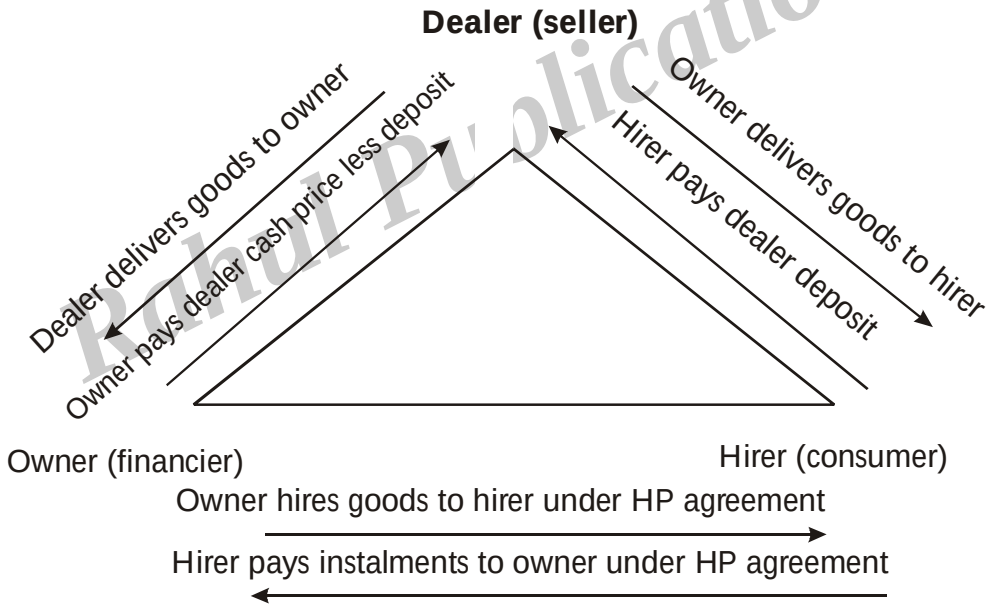

Fig.: Hire-Purchase

Characteristics

Hire purchase (as per Hire Purchase Act 1972, India) is a typical transaction in which the assets are allowed to be hired and the hirer is provided an option to later purchase the same assets.

Following are the features of a regular hire purchase transaction:

- Rental payments are paid as installments over the period of agreement.
- Each rental payment is considered as a charge for hiring the asset. This means that, if the hirer defaults on any payment, the seller has all the rights to take back the assets.

- All the required terms and conditions between both the parties involved are documented in a contract called Hire-Purchase agreement.
- The frequency of the installments may be annual, half-yearly, quarterly, monthly, etc. according to the terms of the agreement.
- Assets are instantly delivered to the hirer as soon as the agreement is signed.
- If the hirer uses the option to purchase, the assets are passed to him after the last installment is paid.
- If the hirer does not want to own the asset, he can return the assets any time and is not required to pay any installment that falls due after the return.
- However, once the hirer returns the assets, he cannot claim back any payments already paid as they are the charges towards the hire and use of the assets.
- The hirer cannot pledge, sell or mortgage the assets as he is not the owner of the assets till the last payment is made.
- The hirer, usually, pays a certain amount as an initial deposit while signing the agreement.
- Generally, the hirer can terminate the hire purchase agreement any time before the ownership rights pass to him.

Q18. Explain the legal frame work for hire purchasing.

Ans :

There is no exclusive legislation dealing with hire purchase transaction in India. The Hire purchase Act was passed in 1972. An Amendment bill was introduced in 1989 to amend some of the provisions of the act. However, the act has been enforced so far. The provisions of are not inconsistent with the general law and can be followed as a guideline particularly where no provisions exist in the general laws which, in the absence of any specific law, govern the hire purchase transactions. The act contains provisions for regulating:

(i) The format / contents of the hire-purchase agreement

(ii) Warrants and the conditions underlying the hire-purchase agreement,

(iii) Ceiling on hire-purchase charges,

(iv) Rights and obligations of the hirer and the owner.

In absence of any specific law, the hire purchase transactions are governed by the provisions of the Indian Contract Act and the Sale of Goods Act.

Sale of Goods Act

In a contract of hire purchase, the element of sale is inherent as the hirer always has the option to purchase the movable asset by making regular payment of hire charges and the property in the goods passes to him on payment of the last installment. So in this context we will discuss the provisions of Sales of Goods Act, which apply to hire purchase contract.

Contract of Sale of Goods

A contract of sales of goods is a contract whereby the seller transfers or agrees to transfer the property in goods to the buyer for a price. It includes both an actual sale and an agreement to sell.

Essential Ingredients of a Sale

A contract of sale is constituted of following elements :

(i) Two parties: namely the buyer and the seller, both competent to contract to effectuate the sale.

(ii) Goods: The subject matter of the contract.

(iii) Money consideration: price of the goods.

(iv) Transfer of ownership: of the general property in goods from the seller to the buyer.

(v) Essentials of a valid contract under the Indian Contract Act.

Q19. Explain the various agreements of hire purchase ?

Ans :

A hire purchase agreement is in many ways similar to a lease agreement, in so far as the terms and conditions are concerned.

The important clauses in a hire purchase agreement are:

1. **Nature of Agreement:** Stating the nature, term and commencement of the agreement.
2. **Delivery of Equipment:** The place and time of delivery and the hirer's liability to bear delivery charges.
3. **Location:** The place where the equipment shall be kept during the period of hire.
4. **Inspection:** That the hirer has examined the equipment and is satisfied with it.
5. **Repairs:** The hirer to obtain at his cost, insurance on the equipment and to hand over the insurance policies to the owner.
6. **Alteration:** The hirer not to make any alterations, additions and so on to the equipment, without prior consent of the owner.
7. **Termination:** The events or acts of hirer that would constitute a default eligible to terminate the agreement.
8. **Risk:** Risk of loss and damages to be borne by the hirer.
9. **Registration and fees:** The hirer to comply with the relevant laws, obtain registration and bear all requisite fees.
10. **Indemnity clause:** The clause as per Contract Act, to indemnify the lender.
11. **Stamp duty:** Clause specifying the stamp duty liability to be borne by the hirer.
12. **Schedule:** Schedule of equipments forming subject matter of agreement.
13. **Schedule of hire charges :** The agreement is usually accompanied by a promissory note signed by the hirer for the full amount payable under the agreement including the interest and finance charges.

So far we discussed the legal aspect, let's now discuss the taxation aspect of the hire purchase agreement.

Q20. Explain the financial evaluation of Hire Purchase.

Ans : **(May-19)**

The financial evaluation structure of a hire purchase can be explained with the help of the assessment of financial lease from the perspectives of both the hirer and the finance company.

From the Perspective of the Hirer (Hire-Purchaser)

The tax treatment in hire-purchase is completely opposite to that of the tax treatment of lease financing in lease financing, the lesser has the right to claim depreciation and other deductions related to the ownership of equipment which includes interest on the amount borrowed to enjoy full deductions of lease rentals. Contradictory in a hire-purchase transaction, the hirer is eligible to claim depreciation and the deduction for the finance charge component of hire installment.

Decision-Criterion

In hire purchase transactions, decisions are made by considering the cost of hire purchase and cost of leasing. If hire purchase cost is less than leasing cost, then hirer prefers the hire-purchase alternative for acquiring the assets and vice-versa. If $H_C > W_C$ then leasing option is preferred.

Cost of Hire Purchase

The cost of hire-purchase to the hirer (CHP) includes the cost of hire purchase which is calculated by deducting the sum of the present value of depreciation and the present value of net salvage value obtained after discounting it with appropriate cost of capital (K_e) from the aggregate value. This aggregate value is obtained as a sum of downpayment charges, service charges, and the present value of hire purchase payments made after discounting them with an appropriate cost of debt.

Mathematically, it is represented by a formula.

Cost of hire purchase = Aggregate value – [PV of Depreciation + K_C + PV of net salvage + K_e]

Whereas, Aggregate value = Down payment + Service charges + (PV of hire purchase payments + K_d)

Cost of Leasing

The Cost of Leasing (COL) includes the following elements.

1. Lease management fee.
2. Present value of lease payment discounted by K_d
3. Present value of tax shield on lease payments and lease management fee discounted by K_e.
4. Present value of interest tax shield on hire purchase discounted by K_e.

From the Perspective of Finance Company (Hire-vendor)

Hire purchase and leasing are two different alternative investment decisions of a finance company / financial intermediary / hire-vendor. Therefore, the decision of acquisition of assets depend on a comparative analysis of the net present values of the two alternatives i.e., hire-purchase and lease financing. An alternative which has higher net present value is selected and one which has lower net present value must rejected.

Q21. Explain the tax framework for hire purchase system ?

Ans :

The taxation aspects of hire-purchase transactions can be divided into three parts :

1. Income Tax

Hire-Purchase, as a financing alternative, offers tax benefits both to the hire-vendor, (hire-purchase finance company) and the hire-purchaser (user of the asset).

(a) Assessment of Hire-Purchaser (Hirer) : According to circular issued by the Central Board of Direct Taxes in 1943 and a number of court rulings, the hirer is entitled to the tax shield on depreciation calculated with reference to the cash purchase price.

(b) The tax shield on the 'consideration for hire' (total charge for credit) : In other words, though the hirer is not the owner of the asset, he is entitled to claim depreciation as a deduction on the entire purchase price. Similarly, he can claim deduction on account of 'consideration for hire' that is, finance charge. The finance charge is difference between the hire-purchase price and cash price. The amount of finance charge to be deducted each year is to be spread evenly over the term of the management.

(c) Assessment of Owner (Hire Vendor): The consideration for hire/ hire charge/ income received by the hire vendor is liable to tax under the head profits and gains of business and profession where hire purchase constitute the business of the assesses, otherwise as income from other sources. The hire incomes from the house property. Normal deduction (except depreciation) are allowed while computing the taxable income.

(d) Tax planning in Hire-Purchase : The Hire-Purchase transaction can be used as a tax planning device in two ways:

(i) First, the net income (finance income less interest on borrowings by the hire-vendor) can be inflated at the rear end of the transaction and thereby defer tax liability.

(ii) Secondly, another possible area of tax planning is to use hire-purchase as a bridge between the lessor and the lessee. Instead of a direct lease an intermediate financier is introduced.

2. Sales tax aspects

The Salient Features of Sales Tax are as follows:

(a) Higher purchase as Sale: Higher-purchase, though not sale in the true sense, is demand to be sale such transactions are liable to sales tax. The sales tax is payable once the goods are

delivered by the owner (hire vendor) to the higher (hire purchaser) even if the transaction does not fructify in to a sale. There is no provision for the refund of sales tax on the unpaid installment. Full tax is payable irrespective of whether the owner gets the full price of the goods or not.

(b) Delivery vs Transfer of property: Taxable Event : A hire-purchase deal is regarded as a sale immediately the goods are delivered and not on the transfer of the title to the goods. That is, a taxable event is the delivery of the goods and not transfers of the title of the goods. For the purpose of levying sales tax, a sale is deemed to take place only when the hirer exercises the option to purchase.

(c) Taxable Quantum : The quantum of sales tax is related to the sales price. It must be determined to be the consideration for the transfer of the goods when the delivery of the goods takes place. The consideration for the sale of the goods is the total amount which is agreed to be paid before the transfer of the goods takes place in a hire purchase contract. In other words, sales tax is levied on the entire amount payable under the agreement by deeming it to be the sale price of the goods instead of reducing the amount by the hire charges assumed to be included and by depreciation in the value of the goods for the period when the goods were on hire.

(d) States Entitled to Impose Tax : When a hire-purchase transaction is entered in the state where the goods are lying, the concerned state is entitled to impose sales-tax. In case where the contract of hire-purchase is entered into one state and goods are in another state, the entitlement to tax vests with the state in which the goods are delivered by the hire-vendor to the hirer even though the goods may be transported/transferred to a different states subsequently.

(e) Rate of Tax : The rates of sales tax on hire-purchase deals vary from state to state. There is, as a matter of fact, no uniformity even regarding the goods to be taxed. If the rates undergo a change during the currency of a hire-purchase agreement, the rate in force on the date of delivery of the goods to the hirer is applicable.

3. Interest-Tax

The hire-purchase finance companies ,like other credit/finance companies, have to pay Interest-Tax Act ,1974 .According to this Act, interest tax is payable on the total amount of interest earned less bad debts in the previous year @ 2 per cent. The tax is treated as a tax-deductible expense for the purpose of computing the taxable income the Income-tax Act.

Q22. Explain the merits and demerits of hire purchase ?

Ans :

Hire-purchase is a mode of financing wherein the price of goods that needs to be sold is paid on some future date in the form of lease installments/ lease rentals. In a hire purchase transaction, the goods are let on hire, the purchase price is to be paid in installments and hiresr is allowed with an option of purchasing them by paying the last installment.

The main advantages of hire purchase system are :

(a) Advantages to Hire Purchaser

1. Use of Expensive Goods

In hire purchase system, people can fulfill their dream of owning luxurious and expensive goods such as cars, machineries, and so on.

2. Easy Payment

In this method, goods are paid in the form of monthly installments.

3. Encouragement to Savings

In leasing, as the payment of goods need to be made over a long period of time, it requires buyer to avoid other expenses in order to pay installments. As a result, it develops savings among them.

4. Facility of Free Repairs

Inspite of buyer using the goods carefully if damage occurs then it is the responsibility of the owner to make arrangements for facilitating normal repairs free of cost till the termination of the lease contracts by paying last installment.

(b) Advantages to Seller

1. Increase in Sales

People get attracted are facilitated to valuable goods through the hire purchase financing which also increases the sales of valuable goods in the market.

2. Recovery of Instalment Easily

If purchaser makes default in the payment of instalment then hire vendor can take back his goods from the buyer without refunding amount received in past. In order to overcome this issue, the buyer himself makes the payment on time.

3. Establish Good Relation between the Buyer and Seller

Good relationship is established between the buyer and seller due to regular transaction and it helps the seller to get the information about the goods. Defective goods must be removed.

4. Possibility of Sales of other Goods

When buyer visit the showroom to make payment of installment, other attractive goods can also be offered to him. In this manner, additional sales can be generated.

5. Facility to Get Capital at Lower Rate

Creditors provide capital to the seller at low rate with full confidence so as to recover instalment amount regularly from the buyer,

(c) Advantages to Society

1. More Production

In hire purchase transaction, there is a rise in sales which results in increase of production, employment and income.

2. Facilitate in Business

In hire purchase, payments are made in installments, which requires less capital in business. So business can be done easily.

3. Increase in Standard of Living

The hire purchase system facilitates the person to use the valuable goods which increases his standard of living.

Disadvantages

Some of the main disadvantages of hire purchase system are :

(a) Disadvantages to Buyer

1. Costly

In a hire purchase transaction, a buyer has to pay additional charges which are usually more than the actual price of such goods. As the hire purchase price is an inclusive of interest on unpaid installments of the goods.

2. Risky for Hire Buyer

If the buyer is failed to pay the required installments, then the seller will take back the goods sold by him on the basis of hire purchase even without paying back the amount paid by buyer in past.

3. Promotion of Wasteful Competition

It is easy to get possession of expensive goods from hire purchase traders as a result people gets attracted towards

luxurious live which is beyond their scope. This results in extravagance and wasteful competition among them.

4. No Right to Sale or Mortgage the Goods

In hire purchase, ownership is transferred after the payment of the last installment. During installments, if the buyer sells or mortgages the goods then the new party is devoid of getting a better title.

(b) Disadvantages to Vendor

1. Large Capital

The business concerns involved in hire purchase transactions need to have large capital to finance their business as its considerable part of capital is held in the form of book-debts (debtors).

2. Difficulty in Repossession of Goods

Seller is entitled to take back the goods from the buyer in case of default in the payment of hire purchase installment. Because, seller has to face lot of difficulty in fulfilling the legal requirements.

3. More Expenses for Accounting

Hire purchase system has to bear more expenses if it involves the selling of goods to customer who are living in remote areas. As a result it creates problem of correspondence and also creates the problem of accounting.

4. Loss on Sale of Goods

Even though, seller can take back the goods let out on hire purchase on account of default payment instalment, he has to incur actual loss as goods taken back may not yield reasonable price on resale.

(c) Disadvantage to Society

It is easy to get expensive things though hire purchase traders. People of medium and lower income group get attracted to luxury goods and even purchase unnecessary goods.

Q23. What is installment system? Explain the features of Installment system.

Ans : **(Sep.-20, Dec.-19)**

Meaning

An installment system is just like a credit purchase and hire purchase system of selling and buying goods. Like hire purchase, in installment system an agreement is made between buyer and seller to purchase and sell of goods. The buyer makes certain down payment at the time of signing agreement and the balance is paying in installment over a period of time.

An installment system is a credit sale in which payments are made in installments over a period of time. In this system, the buyer gets the possession as well as ownership of the goods right at the time of signing the agreement. During the course of paying the installment, if the buyer makes default in paying the installment, the vendor cannot responses the goods. In that case, the vendor can sue the buyer for recovery of dues. Like inhire purchase even the paid installments also can not be forfeited in case of default in paying installment.

Thus, it can be said that installment system is a kind of credit sale where installments are entertained over the period and default in such payment cannot responses the goods and in that case, the vendor can only sue the buyer for the recovery of amount due.

Features

The following are the features of installment purchase system:

(i) Installment purchase system is just like an outright credit sale of goods.

(ii) The buyer makes the payment in different installment over a period of time as agrees upon in the agreement.

(iii) Under installment purchase system, the buyer gets the immediate possession as well as the ownership of goods.

(iv) The seller can not responses the good if the buyer made default in the payment of installment but he/she can sue against the buyer for the recovery of amount due.

(v) In case of default in the payment of installment, the total amount of installments already paid by the buyer can not be forfeited.

(iv) Under installment system, the buyer can sell or mortgage the goods even before clearing all the installments.

(vii) Risk of goods/assets are to be borne by the buyer just after signing the agreement.

(viii) The buyer of the goods under installment purchase system has no right to return the goods to the seller.

4.4.1 Hire Purchase Vs Installment System

Q24. What are the differences between hire purchase and Installment system.

(OR)

Compare and contrast Hire Purchase Vs Installment System.

Ans : **(Imp.)**

Base of Difference	Hire Purchase System	Installment System
1. Ownership	Ownership of the goods or assets is transferred only after the payments of last installment. agreement.	Ownership of the goods or assets is transferred immediately after the
2. Nature of Contact	It is like an agreement of hiring of goods.	It is an agreement of sale of goods.
3. Return of Goods	The hire purchase may return assets without further payment except for the installment already due.	The assets cannot be returned because the purchase is liable to pay the installment due.
4. Forfeiture of Installment paid	In the case of default, the total amount of installment paid is forfeited and treated as hire charges.	In the default, the total amount of installment paid cannot be forfeited.
5. Rights of Purchaser	No right to hire out, sell, transfer, destroy pledge the assets to the purchaser.	The purchases can hire out, sell, transfer, destroy and pledge the assets.
6. Risk	All the risk related to the goods should be taken over by the vendor till the payment of last installment.	All the risks of assets are immediately transferred to the purchaser.
7. Repair	Vender is responsible for repair and maintenance of goods upto the last installment.	Vender is not responsible for repair and maintenance of goods.
8. Status of Purchaser	Under this system hire purchaser is treated as a hirer.	Under this system, purchaser is the owner of the assets.
9. Rights of Return	Purchaser can return goods or assets to the hire vendor before the payment of last installment.	Purchaser cannot return goods or assets to the seller.

Q25. Distinguish between hire purchase and Leasing ?

(OR)

Compare and contrast hire purchase financing and Lease financing ?

(OR)

Compare and contrast hire purchase and lease as a tools of financing.

(OR)

Compare hire purchase versus leasing an asset.

Ans : **(Dec.-19, May-19)**

S.No.	Nature	Hire Purchase System	Lease System
(i)	**Ownership**	The ownership of the goods passes from the buyer to seller on the payment of the installment.	In a contract of lease, the ownership rests with the lessor throughout and the lessee has not option to purchase the goods
(ii)	**Method of Financing**	Hire purchase is a method of financing both business assets and consumer articles.	Leasing is a method of financing business assets.
(iii)	**Depreciation**	Depreciation and investment allowance can be claimed by the hirer.	Depreciation and investment allowance cannot be claimed by the lessee.
(iv)	**Tax Benefits**	Only the interest component of hire purchase installment is tax deductible.	The entire lease rental is tax deductable.
(v)	**Salvage Value**	The hirer, in purchase, being the owner of the assets, enjoys salvage value of the asset.	The lessee, not being the owner of the asset, does not enjoy the salvage value of the asset.
(vi)	**Deposit**	20% deposit is required in hire purchase.	Lessee is not required to make any deposit.
(vi)	**Rent-purchase**	We buy the goods.	We rent the goods.
(viii)	**Extent of Finance**	A margin equal to 20-25% of the cost of the asset is to be paid by the hirer.	Lease financing is invariably 100% financing.
(ix)	**Maintenance**	The cost of maintenance of the hired asset is to be borne by the hirer himself.	In case of finance lease only, the maintenance of leased asset is the responsibility of the lessee.
(x)	**Reporting**	The asset on hire purchase is shown in the balance sheet of the hirer.	The leased assets are shown by way of foot note only.

Q26. What are the factors to be considering while deciding whether to buy asset lease it (or) take it on hire purchase ?

Ans :

The factors that need to be considered for deciding whether to buy, lease or take an asset on hire purchase are as follows,

(a) Availability of Funds

If the firm decides to purchase an asset, it requires a large amount to meet its cost, whereas in the case of leasing and hire purchase, it requires smaller amounts to be paid at regular intervals. Hence, buying involves a larger outlay of funds.

(b) Financial Evaluation

Buying, leasing and hire purchase involve cash outlay. Hence, the firm needs to calculate the net advantage of one over the other. The firm has to select that option which gives the lowest cash outflow.

(c) Possession of Asset

In all the three forms the asset can be obtained, but the ownership lies with the lessor in a leasing agreement. In the case of buying, the ownership is transferred to the owner at the time of agreement whereas in hire purchase the ownership is transferred to the hirer only after he pays the last installment.

(d) Cost of Borrowing

If the asset has to be purchased by borrowing fund then, it involves an additional expenditure in the form of interest whereas in leasing only the lease rent has to be paid. In hire purchase, the installment includes the principal and interest.

(e) Depreciation

The lessee under a lease agreement cannot claim depreciation, as he is not the owner of the asset. The buyer or the hirer in a hire purchase transaction can claim depreciation.

(f) Taxes

In the case of leasing, the lease rent is a tax deductible expenditure, whereas in hire purchase, only the interest component of the hire purchase installment is a tax deductible expenditure.

(g) Salvage Value

The lessee does not enjoy the residual salvage value, whereas the buyer and the hirer enjoy the salvage value.

(h) Risk

The risk related to the asset lies with the lessor, as lessee is not the owner. Whereas the buyer and the hirer have to bear the risk associated with the asset.

(i) Maintenance

In an operating lease, the lessee uses the asset but the maintenance expenditure is borne by the lessor. The hirer and buyer has to meet the maintenance cost of the asset.

Q27. Explain the various methods of interest calculations and reporting in hire purchase.

Ans :

The comparative evaluation between the leasing and hire purchase, computation of interest and division of the installment amount into the 'interest and principal' elements constitute the importance where, flat rate of interest is available. The interest amount is computed by applying the interest rate on the outstanding principal amount at the starting of every period. The principal amount is calculated as a difference between the installment amount per period and the interest amount per period. The methods used for calculating interest are as follows:

Methods of Interest Calculation

In all these methods the annual payment is assumed at the end of the year.

(a) Effective rate of interest or annual percentage rate method.

(b) Sum-of-years digits method.

(c) Straight-line method.

(a) Effective Rate of Interest (ERI)

Effective Rate of Interest (ERI), this method is a kind of the interest calculation method wherein effective rate of interest is ascertained with the help of the popular 'IRR' technique. It is also known as annual percentage rate method. Accordingly, effective rate of interest is that rate of interest which makes all PV's of future annual installment payments equal to the HP principal payable at the starting of the hire purchase contract. The HP principal payable is the excess amount of the cost of asset hire- purchased which is above the down payment made.

Steps involved in ascertaining the ERI is,

(i) Determine HP principal = Cost of asset - Down payment.

(ii) Determine total interest amount for the HP period = [HP principal × Flat rate of interest × HP period of years]:

(iii) Determine total HP amount = [Step 1 + Step 2]:

(iv) Determine annual installment amount = step 3 ÷ number of installments

(v) Determine Effective rate of Interest (ERI)

Rate of interest: → PV of future annual installments = PV of HP principal amount payable

(vi) Determine annual interest amount = Total principal outstanding at the beginning × ERI

(b) Sum-of-years Digits Method

In this method, the annual amount of interest is ascertained as follows:

Annual amount of interest = [Number of years including the current year remained for HP period + Total of all digits representing the period of HP] × Total amount of interest for HP period. Where,

Total interest amount for HP period = Total amount payable × flat rate of interest.

(c) Straight-line Method

In this method, the annual amount of interest is ascertained as an equated annual financial charge as follows:

Annual amount of interest = Total amount of Interest for HP period / Number of HP periods.

Method of Reporting

Both interest charged and the principal component must be disclosed separately in the books of the hirer and the hire vendor. The method used for reporting in hire purchase finance transactions are as follows:

Disclosure in Hirer Books

(a) Both annual interest and depreciation charged need to be debited in P and L a/c every year, unless the loan is paid completely.

(b) The principal component of outstanding hire purchase must be recorded in balance sheet as current liability of hire purchase outstanding within one year and as a secured loan of hire purchase outstanding for periods more than one year.

Disclosure in Hire Vendor Books

(a) The cost of HP deal must be debited to P and L account.

(b) The interest received every year from hirer contribute to finance income and must be credited to P and L account.

Q28. Define the following terms :

(a) Flat Interest Rate

(b) Effective Interest Rate

Ans :

(a) Flat Interest Rate

It refers to fixed rate of interest to be paid by hire vendor to the hirer while repaying he principal amount of asset. Flat interest rate is calculated as follows :

$$\text{Flat interest rate} = \frac{\text{Total charge for credit}}{\text{Consumer credit}} \times 100$$

(b) Effective Interest Rate

The actual rate of interest paid by the hire-vendor to the hirer is nothing but effective rate of interest.

In can be calculated as,

Effective rate of interest

$$= \frac{n}{n+1} \times 2 \times \text{Flat interest rate}$$

PROBLEMS

8. A finance ltd. company has structured a consumer credit deal for Rs. 8,00,000. The monthly repayment periods are 6,18 and 30 months. The equated monthly installments (EMI) are 1,40,000, 50,000 and 30,000. Compute flat and effective rate of interest on each option.

Sol :

Calculation of Interest Rates on 6 Months Re-payment Period

Repayment period = 6 months

EMI = 1,35,000

Total charge of credit = 1,40,000 × 6

= 8,00,000 – 8,00,000

Consumer credit = 8,00,000

$$\text{Flat interest rate} = \frac{40,000}{8,00,000} \times 100$$

$$= 5\%$$

$$\text{Effective interest rate} = \frac{n}{n+1} \times 2 \times F$$

$$= \frac{6}{6+1} \times 2 \times 5$$

$$= \frac{6}{7} \times 10$$

$$= 8.57\%$$

For 18 Months

Repayment period = 18 months

EMI = 50,000

Total charge of credit = 18 × 50,000 – 8,00,000

= 9,00,000 – 8,00,000

= 1,00,000

Consumer credit = 8,00,000

$$\text{Flat interest rate} = \frac{1,00,000}{8,00,000} \times 100$$

$$= 12.5\%$$

$$\text{Effective interest rate} = \frac{n}{n+1} \times 2 \times F$$

$$= \frac{18}{19} \times 2 \times 12.5$$

$$= \frac{18}{19} \times 25$$

$$= 23.68\%$$

For 30 Months

Repayment period = 30 months

EMI = 30,000

Total charge of credit = 30 × 30,000 – 8,00,000

= 9,00,000 – 8,00,000

= 1,00,000

Consumer credit = 8,00,000

$$\text{Flat interest rate} = \frac{1,00,000}{8,00,000} \times 100$$

$$= 12.75\%$$

Effective interest rate,

$$= \frac{n}{n+1} \times 2 \times F$$

$$= \frac{30}{31} \times 2 \times 12.75$$

$$= \frac{30}{31} \times 25$$

$$= 24.19$$

9. Under a hire purchase deal structured by the 'XYZ' Finance Ltd. Company for 'ABC' industry ltd. Company the flat rate of interest is 10%. The 'ABC' Ltd. Company is required to make a cash down payment of 20% and the repayment of the loan is to be made in 30 EMIs (equated monthly installments). Compute ERI or APR on the assumption of payment of installments in :

(i) Advance

(ii) Arear.

The ERI/APR can be calculated either by

(i) Making trial and error approach and

(ii) By making use of the approximation formula.

Sol :

Approximation Method

Computation of ERI or APR

(i) Payment in Advance

$$I = \frac{N}{N-1} \times 2F$$

Where, I = APR / ERI

N = Number of repayments

F = Flat rate of interest per unit time.

$$= \frac{30}{30-1} \times 2 \times 10$$

= 20.68%.

(ii) Payment in Arear

$$I = \frac{N}{N-1} \times 2F$$

Where, I = APR / ERI

N = Number of repayments

F = Flat rate of interest per unit time.

$$= \frac{30}{30+1} \times 2 \times 10$$

= 19.35%

10. Compute ERI for the following information.

Cash down payment = 50%

EMI's = 20

Flat rate of interest = 25%

Payment of instalment in,

(a) Advance

(b) Arear.

Sol :

Computation of ERI

(a) Payment in Advance

$$ERI = \frac{N}{N-1} \times 2F$$

Where,

N = Number of repayments

F = Flat rate of interest per unit time

$$= \frac{20}{20-1} \times 2 \times 25 = 52.63\%$$

(b) Payment in Arear

$$ERI = \frac{N}{N-1} \times 2F$$

Where,

N = Number of repayments

F = Flat rate of interest per unit time

$$= \frac{20}{20+1} \times 2 \times 25$$

$$= \frac{20}{21} \times 50$$

$$= 47.61\%$$

11. ABC Ltd., offers a hire purchase finance to £ customers on acquisition of equipment Rs.1,00,000. The installments are to be paid annually for 10 years and the flat rate o interest is 12%. Calculate the amount o interest and installments. Show how the total interest will be distributed over the period of 10 years.

Sol :

Interest = Rs. 1,00,000 × 12% × 10

= Rs. 1,20,000

Installment = (Rs. 1,00,000 + 1,20,000) / 10

= Rs. 22,000

Calculation of amount of interest each year,

Using Sum-of-Years-digit (SYD) method.

The sum of years digit = 1 + 2 + 3 + 4 + 5 + 6 + 1 + 8 + 9 + 10 = 55

∴ Amount of interest for each year :

Year	Amount
1.	$1,20,000 \times \left(\frac{10}{55}\right) = 21,818$
2.	$1,20,000 \times \left(\frac{9}{55}\right) = 19,636$
3.	$1,20,000 \times \left(\frac{8}{55}\right) = 17,455$

4.	$1,20,000 \times \left(\frac{7}{55}\right) = 15,273$
5.	$1,20,000 \times \left(\frac{6}{55}\right) = 13,091$
6.	$1,20,000 \times \left(\frac{5}{55}\right) = 10,909$
7.	$1,20,000 \times \left(\frac{4}{55}\right) = 8,727$
8.	$1,20,000 \times \left(\frac{3}{55}\right) = 6,545$
9.	$1,20,000 \times \left(\frac{2}{55}\right) = 4,364$
10.	$1,20,000 \times \left(\frac{1}{55}\right) = 2,182$

Calculation of interest and installment under hire purchase system.

Year	Principal (Rs.)	Installment (Rs.)	Interest (Rs.)	Implied principle repaid (Rs.)	Out-standing (Rs.)	Interest Rate (%)
0	1,00,000	—	—	—	– 1,00,000	—
1		22,000	21,818	182	99,818	21.82
2		22,000	19,636	2,364	97,454	19.67
3		22,000	17,455	4,545	92,909	17.91
4		22,000	15,273	6,727	86,182	16.44
5		22,000	13,091	8,909	77,273	15.19
6		22,000	10,909	11,091	66,182	14.12
7		22,000	8,727	13,273	52,909	13.19
8		22,000	6,545	15,455	37,454	12.37
9		22,000	4,364	17,636	19,818	11.65
10		22,000	2,182	19,818	0	11.01
	Total	2,20,000	1,20,000	1,00,000	—	—

4.5 Lease Risk Management

Q29. Briefly explain the risk associated with leasing.

(OR)

What is a lease risk management?

Ans : **(Imp.)**

In a leasing transaction, the use of a fixed asset or service is provided in return for regular payment by the user (the lessee) under the lease contract.

Fixed assets that can be leased typically include light equipment (such as passenger cars, light duty trucks, office equipment, furniture, and appliances,) or heavy equipment (such as earth movers, large machines, industrial equipment, cargo vessels, heavy duty trucks, and airplanes). In some cases, Leasing Companies can own, maintain and operate the leased physical assets, known as operational leasing. In other cases, Leasing Companies simply provide the necessary financing to lessees, known as financial leasing.

The environmental and social risks associated with leasing activities are generally minimal for most transactions but will be more significant if the fixed asset involves the use of heavy equipment and as a function of the industry sector. Improper operation or maintenance of the equipment may impact community or worker safety and result in potential environmental contamination and pollution.

For financial leasing, Leasing Companies have limited exposure to the lessee's environmental and social performance and also limited leverage over the lessee's use of the fixed asset. However, the leasing company may be impacted by legal issues, disruption of lessee operations, and reputational concerns. Through operational leasing, a leasing company is linked to the operation of the leased asset and can be directly responsible for any environmental and social impacts.

A principal risk relating to operating leases is the risk of fluctuation of residual value of the leased property.

Residual Value Risk Management

In order to control fluctuations in residual value, we monitor inventories of leased items, market environments and the overall business environment.

Some operating lease items such as ships or aircraft are classified as long-lived assets, but may only be leased out for a few years, and we bear the residual value risk for these items. We primarily limit our ship operating leases to general-purpose ships that are comparatively easy to repossess and re-lease. We finance larger ships that may have specific uses, but do not own them, as we do in the case of operating leases. For aircraft, as a rule, we have limited our inventory primarily to narrow-bodied aircraft, which are relatively versatile and easy to lease. We monitor the market values of these ships and aircraft and sell assets as necessary or desirable to reduce our exposure to downward trends in the market or take advantage of upward trends.

The automobile industry has a well-established market for used cars, so most of our vehicles are able to be sold. We keep current on trends in the used car market by continuously monitoring the ratio of residual value to purchase cost, selling price trends and other indicators.

The principal risk in direct financing leases and installment loans is the credit risk associated with the customer and its business. Risk management in this field consists of four elements :

1. credit evaluation for each transaction
2. management of credit information
3. implementation of corrective actions for the management of problem assets and
4. portfolio management

Our direct financing lease and installment loan businesses are mainly conducted in our Corporate Financial Services segment, The Americas segment and the Asia, Oceania and Europe segment.

1. Credit Evaluation for Each Transaction

Staff members in our sales and marketing departments are authorized to approve individual credit transactions within specific

limits that are set in line with the seniority of the relevant staff member and determined based on the magnitude of existing and potential new credit and on the corporate value contribution spread (calculated from investment yield, default rates, preservation situation, funding cost and the ratio of administrative costs to capital costs).

If a proposed transaction exceeds the relevant limit, it must be referred to the Risk Management Headquarters for approval. If the transaction value exceeds the approval limit of the Risk Management Headquarters, the matter is referred to the ICC for approval. In connection with each potential credit transaction, the relevant sales and marketing department and the Risk Management Headquarters each performs a comprehensive customer credit evaluation based on the relevant customer's financial position, transactional performance and projected cash flow.

The evaluation also covers the collateral or guarantees, terms and conditions and potential profitability of the transaction. The Risk Management Headquarters regularly conducts by-country, by-region and by-industry evaluations to manage exposure to potentially high-risk markets.

2. Management of Credit Information

Our Risk Management Headquarters obtains information on bankruptcies, dishonored bills and corporate performance from a number of credit data banks on a daily basis. This information is entered into a central database, which is used to prepare industry analysis reports and warning reports that are provided to relevant sales and marketing departments to keep them current on the condition of important customers. In cases where concerns associated with certain industries or customers arise, we take measures that may include freezing the extension of new credit, or reducing our existing exposure, with respect to the industry or customer in question.

3. Corrective Actions for the Management of Problem Assets

We identify and administer problem assets, including debtors who have petitioned for bankruptcy or civil rehabilitation, or other insolvency proceedings, whose bank transactions are suspended, whose bills are dishonored, whose debts are not collected for three months or more, and whose businesses have deteriorated or who are involved in fraud.

Preliminary reports on problem assets are prepared and delivered to the Risk Management Headquarters and senior management depending on the size of the asset, and all pertinent data on such problem assets are entered into our proprietary database. Our sales and marketing departments work together with our Risk Management Headquarters to maintain accurate records of delinquencies and to collect individual problem assets.

Collection progress is reported to different levels of management depending on the size of the asset. Furthermore, the Risk Management Headquarters regularly makes reports to the Group Executive Officer Meetings regarding overall trends in problem assets and problem assets exceeding a specified amount. Such reports on problem assets exceeding specified amounts include details on the individual status, balance, and amount of expected recovery of these problem assets.

In making collections, we believe an early response is extremely important. When information is received regarding the emergence of problem assets, our Risk Management Headquarters takes immediate action, in cooperation with the relevant sales and marketing departments, to take steps to secure collateral or other guarantees and to begin the collection process.

The Risk Management Headquarters plays an important role in the collection process by drawing on its accumulated

experience in collections and working closely with the sales and marketing departments providing such departments with appropriate guidance beginning with early first notices and extending to compulsory legal measures including seizure of collateral pledged against the exposure and other assets.

4. Portfolio Management

In addition to the risks inherent in each individual credit extension and transaction, our Risk Management Headquarters regularly manages the credit risks associated with portfolios of assets. For example, both in Japan and overseas, we regularly evaluate our asset portfolios involving major borrowers by each transactional category, by industry and by type of collateral or guarantee. We also monitor the concentration of specific customers and industries not only by the size of the asset but also by the magnitude of economic capital (hereinafter "Risk Capital") as assessed based on credit value at risk and other standards. We further classify and manage overseas asset portfolios by region, country and other characteristics.

4.6 Leasing as a Financing Decision

4.6.1 Break-Even Lease Rental (BELR)

Q30. Briefly explain the financial evaluation of leasing.

Ans : **(May-19)**

Usually, the financial evaluation process consists of three steps i.e.,

1. Assessing the client in terms of financial strength and credit worthiness
2. Assessing the securities / collateral security offered and
3. Financial assessment of the proposal. The most important part of a leasing transaction for both lessor and lessee is the financial evaluation of the proposal.

The evaluation framework is being explained from the perspective of both the lessees and the lessors.

A) Lessee's Perspective

The finance lease can effectively transfer the risks and rewards related with the ownership of an equipment from the lessor to the lessee. Lease can be assessed either in the form of an investment decision or as a financing alternative.

A lease can be assessed either as an investment decision or as a financing alternative provided that the investment decision is being already made a firm (lessee) need to assess whether it will purchase the asset or obtain it on lease basis. As the lease rental payments are same as the payments of interest on debt, leasing is treated as an important alternative for borrowing. Therefore, the evaluation of lease from the lessee's point of view includes a selection between debt financing and lease financing.

The decision criterion which is being used in the Net Present Value of leasing [NPV(L)]/Net Advantage of Leasing (NAL); discount rate is used i.e., the marginal cost of capital for all cashflows except the lease payments and pre-tax cost of debt for lease payments.

The interest tax shield value is being added as foregone cash flow in the calculation of NPV(L)/ NAL. It can be represented symbolically as,

NPV/(L)/NAL = Investment Cost

(–) Less present value of lease payment (discounted by K_d)

(+) Plus present value of tax shield on lease payment (discounted by K_c)

(–) Less management Fee

(+) Plus present value of tax shield on management fee (discounted by K_c)

(–) Minus present value of depreciation shield (discounted by K_c)

(–) Minus present value of interest shield (discounted by K_c)

(–) Minus present value of residual/salvage value (discounted by K_c)

Where,

K = Post-tax marginal cost of capital

K_d = Post-tax cost of long-term debt

If the NAL/NPV (L) is positive, then it is better to use the leasing alternative or else borrowing alternative would be a better option.

An alternative approach is being used in order to ascertain the present values of the cash outflows after taxes in leasing and the borrowing alternatives. The decision-criterion it to choose an alternative with the lower present value of cash outflows.

Break-even Lease Rental (BELR)

The break-even lease rental (BELR) is the rental wherein the lessee is not concerned about the lease financing, borrowing and buying. NAL is zero in BELR and it shows the maximum level of rental which the lessee would be desiring to pay. The lease proposal would be accepted if increase the BELR is more than the actual lease rental otherwise the proposal would be rejected.

B) Lessor's Viewpoint

From the lessor's point of view, the lease evaluation basically aims at determining as to whether to accept a lease proposal or to select from the alternative proposals. The discounted cash flow technique which is based on the lessor's cash flows is being used as one of the appraisal techniques for evaluating the lessee. The lease-related cash flow includes:

(a) The outflows in terms of the initial investment/ acquisition cost of the asset at the inception of the lease; income-tax on lease payments, sales-tax on lease transaction, if any; lease administration expenses like rental collection charges, expenses on suits for recovery and other direct costs.

(b) The inflows like lease rentals, management fee, tax shield on depreciation, residual value and security deposit, if any and so on.

From the perspective of a lessor, lease evaluation covers the following aspects like break even rental for the lessor, negotiation and fixation of lease rentals. These break-even lease rental indicates the minimum (floor) lease rental which are acceptable in nature. At this level of rental, the NAL/ NPV (L) is zero and discount rate to calculate the NAL is the marginal over-all cost of funds to the lessor.

Negotiation of Lease Rentals

The break-even rentals of both the lessor and the lessee indicates the range of acceptable level of rentals. The lower limit is set by the break-even lease rental of the lessor whereas the upper limit of the range is set by the break-even rental of the lessee. A rental that exists within the range results into a positive NAL/NPV(L) for both the lessor and the lessee. The difference that exists between break-even lease rental for the lessor and the lessee shows the area for bargaining for the purpose of negotiation of the actual lease rental for a lease proposal.

Structuring of Lease Rentals

The lease rentals are structured in such a way that they are being made suitable for the lessors and the lessees. From the lessee point of view the structure of the lease rental must take place along with the operational cash flow pattern. The synchronization dimensions existing between the lease rental and the pattern of cash flows of the lessee are periodicity of rentals. The lease rentals make sure that lessor gets an expected return.

Q31. Explain the impact of tax on leasing.

Ans :

In India, separate law for equipment leasing does not exists. The provisions relating to bailment in the India contract. Act are treated as same for equipment leasing agreements. Sec/48 of the Indian contract Act defines bailment as:

"The delivery of goods by one person to another, for some purpose, upon a contact that they shall, when the purpose is accomplished, be returned or otherwise disposed off according to the directions of the person delivering them. The person delivering the goods is called the 'bailor' and the person to whom they are delivered is called the 'bailee'. Provisions of sec 150 and 168 of the Indian contract Act defined that as equipment lease transaction is treated same as contract of bailment. Hence obligations of the lessor and the lessee will be similar to those of the bailor and the bailee.

The following impacts implications are given by the provisions for the lessor and the lessee.

1. It is the duty of lessor to deliver the asset to the lessee for giving legal authorization to lessee to use the asset, and the asset should be left in possession of the lessee during the agreement,
2. The lessee has the obligation to pay the lease rentals as mentioned in lease agreement, to protect the lessors title, to take reasonable care to protect the lessors title, to take reasonable care of the asset, and to return the leased asset on the expiry of the lease period.

The tax aspects of leasing relating to both income tax and sale tax,

Income Tax Considerations

Leasing being a finance device holds tax implications and provides tax advantages to both the lessor and the lessee. The key variables of leasing are the scope for tax avoidance, reduction/ deferment of tax liability and sharing tax savings at the time of heavy tax incidence. In short, leasing offers an adequate suitable method for transferring the tax incentives benefits from the purchase-owner to the lessor of the asset/ equipment.

1. For Lessor

The main reason which attracts the lessor for leasing is the reduction of depreciation from his taxable income. The following are the most appropriate provisions which are applicable to the calculation of the income of lessor, the tax rates and so on,

(a) Parability of Lease Rentals

According to the provisions of the Income-tax Act 1961, the calculation of taxable income of an assessee includes calculation under different heads of income which are summed up and then reduced by few deductions. Various set of provisions regulates the calculation of taxable income under each head.

The income from lease rentals is taxable under the head profits and gains of business and profession especially in case if the leasing forms the business/ main activity of the assessee. While in other cases, the income from lease is taxed as income from other sources.

(b) Deductibility of Expenses

At the time of calculating the income of lessor from leasing, few expenses are regarded as a deduction in order to asses the taxable income. These include the following,

(i) Depreciation.

(ii) Rent, rates, taxes, repairs, and insurance of the leased asset where such expenditure is incurred by the lessor.

(iii) The amortization of few preliminary expenses like expenditure for preparation of project report, feasibility report, and market survey, legal charges for drafting printing of memorandum of association and articles of association, registration expenses, public issue expenses instead of debentures and loans, which are subjected to a maximum of 2.5 percent of cost of the project/capital used which is permitted in 10 equal instalment.

(iv) Interest on borrowed capital.

(v) Bad debts.

(vi) All the expenses borne in developing trade/ business.

(vii) Entertainment expenses related to specified limits.

(viii) The travel expenditures according to specified limits.

2. For Lessee

The income tax specifications for the lessees are as follows:

(i) Allowability of Lessee Rentals

The Income Tax Act allows lease rentals as a normal business expenditure of the lessee for the purpose of assessment, but on the condition that the expense is not of capital nature, and not a personal expense and that it is associated either completely and exclusively to business purposes of the assessee.

(ii) Deductibility of Incidental Expenses

Usually the lessee is supposed to incur all the expenses related with the leased asset like the repairs and maintenance, insurance, finance charge and so on. The Income Tax Act considers these incidental expenses as deductions from the taxable income of the lessee.

(iii) Tax Planning

Leasing allows tax planning both for the lessor as well as for the lessee and tries to save/avoid taxes. The important device of saving taxes is the depreciation, deduction in the calculation of the taxable income of a lessor. The leasing transaction provides scope for the lessee for tax planning by deducting the lease rentals. Usually there are two methods through which lessee can use leasing as a tax planning instrument:

(a) Flexible structuring of lease rentals and

(b) Transfer of unabsorbed capital allowance to the lessor.

Q32. When is financial lease mutual beneficial to the lessor and lessee

Ans :

When tax situation is same for lessor and lessee, the post-tax cash flow of the lessee will be opposite to that of lessor, Hence, value of lease will be different for lessee and lessor. The gain of lessor will be loss for lessee and vice versa. If lessor and lessee are in same tax situation then lease transaction will be zero sum game. When tax rates are different both lessor and lessee can take the advantage of lease transaction.

The gain from leasing will be more when,

(i) Tax rate of lessor will be more than tax rate of lessee.

(ii) Interest rate is high.

(iii) Depreciation charges are more in initial years of the lease.

(iv) Lease is structured in the way wherein lease payments are concentrated towards the end of lease period.

Q33. What is an equivalent loan amount?

Ans :

Equivalent loan amount is calculated in equivalent loan method to ascertain a financial lease. Equivalent loan is the amount of loan which binds the firm with fixed obligations like lease liability. The equivalent loan is the present value of lease cash flows which is discounted at the after-tax cost of borrowing and it is calculated as follows,

Equivalent Loan = Present Value of Cash Flows of a Lease.

$$EL = \sum_{i=1}^{n} \frac{(1-T)\, L_t + DTS_t}{[1+k_d\,(1-T)]^t}$$

This equation can be modified in order to include other lease cash flows like operating expenses incurred by the lessor or lessee for maintaining the leased asset and the salvage value of the asset which is foregone by the lessee.

4.7 ADVANTAGES OF LEASING

Q34. Explain the advantages of leasing.

(OR)

Discuss the advantages of leasing.

(OR)

Elucidate the advantages of leasing.

(OR)

Explain about advantages of leasing.

Ans : **(Sep.-20, Dec.-19, May-19)**

(i) Permit Alternative Use of Funds

A leasing arrangement provides a firm with the use and control over asset without incurring huge capital expenditure. The firm is required only to make periodical rental payments. It saves considerable funds for alternative uses which would otherwise be tied up in fixed capital.

(ii) Faster and Cheaper Credit

Depending on tax structure of the lessee it costs less than other methods of acquiring assets. It permits firms to acquire new equipment without going through thorough formal scrutiny procedure. Hence acquisition of assets under leasing agreement is cheaper and faster than any other source of finance.

(iii) Flexibility

Leasing arrangements may be tailored to the lessee's needs more easily than ordinary financing. Lease rentals can be structured to match the lessee's cash flows. It can be skipped during the months when the cash flows are expected to be low.

(iv) Facilities Additional Borrowings

Leasing may increase long-term ability to acquire funds. The lessee can utilize more funds for working capital needs. Acquisition of assets under the lease agreement does not alter debt equity ratio. Hence, the lessee can go for additional borrowings in case need arise.

(v) Boon to Small Firms

The firms which are either small or have uncertain records of earning are able to obtain the use of asset through lease financing. It is a boon to small firms and technocrats who are able to make promoter's contribution as required by financial institutions.

(vi) Hundred Percent Financing

Lease financing enables the firm to acquire the use of an asset without having to make a down payment. So hundred percent financing is assured to the lessee.

(vii) No Restrictive Covenants

The restrictive covenants such as debt equity ratio, declaration of dividend etc. which are usually imposed under debenture or loan agreement are absolutely absent in a lease agreement.

(viii) Protection against Obsolescence

A firm can avoid risk of obsolescence by entering into operating lease agreement. This is highly useful in respect of assets which become obsolete at a faster rate.

Q35. What are the limitations of leasing?

(OR)

Discuss the disadvantages of leasing.

Ans :

1. Lease is not suitable mode of project finance. This is because rentals are repayable soon after entering into lease agreement while in new projects cash generations may start only after a long gestation period.
2. Certain tax benefits/incentives such as subsidy may not be available on leased equipment.
3. The value of real assets such as land and building may increase during lease period. In such a case the lessee loses the advantage of a potential capital gain.
4. The cost of financing is generally higher than that of debt financing.
5. A manufacturer who wants to discontinue a particular line of business will not in a position to terminate the contract except by paying heavy penalties. If it is a owned asset the manufacturer can sell the equipment at his will.
6. If the lessee is not able to pay rentals regularly, the lessor would suffer a loss particularly when the asset is a sophisticated one and less liquid.
7. In case of lease agreement, it is lessor who has purchased the asset from the supplier and not the lessee. Hence, the lessee by himself is not entitled to any protection in case the supplier commits breach of warranties in respect of the leased assets.
8. In the absence of exclusive laws dealing with the lease transaction, several problems crop up between lessor and lessee resulting in unnecessary complications and avoidable tension.

4.8 Leasing Decision in Practice

Q36. Explain the concept of leasing decision in practice.

Ans :

Leasing industry in India provides favourable situation for international investments, where the returns are expected to be four-to-five times more without any damage to quality. Thus, providing gateways for cross-border investments in the form of collaboration with Indian companies, subsidiaries or offshore leasing.

Offshore leasing refers to the lease agreement between lessee (who is within the country) and lessor out of country.

It is now in initial stages as commercial and income tax laws are strictly stipulated relating to this leasing. Operating lease is another developing horizon in Indian lease. Operating lease refers to the international lease where leasing firms are differentiated on the basis of the products they are providing in comparison with the competitors products.

Success of lease financing in India is a product of two factors. They are mentioned as below,

(a) Spread

(b) Leveraging.

(a) Spread

Spread refers to the differential rate between the leasing companies providing the funds and procuring them.

(b) Leveraging

Leveraging refers to the value of asset which is bought by the lessor through loanable funds. Leasing companies provides the funds depending upon the competition. Recently competition is within the industry.

In general context, client decides for leasing based upon flexibility, tax preference, speed, funding etc., sometimes, clients compare net cost of leasing with rest of methods of funding. It is expected that competition may increase externally to the industry i.e., from other funding modes. Tax preference of leasing is less preferred due to depreciation allowance reforms.

Popular determinants are speed and full funding. Speed which is considered as feature of today's lessor in comparison with today's banker. Lessors cannot be slow like bankers in providing funds. In case of funding also bankers follow the same slow and conservatism.

Short Question and Answers

1. What is lease financing?

Ans :

Meaning

A lease is a contractual agreement whereby, the owner of an asset grants the right of the asset to the other party, in return for a periodic payment. Basically, it refers to renting of an asset for a specific period.

- **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.

The lease is divided into two categories namely, finance lease and operating lease. The financial lease covers the full useful economic life of the asset. It is also known as a capital lease. Whereas, in operating lease is an agreement in which the lessee acquires the use of an asset on a period to period basis. This agreement is shorter than the life of an asset.

A leasing company intends to recover the full or the major part of the outlay on a leased asset. The lesser must ensure that the lessee is reliable and capable of paying rent for the primary lease period and during the due period. The inherent risks of ownership, default claims, collateral and interest and tax assumptions increase the amount of risk in financial leasing.

Definition

(i) According to James C. Van Horne lease is a contract whereby the owner of an asset (lessor) grants to mother party (lessee) the exclusive right to use the asset usually for an agreed period of time in return for the payment of rent.

(ii) Lease is a form of contract transferring the user or occupancy of land, space, structure or equipment in consideration of a payment, usually in the form of a rent.

(iii) Lease is a contract whereby the owner of an asset grants to another party the exclusive right to use the asset usually for an agreed period of time in return for the payment of rent.

2. Explain the advantages of leasing.

Ans :

(i) Permit Alternative Use of Funds

A leasing arrangement provides a firm with the use and control over asset without incurring huge capital expenditure. The firm is required only to make periodical rental payments. It saves considerable funds for alternative uses which would otherwise be tied up in fixed capital.

(ii) Faster and Cheaper Credit

Depending on tax structure of the lessee it costs less than other methods of acquiring assets. It permits firms to acquire new equipment without going through thorough formal scrutiny procedure. Hence acquisition of assets under leasing agreement is cheaper and faster than any other source of finance.

(iii) Flexibility

Leasing arrangements may be tailored to the lessee's needs more easily than ordinary financing. Lease rentals can be structured to match the lessee's cash flows. It can be skipped during the months when the cash flows are expected to be low.

(iv) Facilities Additional Borrowings

Leasing may increase long-term ability to acquire funds. The lessee can utilize more funds for working capital needs. Acquisition of assets under the lease agreement does not alter debt equity ratio. Hence, the lessee can go for additional borrowings in case need arise.

(v) Boon to Small Firms

The firms which are either small or have uncertain records of earning are able to obtain the use of asset through lease financing. It is a boon to small firms and technocrats who are able to make promoter's contribution as required by financial institutions.

(vi) Hundred Percent Financing

Lease financing enables the firm to acquire the use of an asset without having to make a down payment. So hundred percent financing is assured to the lessee.

(vii) No Restrictive Covenants

The restrictive covenants such as debt equity ratio, declaration of dividend etc. which are usually imposed under debenture or loan agreement are absolutely absent in a lease agreement.

3. What is a lease risk management?

Ans :

In a leasing transaction, the use of a fixed asset or service is provided in return for regular payment by the user (the lessee) under the lease contract.

Fixed assets that can be leased typically include light equipment (such as passenger cars, light duty trucks, office equipment, furniture, and appliances,) or heavy equipment (such as earth movers, large machines, industrial equipment, cargo vessels, heavy duty trucks, and airplanes). In some cases, Leasing Companies can own, maintain and operate the leased physical assets, known as operational leasing. In other cases, Leasing Companies simply provide the necessary financing to lessees, known as financial leasing.

The environmental and social risks associated with leasing activities are generally minimal for most transactions but will be more significant if the fixed asset involves the use of heavy equipment and as a function of the industry sector. Improper operation or maintenance of the equipment may impact community or worker safety and result in potential environmental contamination and pollution.

For financial leasing, Leasing Companies have limited exposure to the lessee's environmental and social performance and also limited leverage over the lessee's use of the fixed asset. However, the leasing company may be impacted by legal issues, disruption of lessee operations, and reputational concerns. Through operational leasing, a leasing company is linked to the operation of the leased asset and can be directly responsible for any environmental and social impacts.

A principal risk relating to operating leases is the risk of fluctuation of residual value of the leased property.

4. What is an equivalent loan amount?

Ans :

Equivalent loan amount is calculated in equivalent loan method to ascertain a financial lease. Equivalent loan is the amount of loan which binds the firm with fixed obligations like lease liability. The equivalent loan is the present value of lease cash flows which is discounted at the after-tax cost of borrowing and it is calculated as follows,

Equivalent Loan = Present Value of Cash Flows of a Lease.

$$EL = \sum_{i=1}^{n} \frac{(1-T)\, L_t + DTS_t}{[1+k_d\,(1-T)]^t}$$

This equation can be modified in order to include other lease cash flows like operating expenses incurred by the lessor or lessee for maintaining the leased asset and the salvage value of the asset which is foregone by the lessee.

5. Compare and contrast Hire Purchase Vs Installment System

Ans :

Base of Difference	Hire Purchase System	Installment System
1. Ownership	Ownership of the goods or assets is transferred only after the payments of last installment. agreement.	Ownership of the goods or assets is transferred immediately after the
2. Nature of Contact	It is like an agreement of hiring of goods.	It is an agreement of sale of goods.
3. Return of Goods	The hire purchase may return assets without further payment except for the installment already due.	The assets cannot be returned because the purchase is liable to pay the installment due.
4. Forfeiture of Installment paid	In the case of default, the total amount of installment paid is forfeited and treated as hire charges.	In the default, the total amount of installment paid cannot be forfeited.
5. Rights of Purchaser	No right to hire out, sell, transfer, destroy pledge the assets to the purchaser.	The purchases can hire out, sell, transfer, destroy and pledge the assets.
6. Risk	All the risk related to the goods should be taken over by the vendor till the payment of last installment.	All the risks of assets are immediately transferred to the purchaser.
7. Repair	Vender is responsible for repair and maintenance of goods upto the last installment.	Vender is not responsible for repair and maintenance of goods.
8. Status of Purchaser	Under this system hire purchaser is treated as a hirer.	Under this system, purchaser is the owner of the assets.
9. Rights of Return	Purchaser can return goods or assets to the hire vendor before the payment of last installment.	Purchaser cannot return goods or assets to the seller.

6. What are the characteristics of leasing?

Ans :

The following are the characteristics of a lease:

(i) The Parties

Lease agreement involves two parties i.e., the lessor and the lessee. Lessor is the person who transfers the right to use an asset in consideration of a periodical rental payment whereas lessee is the person who acquires the right to use an asset from the lessor for periodical rental payment for an agreed period (pre-determined) of time.

(ii) The Asset

Leasing is mostly used to finance the use of fixed assets of high value. The asset is the property which is to be leased out such as automobile, an aircraft, plant and machinery, building, and so on. In leasing the ownership of an asset is segregated from the use of the asset. During the lease period, ownership lies with the lesser where as it use is being transferred to the lesser.

(iii) The Term

The term of lease agreement is known as lease period. It considered as illegal to have a lease without a specified period of term. In case of a perpetual lease, lease period is for an infinite period of time and in case of financial lease, lease period is in connection with the economic life of the asset. Quite a few times the lease period is being divided into primary lease period and secondary lease period.

(iv) The Lease Rentals

Lease rentals forms the consideration which is payable by the lessee as being mentioned in the lease transaction. Rentals are ascertained in order to cover up such cost i.e., interest on the less or's investment, any repairs and maintenance costs which forms the part of the lease package, depreciation on the leased asset and any other service charges in relation to the lease.

7. Financial Lease

Ans :

The financial lease, usually covers the complete economic life of the asset. During the lease period the lessor receives the lease rental in order to not only recover the full cost of the asset, but also the reasonable return on the funds which are being to buy the asset. Infact finance lease in also known as capital lease.

Finance lease is generally noncancellable in nature and the lesser provides for the proper asset maintenance. The asset would be returned to the lesser (or) managed as per the lease contract at the end of the period. Lease rental is usually considered as a payment for the usage of the asset only and a responsibility of repairing and maintain-ing the asset usually lies with the lessee.

8. Operating Lease

Ans :

An operating lease is an agreement where in the lessee obtains the use of an asset on a periodical basis. It is a lease arrangement for a period which is usually shorter than the life of an asset. An asset may be leased by the lesser to the different lessees one after the other. During the lease period the lease rental payable by one lessee is insufficient to completely cover the asset cost plus return. Therefore the present value of lease payment is usually lower than the actual price of the asset.

9. What are the characteristic features of financial and operating lease?

Ans :

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.

10. What is a leveraged lease?

Ans :

Meaning

When the lessor borrows a part of the purchase price from any leading institution then such a lease is known as leveraged lease. Under this lease, with the help of assets and the lease rentals the loan is being secured. The lessee (or) the lessor directly repay the loan out of the lease rentals.

In this leveraged lease the lender finances the as-set. Initially the lease rentals are distributed for payment to the lender in order to satisfy the debt obligation and any surplus and the remaining amount would be sent back to the lessor.

Characteristics

- In the leveraged lease, the finance provider which is lender is without recourse to the lessor.
- The lender holds the asset since it carries the payment obligation.
- The lessor will be free from the obligation of the payments to the lender the payment is directly done to the lender by the lessee but in case of default, the lessor will be obliged to pay the dues.
- The small portion of the fund is arranged by the lessor and the majority portion of the fund which is required to obtain the asset is borrowed by the lender.
- The lender will have more rights in regard to the sale or resale of the asset in comparison to the lessor.

11. Define hire purchase ?

Ans :

Meaning

Hire Purchase is one of the most commonly used modes of financing for acquiring various assets. It aids by spreading huge cost of an asset over a longer period of time. Thus it frees a lot of capital to be directed to other important purposes.

Definition

Hire Purchase is defined as an agreement in which the owner of the assets lets them on hire for regular installments paid by the hirer. The hirer has the option to purchase and own the asset once all the agreed payments have been made. These periodic payments also include an interest component paid towards the use of the asset apart from the price of the asset.

The term 'Hire-Purchase' is a UK term and is synonymous to 'rent-to-own' or 'installment plan' in various other countries. Owning goods through hire purchase lets companies improve their earnings performance. Not just beneficial to the hirer, this system is also the most effective and secured form of credit sales for the current owner of the asset.

12. What is Installment System?

Ans :

Meaning

An installment system is just like a credit purchase and hire purchase system of selling and buying goods. Like hire purchase, in installment system an agreement is made between buyer and seller to purchase and sell of goods. The buyer makes certain down payment at the time of signing agreement and the balance is paying in installment over a period of time.

An installment system is a credit sale in which payments are made in installments over a period of time. In this system, the buyer gets the possession as well as ownership of the goods right at the time of signing the agreement. During the course of paying the installment, if the buyer makes default in paying the installment, the vendor cannot responses the goods. In that case, the vendor can sue the buyer for recovery of dues. Like inhire purchase even the paid installments also can not be forfeited in case of default in paying installment.

Thus, it can be said that installment system is a kind of credit sale where installments are entertained over the period and default in such payment cannot responses the goods and in that case, the vendor can only sue the buyer for the recovery of amount due.

13. Features of Installment System.

Ans :

Features

The following are the features of installment purchase system:

(i) Installment purchase system is just like an outright credit sale of goods.

(ii) The buyer makes the payment in different installment over a period of time as agrees upon in the agreement.

(iii) Under installment purchase system, the buyer gets the immediate possession as well as the ownership of goods.

(iv) The seller can not responses the good if the buyer made default in the payment of installment but he/she can sue against the buyer for the recovery of amount due.

(v) In case of default in the payment of installment, the total amount of installments already paid by the buyer can not be forfeited.

(iv) Under installment system, the buyer can sell or mortgage the goods even before clearing all the installments.

(vii) Risk of goods/assets are to be borne by the buyer just after signing the agreement.

(viii) The buyer of the goods under installment purchase system has no right to return the goods to the seller.

Exercise Problems

1. ABC Machine tool company ltd is considering the acquisition of a large equipment to set up its factory in a backward region for Rs 12,00,000. The equipment is expected to have an economic useful life of 8 years. The equipment can be financed either with an 8 year term loan at 14 percent interest, repayable in equal installments of 2,58,676 per year, or by an equivalent amount of lease rent per year. In both cases, payments are due at the end of the year. The equipment is subject to the straight line method of depreciation for tax purposes. Assuming no salvage value after the 8 year useful life and 50 percent tax rate, which of the financing alternatives should it select ?

   [Ans : 4,00,125]

2. A Cement manufacturer is considering to lease a drying equipment which is worth Rs 75 lakh. It will have to pay five annual beginning-of-the year lease rentals of Rs 20 lakhs. The tax rate is 35 per cent and the manufacturer can write-off the cost of equipment at 25 per cent written down basis for .5 years. The manufacturer's effective borrowing rate is 16 per cent. Should the equipment loan method and net advantage of lease method will lead to the same answer.

   [Ans : –9,74,658]

3. A company wants to lease a ` 10 lakhs equipment. The lessor requires eight annual end-of-the-year lease payments of ` 1,75,000. The company's marginal tax rate is 35 percent. If it buys the equipment, it can write-off the written-sown cost of asset at 25 percent. The company's borrowing rate is 15 percent. Should the company lease the equipment? Use equipment loan method to answer the question.

   [Ans : –4,30,602]

4. N-A company is considering the lease of an equipment which has a purchase price of Rs 350,000. The equipment has an estimated economic life of 5 years. As per the Income Tax Rule a written down depreciation at 25 per cent is allowed. The lease rentals per year are Rs 120,000. Assume that the company's marginal corporate tax rate is 50 per cent. If the before-tax borrow-ing rate for the company is 16 per cent, should the company lease the equipment ? Ignore tax shield on depreciation after 5 years.

   [Ans : –747]

5. PQR Ltd. is considering the possibility of purchasing a multipurpose machine,

   The machine costs ` 50 crores, The machine has an expected life of 5 years with a salvage value of ` 15 crores. The machine generates an additional sales of ` 55 crores per year where as the additional cost would be ` 38 crores. The depreciation allowable for the machine is 20% on written down value. The company's tax rate is 30%. A leasing company quoted, a rent of ` 11 crores per year to finance the asset. Alternatively the company can buy the machine using its own funds. The company wants you to evaluate the lease and buy options. The cost of capital of the company is 10% and for lease option it wants you to consider a discount rate of 12%.

   [Ans : 12.37]

UNIT V

FINANCING DECISIONS:

Mergers and Acquisitions - need, Strategy, Diversification and Mergers and Acquisitions, Theories of Mergers, Types of Mergers, Cost of Mergers, Government guidelines for Takeover, Problems on Mergers & Acquisitions and cases

5.1 MERGERS AND ACQUISITIONS

Q1. What is a Merger?

(OR)

Define Merger.

Ans : **(Sep.-20)**

A merger refers to integration or combination of two or more companies but, only one company continues its business. The other company which discontinues its business transfer its assets, debts, etc., to the company which is in existence. Merger can take place in four ways,

1. Purchase of Assets

When company A purchases the assets of company B then company B is legally stopped, because it posses capital structure without any resources. Hence, company A alone sustains in asset merger.

2. Purchase of Common Stock

When common stock of company B is sold to company A then company B closes down its business.

3. Exchange of Stock for Assets

Company A provides its shares to shareholders of B in return of assets of B. With the help of voting right of shareholders, company B can be dissolved.

4. Exchange of Stock for Stock

When company A provides its shares to the shareholders of company B, then company B can be dissolved. According to Sec. 2(1A) of the income tax act, 1961, merger means one or more companies combining the existing company or a group of two or more companies combine to form a new company. Merger is termed as amalgamation by Indian Law.

Q2. What is acquisition and takeover?

(OR)

Define the following terms:

(i) Acquisition

(ii) Takeover

Ans : **(May-19)**

(i) Acquisition

This refers to the purchase of controlling interest by one company in the share capital of an existing company. This may be by :

(a) An agreement with majority holder of interest.

(b) Purchase of new shares by private agreement.

(c) Purchase of shares in open market (open offer)

(d) Acquisition of share capital of a company by means by cash, issuance of shares.

(e) Making a buyout offer to general body of shareholders.

(ii) Takeover

Normally acquisitions are made friendly, however when the process of acquisition is unfriendly (i.e., hostile) such acquisition is referred to as 'takeover') Hostitle 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.

Q3. What is demerger?

(OR)

Write a short note on demerger.

(OR)

Define divestment.

Ans :

Divestment is also known as demerger (or) divestiture.

Divestment is the process of selling subsidiary assets, investments, or divisions of a company in order to maximize the value of the parent company, divestment is effectively the opposite of an investment and is usually done when that subsidiary asset or division is not performing up to expectations.

In some cases, however, a company may be forced to sell assets as the result of legal or regulatory action. Companies can also look to a divestment strategy to satisfy other strategic business, financial, social, or political goals.

Divestment involves a company selling off a portion of its assets, often to improve company value and obtain higher efficiency. Many companies will use divestment to sell off peripheral assets that enable their management teams to regain sharper focus on the core business.

Divestment can result from either a corporate optimization strategy or else be driven by extraneous circumstances, such as when investments are reduced and firms withdraw from a particular geographic region or industry due to political or social pressure. One major current instance is the impact of the pandemic, remote work, and the rise of technology use and their impact on offices, commercial real estate.

Types

Divestment will typically take the form of a

(i) Spin-off

(ii) Equity carve-out or direct sale of assets.

(i) Spin-off

Spin-offs are non-cash and tax-free transactions, when a parent company distributes shares of its subsidiary to its shareholders. Thus, the subsidiary becomes a stand-alone company whose shares can be traded on a stock exchange. Spin-offs are most common among companies that consist of two separate and distinct businesses that have different growth or risk profiles.

(ii) Equity Carve-out or Direct Sale of Assets.

Under the equity carve-out scenario, a parent company sells a certain percentage of the equity in its subsidiary to the public through a stock market offering. Equity carve-outs are often tax-free transactions that involve an equal exchange of cash for shares. Because the parent company typically retains a controlling stake in the subsidiary, equity carve-outs are most common among companies that need to finance growth opportunities for one of their subsidiaries. Additionally, equity carve-outs allow companies to establish trading avenues for their subsidiaries' shares and later disposes of the remaining stake under proper circumstances.

A direct sale of assets, including entire subsidiaries, is another common form of divestment. In this case, a parent company sells assets, such as real estate or equipment to another party. The sale of assets typically involves cash and may trigger tax consequences for a parent company if assets are sold at a gain. This type of divestiture that occurs under duress may result in a fire sale with assets sold for below book value.

5.1.1 Need

Q4. Discuss the possible reasons for mergers.

(OR)

Discuss in brief the various reasons for mergers.

(OR)

What are the possible reasons for mergers.

(OR)

Explain the various reasons for mergers.

(OR)

Why mergers are necessitated?

Ans : **(Dec.-19, Dec.-18)**

1. Strategic Benefit

If a firm has decided to enter or expand in a particular industry, acquisition of a firm engaged in that industry, rather than dependence on internal expansion, may offer several strategic advantages:

(i) As a pre-emptive move it can prevent a competitor from establishing a similar position in that industry,

(ii) It offers a special 'timing' advantage because the merger alternative enables a firm to 'leap frog' several stages in the process of expansion,

(iii) It may entail less risk and even less cost,

(iv) In a 'saturated' market, simultaneous expansion and replacement (through a merger) makes more sense than creation of additional capacity through internal expansion.

2. Economies of Scale

When two or more firms combine, certain economies are realised due to the larger volume of operations of the combined entity. These economies arise because of more intensive utilisation of production capacities, distribution networks, engineering services, research and development facilities, data processing systems, so on and so forth. Economies of scale are most prominent in the case of horizontal mergers where the scope for more intensive utilisation of resources is greater. In vertical mergers the principal sources of benefits are improved coordination of activities, lower inventory levels, and higher market power of the combined entity. Finally, even in conglomerate mergers there is scope for reduction or elimination of certain overhead expenses.

3. Economies of Scope

A company may use a specific set of skills or assets that it possesses to widen the scope of its activities. For example, Proctor and Gamble can enjoy economies of scope if it acquires a consumer product company that benefits from its highly regarded consumer marketing skills.

4. Economies of Vertical Integration

When companies engaged at different stages of production or value chain merge, economies of vertical integration may be realised. For example, the merger of a company engaged in oil exploration and production (like ONGC) with a company engaged in refining and marketing (like HPCL) may improve coordination and control.

Vertical integration, however, is not always a good idea. If a company does everything in-house, it may not get the benefit of outsourcing from independent suppliers who may be more efficient in their segments of the value chain.

5. Complementary Resources

If two firms have complementary resources, it may make sense for them to merge. For example, a small firm with an innovative product may need the engineering capability and marketing reach of a big firm. With the merger of the two firms it may be possible to successfully manufacture and market the innovative product. Thus, the two firms, thanks to their complementary resources, are worth more together than they are separately.

6. Tax Shields

When a firm with accumulated losses and/or unabsorbed depreciation merges with a profit-making firm, tax shields are utilised better. The firm with accumulated losses and/or unabsorbed depreciation may not be able to derive tax advantages for a long time. However, when it merges with a profit-making firm, its accumulated losses and/or unabsorbed depreciation can be set-off against the profits of the profit-making firm and tax benefits can be quickly realised.

7. Utilization of Surplus Funds

A firm in a mature industry may generate a lot of cash but may not have opportunities for profitable investment. Such a firm ought to distribute generous dividends and even buy back its shares, if the same is possible. However, most managements have a tendency to make further investments, even though they may not be profitable. In such a situation, a merger with another firm involving cash compensation often represents a more efficient utilisation of surplus funds.

8. Managerial Effectiveness

One of the potential gains of merger is an increase in managerial effectiveness. This may occur if the existing management team, which is performing poorly, is replaced by a more effective management team. Often a firm, plagued with managerial inadequacies, can gain immensely from the superior management that is likely to emerge as a sequel to the merger. Another allied benefit of a merger may be in the form of greater congruence between the interests of the managers and the shareholders.

A common argument for creating a favourable environment for mergers is that it imposes a certain discipline on the management. If LackLustre performance renders a firm more vulnerable to potential acquisition, existing managers will strive hard continually to improve their performance.

Q5. Discuss the reasons for acquisition.

Ans : **(Dec.-18)**

1. Minimizing Dependency

Carrying out the business by marketing only single product would make a firm dependent on that particular product for success. The firm would enjoy good returns in the favourable market conditions. In case of high competition, low demand or any other unfavourable market conditions, the returns from the particular product would be very low. As a result the complete operations of the firm would get disturbed. But in case of acquisition, firm won't be dependent on one particular product. Therefore, acquisition minimizes dependency.

2. Less Risk Compared to New Product Development

New Product Development (NPD) requires huge capital and a number of resources. Apart from this, NPD involves huge risk as one may not be more whether the new product would be successful in the market or not. But in case of acquisition, products are not new to the customers. They are the products with good demand in the market. Therefore, acquisition involve less risk than compared to NPD.

3. Overcoming Entry Barriers

Entering into new markets is not always an easy task for business firms. In some markets, there are larger number of entry barriers which block the entry of a new firm. The existing firms usually hold strong share in the markets. These firms make use of various distinctive competitive strategies and enjoy large share of customer loyalty. Thus, it becomes very difficult for the firms to adjust in market. Therefore, acquiring existing firm would be the best option for the firms to overcome the entry barriers. By acquiring the existing firm, it would be easier to study and analyse the markets within short period.

4. Increased Diversification

Basically, when a firm aims to diversify its operations into unrelated products, it need to improve its capacity to produce them. Acquiring a readymade business of unrelated products would be more beneficial compared to increasing the existing capacity levels.

5.1.2 Strategy

Q6. Explain how mergers and acquisitions strategies are framed an implemented.

Ans :

When compared to the acquisitions which emerge from opportunistic reactions to the appearance of candidates, the acquisitions depending on a fundamental strategy would be more successful.

The decisions related to the acquisitions from opportunistic reactions are irregular and varies from normal experience and are done on restricted information so as to maintain the secrecy.

The first step involves organizing the strategy behind the merger or acquisition and ascertaining the responsibility for the process. This requires a clear understanding of what the acquisition would bring about and the reason behind the strategy. The acquiring firm should be clear of what they want and should have a strong reason to elucidate how the acquisition would help to attain its strategy and they should express its vision which helps to attract the employees of competitor. These acquisitions help the firm to get strength and also to change its direction.

Acquisitions can develop the value when they can improve the capabilities of both the firms and the managers are responsible to maintain the balance between the need for independence of the acquired firm with the need to exchange the capacities between the two. For the creation of an acquisition strategy, identifying various types of acquisitions which makes varied contributions to the firms improvement are also needed and they are as follows,

(i) Strengthen the firms presence in the existing region and this can be obtained from,

  (a) By identifying the urge to reinforce its position in the industry

  (b) By the urge to tackle with the overcapacity in the industry

  (c) The urge to integration.

  Acquisition helps the acquiring firm to become more efficient and to decrease the costs through economies of scale, whereas the acquirer starts integrating the firms in a fragmented industry so as to achieve the economies of scale.

(ii) Increase the firm area in terms of products, markets or capabilities depending on the cross-border acquisitions and by expanding the firm into new geographic markets. This type of acquisitions include various cultural differences between the two firms and the history of successful acquisitions would be helpful in this case.

(iii) Acquisition helps the firms to expand into new areas and new businesses which need new potentials. This type of acquisition can replace internal research and development.

Implementation of Merger Strategy

The aspects that need to be considered for implementation of mergers are - effective date of the merger, registration of merger, taking approvals from board and shareholders, public announcement, informing stock exchanges and so on.

Implementation of Acquisition Strategies

According to Drucker, acquisition strategy can be successfully implemented with the help of the following criteria,

(i) The organization/acquirer should contribute something to the organization which it acquired through acquisition strategy.

(ii) There should be a common core of unity between two organizations (acquirer and acquiry).

(iii) The business of acquired organization should be respected by acquirer.

Q7. Discuss the issues that arises while dealing with mergers.

Ans : **(Imp.)**

(i) Financial Issues

Financial issues include the valuation of business and shares of seller company and the financing sources by the acquiring company. Valuation is done on the basis of current earnings, assets and stock value. For valuation, the discounted cash flow method (DCF) can be adopted. The other methods include profit earning capacity value, net tangible asset value, fair value or a combination of these methods. Capital asset pricing method (CAPM) is more preferrable in case of liquidation of assets (i.e., amalgamation or consolidation).

Evaluation is carried out mainly to determine the affect of the merger on earning per share (EPS). There is a possibility that EPS may increase or remain unchanged or it may decline.

(ii) Legal Issues

Legal issues relate to the legal aspects such as provisions of law of mergers. Companies Act 1956, provides the various provisions relating to mergers and amalgamations. It is essential to have a complete understanding of the related legal provisions for the implementation of mergers or acquisitions. The entire process involve several legal issues that are to be analyzed and resolved in an appropriate manner. Any negligence may lead to the problems in merger process.

(iii) Strategic Issues

Strategic issues are nothing but the strategic interests between the buyer and seller firms. There could be the commodity/conflict of interests between the two firms. It is important to analyze these issues to determine whether the mergers would provide synergistic benefits to a great extent or not. This requires the analysis of competencies, objectives, strategic perceptions of the merging companies.

(iv) Managerial Issues

Managerial issues are considered as the most sensitive issues as it involves man, management and staff members. These issues may arise both during and after merger. Many changes are brought in mergers, specially the changes of staff i.e., senior and top-level management, reallocation of jobs etc. The impact of these changes can be clearly observed in financial management, tension, performance reporting, performance target-setting, and even resignations.

Q8. Distinguish between mergers and acquisitions.

(OR)

Distinguish mergers from acquisition.

(OR)

Differentiate mergers and acquisitions.

(OR)

Compare and contract between mergers and acquisitions.

Ans : **(Dec.-19, May-19)**

S.No.	Merger	S.No.	Acquisition
1.	Merger is an integration of two or more companies but only one company continues its business.	1.	Acquisition is an activity in which one company controls the other company.
2.	In mergers, the CEO's of both the companies agrees for combining their business.	2.	In acquisitions, the company which is acquired may not be willing to combine.
3.	Mergers are financed by stock swap.	3.	Acquisitions are financed by cash and debt combination.
4.	Horizontal, vertical, conglomerate and congeneric are the different types of mergers.	4.	Horizontal, vertical, related and cross-border mergers acquisitions are the different types of acquisitions
5..	Merger is a narrow, technical term of specific legal procedure which may or may not follow	5.	Acquisition is a generic term used to explain a transfer of ownership, acquisition.
6.	In mergers, one company purchases the stock of company and second company closes down quantity i.e., 51 percent.	6.	In acquisitions, one company controls the other other company by purchasing voting shares in large its business.
7.	Example: ITC Kakatiya and Sherton merged into a single entity.	7.	Example: Walt Disney company acquired capital cities/ABC Inc.

5.2 DIVERSIFICATION

Q9. Define diversification ? Explain different types of diversification.

(OR)

Discuss diversification strategies.

Ans : **(May-19, Imp.)**

Meaning

Diversification is a business development strategy allowing a company to enter additional lines of business that are different from the current products, services and markets.

In the current conditions of dynamic markets and strong competition, a successful instrument of risk management is to avoid focusing on a single product, service and/or their distribution to a single limited market. When implemented wisely it contributes to keeping the company stable even in hard times since the *economic downturn* usually occurs simultaneously in all sectors and all markets.

Diversification of business activities brings competitive advantages allowing companies to reduce business risks. That is why it is a great tool for business development. However, its successful implementation requires profound knowledge and thorough preliminary assessment of the company and its environment. And, although sometimes diversification is difficult for the small companies, it can prove to be inevitable when their original markets become unviable.

Types

Diversification is a strategic approach adopting different forms. Depending on the applied criteria, there are different classifications.

Depending on the direction of company diversification, the different types are:

1. Horizontal Diversification

Acquiring or developing new products or offering new services that could appeal to the company´s current customer groups. In this case the company relies on sales and technological relations to the existing product lines. For example a dairy, producing cheese adds a new type of cheese to its products.

2. Vertical Diversification

Occurs when the company goes back to previous stages of its *production cycle* or moves forward to subsequent stages of the same cycle - production of raw materials or distribution of the final product. For example, if you have a company that does reconstruction of houses and offices and you start selling paints and other construction materials for use in this business. This kind of diversification may also guarantee a regular supply of materials with better quality and lower prices.

3. Concentric Diversification

Enlarging the production portfolio by adding new products with the aim of fully utilising the potential of the existing technologies and marketing system. The concentric diversification can be a lot more financially efficient as a strategy, since the business may benefit from some synergies in this diversification model. It may enforce some investments related to modernizing or upgrading the existing processes or systems. This type of diversification is often used by small producers of consumer goods, e.g. a bakery starts producing pastries or dough products.

4. Heterogeneous (conglomerate) diversification

Is moving to new products or services that have no technological or commercial relation with current products, equipment, distribution channels, but which may appeal to new groups of customers. The major motive behind this kind of diversification is the high return on investments in the new industry. Furthermore, the decision to go for this kind of diversification can lead to additional opportunities indirectly related to further developing the main company business - access to new technologies, opportunities for strategic partnerships, etc.

5. Corporate Diversification

Involves production of unrelated but definitely profitable goods. It is often tied to large investments where there may also be high returns.

Q10. Why firms diversify?

Ans :

Diversification strategy is observed when new products are introduced in a completely new market by the company. The strategy is loaded with hurdles because it requires a lot of investment and a lot of man power as well as focus of the top management. But still, in the long run, diversification strategy is one of the best growth strategy in the long run. Here are seven reasons for the support of diversification strategy.

1. Companies gain more technological capability

With more R&D expenditure, it is likely that the company will develop technological capabilities. The goal of R&D is mostly technological advancement – bringing new and better products in the market. Thus, once you implement diversification strategy, you are bound to gain more technological capability for your company.

2. Economies of scale

Economies of scale comes in the picture when you are using same fixed Cost for more output. Whenever you are using the same factory to manufacture more number of products, naturally with advantage of economies of scale, your cost comes down and margins goes up. This is another advantage of diversification strategy.

3. Cross selling

Cross selling becomes more possible with the diversification strategy. You can introduce older products in the new market or introduce the new products in older and more mature market. An example in this case is LG which gives a large variety of products to end consumers and hence cross sells its own products.

4. Brand Equity

It receives a substantial boost with more products and more presence in the market, brand surges in brand recall as well as brand reach. This results in long term benefits for your brand. Perfect example in this case is Samsung. Samsung smart phones have created a tremendous boost for the Samsung brand, which has resulted in all of its products receiving a positive vibe because its Samsung.

5. Risk factor is reduced

Due to diversification strategy, and introduction of new products in new markets, your reliance on one single product or one single market is reduced and you begin to have advantage of more products and more markets to rely on. Thus, overall risk of the company is reduced.

All marketing experts say, that a business which does not keep adding new customers is bound to fail in the long run. At the same time, a company which does not expand at the right time is bound to lose a lot of its customers and market share. The diversification growth strategy helps the company expand in the right direction and manages risk for the company at the same time contributing to the bottom line. Thus, Diversification strategy is very beneficial for the company in the long run.

5.3 THEORIES OF MERGERS

Q11. Explain the various theories of mergers?

Ans : **(Dec.-18, Imp.)**

The following are the various theories of mergers are :

A) Differential Efficiency

- According to this theory if the management of firm A is more efficient than the firm B and if the firm Acquires firm B, the efficiency of firm B is likely to be brought up to the level of the firm A.
- The theory implies that some firms operate below their potential and as a result have below average efficiency.
- Such firms are most vulnerable to acquisition by other more efficient firms in the same industry. This is because firms with greater efficiency would be able to identify firms with good potential but operating at lower efficiency.

B) Inefficient Management Theory

- This is similar to the concept of managerial efficiency but it is different in that inefficient management means that the management of one company simply is not performing uptoits potential.
- Inefficient management theory simply represents that is incompetent in the complete sense.

C) Synergy

- Synergy refers to the type of reactions that occur when two substances or factors combine to produce a greater effect together than that which the sum of the two operating independently could account for.
- The ability of a combination of two firms to be more profitable than the two firms individually.

There are two types of synergy:

(i) Financial synergy.

(ii) Operating synergy.

(i) Financial Synergy

Financial synergies refer to lower cost of capital, tax benefits, low transactions costs and reduced corporate risk.

According to financial synergies theory, when the cash flow rate of the acquirer is greater than that of the acquired firm, capital is relocated to the acquired firm and its investment opportunities improve.

(ii) Operating Synergy

Refers to efficiencies in production, supply chain, R & D and Technology. Improved operational efficiency through economies of scale and scope by acquiring a customers, suppliers and competitors. Accordingly the synergies can be classified as follows :

(a) Economies of Scale

(b) Economies of Scope

(a) Economies of Scale

- It means reduction of average cost with increase in volume or production. Because of fixed overhead expenses such as steel, pharmaceutical, chemical and aircraft manufacturing.
- In that merging of company in same line of business such as horizontal merger it eliminates duplication and concentrate a great volume of activity in available facility. In vertical mergers **com** expands forward towards the customer or backward towards the source of raw material (suppliers).
- By acquiring com control over the distribution and purchasing bring in economies of scale.

(b) Economies of Scope

- Using a physical asset in its physical production or services.
- Deploying specific skill set of its manpower currently employed in its physical production or services.

D) Pure Diversification

Diversification provides numerous benefits to managers, employees, owners of the firms and to the firm itself. Diversification through mergers is commonly preferred to diversification through internal growth, given that the firm may lack internal resources or capabilities requires.

E) Strategic Realignment to Changing Environment

It suggests that the firms use the strategy of M & As as ways to rapidly adjust to changes in their external environments. When a company has an opportunity of growth available only for a limited period of time slow internal growth may not be sufficient.

F) Hubris Hypothesis

- Hubris hypothesis implies that managers look for acquisition of firms for their own

potential motives and that the economic gains are not the only motivation for the acquisitions.

- This theory is particularly evident in case of competitive tender offer to acquire a target. The urge to win the game often results in the winners curse refers to the ironic hypothesis that states that the firm which over estimates the value of the target mostly wins the contest.

G) Empire Building Managerialism

Mergers become a threat for the firms due to managerial inefficiency or agency problem. It happens with the contradiction of share holders goals as there exists a managerial and owners differentials.

This happens when managers hold little equity and shareholders are too dispersed to take action against non-value maximization behaviour, insiders may deploy corporate actions to obtain personal benefits, such as shirking and perquisite consumption. When ownership and control is divided within a company, agency cost arise.

- Objective is to increase the size for pay through size of the firm.
- Managers may increase the size of the firm through mergers in the beliefs that their compensation is determined by size.
- In practice management compensation is determined by profitability

5.4 Types of Mergers

Q12. What are the different types of mergers?

(OR)

Explain different types of mergers.

(OR)

Discuss in brief the various types of mergers.

Ans : **(Sep.-20, Dec.-19)**

A company can merge with another company in four different types. They are as follows,

1. Horizontal merger
2. Vertical merger
3. Conglomerate merger
4. Congeneric merger.
5. Reverse merger

1. 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.

Example: Combination of two book publishers or two pharmaceutical manu-facturing companies.

In this type of merger, companies expand their business and enjoy economies of scale and reduces competitors.

Causes

(i) Companies prefer horizontal merger in order to diversify their businesses.

(ii) Availing economies of scale and economies of scope could be one of the reason behind horizontal merger.

(iii) Companies aiming of increasing their market share would go for horizontal merger.

(iv) In order to reduce the number of competitors, companies undergo horizontal merger.

(v) The complementary skills and resources of the companies can be shared with each other in horizontal merger.

2. Vertical Merger

This merger happens when two companies that have 'buyer-seller' relationship (or potential buyer-seller relationship) come together.

Example: Combining a automobile manufacturing company and automobile marketing company or combining eatables manu-facturing company and its packaging company.

Vertical merger can also exist in the form of forward and backward merger. When a specific company merges with it suppliers, it is backward merger and if a company merges with its customers, it is a forward merger.

Causes

(i) Vertical merger ensures free flow of information among supply chain intermediaries.

(ii) Companies undergo vertical merger to increase synergies such as financial synergy, operating synergy, managerial synergy and so on.

(iii) Efficient quality control is ensured through vertical merger.

3. Conglomerate Merger

Such mergers involve firms engaged in unrelated type of business operations. In other words, the business activities of acquirer and the target are neither related to each other horizontally (i.e., producing the same or competiting products) nor vertically (having relationship of buyer and supplier). In a pure conglomerate merger, there are no important common factors between the companies in production, marketing, research and development and technology.

There may however be some degree of overlapping in one or more of these common factors. Such mergers are in fact, unification of different kinds of businesses under one flagship company. The purpose of merger remains utilization of financial resources, enlarged debt capacity and also synergy of managerial functions.

Example

Combination of cement manufacturing, electronic products, insurance investment and advertising agencies. Conglomerate firms must have knowledge about research, production, marketing, etc., then only a conglomerate merger becomes successful.

4. 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.

Example

A pharmaceutical company producing antiulcer drugs merging with company producing anticancer drugs.

Congeneric merger is useful for these companies who are in sales and distribution channels, to benefit customers of both the businesses.

5. Reverse Merger

Such mergers involve acquisition of a public (Shell Company) by a private company, as it helps private company to by-pass lengthy and complex process required to be followed in case it is interested in going public.

Sometimes, it might be possible that a public company continuously a public traded corporation but it has no or very little assets and what remains only its internal structure and shareholders. 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.

Q13. How does conglomerate merger differ from horizontal merger.

Ans :

S.No.	Conglomerate Merger	S.No.	Horizontal Merger
1.	In conglomerate merger, companies are engaged in different fields of business activity.	1.	In horizontal merger, companies are engage in same type of production, distribution or area of business merger with each other.
2.	In follows financial synergies.	2.	It follows collusive synergies.

Q14. List out the advantages and disadvantages of mergers.

(OR)

Outline the advantages of mergers.

(OR)

What are the problems of mergers?

Ans : **(Sep.-20)**

Advantages

(i) Increases Market Share

When companies merge, the new company gains a larger market share and gets ahead in the competition.

(ii) Reduces the Cost of Operations

Companies can achieve economies of scale, such as bulk buying of raw materials, which can result in cost reductions. The investments on assets are now spread out over a larger output, which leads to technical economies.

(iii) Avoids Replication

Some companies producing similar products may merge to avoid duplication and eliminate competition. It also results in reduced prices for the customers.

(iv) Expands Business into New Geographic Areas

A company seeking to expand its business in a certain geographical area may merge with another similar company operating in the same area to get the business started.

(v) Prevents Closure of an Unprofitable Business

Mergers can save a company from going bankrupt and also save many jobs.

Disadvantages

(i) Raises Prices of Products or Services

A merger results in reduced competition and a larger market share. Thus, the new company can gain a monopoly and increase the prices of its products or services.

(ii) Creates Gaps in Communication

The companies that have agreed to merge may have different cultures. It may result in a gap in communication and affect the performance of the employees.

(iii) Creates Unemployment

In an aggressive merger, a company may opt to eliminate the under performing assets of the other company. It may result in employees losing their jobs.

(iv) Prevents Economies of Scale

In cases where there is little in common between the companies, it may be difficult to gain synergies. Also, a bigger company may be unable to motivate employees and achieve the same degree of control. Thus, the new company may not be able to achieve economies of scale.

Q15. Explain the various Motives for Mergers.

Ans : **(Imp.)**

There are many reasons behind mergers but some of them do not contribute for economic development of the firm. Some reasons which do not create value are, so will be prosecuted.

(a) Strategic Benefit

Strategic benefit mainly aims at achieving long term plans and implementing them. When a firm desires to enter or expand in a particular industry, acquisition provides more advantages than internal expansion. Some of them are,

- It prevents competitors and avoids competition.
- It can pass over several stages of expansion in a short span of time.
- It ensure less risk and less cost.
- Merging in a saturated market helps in expansion and replacement which is more suitable than developing a new firm through internal expansion.

(b) Economies of Scope

A company can broaden its scope by a particular set of skills or assets which it possesses.

(c) Economies of Vertical Integration

Economies of vertical integration can be accomplished when companies engaged in different stages of production merge together. However, vertical integration is not suitable in all situations. If a company performs all functions on its own, then benefit of outsourcing is lost.

(d) Complementary Resources

Each firm specializes in certain activities. When firms with complementary resources merge together, they can effectively utilize the resources and produce innovative products.

(e) Managerial Effectiveness

In the event of merger, managerial effectiveness also increases. When inefficient managerial team is replaced by an effective managerial team, it leads to the progress of the firm. Another advantage would be in the form of compatibility between the interests of the managers and the shareholders. With the help of merger an effective discipline of management can be maintained.

If poor performance leads to the risk of acquisition of a firm, the managers will struggle and improve their performance.

(f) Diversification

The main reason for merger is to reduce risk through diversification. Diversification implies dividing or spreading the business in different product lines. Reduction of risk in the merging concept depends on correlation between the earnings. Correlation explains how the two variables are related or dependent on each other. When there is a negative correlation it implies low risk and positive correlation implies high risk.

Q16. What are the possible causes for acquisition?

Ans :

(i) Provide New Services or Products

By acquiring a company a buyer can get access to new services or products. These acquired services or products of the target company can be sold to a buyer's own clients. Also the other way around: the products of the own company can be used to increase

the sales to clients of the target company. In this way synergies can be realized in the sales of both companies. This will help to make 1+1=3 and have the buyer benefit from positive synergies in an acquisition.

(ii) Sell into New Industries

If a buyer is strong in a specific industry and wants to grow it's position it can acquire a target that provides similar services in another industry. Especially if the products or services of the two companies are reasonably similar this can be a good strategy to grow market share. Industries that have a similar nature are most suited for this type of acquisition. In practice one has to investigate together with the acquirer which industry would be ideal for an acquisition.

(iii) Acquire New Technologies or Skills

Access to new technologies or skills is an important reason for companies to acquire a target. Especially in the case where an established company lacks knowledge of these new technologies. This can be especially relevant in online businesses. At the stage when they realized that they had missed the boat it was too late to build something similar their selves. The only opportunity left then is to acquire a company that is leading in that specific area of technology.

Q17. What are the different types of acquisition?

Ans :

There are four types of acquisition strategies, they are :

(i) Horizontal acquisitions

(ii) Vertical acquisitions

(iii) Related acquisitions

(iv) Cross-border acquisitions

(i) Horizontal acquisitions

When a company acquires another company which is also involved in same industry is known as horizontal acquisition. Firm engaged in horizontal acquisition can increase their market share by utilizing cost-based and revenue based synergies. Usually, horizontal acquisitions are more effective, when asses of both acquiring company and acquired company are combined.

(ii) Vertical acquisitions

When a company acquires its supplier of raw material or distributor of final product, it is known as vertical acquisition. Through vertical acquisition, a firm can acquire control over other parts of the value chain. Vertical integration can also take place in business.

(iii) Related acquisitions

When a company acquires another company from a highly related industry, it is known as related acquisition. There are many complications in valuing a related acquisition because synergies cannot be achieved easily. Firms which engage in related acquisition to develop and increase their market share must identify each and every political aspect in general, so that acquisition strategy can be utilized.

(iv) Cross-border acquisitions

When acquisition are made between head quarters of different companies studied in different countries, it is known as cross-border acquisition. The main purpose of cross-border acquisition is to remove entry barriers but it is difficult to arrange and manage, due to the differences in foreign cultures.

Q18. What are the problems faced by firms in achieving acquisitions?

Ans :

(i) Integration Difficulties

Integrating the operations of two different firms is not at all an easy task. It is very difficult to integrate financial, managerial, manufacturing, logistics and other key functions of two firms. Lack of effective integration would give negative results to the management.

(ii) Too Much Diversification

Diversification increases the competitive advantage and the normal profits of the firm, thus firms are greatly interested in diversifying their operations in the continuous manner. But continuous acquisitions and mergers would often result in over diversification.

(iii) Inadequate Evaluation of Target

Many firms face serious issues due to inadequate evaluation of acquired company in their pre-acquisition period. Firms usually follow the process of "due deligence" for evaluating the firms which are to be acquired.

(iv) Large or Extraordinary Debt

For the purpose of mergers and acquisitions, researchers have observed that the firms are significantly increasing their levels of debt.

(v) Inability to Achieve Synergy

Basically the word synergy means working together. When two different firms work together and achieve those results, which were difficult to be achieved if in case they worked independently, then such working together is called as "synergy". Creating synergy is a difficult task for the firms. It requires extraordinary efforts to analyse the present, past and estimate the future operations of both the firms.

5.5 Cost of Mergers

Q19. Discuss the various cost of mergers.

Ans :

Costs of mergers and acquisitions are an important and integral part of mergers and acquisitions process. Before going for any merger or acquisition, both the companies calculate the costs of mergers and acquisitions to find out the viability and profitability of the deal. Based on the calculation, they decide whether they should go with the deal or not.

In mergers and acquisitions, both the companies may have different theories about the worth of the target company. The seller tries to project the value of the company high, whereas buyer will try to seal the deal at a lower price. There are a number of legitimate methods for valuation of companies.

Valuation Models in Mergers and Acquisitions

There are a number of methods used in mergers and acquisition valuations. Some of those can be listed as:

1. Replacement Cost Method

In Replacement Cost Method, cost of replacing the target company is calculated and acquisitions are based on that. Here the value of all the equipments and staffing costs are taken into consideration. The acquiring company offers to buy all these from the target company at the given cost. Replacement cost method isn't applicable to service industry, where key assets (people and ideas) are hard to value.

2. Discounted Cash Flow (DCF) Method

Discounted Cash Flow (DCF) method is one of the major valuation tools in mergers and acquisitions. It calculates the current value of the organization according to the estimated future cash flows.

Estimated Cash Flow = Net Income + Depreciation/Amortization - Capital Expenditures - Change in Working Capital

These estimated cash flows are discounted to a present value. Here, organization's Weighted Average Costs of Capital (WACC) is used for the calculation. DCF method is one of the strongest methods of valuation.

3. Economic Profit Model

In this model, the value of the organization is calculated by summing up the amount of capital invested and a premium equal to the current value of the value created every year moving forward.

Economic Profit = Invested Capital x (Return on Invested Capital - Weighted Average Cost of Capital)

Economic Profit = Net Operating Profit Less Adjusted Taxes - (Invested Capital x Weighted Average Cost of Capital)

Value = Invested Capital + Current Value of Estimated Economic Profit

4. Price-Earnings Ratios (P/E Ratio)

This is one of the comparative methods adopted by the acquiring companies, based on which they put forward their offers. Here, acquiring company offers multiple of the target company's earnings.

5. Enterprise-Value-to-Sales Ratio (EV/ Sales)

Here, acquiring company offers multiple of the revenues. It also keeps a tab on the price-to-sales ratio of other companies.

Q20. Explain the financial benefits of mergers ?

Ans :

A merger may help in

(a) Eliminating the financial constraint

(b) Deploying surplus cash

(c) Enhancing debt capacity

(d) Lowering the financing costs

(a) Eliminating the Financial Constraint

A company may be constrained to grow through internal development due to shortage of funds. The company can grow externally by acquiring another company by the exchange of shares and thus, release the financing constraint.

(b) Deploying Surplus Cash

A cash-rich company may face a different situation. It may into have enough internal opportunities to invest its surplus cash. It may either distribute its surplus cash to its shareholders or use it to acquire some other company. The shareholders may not really benefit much if surplus cash is returned to them since they would have to pay tax at ordinary income tax rate.

Their wealth may increase through an increase in the market value of their shares if surplus cash is used to acquire another company. If they sell their shares, they would pay tax at a lower, capital gains tax rate. The company would also be enabled to keep surplus funds and grow through acquisition.

(c) Enhancing Debt Capacity

A merger of two companies, with fluctuating, but negatively correlated, cash flows can bring stability of cash flows of the combined company. The stability of cash flows reduces the risk of insolvency and enhances the capacity of the new entity to service a larger amount of debt. The increased borrowing allows a higher interest tax shield which adds to the shareholders wealth.

(d) Lowering the Financing Costs

Since, the probability of insolvency is reduced due to financial stability and increased protection to lenders, the merged firm should be able to borrow at a lower rate of interest. This advantage may be taken off partially or completely be increase in the shareholders' risk on account of providing better protection to lenders.

5.6 GOVERNMENT GUIDELINES FOR TAKEOVER

Q21. Discuss different government guidelines for takeover.

(OR)

What are the different government guidelines for takeover?

(OR)

Explain the government guidelines for takeover of the companies.

(OR)

Critically examine the role of government in avoiding the hostile takeovers

Ans : **(May-19, Imp.)**

The salient features of some of the important guidelines as follows :

1. Disclosure of share acquisition/holding

Any person who acquires 5% or 10% or 14% shares or voting rights of the target company, should disclose of his holdings at every stage to the target company and the Stock Exchanges within 2 days of acquisition or receipt of intimation of allotment of shares.

Any person who holds more than 15% but less than 75% shares or voting rights of target company, and who purchases or sells shares aggregating to 2% or more shall within 2 days disclose such purchase or sale along with the aggregate of his share holding to the target company and the Stock Exchanges.

Any person who holds more than 15% shares or voting rights of target company and a promoter and person having control over the target company, shall within 21 days from the financial year ending March 31 as well as the record date fixed for the purpose of dividend declaration, disclose every year his aggregate share holding to the target company.

2. Public announcement and open offer

An acquirer who intends to acquire shares which along with his existing share holding would entitle him to exercise 15% or more voting rights, can acquire such additional shares only after making a public announcement to acquire at least additional 20% of the voting capital of target company from the shareholders through an open offer.

An acquirer who holds 15% or more but less than 75% of shares or voting rights of a target company, can acquire such additional shares as would entitle him to exercise more than 5% of the voting rights in any financial year ending March 31 only after making a public announcement to acquire at least additional 20% shares of target company from the shareholders through an open offer.

An acquirer, who holds 75% shares or voting rights of a target company, can acquire further shares or voting rights only after making a public announcement to acquire at least additional 20% shares of target company from the shareholders through an open offer.

(i) Offer Price

The acquirer is required to ensure that all the relevant parameters are taken into consideration while determining the offer price and that justification for the same is disclosed in the letter of offer. The relevant parameters are:

- negotiated price under the agreement which triggered the open offer.
- price paid by the acquirer for acquisition, if any, including by way of allotment in a public or rights or preferential issue during the twenty six week period prior to the date of public announcement, whichever is higher:
- the average of the weekly high and low of the closing prices of the shares of the target company as quoted on the stock exchange where the shares of the company are most frequently traded during the twenty six weeks or the average of the daily high and low prices of the shares as quoted on the stock exchange where the shares of the company are most frequently traded during the two weeks preceding the date of public announcement, whichever is higher.

In case the shares of Target Company are not frequently traded then parameters based on the fundamentals of the company such as return on net worth of the company, book value per share, EPS etc. are required to be considered and disclosed.

(ii) Disclosure

The offer should disclose the detailed terms of the offer, identity of the offerer, details of the offerer's existing holdings in the offeree company etc. and the information should be made available to all the shareholders at the same time and in the same manner.

(iii) Offer document

The offer document should contain the offer's financial information, its intention to continue the offeree company's business and to make major change and long-term commercial justification for the offer.

The objectives of the Companies Act and the guidelines for takeover are to ensure full disclosure about the mergers and takeovers and to protect the interests of the shareholders, particularly the small shareholders. The main thrust is that public authorities should be notified within two days.

In a nutshell, an individual or company can continue to purchase the shares without making an offer to other shareholders until the share holding exceeds 10 per cent. Once the offer is made to other shareholders, the offer price should not be less than the weekly average price in the past 6 months or the negotiated price.

3. Legal Procedures

The following is the summary of legal procedures for merger or acquisition laid down in the Companies Act, 1956:

- **Permission for merger :** Two or more companies can amalgamate only when amalgamation is permitted under their memorandum of association: Also, the acquiring company should have the permission in its object clause to carry on the business of the acquired company. In the absence of these provisions in the memorandum of association, it is necessary to seek the permission of the shareholders, board of directors and the Company Law Board before affecting the merger.
- **Information to the stock exchange :** The acquiring and the acquired companies should inform the stock exchanges where they are listed about the merger.
- **Approval of board of directors :** The boards of the directors of the individual companies should approve the draft proposal for amalgamation and authorize the managements of companies to further pursue the proposal.
- **Application in the High Court :** An application for approving the draft amalgamation proposal duly approved by the boards of directors of the individual companies should be made to the High Court. The High Court would convene a meeting of the shareholders and creditors to approve the amalgamation proposal. The notice of meeting should be sent to them at least 21 days in advance.
- **Shareholders' and creditors' meetings :** The individual companies should hold separate meetings of their shareholders and creditors for approving the amalgamation scheme. At least, 75 per cent of shareholders and creditors in separate meeting, voting in person or by proxy, must accord their approval to the scheme.
- **Sanction by the High Court :** After the approval of shareholders and creditors, on the petitions of the companies, the High Court will pass order sanctioning the amalgamation scheme after it is satisfied that the scheme is fair and reasonable. If it deems so, it can modify the scheme. The date of the court's hearing will be published in two newspapers, and also, the Regional Director of the Company Law Board will be intimated.
- **Filing of the Court order :** After the Court order, its certified true copies will be filed with the Registrar of Companies.
- **Transfer of assets and liabilities :** The assets and liabilities of the acquired company will be transferred to the acquiring company in accordance with the approved scheme, with effect from the specified date.
- **Payment by cash or securities :** As per the proposal, the acquiring company will exchange shares and debentures and/or pay cash for the shares and debentures of the acquired company. These securities will be listed on the stock exchange.

5.7 Problems on Mergers & Acquisitions

1. Gama Fertilisers Company is taking over Theta Petrochemical Company. The shareholders of Theta would receive 0.8 shares of Gama for each shares held by them. The merger is not expected to yield in economies of scale and operating synergy. The relevant data for the two companies are as follows :

Particulars	Gama	Theta
Net sales (Rs in crore)	335.00	118.00
Profit after-tax (Rs in crore)	58.00	12.00
Number of share (crore)	12.00	3.00
Earnings per share (Rs)	4.83	4.00
Market value per share (Rs)	30.00	20.00
Price-earnings ratio	6.21	5.00

For the combined company (after merger), you are required to calculate (a) EPS, (b) P/E ratio, (c) market value per share, (d) number of shares, and (e) total market capitalisation. Also calculate the premium paid by Gama to the shareholders of Theta.

Sol :

Premium paid to Theta's shareholders:

Value of each share in Gama: 0.8 x Rs 30 = Rs. 24

Value of Theta's share before merger = Rs. 20

Premium = Rs. 4

Premium percentage = 4/20 = 20 per cent

Number of shares paid to Theta's shareholders: 3 × 0.8 = 2.4 crore

Number of shares of the combined company: 12 + 2.4 = 14.4 crore

Combined profit after tax: Rs 58 + Rs 12 = Rs 70 crore

Combined EPS = 70/14.4 = Rs 4.86

Combined price-earnings ratio:

6.21 × (58/70) + 5 × (12/70) = 6.00

Combined firm's market capitalization :

Market value per share = P/E ratio × EPS = 6.00 × 4.86

= Rs 29.16

Capitalisation: Market value per shares × No. of shares = Rs. 29.16 × 14.4

= Rs 419.9 crore

2. Pee Company has decided to acquire Kay company. The following are the relevant financial data for the two companies :

Particulars	Pee Co.	Kay Co.
Net sales (Rs in lakh)	350.00	45.00
Profit after-tax (Rs in lakh)	28.13	3.75
Number of shares (lakh)	7.50	1.50
Earnings per share (Rs)	3.75	2.5
Dividend per share (Rs)	1.30	0.60
Total market capitalisation (Rs in lakh)	420.00	45.00

Calculate :

(a) pre-merger market value per share for both companies,

(b) post-merger EPS, market value per share and price-earnings ratio if Kay's shareholders are offered a share of (i) Rs. 30, or (ii) Rs. 56, or (iii) Rs. 20 in a share exchange for merger,

(c) Pee's EPS if Kay's shareholders are offered Rs. 100,15 per cent convertible debenture for each 3 shares held in Kay, and

(d) post-merger dividend or interest available to Kay's shareholders with exchanges referred in (b) and (c) Assume 50 per cent tax rate.

Sol :

(a) Pre-merger market value per share = $\frac{\text{Market capitalisation}}{\text{Number of shares}}$

Pee: 420/7.50 = Rs. 56;

Kay: 45/1.50 = Rs. 30

(b) Share exchange ratio:

(i) 30/56 = 0.536

(ii) 56/56 = 1

(iii) 20/56 = 0.357

Number of shares of the surviving company:

(i) 7.5 + (0.536 × 1.5) = 8.30

(ii) 7.5 + (1 × 1.5) = 9.00

(iii) 7.5 + (0.357 × 1.5) = 8.04

Combined EPS: Combined PAT/Combined number of shares

(i) (28.13+ 3.75) / 8.30 = Rs. 3.84

(ii) (28.13 + 3.75) / 9.00 = Rs. 3.5

(iii) (28.13 + 3.75 / 8.04 = Rs. 3.97

Combined firm's P/E ratio = weighted average of the individual firm's pre-merger P/E ratio

{(420/28.13) × {(28.13 / (28.13 + 3.75)}

+ {(45/3.75) × {3.75/(28.13 + 13.75)}

= 14.93 × 0.882 + 12 × 0.118 = 14.58

Market value per share of the surviving firm:

i) (3.84 × 14.58) = Rs. 56

ii) (3.54 × 14.58) = Rs. 51,61

iii) (3.97 × 14.58) = Rs. 57.88

(c) Number of convertible debentures; 1.50/3 = 0.50 lakh

Interest on debenture 0.5 × Rs. 100 × 15% = Rs 7.5 lakh

Combined profit after-tax = 28.13 + 3.75 – 7.5 + 0.5 × 7.5

Pee's EPS after merger = 28.13/7.50 = Rs 3.75

Note: Interest will be deducted from the combined profit but is will save tax at 50 per cent tax rate.

(d) Dividend to Kay's shareholders after merger:

Exchange of shares:

i) 0.804 × 1.30 = Rs 1.05 lakh

ii) 1.50 × 1.30 = Rs 1.95 lakh

iii) 0.536 × 1.30 = Rs 0.70 lakh

Interest 0.50 × 100 × 0.15 = Rs 7.50 lakh

Post-merger dividend: 1.50 × 0.6 = Rs 0.90 lakh.

3. Small Company is being acquired by Large Company on a share exchange basis. Their selected data are as follows :

Particulars	Large	Small
Profit after-tax (Rs in lakh)	**56**	**21**
Number of shares (lakh)	**10**	**8.4**
Earnings per share (Rs)	**5.6**	**2.5**
Price-earnings ratio	**12.5**	**7.5**

Determine :

(a) pre-merger, market value per share, and

(b) the maximum exchange ratio Large Company should offer without the dilution of (i) EPS (ii) market value per share.

Sol :

(a) Pre-merger market-value per share: P/E ratio × EPS

Large: 12.5 × 5.6 = Rs 70

Small: 7.5 × 2.5 = Rs 18.75

(b) (i) Maximum exchange ratio without dilution of EPS:

Pre-merger PAT of Large (Rs in lakh)	56
Pre-merger PAT of Small (Rs in lakh)	21
Combined PAT without Synergy (Rs in lakh)	77
Large's EPS	5.6
Maximum number of shares of Large after merger (77/5.6) (lakh)	13.75
(–) Existing number of shares (lakh)	10.00
Maximum number of shares to be exchanged (lakh)	3.75
Maximum share exchange ratio: 3.75/8.4	0.446

(ii) Maximum exchange ratio without dilution of market value per share:

Pre-merger market capitalisation of Large:	
MV × No. of shares = Rs 70 × 10 lakh	700
Pre-merger market capitalisation of Small:	
MV × No. of shares = Rs 18.75 × 8.4 lakh	157.5
Combined market capitalisation (Rs in lakh)	857.5
Current market value per share for Large shareholders (Rs)	70
Maximum number of shares of Large (surviving company) (857.5/70) (lakh)	12.25
(–) Current number of shares of Large (lakh)	10.00
Maximum number of shares to be exchanged (lakh)	2.25
Maximum shares exchanged ratio: 2.25/8.4	0.268

Note: In a share exchange, there would not be a dilution of EPS if the acquiring company offers to pay a P/E ratio for the acquired firm's shares equal to its pre-merger P/E ratio. Large has a P/E ratio of 12.5 and the acquired firm's pre-merger EPS is Rs 2.5. Thus it could offer upto 12.5 × 2.5 = Rs. 31.25 for Small's shares. The maximum exchange ratio is: 31.25/70 = 0.446.

4. XYZ Company is acquiring PQR Company. XYZ will pay 0.5 of it shares to the shareholders of PQR for each share held by them. The data for the two companies are as given below:

Particulars	XYZ	PQR
Profit after-tax (Rs in lakh)	**150**	**30**
Number of shares (lakh)	**25**	**8**
Earnings per share (Rs)	**6.00**	**3.75**
Market price of share (Rs)	**78.00**	**33.75**
Price-earnings ratio	**13**	**9**

Calculate the earnings per share of the surviving firm after merger. If the price-earnings ratio falls to 12 after the merger, what is the premium received by the shareholders of PQR (using the surviving firm's new price)? Is the merger beneficial for XTZ's shareholders ?

Sol :

Combined profit after-tax = 150 + 30 = Rs 180 lakh

Combined shares = 25 + 0.5 (8)

= 25 + 4 = 29 lakhs

EPS = 180/29 = Rs 6.21

Market price after merger = P/E × EPS = 12 × 6.21 = Rs 74.52

Premium = {0.5 (74.52) – 33.75 } /33.75

= (37.26 - 33.75) / 33.75 = 0.104 or 10.4%

The merger is not beneficial to XYZ's shareholders because their price falls from Rs 78 to Rs 74.52 – a loss of 4.5 per cent.

$$= \frac{74.52 - 78}{78} \times 100$$

$$= \frac{-3.48}{78} \times 100 = -4.5\%$$

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5. The chief executive of a company thinks that shareholders always look for the earnings per share. Therefore, he considers maximisation of the earnings per share as his company's objective. His company's current net profits are Rs 80 lakh and EPS is Rs 4. The current market price is Rs 42. He wants to buy another firm which has current income of Rs 15.75 lakh, EPS of Rs 10.50 and the market price per share of Rs 85.

What is the maximum exchange ratio which the chief executive should offer so that he could keep EPS at the current level? If the chief executive borrows funds at 15 per cent rate of interest and buys-out another company by paying cash, how much should he offer to maintain his EPS? Assume a tax rate to 52 per cent.

Sol :

(a) Combined net profit/No. of shares = 4.00

(80 + 15.75) / (20 + x) = 4

80 + 15.75 = 80 + 4x

x = 3.9375 lakh

Thus the share exchange ratio is 3.9375/1.5 = 2.625

Note: Number of shares = PAT/EPS

(b) Combined net profit / No. of shares = 4.00

{80 + 15.75 – 0.15 (Debt) (1 – 0.52) }/20 = 4.00

(95.75 – 0.072 Debt)/20 = 4

$$\left[\frac{95.75 - 0.072\ (\text{debt})}{20}\right] = 4$$

$95.75 - 0.072\ (\text{debt}) = 80$

$95.75 - 80 = 0.072\ (\text{debt})$

$$\text{debt} = \frac{15.75}{0.072}$$

$= 218.75$

$\therefore$ Debt = Rs. 218.75 lakhs

The chief executive should offer Rs 218.75/1.5

= Rs 145.83 cash per share.

6. Rama International is investigating the acquisition of Shivani International Company. Shivani's balance sheet is given below:

Particulars		(Rs in crore)
10% cumulative preference capital		**100**
Ordinary share capital		
(30 crore shares at Rs 10 per share)		**300**
Reserves and surplus		**150**
14% Debentures		**80**
Current liabilities		**100**
Total		**730**
Net fixed assets		**275**
Investments		**50**
Current Assets:		
Stock	**190**	
Book debts	**150**	
Cash and bank balance	**65**	**405**
Total		**730**

Rama proposed to offer the following to Shivani :

(a) 10% convertible preference shares of Rs 100 crore in Rama for paying 10% cumulative preference capital of Shivani;

(b) 12% convertible debentures of Rs. 84 crore in Rama to redeem 14% debentures of Shivani;

(c) One ordinary share of Rama for every three shares held by Shivani's shareholders, the market price per share being Rs. 42 for Rama's shares and Rs 20 for Shivani's shares.

After acquisition, Rama is expected to dispose off Shivani's stock (inventory) for Rs.150 crore, book debts for Rs 102 crore and investments for Rs. 55 crore. It would pay entire current liabilities. What is the cost of acquisition to Rama? If Rama's required rate of return is 20 per cent, how much should be the annual after-tax cash flows from Shivani's acquisition assuming a time horizon of eight years and a zero salvage value? Would your answer change if there is a salvage value of Rs 30 crore after 8 years ?

Sol :

(a) Cost of acquisition

Particulars		(Rs in crore)
10% convertible preference share		100
12% convertible debentures		84
Ordinary share capital: (30/3) x Rs 42		420
Payment of current liabilities		100
Gross payment		704
Less: Realisation from:		
Investments	55	
Stock	150	
Book debts	102	
Cash	65	372
Net Cost		332

(b) (i) $332 = A \times PVAF_{0.20, 8}$

$332 = A \times 3.837$

$A = 332 / 3.837 =$ Rs 86.53 crore

(ii) $332 = A \times PVAF_{0.20, 8} + 30\ PVF_{0.20, 8}$

$332 = 3.837\ A + 0.233 \times 30$

$332 = 3.837\ A + 6.99$

$A = (332 - 6.99) / 3.837 =$ Rs 84.70 crore.

7. X company limited intends to take over Y company limited by offering two of its shares for every five shares in Y company limited relevant financial data are as follows,

Particulars	X Co. Ltd.	Y Co. Ltd.
Earnings per share (`)	**2**	**2**
Market price per shares (`)	**100**	**40**
Price-earnings ratio	**50**	**20**
Number of shares (' 000)	**100**	**250**
Profit after tax (' 000)	**200**	**500**
Total market value (' 000)	**10,000**	**10,000**

What is the combined earnings per share ? Calculate the P/E ratio of the combined firm. Has any wealth been created for shareholders?

Sol :

i) Combined EPS

Combined profit after tax = 200 + 500 = 700

Combined shares = 100 + 4(250) = 1100

$$EPS = \frac{700}{1100} = 0.64$$

ii) Combined P/E Ratio

$$P/E \text{ ratio} = 50 \times \frac{200}{700} + 20 \times \frac{500}{700}$$

$$= 50 \times 0.286 + 20 \times 0.714$$

$$= 14.3 + 14.28$$

$$= \text{Rs. } 28.58$$

$$= 28$$

Yes. wealth is created for shareholders as combined P/E ratio is more than the P/E ratio of individual firms.

8. Hypothetical Ltd (TL) wishes to acquire Target Ltd (TL), a small company with good growth prospects. The relevant information for both companies is as follows :

Company	Equity shares outstanding	Share price	Earnings after taxes (EAT)	Earnings per share (EPS)
Hypothetical Ltd	Rs.10,00,000	Rs. 25	Rs.20,00,000	Rs. 2
Target Ltd	1,00,000	10	2,00,000	2

Hypothetical Ltd is considering three different acquisition plans :

i) Pay Rs 12.5 per share for each share of TL.

ii) Exchange Rs 25 cash and one share of HL for every four shares of TL.

iii) Exchange one share for every' two shares of TL.

What will HL's EPS be under each of the three plans? What will the share prices of HL be under each of the three plans, if its current P/E ratio remains unchanged?

Sol :

Determination of EPS and market price per share under different acquisitions plans.

Particulars	Acquisition plans		
	Plan 1	Plan 2	Plan 3
Post-merger earnings	Rs. 22,00,000	Rs.22,00,000	Rs.22,00,000
Divide by the number of shares	10,00,000	10,25,000	10,50,000
EPS	2.2	2.146	2.095
Multiply by P/E ratio (Rs 25 ÷ 2)	12.5	12.5	12.5
Market price per share	27.5	26.82	26.19

9. XYZ Ltd is considering merging with ABC Ltd. XYZ's shares are currently traded at Rs 25, it has 2,00,000 shares outstanding and its earnings after taxes (EAT) amount to Rs 4,00,000. ABC has 1,00,000 shares outstanding; its current market price is Rs 12.5, and its EAT are Rs 1,00.000. The merger will be effected by means of a stock swap (exchange). ABC has agreed to a plan under which XYZ 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's P/E ratio is 8, what is its current market price? What is the exchange ratio? What will XYZ's post-merger EPS be?

(iii) What must the exchange ratio be for XYZ's pre- and post-merger EPS to be the same?

Sol :

i) **Pre-merger EPS and P/E ratios of XYZ Ltd and ABC Ltd.**

Particulars	XYZ	ABC
Earnings after taxes	Rs.4,00,000	Rs.1,00,000
Divide by the number of shares outstanding	2,00,000	1,00,000
EPS	2	1
Market price per share	25	12.5
P/E ratio (times)	12.5	12.5

ii) (a) Current market price of ABC Ltd, if P/E ratio is 8 = Re 1 × 8 = Rs. 8

(b) Exchange ratio = Rs. 25/8 = 3.125

(c) Post-merger EPS of XYZ Ltd = (Rs 4,00,000 + Rs 1,00,000)/(2,00,000 + 32,000)

= Rs. 2.16

iii) **Desired exchange ratio**

(a) Total number of shares in post-merged company = Post merger earnings/Pre-merger EPS of XYZ Ltd = Rs 5,00,000/2 = 2,50,000.

(b) Number of shares required to be issued

= 2,50,000 – 2,00,000 = 50,000

(c) Therefore, the exchange ratio is

= 50,000/1,00,000 = 0.5

10. A Ltd has acquired T Ltd in the current year. T Ltd has its base year earnings of Rs. 15 lakh. At the time of merger, its equity shareholders received initial payment of 1 lakh shares of A Ltd. The market value of A Ltd's share is Rs 100 per share and the P/E ratio is 10. As a part of the agreement, it has been also decided to pay to the shareholders of T Ltd on deferred payment basis for next 3 years; the payment is contingent to the realisation of the potential projected earnings after merger.

The projected post-merger earnings of T Ltd for next 3 years are Rs.18 lakh, Rs.20 lakh and Rs. 25 lakh respectively. Assuming no change in the P/E ratio and share prices of T Ltd, determine the number of shares required to be issued to the shareholders of T Ltd during these years.

Sol :

The number of required shares = (Excess post-merger earnings x P/E ratioj/Share price of acquiring firm.

Year 1 : (Rs. 3 lakh x 10)/100 = 30,000

2 : (Rs. 5 lakh x 10)/100 = 50,000

3 : (Rs. 10 lakh x 10)/100 = 1,00,000

11. Olive Ltd. is acquiring all the outstanding equity shares of Star Ltd. by exchanging one share of its own equity shares for each shares of Star Ltd. Olive Ltd. has a policy of keeping 50 percent of its capital structure in debt. The capital structure of both these firms before the merger is as follows :

(a) What will the capital structures of the merged firm be? Determine the percentage share of the debt in the merged firm.

(b) Has the merged firm's financial risk declined.

(c) How much additional debt can be combined firm borrow to retain a capital structure, 50% of which is debt ?

Sol :

(a) (i) Capital Structure of Merged Firm :

Particulars	**Amount (` in Lakhs)**
Equity Capital (20,00,000 + 5,00,000)	25,00,000
Retained Earnings (25,00,000 + 25,00,000)	50,00,000
14% Preference Shares	5,00,000
13% Debt.	50,00,000
	1,30,00,000

(ii) Percentage Share of Debt :

$$\frac{\text{Debt}}{\text{Total Capital}} \times 100 = \frac{50,00,000}{1,30,00,000} \times 100 = 38.46 = 38.5 \text{ percent.}$$

(b) Yes, there is decline in financial risk due to low debt ratio of the merged firm.

(c) $0.50 = \frac{(50,00,000 + x)}{1,30,00,000 + x}$

x is additional debt

$0.5\ (1,30,00,000 + x) = 50,00,000 + x$

$65,00,000 + 0.5\,x = 50,00,000 + x$

$65,00,000 - 50,00,000 = -0.5\,x + x$

$15,00,000 = 0.5\,x$

$x = \frac{15,00,000}{0.5}$

= ` 30,00,000.

12. There is a company A Ltd. which has total accumulated losses and to diversify its past several years. The B Ltd. has acquired the company A Ltd. to use these losses and to diversify its operations. The B Ltd's expected earnings before taxes are ` 18 lakh per year for the next 3 years.

Assuming these earnings are realized and setting off the losses is allowed under tax laws, determine the likely benefit to B Ltd., given corporate tax rate of 30 percent and its cost of capital as 12 percent.

Sol :

[**Note :** As total accumulated losses of A Ltd. are not given in problem. Let us assume, total accumulated losses as ` 23 lakh]

Present Value of Tax Savings (Benefit) to B Ltd. (` Lakh)

Year	Tax Savings	PV Factor at 0.12	Total PV
1	18 × 0.30 = 5.4	0.893	4.8
2	5 × 0.30 = 1.5	0.797	1.2
			6.0

∴ The likely benefit to B Ltd. is ` 6 Lakhs.

13. Alpha Company has a value of ` 25 million and Beta Company has a value of ` 10 million. If the two companies merge, cost savings with a present value of ` 4 million would occur. Alpha proposes to offer ` 15 million cash compensation to acquire Beta. What is the net present value of the merger to the two firms?

Sol :

Given,

PV_{Alpha} = ` 25 million $\Rightarrow PV_{(a)}$

PV_{Beta} = ` 10 million $\Rightarrow PV_{(b)}$

PV_{Both} = ` 39 million (25 + 10 + 4) $\Rightarrow PV_{(ab)}$

Cash = ` 15 million

∴ Benefit = $PV_{ab} - (PV_a + PV_b) = 39 - (25 + 10) = 4$ million

Cost = Cash – PV_b = 15 – 10 = ` 5 million

NPV to Alpha = Benefit – Cost = 4 – 5 = (1) million

NPV to Beta = Cash – PV_b = 15 – 10 = ` 5 million.

NPV to Alpha is negative ` 1 million and NPV to Beta is ` 5 million.

14. 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.

Sol :

(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 = 7 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.

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:

Particulars	A Ltd.	T Ltd.
Profit after tax	` 8,00,000	` 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.

Sol :

(i) The number of shares to be issued by A Ltd.:

The Exchange ratio is 0.5

So, New Shares = 1,80,000 × 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 × 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 × 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 × 31.30) ` 2,15,97,000

16. Nelson Electronic Company acquires Borton Electronic Company on 'share for share exchange' basis. The position before takeover was as under :

Particulars	Nelson Company	Borton Company
Number of Shares	20,000	10,000
Total Earnings (`)	2,00,000	1,00,000
Market Price of (`)	20	15

The shareholders of Borton Company are offered 7,500 shares of Nelson Electronic Company for 10,000 shares (i.e., each shareholder of Borton electronic company gets 0.75 shares of Nelson electronic company for 1 share of Borton electronic company).

You are required to calculate the EPS of the amalgamated company vis-a-vis before takeover position of the two companies and the gain/loss of the shareholders of the two independent companies consequent to amalgamation.

Sol : **(Sep.-20)**

(a) Calculation of EPS of Nelson Company and Borton Company Pre and Post Amalgamation

Particulars	Pre-Amalgamation		Post-Amalgamation
	Nelson	Borton	Combined
Total Earnings (`)	2,00,000	1,00,000	3,00,000
Number of Shares	20,000	10,000	27,500 (i.e., 20,000 + 7,500)
Earnings Per Share (`) $\left[\frac{\text{Total Earnings}}{\text{Number of Shares}}\right]$	10	10	10.91

(b) (i) Calculation of Gain/Loss to Shareholder in Terms of EPS

Particulars	Amount
Nelson Company	
EPS Post Amalgamation	10.91
Less : EPS Pre-Amalgamation	10.00
Gain to Shareholders of Nelson Company	0.91
Borton Company	
EPS Post-Amalgamation (EPS Corresponding to 1 Share)	8.18
(0.75 × 10.91 = 8.18)	
Less : EPS Pre-Amalgamation	10.00
Loss to Shareholders to Borton Company	(1.82)

(ii) Calculation of Gain/Loss to Shareholder in Terms of Valuation

Particulars		Amount
Post-Amalgamation Value		6,00,000
27,500 Shares × $\frac{3,00,000}{27,500}$ × 2		
(assuming Nelson Company Maintain its existing		
P/E Ratio of 2 (i.e., 20 ÷ 10)		
Less : Pre-Amalgamation Market Value		
Nelson Company 20,000 × 20 =	4,00,000	
Borton Company 10,000 × 15 =	1,50,000	5,50,000
Total Gain from the Amalgamation		50,000

(iii) Calculation of Gain/Loss to Shareholder in Terms of EPS

Post-Amalgamation Value	4,36,363.64
$\left[20,000 \text{ Shares} \times \frac{30,00,000}{27,500} \times 2\right]$	
Less : Pre-Amalgamation Market Value	4,00,000.00
[20,000 Shares × ` 20 (Market Price Per Share)]	
Gain from the Amalgamation	36,363.64

(iv) Calculation of Gain/Loss to Shareholder in Terms of EPS

Post-Amalgamation Value	1,63,636.36
$\left[7,500 \text{ Shares} \times \frac{3,00,000}{27,500} \times 2\right]$	
Less : Pre-Amalgamation Market Value	1,50,000.00
[10,000 Shares × ` 15 (Market Price Per Share)]	
Gain from the Amalgamation	13,636.36

Working Notes :

Number of Shares of Nelson Electronic Company before takeover	20,000
(+) Shares offered to Borton Company by Nelson Company	7,500
Combined Shares After Amalgamation	27,500

17. Rosy Ltd. is contemplating the purchase of Lily Ltd. Rosy Ltd has 3,00,000 shares having a market price of ` 30 per share while Lily Ltd has 2,00,000 shares selling at ` 20 per share. The EPS of Rosy Ltd and Lily Ltd are ` 4 and ` 2.25 respectively. There is a proposal for exchange of 0.5 share of Rosy Ltd for 1 share of Lily Ltd. Calculate EPS after merger and the impact on EPS for the shareholders of both the companies.

Sol : **(Dec.-18)**

(a) Calculation of Total Earnings after Merger

Company (1)	Original Number of Shares (2)	EPS (3)	Total Earnings After Tax (4) = (2) × (3)
Rosy Ltd.	3,00,000	4	12,00,000
Lily Ltd.	2,00,000	2.25	4,50,000
Total Earnings after Merger			16,50,000

EPS after Merger when Shares Exchange Ratio is 0.5

Particulars	Amount
Earnings after merger	` 16,50,000
Total number of shares after merger [3,00,000 + 1,00,000 (i.e., 0.5 × 2,00,000)]	` 4,00,000
Combined EPS after merger $\left[\frac{16,50,000}{4,00,000} = 4.125\right]$	` 4.125

(b) Impact on EPS for the Shareholders of Rosy Ltd. and Lily Ltd. when Share Exchange Ratio is 0.5

Particulars	`
Shareholders of Rosy Ltd.	
EPS after merger $\left[\frac{16,50,000}{4,00,000}\right]$	4.125
Less : EPS before merger	4.000
Accretion in EPS	0.125
Shareholders of Lily Ltd.	
EPS after merger (4.125 × 0.5)	2.0625
Less : EPS before merger	2.2500
Dilution in EPS	–0.1875

5.8 Mergers and Acquisition Cases

Rationale for M & A and Valuation

Bharti Airtel to buy Loop Mobile for ` 700 crores

In February 2014. Bharti Airtel ("Airtel"), a leading global telecommunications services provider with operations in 20 countries across Asia and Africa has announced to buy Mumbai based Loop Mobile. Although the price was not stated it is understood to be in the region of around ` 700 crores. The proposed association will undergo seamless integration once definitive agreements are signed and is subject to regulatory and statutory approvals. Under the agreement, Loop Mobile's 3 million subscribers in Mumbai will join Airtel's over 4 million subscribers, creating an unmatched mobile network in Mumbai.

The merged network will be the largest by customer base in the Mumbai circle. The proposed transaction will bring together Loop Mobile's 2G/EDGE enabled network supported by 2,500 plus cell sites, and Airtel's 2G and 3G network supported by over 4000 cell sites across Mumbai. It will also offer subscribers the widest exclusive retail reach with 220 outlets that will enable best in class customer service. The agreement will ensure continuity of quality services to Loop Mobile's subscribers, while offering them the added benefits of Airtel's innovative product portfolio and access to superior services, innovative products like 3G, 4G, Airtel Money, VAS and domestic/international roaming facilities. Loop Mobile subscribers will become part of Airtel's global network that serves over 289 million customers in 20 countries. Globally, Airtel is ranked as the fourth largest mobile services provider in terms of subscribers.

(Based on Press release hosted on Bharti Airtel's website)

Valuation Analysis

Listed Software Company X to Merge with unlisted Company Y

Company X and company Y were in the software services business. X was a listed company and Y was an unlisted entity. X and Y decided to merge in order to benefit from marketing. Operational synergies and economies of scale. With both companies being mid-sized, the merger would make them a larger player, open new market avenues, bring in expertise in more verticals and wider management expertise. For company X, the benefit lies in merging with a newer company with high growth potential and for company Y, the advantage was in merging with a business with track record, that too a listed entity.

The stock swap ratio considered after valuation of the two businesses was 1:1.

Several key factors were considered to arrive at this valuation. Some of them were very unique to the businesses and the deal:

- Valuation based on book value net asset value would not be appropriate for X and Y since they are in the knowledge business, unless other intangibles assets like human capital, customer relationships etc. could be identified and valued.
- X and Y were valued on the basis of

  (a) expected earnings (b) market multiple.
- While arriving at a valuation based on expected earnings, a higher growth rate was considered for Y, it being on the growth stage of the business life cycle while a lower rate was considered for X, it being in the mature stage and considering past growth.
- Different discount factors were considered for X and Y, based on their cost of capital, fund raising capabilities and debt-equity ratios.

- While arriving at a market based valuation, the market capitalization was used as the starting point for X which was a listed company. Since X had a significant stake in Z, another listed company, the market capitalization of X reflected the value of Z as well. Hence the market capitalization of Z had to be removed to the extent of X's stake from X's value as on the valuation date.
- Since Y was unlisted, several comparable companies had to be identified, based on size, nature of business etc. and a composite of their market multiples had to be estimated as a surrogate measure to arrive at Y's likely market capitalization, as if it were listed. This value had to be discounted to remove the listing or liquidity premium since the surrogate measure was estimated from listed companies.
- After arriving at two sets of values for X and Y, a weighted average value was calculated after allotting a higher weight for market based method for X (being a listed company) and a higher weight for earnings based method for Y (being an unlisted but growing company). The final values for X and Y were almost equal and hence the 1:1 ratio was decided.

Short Question and Answers

1. Explain the various reasons for mergers.

Ans :

(a) Strategic Benefit

If a firm has decided to enter or expand in a particular industry, acquisition of a firm engaged in that industry, rather than dependence on internal expansion, may offer several strategic advantages:

(i) As a pre-emptive move it can prevent a competitor from establishing a similar position in that industry,

(ii) It offers a special 'timing' advantage because the merger alternative enables a firm to 'leap frog' several stages in the process of expansion,

(iii) It may entail less risk and even less cost,

(iv) In a 'saturated' market, simultaneous expansion and replacement (through a merger) makes more sense than creation of additional capacity through internal expansion.

(b) Economies of Scale

When two or more firms combine, certain economies are realised due to the larger volume of operations of the combined entity. These economies arise because of more intensive utilisation of production capacities, distribution networks, engineering services, research and development facilities, data processing systems, so on and so forth. Economies of scale are most prominent in the case of horizontal mergers where the scope for more intensive utilisation of resources is greater. In vertical mergers the principal sources of benefits are improved coordination of activities, lower inventory levels, and higher market power of the combined entity. Finally, even in conglomerate mergers there is scope for reduction or elimination of certain overhead expenses.

(c) Economies of Scope

A company may use a specific set of skills or assets that it possesses to widen the scope of its activities. For example, Proctor and Gamble can enjoy economies of scope if it acquires a consumer product company that benefits from its highly regarded consumer marketing skills.

(d) Economies of Vertical Integration

When companies engaged at different stages of production or value chain merge, economies of vertical integration may be realised. For example, the merger of a company engaged in oil exploration and production (like ONGC) with a company engaged in refining and marketing (like HPCL) may improve coordination and control.

Vertical integration, however, is not always a good idea. If a company does everything in-house, it may not get the benefit of outsourcing from independent suppliers who may be more efficient in their segments of the value chain.

(e) Complementary Resources

If two firms have complementary resources, it may make sense for them to merge. For example, a small firm with an innovative product may need the engineering capability and marketing reach of a big firm. With the merger of the two firms it may be possible to successfully manufacture and market the innovative product. Thus, the two firms, thanks to their complementary resources, are worth more together than they are separately.

2. Differentiate mergers and acquisitions.

Ans :

S.No.	Merger	S.No.	Acquisition
1.	Merger is an integration of two or more companies but only one company continues its business.	1.	Acquisition is an activity in which one company controls the other company.
2.	In mergers, the CEO's of both the companies agrees for combining their business.	2.	In acquisitions, the company which is acquired may not be willing to combine.
3.	Mergers are financed by stock swap.	3.	Acquisitions are financed by cash and debt combination.
4.	Horizontal, vertical, conglomerate and congeneric are the different types of mergers.	4.	Horizontal, vertical, related and cross-border mergers acquisitions are the different types of acquisitions
5..	Merger is a narrow, technical term of specific legal procedure which may or may not follow	5.	Acquisition is a generic term used to explain a transfer of ownership, acquisition.
6.	In mergers, one company purchases the stock of company and second company closes down quantity i.e., 51 percent.	6.	In acquisitions, one company controls the other other company by purchasing voting shares in large its business.
7.	Example: ITC Kakatiya and Sherton merged into a single entity.	7.	Example: Walt Disney company acquired capital cities/ABC Inc.

3. What are the possible causes of Horizontal and Vertical Mergers?

Ans :

(a) 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.

Example: Combination of two book publishers or two pharmaceutical manu-facturing companies.

In this type of merger, companies expand their business and enjoy economies of scale and reduces competitors.

Causes

(i) Companies prefer horizontal merger in order to diversify their businesses.

(ii) Availing economies of scale and economies of scope could be one of the reason behind horizontal merger.

(iii) Companies aiming of increasing their market share would go for horizontal merger.

(iv) In order to reduce the number of competitors, companies undergo horizontal merger.

(v) The complementary skills and resources of the companies can be shared with each other in horizontal merger.

(b) Vertical Merger

This merger happens when two companies that have 'buyer-seller' relationship (or potential buyer-seller relationship) come together.

Example: Combining a automobile manufacturing company and automobile marketing company or combining eatables manu-facturing company and its packaging company.

Vertical merger can also exist in the form of forward and backward merger. When a specific company merges with it suppliers, it is backward merger and if a company merges with its customers, it is a forward merger.

Causes

(i) Vertical merger ensures free flow of information among supply chain intermediaries.

(ii) Companies undergo vertical merger to increase synergies such as financial synergy, operating synergy, managerial synergy and so on.

(iii) Efficient quality control is ensured through vertical merger.

4. Define Merger.

Ans :

A merger refers to integration or combination of two or more companies but, only one company continues its business. The other company which discontinues its business transfer its assets, debts, etc., to the company which is in existence. Merger can take place in four ways,

(i) Purchase of Assets

When company A purchases the assets of company B then company B is legally stopped, because it posses capital structure without any resources. Hence, company A alone sustains in asset merger.

(ii) Purchase of Common Stock

When common stock of company B is sold to company A then company B closes down its business.

(iii) Exchange of Stock for Assets

Company A provides its shares to shareholders of B in return of assets of B. With the help of voting right of shareholders, company B can be dissolved.

(iv) Exchange of Stock for Stock

When company A provides its shares to the shareholders of company B, then company B can be dissolved. According to Sec. 2(1A) of the income tax act, 1961, merger means one or more companies combining the existing company or a group of two or more companies combine to form a new company. Merger is termed as amalgamation by Indian Law.

5. Discuss the reasons for acquisition.

Ans :

(i) Minimizing Dependency

Carrying out the business by marketing only single product would make a firm dependent on that particular product for success. The firm would enjoy good returns in the favourable market conditions. In case of high competition, low demand or any other unfavourable market conditions, the returns from the particular product would be very low. As a result the complete operations of the firm would get disturbed. But in case of acquisition, firm won't be dependent on one particular product. Therefore, acquisition minimizes dependency.

(ii) Less Risk Compared to New Product Development

New Product Development (NPD) requires huge capital and a number of resources. Apart from this, NPD involves huge risk as one may not be more whether the new product would be successful in the market or not. But in case of acquisition, products are not new to the customers. They are the products with good demand in the market. Therefore, acquisition involve less risk than compared to NPD.

(iii) Overcoming Entry Barriers

Entering into new markets is not always an easy task for business firms. In some markets, there are larger number of entry barriers which block the entry of a new firm. The existing firms usually hold strong share in the markets. These firms make use of various distinctive competitive strategies and enjoy large share of customer loyalty. Thus, it becomes very difficult for the firms to adjust in market. Therefore, acquiring existing firm would be the best option for the firms to overcome the entry barriers. By acquiring the existing firm, it would be easier to study and analyse the markets within short period.

6. What is demerger?

Ans :

Divestment is also known as demerger (or) divestiture.

Divestment is the process of selling subsidiary assets, investments, or divisions of a company in order to maximize the value of the parent company, divestment is effectively the opposite of an investment and is usually done when that subsidiary asset or division is not performing up to expectations.

In some cases, however, a company may be forced to sell assets as the result of legal or regulatory action. Companies can also look to a divestment strategy to satisfy other strategic business, financial, social, or political goals.

Divestment involves a company selling off a portion of its assets, often to improve company value and obtain higher efficiency. Many companies will use divestment to sell off peripheral assets that enable their management teams to regain sharper focus on the core business.

Divestment can result from either a corporate optimization strategy or else be driven by extraneous circumstances, such as when investments are reduced and firms withdraw from a particular geographic region or industry due to political or social pressure. One major current instance is the impact of the pandemic, remote work, and the rise of technology use and their impact on offices, commercial real estate.

7. Acquisition

Ans :

This refers to the purchase of controlling interest by one company in the share capital of an existing company. This may be by :

(a) An agreement with majority holder of interest.

(b) Purchase of new shares by private agreement.

(c) Purchase of shares in open market (open offer)

(d) Acquisition of share capital of a company by means by cash, issuance of shares.

(e) Making a buyout offer to general body of shareholders.

8. Define diversification.

Ans :

Diversification is a business development strategy allowing a company to enter additional lines of business that are different from the current products, services and markets.

In the current conditions of dynamic markets and strong competition, a successful instrument of risk management is to avoid focusing on a single product, service and/or their distribution to a single limited market. When implemented wisely it contributes to keeping the company stable even in hard times since the *economic downturn* usually occurs simultaneously in all sectors and all markets.

Diversification of business activities brings competitive advantages allowing companies to reduce business risks. That is why it is a great tool for business development. However, its successful implementation requires profound knowledge and thorough preliminary assessment of the company and its environment. And, although sometimes diversification is difficult for the small companies, it can prove to be inevitable when their original markets become unviable.

9. Explain different types of diversification.

Ans :

Diversification is a strategic approach adopting different forms. Depending on the applied criteria, there are different classifications.

Depending on the direction of company diversification, the different types are:

(i) Horizontal Diversification

Acquiring or developing new products or offering new services that could appeal to the company´s current customer groups. In this case the company relies on sales and technological relations to the existing product lines. For example a dairy, producing cheese adds a new type of cheese to its products.

(ii) Vertical Diversification

Occurs when the company goes back to previous stages of its *production cycle* or moves forward to subsequent stages of the same cycle - production of raw materials or

distribution of the final product. For example, if you have a company that does reconstruction of houses and offices and you start selling paints and other construction materials for use in this business. This kind of diversification may also guarantee a regular supply of materials with better quality and lower prices.

(iii) Concentric Diversification

Enlarging the production portfolio by adding new products with the aim of fully utilising the potential of the existing technologies and marketing system. The concentric diversification can be a lot more financially efficient as a strategy, since the business may benefit from some synergies in this diversification model. It may enforce some investments related to modernizing or upgrading the existing processes or systems. This type of diversification is often used by small producers of consumer goods, e.g. a bakery starts producing pastries or dough products.

(iv) Heterogeneous (conglomerate) diversification

Is moving to new products or services that have no technological or commercial relation with current products, equipment, distribution channels, but which may appeal to new groups of customers. The major motive behind this kind of diversification is the high return on investments in the new industry. Furthermore, the decision to go for this kind of diversification can lead to additional opportunities indirectly related to further developing the main company business - access to new technologies, opportunities for strategic partnerships, etc.

(v) Corporate Diversification

Involves production of unrelated but definitely profitable goods. It is often tied to large investments where there may also be high returns.

10. How does conglomerate merger differ from horizontal merger?

Ans :

S.No.	Conglomerate Merger	S.No.	Horizontal Merger
1.	In conglomerate merger, companies are engaged in different fields of business activity.	1.	In horizontal merger, companies are engage in same type of production, distribution or area of business merger with each other.
2.	In follows financial synergies.	2.	It follows collusive synergies.

11. Discuss the issues that arises while dealing with mergers.

Ans :

(i) Financial Issues

Financial issues include the valuation of business and shares of seller company and the financing sources by the acquiring company. Valuation is done on the basis of current earnings, assets and stock value. For valuation, the discounted cash flow method (DCF) can be adopted. The other methods include profit earning capacity value, net tangible asset value, fair value or a combination of these methods. Capital asset pricing method (CAPM) is more preferrable in case of liquidation of assets (i.e., amalgamation or consolidation).

Evaluation is carried out mainly to determine the affect of the merger on earning per share (EPS). There is a possibility that EPS may increase or remain unchanged or it may decline.

(ii) Legal Issues

Legal issues relate to the legal aspects such as provisions of law of mergers. Companies Act 1956, provides the various provisions relating to mergers and amalgamations. It is essential to have a complete understanding of the related legal provisions for the implementation of mergers or acquisitions. The entire process involve several legal issues that are to be analyzed and resolved in an appropriate manner. Any negligence may lead to the problems in merger process.

(iii) Strategic Issues

Strategic issues are nothing but the strategic interests between the buyer and seller firms. There could be the commodity/conflict of interests between the two firms. It is important to analyze these issues to determine whether the mergers would provide synergistic benefits to a great extent or not. This requires the analysis of competencies, objectives, strategic perceptions of the merging companies.

(iv) Managerial Issues

Managerial issues are considered as the most sensitive issues as it involves man, management and staff members. These issues may arise both during and after merger. Many changes are brought in mergers, specially the changes of staff i.e., senior and top-level management, reallocation of jobs etc. The impact of these changes can be clearly observed in financial management, tension, performance reporting, performance target-setting, and even resignations.

12. Advantages of Mergers

Ans :

(i) Increases Market Share

When companies merge, the new company gains a larger market share and gets ahead in the competition.

(ii) Reduces the Cost of Operations

Companies can achieve economies of scale, such as bulk buying of raw materials, which can result in cost reductions. The investments on assets are now spread out over a larger output, which leads to technical economies.

(iii) Avoids Replication

Some companies producing similar products may merge to avoid duplication and eliminate competition. It also results in reduced prices for the customers.

(iv) Expands Business into New Geographic Areas

A company seeking to expand its business in a certain geographical area may merge with another similar company operating in the same area to get the business started.

(v) Prevents Closure of an Unprofitable Business

Mergers can save a company from going bankrupt and also save many jobs.

13. What are the problems of mergers?

Ans :

(i) Raises Prices of Products or Services

A merger results in reduced competition and a larger market share. Thus, the new company can gain a monopoly and increase the prices of its products or services.

(ii) Creates Gaps in Communication

The companies that have agreed to merge may have different cultures. It may result in a gap in communication and affect the performance of the employees.

(iii) Creates Unemployment

In an aggressive merger, a company may opt to eliminate the underperforming assets of the other company. It may result in employees losing their jobs.

(iv) Prevents Economies of Scale

In cases where there is little in common between the companies, it may be difficult to gain synergies. Also, a bigger company may be unable to motivate employees and achieve the same degree of control. Thus, the new company may not be able to achieve economies of scale.

Exercise Problems

1. XYZ Ltd wants to acquire ABC Ltd by exchanging its 1.6 shares for every share of ABC Ltd. XYZ anticipates to maintain the existing P/E ratio subsequent to the merger also. The relevant financial data are furnished below:

Particulars	XYZ Ltd	ABC Ltd
Earnings after taxes (EAT)	Rs. 15,00,000	Rs. 4,50,000
Number of equity shares	3,00,000	75,000
Market price per share (MPS)	35	40

i) What is the exchange ratio based on market prices?

ii) What is the pre-merger EPS and P/E ratio for each company?

iii) What was the P/E ratio used in acquiring ABC Ltd?

iv) What is the EPS of XYZ Ltd after the acquisition?

v) What is expected MPS of the merged company?

[Ans : i) 1.4,

ii) EPS Rs 5 (XYZ), Rs 6 (ABC Ltd), P/E ratio 7 (XYZ) 6.67 (ABC Ltd),

iii) 9.33,

iv) Rs. 4.64,

v) Rs. 32.48.]

2. A Ltd wants to acquire T Ltd by exchanging 0.5 of its shares for each share of T Ltd. The relevant financial data is as follows :

Particulars	A Ltd	B Ltd
Earnings after taxes	Rs.18,00,000	Rs. 3,60,000
Equity shares outstanding	6,00,000	1,80,000
Earnings per share	3	2
P/E ratio	10	7
Market price per share	30	14

i) What is the number of equity shares required 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 MPS of A Ltd after the acquisition, assuming its P/E multiple remains unchanged?

v) Determine the market value of the merged firm.

[Ans : i) 90,000 shares,
ii) Rs 3.13,
iii) Rs 1.56,
iv) Rs 31.3,
v) Rs 2,15,97,000.]

3. The following data relate to companies A and B :

Particulars	A Ltd	B Ltd
Earnings after taxes	Rs.1,40,000	Rs.37,500
Equity shares outstanding	20,000	7,500
Earnings per share	7	5
P/E ratio	10	8
Market price per share	70	40

A Ltd is the acquiring company, exchanging its one share for every 1.5 shares of T Ltd. Assuming that A Ltd expects to have the same earnings and P/E ratios after the merger as before, show the extent of gain accruing to the shareholders of the two companies as a result of the merger. Are they better or worse-off than they were before the merger ?

[Ans : Gain from merger Rs 75,000; Rs 20,000 gain to firm A, Rs 55,000 gain to firm B; better off.

4. Ltd is planning to acquire T Ltd The relevant financial detaiils of the two firms prior to merger announcement are as follows:

Particulars	A Ltd	T Ltd
Market price per share	Rs.75	Rs. 30
Number of shares	10,00,000	5,00,000
Market value of the firm (Rs lakh)	750	150

The merger is expected to bring gains which have present value of Rs 150 lakh. A Ltd offers 2,50,000 shares in exchange for 5 lakh shares to the shareholders of T Ltd .

You are required to determine:

i) total value of the combined firm AT Ltd (PVAT) after merger;

ii) gains to the shareholders of A; and

iii) true cost of acquiring T Ltd.

[Ans : i) Rs. 10.5 crore
ii) Gain to A Ltd, Rs. 0.09 crore
iii) Rs 0.6 crore]

Internal Assessment (Mid Examinations)

The pattern of Mid Exams or Continuous Internal Evaluation (CIE) prescribed by the JNTU-H as per the Regulations 2019 (R19) for all the semesters is as follows,

- There would be two Mid Exams or Continuous Internal Evaluation (CIE) for each semester,
  - The **Ist Mid Term Examinations** would be conducted during the Middle of the Semester.
  - The **IInd Mid Term Examinations** during the last week of instructions.
- The Mid Exam I and II would have the same pattern of question paper which would carry **25 Marks** each and the time duration for conducting each Mid exam would be 120 min.
- The pattern of Mid Exam Question Paper would consist of two parts i.e., **Part-A** and **Part-B.**
  - **Part-A** consist of 5 compulsory questions each carries 2 marks (i.e 5 × 2 = 10 marks).
  - **Part-B** consist of 5 questions out of which 3 questions should be answered, each question carries 5 marks (i.e 5 × 3 = 15 marks).
- The average of the two Mid exams will be added with the 75 marks of External end examination which equals to 100 marks (i.e 25 + 75 = 100).

UNIT - I

Part - A

1. What is certainty equivalent approach ? (Refer Unit-I, SQA-1)
2. Describe any two methods used for decision making under uncertainity. (Refer Unit-I, SQA-3)
3. Explain briefly about various criteria involved in the process of decision making under risk. (Refer Unit-I, SQA-4)
4. Explain briefly about risk analysis in investment decisions. (Refer Unit-I, SQA-5)
5. Define decision tree. (Refer Unit-I, SQA-7)
6. What is simulation ? (Refer Unit-I, SQA-9)
7. Define capital rationing. (Refer Unit-I, SQA-10)

Part - B

1. What are investment decisions? State the characteristics of investment decisions. (Refer Unit-I, Q.No. 1)
2. What are the constraints while making investments in new projects? Explain. (Refer Unit-I, Q.No. 2)
3. Explain briefly about various criteria involved in the process of decision making under risk. (Refer Unit-I, Q.No. 6)
4. Explain briefly about risk analysis in investment decisions. (Refer Unit-I, Q.No. 8)

5. Explain the relevance of Risk Adjusted rate of return in investment analysis. (Refer Unit-I, Q.No. 9)
6. Explain the advantages and disadvantages of decision tree approach. (Refer Unit-I, Q.No. 13)
7. Explain briefly about sensitivity analysis. (Refer Unit-I, Q.No. 14)
8. What are the various types of Simulation ? (Refer Unit-I, Q.No. 16)
9. Explain the concept of diversification of projects. (Refer Unit-I, Q.No. 27)

UNIT - II

Part - A

1. Define Pure, Simple and Mixed Investments. (Refer Unit-II, SQA-2)
2. How is modified IRR calculated? (Refer Unit-II, SQA-3)
3. Define IRR. (Refer Unit-II, SQA-5)
4. Discuss the multiple IRR. (Refer Unit-II, SQA-7)
5. How is modified NPV calculated? (Refer Unit-II, SQA-10)

Part - B

1. What are the different types of invest-ments ? What is the rationale behind choosing each? (Refer Unit-II, Q.No. 1)
2. Define IRR ? Explain the merits and demerits of IRR. (Refer Unit-II, Q.No. 9)
3. Explain briefly about evidence of IRR. (Refer Unit-II, Q.No. 10)
4. Compare and contrast between IRR, MIRR and multiple IRR. (Refer Unit-II, Q.No. 13)
5. What is Lorie Savage Paradox? Explain in detail. (Refer Unit-II, Q.No. 16)
6. Explain briefly about Adjusted Net Present Value. (Refer Unit-II, Q.No. 18)
7. How can inflation influence on Capital Budgeting Decisions? (Refer Unit-II, Q.No. 21)

UNIT - III

Part - A

1. Define capital budgeting. (Refer Unit-III, SQA-1)
2. Principles of Capital Budgeting. (Refer Unit-III, SQA-2)
3. Merits and demerits of payback period? (Refer Unit-III, SQA-4)
4. Write a short note on discounted payback method. (Refer Unit-III, SQA-5)
5. Write a short note on Bail-out Pay Back. (Refer Unit-III, SQA-7)
6. Define Terminal Value Method. (Refer Unit-III, SQA-10)
7. Single period constraints. (Refer Unit-III, SQA-11)

Part - B

1. State the importance of capital budgeting. (Refer Unit-III, Q.No. 3)
2. Explain the various kinds of capital budgeting decisions ? (Refer Unit-III, Q.No. 4)

3. Explain the various reasons for the importance of capital budgeting Decisions. (Refer Unit-III, Q.No. 5)
4. Discuss briefly about surplus life and surplus pay back period. (Refer Unit-III, Q.No. 11)
5. Explain the concept of single period constraints. (Refer Unit-III, Q.No. 19)
6. Explain briefly about multi period capital constraints an unresolved problem. (Refer Unit-III, Q.No. 20)
7. Explain briefly about Hertz simulation ? Elaborate the process of Hertz simulation. (Refer Unit-III, Q.No. 22)
8. Discuss the Hillier Approach in analysis and appraisal of project. (Refer Unit-III, Q.No. 23)

UNIT - IV

Part - A

1. What is lease financing? (Refer Unit-IV, SQA-1)
2. What is a lease risk management? (Refer Unit-IV, SQA-3)
3. Compare and contrast Hire Purchase Vs Installment System (Refer Unit-IV, SQA-5)
4. What are the characteristics of leasing? (Refer Unit-IV, SQA-6)
5. Operating Lease (Refer Unit-IV, SQA-8)
6. What are the characteristic features of financial and operating lease? (Refer Unit-IV, SQA-9)
7. What is a leveraged lease? (Refer Unit-IV, SQA-10)
8. Features of Installment System. (Refer Unit-IV, SQA-13)

Part - B

1. What are the differences between financial lease and operating lease. (Refer Unit-IV, Q.No. 8)
2. Define hire purchase ? Explain the characteristics of hire purchase. (Refer Unit-IV, Q.No. 17)
3. What is installment system? Explain the features of Installment system. (Refer Unit-IV, Q.No. 23)
4. Compare and contrast Hire Purchase Vs Installment System. (Refer Unit-IV, Q.No. 24)
5. What are the factors to be considering while deciding whether to buy asset lease it (or) take it on hire purchase ? (Refer Unit-IV, Q.No. 26)
6. Briefly explain the risk associated with leasing. (Refer Unit-IV, Q.No. 29)
7. Briefly explain the financial evaluation of leasing. (Refer Unit-IV, Q.No. 30)

UNIT - V

Part - A

1. Define Merger. (Refer Unit-V, SQA-4)
2. What is demerger? (Refer Unit-V, SQA-6)
3. Acquisition (Refer Unit-V, SQA-7)
4. Define diversification. (Refer Unit-V, SQA-8)
5. How does conglomerate merger differ from horizontal merger? (Refer Unit-V, SQA-10)
6. Advantages of Mergers (Refer Unit-V, SQA-12)

Part - B

1. Define the following terms:
   (i) Acquisition
   (ii) Takeover (Refer Unit-V, Q.No. 2)
2. Write a short note on demerger. (Refer Unit-V, Q.No. 3)
3. Discuss the possible reasons for mergers. (Refer Unit-V, Q.No. 4)
4. Explain how mergers and acquisitions strategies are framed an implemented. (Refer Unit-V, Q.No. 6)
5. Explain the various theories of mergers? (Refer Unit-V, Q.No. 11)
6. What are the different types of mergers? (Refer Unit-V, Q.No. 12)
7. Discuss different government guidelines for takeover. (Refer Unit-V, Q.No. 21)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA IV Semester Examination

R17

September - 2020

STRATEGIC INVESTMENT AND FINANCING DECISIONS

Time : 2 Hours] [Max. Marks : 75

ANSWERS

Note : Answer any Five questions.

All questions carry equal marks

1. Explain Monte Carlo approach to simulation. **(Unit-I, Q.No.17)**

2. Explain the impact of inflation on Capital Budgeting decisions. **(Unit-II, Q.No.21)**

3. Write a short note on:

   (a) Bailout payback **(Unit-III, Q.No.12)**

   (b) Hertz simulation **(Unit-III, Q.No.22)**

4. Discuss the advantages of leasing. **(Unit-IV, Q.No.34)**

5. Nelson Electronic Company acquires Borton Electronic Company on 'share for share exchange' basis. The position before takeover was as under:

Particulars	Nelson Company	Borton Company
Number of Shares	20,000	10,000
Total Earnings (`)	2,00,000	1,00,000
Market Price of Share (`)	20	15

The shareholders of Borton Company are offered 7,500 shares of Nelson Electronic Company for 10,000 shares (i.e., each shareholder of Borton electronic company gets 0.75 shares of Nelson electronic company for 1 share of Borton electronic company).

You are required to calculate the EPS of the amalgamated company vis-a-vis before takeover position of the two companies and the gain/loss of the shareholder of the two independent companies consequent to amalgamation. **(Unit-V, Prob.16)**

6. Explain scope and importance of information and data bank in project selection. **(Unit-III, Q.No. 24)**

7. Define merger. Explain different types of mergers. Outline its advantages. **(Unit-V, Q.No.1,12,14)**

8. Write short notes on:

   (a) Modified IRR **(Unit-II, Q.No.12)**

   (b) Hire purchase and Installment Decisions. **(Unit-IV, Q.No.17, 23)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A IV - Semester Examination **R17**

December - 2019

STRATEGIC INVESTMENT AND FINANCING DECISIONS

Time : 3 Hours] [Max. Marks : 75

Note : This question paper contains two Parts **A** and **B.**

Part A is compulsory which carries 25 marks. Answer **all** questions in **Part** A.

Part B consists of 5 Units. Answer any **one** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (5 × 5 = 25 Marks)

ANSWERS

1. (a) What is Certainty Equivalent Approach? **(Unit-I, SQA.1)**

   (b) What is risk adjusted NPV? **(Unit-II, SQA.1)**

   (c) What is equivalent annual cost? **(Unit-III, SQA.9)**

   (d) What is Lease Financing? What are its advantages? **(Unit-IV, SQA.1,2)**

   (e) Why mergers are necessitated? **(Unit-V, SQA.1)**

Part - B (5 × 10 = 50 Marks)

2. Calculate portfolio return and risk form the following information. The portfolio consists of equal weights of security X and Y.

Rx **(%)**	13	15	13	17	14
Ry **(%)**	21	23	26	19	24

(Unit-I, Prob.26)

OR

3. Explain the Methods of Capital Rationing. **(Unit-I, Q.No.23)**

4. Differentiate among Simple, Pure and Mixed Investment. **(Unit-II, Q.No.15)**

OR

5. Discuss the multiple IRR and modified IRR. **(Unit-II, Q.No.13)**

6. A Project cost ` 28,000 and has a scrap value of ` 5,000 after 5 years. The net profit before depreciation and taxes for the five years period are expected to be ` 4,000, ` 6,000, ` 7000, ` 9,000, ` 12,000. Calculate the ARR assuming 35% rate of tax and depreciation on straight line method. **(Unit-III, Prob.7)**

OR

7. Explain the model of Hertz's Simulation. **(Unit-III, Q.No.22)**

8. Explain the hire purchase and installment decisions. **(Unit-IV, Q.No.17,23)**

OR

9. Compare hire purchase versus leasing an asset. **(Unit-IV, Q.No.25)**

10. Distinguish merger from Acquisition. Evaluate the two strategies. **(Unit-V, Q.No.8)**

OR

11. Explain different types of mergers. **(Unit-V, Q.No.12)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A IV - Semester Examination **R17**

April / May - 2019

STRATEGIC INVESTMENT AND FINANCING DECISIONS

Time : 3 Hours] [Max. Marks : 75

Note : This question paper contains two Parts **A** and **B.**

Part A is compulsory which carries 25 marks. Answer **all** questions in **Part** A.

Part B consists of 5 Units. Answer any **one** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (5 × 5 = 25 Marks)

ANSWERS

1. (a) What is sensitivity analysis? Explain its impact on project investment decisions. **(Unit-I, SQA.2)**

   (b) Define pure, simple and mixed investments. **(Unit-II, SQA.2)**

   (c) Compare single period constraints and multi period capital constraint. **(Unit-III, SQA.13)**

   (d) Define a lease. Elucidate its advantages. **(Unit-IV, SQA.1,2)**

   (e) Differentiate mergers and acquisitions. **(Unit-V, SQA.2)**

Part - B (5 × 10 = 50 Marks)

2. What are the constraints while making investments in the new projects? Explain. **(Unit-I, Q.No. 2)**

OR

3. The Delta corporation is considering an investment in one of the two mutually exclusive proposals: project A which involves an initial outlay of 1,50,000. The certainty equivalent approach is employed in evaluating risky investments. The current yield on treasury bills is 0.05 and the company uses as the riskless rate. The expected values of net cash flows with their respectively certainty-equivalents are :

Year	Project A		Project B	
	Cash flows (` Thousands)	Certainty-equivalent	Cash flows (` Thousands)	Certainty-equivalent
1	90	0.8	90	0.9
2	100	0.7	90	0.8
3	110	0.5	100	0.6

   (a) Which project should be acceptable to the company?

   (b) Which project is riskier ? How do you know?

   (c) If the company was to use the risk-adjusted discount rate method, which project would analyzed with higher rate ? **(Unit-I, Prob.11)**

4. What are the different types of investments? What is the rationale behind choosing each ? **(Unit-II, Q.No.1)**

OR

5. A plastic manufacturer has under consideration the proposal of production of high quality plastic glasses. The necessary equipment to manufacture the glasses would cost `1 lakh and would last 5 years. The tax relevant rate of depreciation is 25 per cent on written down value. There is no other asset in this block. The expected salvage value is ` 10,000. The glasses can be sold at ` 4 each. Regardless of the level of production, the manufacturer will incur cash cost of ` 25,000 each year if the project is undertaken. The overhead costs allocated to this new line would be ` 5,000. The variable costs are estimated at ` 2 per glass. The manufacturer estimates it will sell about 75,000 glasses per year; the tax rate is 35 per cent. Should the proposed equipment be purchased? Assume 20 per cent cost of capital and additional working requirement, ` 50,000 **(Unit-II, Prob.3)**

6. Write a short note on :
   (a) Discount pay back **(Unit-III, Q.No.10)**
   (b) Post payback **(Unit-III, Q.No.11)**
   (c) Surplus payback **(Unit-III, Q.No. 11)**

OR

7. Briefly discuss the Hillier approach and Hertz simulation. **(Unit-III, Q.No.23,22)**

8. Welsh Limited is faced with a decision to purchase or acquire on lease a mini car. The cost of the mini car is ` 1,26,965. It has a life of 5 years. The mini car can be obtained on lease by paying in advance equal lease rentals annually. The leasing company desires a return of 10 per cent on the gross value of the asset. Welsh Limited can also obtain 100 per cent finance from its regular banking channel. The annual rate of interest will be 15 percent and the loan will be paid in 5 annual equal installments, inclusive of interest, each installment becoming due at the beginning of the year. The effective tax rate of the company is 40 percent. For the purpose of taxation, it is to be assumed that the asset will be written off over a period of 5 years on a straight line basis.
   (a) Advice welsh Limited about the method of acquiring the car.
   (b) What should be the annual lease rental to be charged by the leasing company to match the loan option? **(Unit-IV, Prob.4)**

OR

9. How do lease financial decisions evaluated compare to hire purchase? **(Unit-IV, Q.No.20,30)**

10. Define takeover. What are the government guidelines for takeover? **(Unit-V, Q.No.2, 21)**

OR

11. Discuss diversification strategies. **(Unit-V, Q.No.9)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A IV - Semester Examination **R19**

Model Paper - I

STRATEGIC INVESTMENT AND FINANCING DECISIONS

Time : 3 Hours] [Max. Marks : 75

Note : This question paper contains two Parts **A** and **B.**

Part A is compulsory which carries 25 marks. Answer **all** questions in **Part** A.

Part B consists of 5 Units. Answer any **one** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (5 × 5 = 25 Marks)

ANSWERS

1. (a) Describe any two methods used for decision making under uncertainity. **(Unit-I, SQA-3)**
   (b) Differentiate among simple, pure and mixed investments. **(Unit-II, SQA-6)**
   (c) Define capital budgeting. **(Unit-III, SQA-1)**
   (d) What is an equivalent loan amount? **(Unit-IV, SQA-4)**
   (e) What are the possible causes of Horizontal and Vertical Mergers? **(Unit-V, SQA-3)**

Part - B (5 × 10 = 50 Marks)

2. Explain briefly about various criteria involved in the process of decision making under Uncertainity. **(Unit-I, Q.No.7)**

OR

3. The Delta corporation is considering an investment in one of the two mutually exclusive proposals: project A which involves an initial outlay of 1,50,000. The certainty equivalent approach is employed in evaluating risky investments. The current yield on treasury bills is 0.05 and the company uses as the riskless rate.

   The expected values of net cash flows with their respectively certainty-equivalents are :

Year	Project A		Project B	
	Cash flows (` Thousands)	Certainty-equivalent	Cash flows (` Thousands)	Certainty-equivalent
1	90	0.8	90	0.9
2	100	0.7	90	0.8
3	110	0.5	100	0.6

   (a) Which project should be acceptable to the company?
   (b) Which project is riskier ? How do you know?
   (c) If the company was to use the risk-adjusted discount rate method, which project would analyzed with higher rate ? **(Unit-I, Prob.11)**

4. Discuss the effect of Inflation on Capital Budgeting Decisions. **(Unit-II, Q.No.21)**

OR

5. Company is considering two mutually exclusive projects A and B, whose costs and cash flows are shown below.

Year	A	B
0	(1,000)	(1,000)
1	100	1,000
2	300	100
3	400	50
4	700	50

Calculate,

(a) MIRR at a rate of 12%

(b) Calculate NPV for both projects whose cost of capital is 12% which project is accepted. **(Unit-II, Prob.9)**

6. Discuss briefly about surplus life and surplus pay back period. **(Unit-III, Q.No.11)**

OR

7. A project involves initial investment of Rs. 25,000 life of the project is 4 years and cash inflows are Rs. 12,000 p.a for 4 years cost of capital is 12%. The expected rate at which cash inflows will be reinvested at the end of the year.

Year	1	2	3	4
Percentage	5%	5%	10%	10%

You are required to analyses the feasibility of the project using terminal value method. **(Unit-III, Prob.11)**

8. Distinguish between hire purchase and Leasing ? **(Unit-IV, Q.No.25)**

OR

9. 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 and installments, the equipment can be sold at the and 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.

Advice which of the financing options should XYZ Ltd. exercise and why ? **(Unit-IV, Prob.3)**

10. Discuss the possible reasons for mergers. **(Unit-V, Q.No.4)**

OR

11. 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:

Particulars	A Ltd.	T Ltd.
Profit after tax	` 8,00,000	` 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. **(Unit-V, Prob.15)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A IV - Semester Examination

R19

Model Paper - II

STRATEGIC INVESTMENT AND FINANCING DECISIONS

Time : 3 Hours] [Max. Marks : 75

Note : This question paper contains two Parts **A** and **B.**

Part A is compulsory which carries 25 marks. Answer **all** questions in **Part** A.

Part B consists of 5 Units. Answer any **one** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (5 × 5 = 25 Marks)

ANSWERS

1. (a) Explain briefly about risk analysis in investment decisions. **(Unit-I, SQA.5)**
   (b) Define Pure, Simple and Mixed Investments. **(Unit-II, SQA.2)**
   (c) Write a short note on discounted payback method. **(Unit-III, SQA.5)**
   (d) What is a lease risk management? **(Unit-IV, SQA.3)**
   (e) Define Merger. **(Unit-V, SQA.4)**

Part - B (5 × 10 = 50 Marks)

2. Discuss the concept of risk adjusted discount rate approach. **(Unit-I, Q.No.9)**

OR

3. An investment corporation considers three independent factors namely,
   i) Market demand in units
   ii) Price per unit minus cost per unit and
   iii) The investment required.

   These factors are considered to carry out the investment project and to analyze new consumer product. The probability distribution of investment corporation related to new consumer product are as follows,

Annual Demand	Probability	(Price-cost) Per unit Rs.	Probability	Investment (Rs.)	Required Probability
30,000	0.03	2.00	0.09	29,80,000	0.30
35,000	0.07	6.00	0.19	40,00,000	0.40
40,000	0.15	8.00	0.20	45,00,000	0.30
45,000	0.20	11.00	0.25		
50,000	0.25	12.00	0.27		
55,000	0.10				
60,000	0.20				

By using simulation process, repeat the trial 10 times. Based on the data provided for each trial calculate return on investment and determine the most likely return. Use the following random numbers to determine annual demand, (Price-Cost) and the investment required,

i) 25, 30, 38, 52, 67, 72, 78, 80, 90, 95;

ii) 15, 18, 21, 42, 63, 74, 81, 87, 97, 16;

iii) 11, 20, 26, 37, 58, 49, 04, 90, 79, 90; **(Unit-I, Prob.18)**

4. Compare and contrast between IRR, MIRR and multiple IRR. **(Unit-II, Q.No.13)**

OR

5. Nikhil electricals limited is evaluating a capital project requiring an outlay of ` 8 million. It is expected to generate a net cash inflow of ` 2 million annually for 6 years. The opportunity cost of capital is 18%. Nikhil electronics Ltd., can raise a term loan of ` 5 million for the project. The term loan will carry an interest rate of 15% and would be repayable in 5 equal annual installments, assume the first year installment is due for second year. The balance amount required for the project can be raised by issuing external equity. The issue cost is expected to be 10%. The tax rate for the company is 40%.

(i) What is the base NPV?

(ii) What is adjusted NPV? **(Unit-II, Prob.14)**

6. Define project selection ? Discuss the significance of information and data bank in project selections. **(Unit-III, Q.No.24)**

OR

7. The expected cashflows of a project are as follows

Year	0	1	2	3	4	5
Cashflow	-100,000	20,000	30,000	40,000	50,000	30,000

The cost of capital is 12%. Calculate discounted payback period. **(Unit-III, Prob.1)**

8. Briefly explain the risk associated with leasing. **(Unit-IV, Q.No.29)**

OR

9. Explain the advantages of leasing. **(Unit-IV, Q.No.34)**

10. Discuss different government guidelines for takeover. **(Unit-V, Q.No.21)**

OR

11. The chief executive of a company thinks that shareholders always look for the earnings per share. Therefore, he considers maximisation of the earnings per share as his company's objective. His company's current net profits are Rs 80 lakh and EPS is Rs 4. The current market price is Rs 42. He wants to buy another firm which has current income of Rs 15.75 lakh, EPS of Rs 10.50 and the market price per share of Rs 85.

What is the maximum exchange ratio which the chief executive should offer so that he could keep EPS at the current level? If the chief executive borrows funds at 15 per cent rate of interest and buys-out another company by paying cash, how much should he offer to maintain his EPS? Assume a tax rate to 52 per cent. **(Unit-V, Prob.5)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A IV - Semester Examination

R19

Model Paper - III

STRATEGIC INVESTMENT AND FINANCING DECISIONS

Time: 3 hours Max. Marks: 75

Note : This question paper contains two Parts **A** and **B.**

Part A is compulsory which carries 25 marks. Answer **all** questions in **Part** A.

Part B consists of 5 Units. Answer any **one** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (5 × 5 = 25 Marks)

ANSWERS

1. (a) What is Risk Adjusted Rate of Return? **(Unit-I, SQA.6)**
   (b) What is risk Adjusted NPV? **(Unit-II, SQA.1)**
   (c) Write a short note on Bail-out Pay Back **(Unit-III, SQA.7)**
   (d) What is lease financing? **(Unit-IV, SQA.1)**
   (e) How does conglomerate merger differ from horizontal merger? **(Unit-V, SQA.10)**

Part - B (5 × 10 = 50 Marks)

2. Explain the various methods of Capital Rationing Decisions. **(Unit-I, Q.No.23)**

OR

3. Rahul Ltd. has a portfolio of five stocks with the following expected market values and returns.

Stocks	Market value (Rs.)	Return (%)
Ace	40,000	8
Bell	50,000	20
Crown	20,000	15
Dell	1,00,000	9
Egan	30,000	12
	2,40,000	

Determine Rahul Ltd's expected portfolio return. **(Unit-I, Prob.24)**

4. Explain the concept of Multiple IRR with an example. **(Unit-II, Q.No.11)**

OR

5. Cummings products company is considering two mutually exclusive investment.

The project expected net cash flows are as follows,

Year	A	B
0	(300)	(405)
1	(387)	134
2	(193)	134
3	000)	134
4	600	134
5	600	134
6	850	134
7	(180)	0

(a) Construct NPV profiles for A and B projects discounted at 10%.

(b) What is each projects MIRR at a cost of capital 10%? **(Unit-II, Prob.10)**

6. Explain briefly about Hertz simulation ? Elaborate the process of Hertz simulation. **(Unit-III, Q.No.22)**

OR

7. A company is considering two mutually exclusive projects X and Y Project X costs Rs. 30,000 and Project Y Rs. 36,000. You have been given below the net present value probability distribution for each project :

Project X		Project Y	
NPV Estimate Rs.	Probability	NPV Estimate Rs.	Probability
3,000	0.1	3,000	0.2
6,000	0.4	6,000	0.3
12,000	0.4	12,000	0.3
15,000	0.1	15,000	0.2

(i) Compute the expected net present value of projects X and Y.

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

(iii) Which project do you consider more risky and why ?

(iv) Compute the profitability index of each project. **(Unit-III, Prob.17)**

8. Briefly explain the financial evaluation of leasing. **(Unit-IV, Q.No.30)**

OR

9. What are the differences between borrowing and procuring? **(Unit-IV, Q.No.16)**

10. Define diversification ? Explain different types of diversification. **(Unit-V, Q.No.9)**

OR

11. Rosy Ltd. is contemplating the purchase of Lily Ltd. Rosy Ltd has 3,00,000 shares having a market price of ` 30 per share while Lily Ltd has 2,00,000 shares selling at ` 20 per share. The EPS of Rosy Ltd and Lily Ltd are ` 4 and ` 2.25 respectively. There is a proposal for exchange of 0.5 share of Rosy Ltd for 1 share of Lily Ltd. Calculate EPS after merger and the impact on EPS for the shareholders of both the companies. **(Unit-V, Prob.17)**