ISS RATHORE INSTITUTE ISS

Strategic Financial Management
By CA. Gaurav Jain

100% Coverage
More than 300 Concepts covered in Just 25 Classes
+ 2 Theory Classes

All Classes At:
1/50 iSS Building, Lalita Park, Laxmi Nagar, New Delhi- 110092
Contact Details: 08527336600 / 011- 43073355
Email: gjainca@gmail.com
# Strategic Financial Management

## List of Chapters Covered:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dividend Policy</td>
<td>3</td>
</tr>
<tr>
<td>2. Bond Valuation</td>
<td>26</td>
</tr>
<tr>
<td>3. Mutual Fund</td>
<td>49</td>
</tr>
<tr>
<td>4. Portfolio Management</td>
<td>54</td>
</tr>
<tr>
<td>5. Futures</td>
<td>83</td>
</tr>
<tr>
<td>6. Options</td>
<td>97</td>
</tr>
<tr>
<td>7. Foreign Exchange Risk Management (FOREX)</td>
<td>124</td>
</tr>
<tr>
<td>8. Valuation of Business</td>
<td>151</td>
</tr>
<tr>
<td>9. Merger and Acquisition</td>
<td>159</td>
</tr>
<tr>
<td>10. Leasing</td>
<td>169</td>
</tr>
<tr>
<td>11. Capital Budgeting</td>
<td>180</td>
</tr>
<tr>
<td>12. Miscellaneous</td>
<td>195</td>
</tr>
<tr>
<td>13. Last year Exam Paper</td>
<td>214</td>
</tr>
</tbody>
</table>
# DIVIDEND POLICY

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. -1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept No. - 2: Dividend Yield, Dividend Pay-out</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. - 3: EPS, DPS, MPS</td>
<td></td>
</tr>
<tr>
<td>Concept No. - 4: Dividend Payment Chronology</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. - 5: Dividend Policy (Models / Theory)</td>
<td>3,4,5</td>
</tr>
<tr>
<td>Concept No. - 6: Gordon’s Model/Growth Model/ Dividend discount Model</td>
<td>6,7</td>
</tr>
<tr>
<td>Concept No. - 7: Determination of Growth rate</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. – 8 : MM Approach (IRRELEVANCE THEORY)</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. – 9 : Multi-stage Dividend discount Model [ If $g &gt; K_e$ ]</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. – 10 : Present Value of Growth Opportunity (PVGO)</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. – 11 : Application of Floating Cost</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. – 12 : Application of P / E Ratio</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. – 13 : Redical Approach</td>
<td>14</td>
</tr>
<tr>
<td>Concept No. – 14 : IRR Technique &amp; Growth Model</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. – 15 : Over – Valued &amp; Under – Valued Shares</td>
<td>16</td>
</tr>
<tr>
<td>Concept No. – 16: Holding Period Return (HPR)</td>
<td>17</td>
</tr>
<tr>
<td>Concept No. – 17: Negative Growth</td>
<td>18</td>
</tr>
<tr>
<td>Concept No. – 18: Approaches to Dividend</td>
<td>19</td>
</tr>
<tr>
<td>Concept No. – 19: P / E Ratio at which Dividend payout will have no effect on the value of the share</td>
<td>20</td>
</tr>
<tr>
<td>Concept No. – 20: Return on Equity</td>
<td>21</td>
</tr>
<tr>
<td>Concept No. – 21: Book Value Per Share (BVPS)</td>
<td>22</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>Concept No. – 22: Maximum Dividend</td>
<td>23</td>
</tr>
<tr>
<td>Concept No. – 23: Price at the end of each year</td>
<td>24</td>
</tr>
<tr>
<td>Concept No. – 24: Graham &amp; Dodd Model (traditional Approach)</td>
<td>25</td>
</tr>
<tr>
<td>Concept No. – 25: Linter’s Model</td>
<td>26</td>
</tr>
<tr>
<td>Concept No. – 26: Increase or Decrease in MPS due to Investment in new Project</td>
<td>27</td>
</tr>
<tr>
<td>Concept No. – 27: Maximization of Shareholder’s Wealth</td>
<td>28</td>
</tr>
<tr>
<td>Concept No. – 28: If $\text{EPS}_0$ or $\text{EPS}_1$ is given</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 29: Preference Dividend Coverage Ratio &amp; Equity Dividend Coverage Ratio</td>
<td></td>
</tr>
</tbody>
</table>
Concept No. - 1: Introduction

Dividend Policy divides net earnings into retained earnings and dividends.

Two types of decision are taken in Dividend Policy:-

(i) Long-term financing decision
(ii) Wealth maximization decision

Internal Financing & External Financing:

➢ Internal source of financing means using own funds i.e. Retained Earnings.

➢ External source of financing means taking funds from outside i.e. Equity Share Capital, Preference Share Capital, Debentures, Bonds, etc.

➢ Internal financing is generally less expensive because firm doesn’t incur any floating cost to obtain it.

Factors Effecting Dividend Policy:

1. Financial needs of the company
2. Desire of Share Holders
3. Funds Availability
4. Industry Trend
5. Legal Constraints
6. Cost of Capital & Internal rate of return
7. Ownership/Control
8. Discretion of Management
9. Liquidity needs of Company
10. Stability of Dividends
Define:

1. **Cash Dividends**
   - Regular Dividends: Occurs when a company pays out a portion of profits on a consistent basis. E.g. Quarterly, Yearly, etc.
   - Special Dividends: They are used when favourable circumstances allow the firm to make a one-time cash payment to shareholders, in addition to any regular dividends. E.g. Cyclical Firms
   - Liquidating Dividends: Occurs when company goes out of business and distributes the proceeds to shareholders.

2. **Stock Dividends (Bonus Shares)**:
   - Stock Dividend are dividends paid out in new shares of stock rather than cash. In this case, there will be more shares outstanding, but each one will be worth less.
   - Stock dividends are commonly expressed as a percentage. A 20% stock dividend means every shareholder gets 20% more stock.

**Example: Stock dividend**

Dwight Craver owns 100 shares of Carson Construction Company at a current price of Rs. 30 per share. Carson has 10,00,000 shares of stock outstanding, and its earnings per share (ESP) for last year were Rs.1.50. Carson declares a 20% stock dividend to all shareholders of record as of June 30.

What is the effect of the stock dividend on the market price of the stock, and what is the impact of the dividend on Craver’s ownership position in the company?

**Solution:**

**Impact of 20% stock Dividend on Shareholders**

<table>
<thead>
<tr>
<th></th>
<th>Before Stock Dividend</th>
<th>After Stock Dividend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share outstanding</td>
<td>10,00,000</td>
<td>10,00,000 × 1.20 = 12,00,000</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>Rs. 1.50</td>
<td>Rs. 1.50 / 1.20 = Rs. 1.25</td>
</tr>
</tbody>
</table>
### Stock Splits:

1. Stock Splits divide each existing share into multiple shares, thus creating more shares. There are now more shares, but the price of each share will drop correspondingly to the number of shares created, so there is no change in the owner’s wealth.

2. Splits are expressed as a ratio. In a 3-for-1 stock split, each old share is split into three new shares.

3. Stock splits are more common today than stock dividends.

#### Example: Stock Split

Carson Construction Company declares a 3-for-2 stock split. The current stock price is Rs. 30, earnings for last year were Rs. 1.50, dividends were Rs. 0.60 per share, and there are 1 million shares outstanding.

What is the impact on Carson’s shares outstanding, stock price, EPS, dividends per share,, dividend yield, P/E, and market value?

#### Solution:

**Impact of a 3-for-2 stock split on shareholders**

<table>
<thead>
<tr>
<th></th>
<th>Before Stock Dividend</th>
<th>After Stock Dividend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share outstanding</td>
<td>10,00,000</td>
<td>10,00,000 × (3/2) = 15,00,000</td>
</tr>
<tr>
<td>Stock price</td>
<td>Rs. 30.00</td>
<td>Rs. 30.00 / (3/2) = Rs. 20.00</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>Rs. 1.50</td>
<td>Rs. 1.50 / (3/2) = Rs. 1.00</td>
</tr>
<tr>
<td>Dividends per share</td>
<td>Rs. 0.60</td>
<td>Rs. 0.60 / (3/2) = Rs. 0.40</td>
</tr>
<tr>
<td>Dividend yield</td>
<td>Rs. 0.06 / Rs. 30.00 = 2.0%</td>
<td>Rs. 0.40 / Rs. 20.00 = 2.0%</td>
</tr>
<tr>
<td>P / E Ratio</td>
<td>Rs. 30.00 / Rs. 1.50 = 20</td>
<td>Rs. 20.00 / Rs. 1.00 = 20</td>
</tr>
<tr>
<td>Total Market Value</td>
<td>10,00,000×Rs.30=Rs.3,00,00,000</td>
<td>15,00,000×Rs.20=Rs.3,00,00,000</td>
</tr>
<tr>
<td>Earning Yield</td>
<td>1.5 / 30 = 0.05</td>
<td>1 / 20 = 0.05</td>
</tr>
</tbody>
</table>
4. **Reverse Stock splits:**
   i. *Reverse stock splits* are the opposite of stock splits.
   ii. After a reverse split there are fewer shares outstanding but a higher stock price. Since these factors offset one another, shareholder wealth is Unchanged.
   iii. A company in financial distress whose stock has fallen dramatically may declare a reverse stock split to increase the stock price.

**Effects on Financial ratios:**
   i. Paying a cash dividend decreases assets (cash) and shareholders’ equity (retained earnings). Other things equal, the decrease in cash will decrease a company’s liquidity ratios and increase its debt-to-assets ratio, while the decrease in shareholders’ equity will increase its debt-to-equity ratio.
   ii. Stock dividends, stock splits, and reverse stock splits have no effect on a company’s leverage ratio or liquidity ratios or company’s assets or shareholders’ equity.

*Note 1:* Dividend is 1st paid to preference share holder before any declaration of dividend to equity share holders.

*Note 2:* Dividend is always paid upon FV(Face Value) not on Market Value.

**Concept No. - 2: Dividend Yield, Dividend Pay-out Ratio, Dividend Rate, Retention Ratio**

\[
\text{Dividend Yield} = \frac{\text{Dividend per share}}{\text{Market price per share}} \times 100
\]

\[
\text{Dividend pay-out Ratio} = \frac{\text{Dividend per share}}{\text{Earning per share}} \times 100
\]

\[
\text{Dividend Rate} = \frac{\text{Dividend per share}}{\text{Face value per share}} \times 100
\]

\[
\text{Earning Yield} = \frac{\text{Earning per share}}{\text{Market Price per share}} \times 100
\]

\[
\text{Retention Ratio} = \frac{\text{Retained Earning per share}}{\text{Earning per share}} \times 100
\]

\[
= \frac{\text{EPS} - \text{DPS}}{\text{EPS}} \times 100
\]
OR

\[ = 1 - \text{Dividend Payout Ratio} \]

Note: Dividend yield and Earning Yield is always calculated on annual basis.

Concept No. - 3: \( EPS, DPS, MPS \)

\[
EPS = \frac{\text{Total earning available to equity shareholders}}{\text{Total number of equity shares}}
\]

\[
DPS = \frac{\text{Total dividend paid to equity shareholders}}{\text{Total number of equity shares}}
\]

\[
MPS = \frac{\text{Total Market Value/ Market Capitalization/ Market Cap}}{\text{Total number of equity shares}}
\]

Concept No. - 4: Dividend Payment Chronology

<table>
<thead>
<tr>
<th>Declaration Date</th>
<th>Last cum-dividend Date</th>
<th>Ex-dividend Date</th>
<th>Holder-of-record Date</th>
<th>Payment Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 25</td>
<td>September 14</td>
<td>September 15</td>
<td>September 17</td>
<td>September 30</td>
</tr>
</tbody>
</table>

Declaration Date :- The date the board of directors approves payment of the dividend.

Last cum-dividend Date :- The date before Ex-dividend date. If any shareholder purchase or own this share on or before this date he will be entitled for dividend. Date upto which shares can be bought in the stock market, and be eligible to receive dividend.

Ex-dividend date :- The first day a share of stock trades without the dividend. The ex-dividend date is occurs two business days before the holder-of-record date. If you buy the share on or after the ex-dividend date, you will not receive the dividend.

Holder-of-record date :- The date on which the shareholders of record are designated to receive the dividend.

Payment date:- The date the dividend checks are mailed out, or when the payment is electronically transferred to shareholder accounts.

Note:
1. If Question is Silent, always Assume Ex-Dividend price of share.

2. It may be noted that in all the formula, we consider Ex-Dividend & not Cum-Dividend.

**Concept No. - 5: Dividend Policy (Models / Theory)**

Dividend Policy (Models/Theory)

- **Relevant Theory**
  - Walter’s Model
  - Growth Model

- **Irrelevant Theory**
  - MM Approach

**Relevant Theory**: Dividend played an important role in determination of market price of share.

**Irrelevant Theory**: Dividend do not play any role in determination of market price of share.

**Walter’s Model**:

Walter’s supports the view that the dividend policy plays an important role in determining the market price of the share.

He emphasis **two factor** which influence the market price of a share:-

(i) Dividend Payout Ratio.

(ii) The relationship between Internal return on Retained earnings (r) and cost of equity capital (Kₑ)

Walter classified all the firms into **three categories**:-

i. Growth Firm.

ii. Declining Firm.

iii. Normal or Constant Firm

**Growth Firm**:

- If rate of return on Retained earnings (r) exceeds its cost of equity capital (Kₑ)i.e. (r >Kₑ). In this case, the shareholder’s would like the company to retain maximum amount i.e. to keep payout ratio quite low.
- In this case, there is negative correlation between dividend and market price of share.
If \( r > K_e \), Higher the Retention Ratio [i.e. Lower the Dividend Pay-out Ratio] Higher the Market Price per Share.

**Declining Firm**:

- If rate of return on Investment (\( r \)) is lower than the cost of equity capital (\( K_e \)) i.e. (\( r < K_e \)). In this case, the shareholder’s won’t like the firm to retain the profits so that they can get higher return by investing the dividend received by them.

- In this case, there is positive correlation between dividend and market price of share.

- If \( r < K_e \), Lower the Retention Ratio [i.e. Higher the Dividend Pay-out Ratio] Higher the Market Price per Share.

**Constant Firm**:

- If rate of return on Retained earnings (\( r \)) is equal to the cost of equity capital (\( K_e \)) i.e. (\( r = K_e \)). In this case, the shareholder’s would be indifferent about splitting off the earnings between dividend & Retained earnings.

- If \( r = K_e \), Any Retention Ratio or Any Dividend Payout Ratio will not affect Market Price of share. MPS will remain same Under any Dividend Payout Or Retention Ratio.

**Note**: Walter concludes:-

(i) The optimum payout ratio is NIL in case of growth firm.

(ii) The optimum payout ratio for declining firm is 100%

(iii) The payout ratio of constant firm is irrelevant.

**Crux**:

<table>
<thead>
<tr>
<th>Category of the Firm</th>
<th>( r \ Vs. K_e )</th>
<th>Correlation between size of dividend &amp; market price of share</th>
<th>Optimum Payout Ratio</th>
<th>Optimum Retention Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>( r &gt; K_e )</td>
<td>Negative</td>
<td>0 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Constant</td>
<td>( r = K_e )</td>
<td>No Correlation</td>
<td>Every payout is Optimum</td>
<td>Every payout is Optimum</td>
</tr>
<tr>
<td>Decline</td>
<td>( r &lt; K_e )</td>
<td>Positive</td>
<td>100%</td>
<td>0 %</td>
</tr>
</tbody>
</table>

Current market price of a share is the present value of two cash flow streams:-

i. Present Value of all dividend.

ii. Present value of all return on retained earnings.
In order to testify the above, Walter has suggested a mathematical valuation model i.e.,

\[ P_0 = \frac{DPS}{K_e} + \frac{r}{K_e} \left( \frac{EPS - DPS}{K_e} \right) \]

Or

\[ P_0 = \frac{D + \frac{r}{K_e} (E - D)}{K_e} \]

When \( P_0 \) = Current price of equity share (Ex-dividend price)

DPS = Dividend per share paid by the firm

\( r \) = Rate of return on investment of the firm / IRR / Return on equity

\( K_e \) = Cost of equity share capital / Discount rate / expected rate of return/opportunity cost / Capitalisation rate

EPS = Earning per share of the firm

**Assumptions** :-

i. DPS & EPS are constant.

ii. \( K_e \) & \( r \) are constant.

iii. Going concern assumption, company has infinite life.

**Concept No. - 6: Gordon’s Model/Growth Model/ Dividend discount Model**

➢ Gordon’s Model suggest that the dividend policy is relevant and can effect the value of the share.

➢ Dividend Policy is relevant as the investor’s prefer current dividend as against the future uncertain Capital Gain

Current Market price of share = PV of future Dividend, growing at a constant rate

\[ P_0 = \frac{D_0 (1+g)}{K_e - g_c} \]

OR

\[ P_0 = \frac{D_1 (\text{next expected dividend})}{K_e - g_c} \]
OR

\[ P_0 = \frac{E(1-b)}{K_e-br} \]

\( P_0 \) = Current market price of share.

\( K_e \) = Cost of equity capital/ Discount rate/ expected rate of return/ Opportunity cost / Capitalisation rate.

\( g \) = Growth rate

\( D_1 \) = DPS at the end of year / Next expected dividend / Dividend to be paid

\( D_0 \) = Current year dividend / dividend as on today / last paid dividend

\( EPS \) = EPS at the end of the year

\( b \) = Retention Ratio

\( 1-b \) = Dividend payout Ratio

**Note:**
Watch for words like ‘Just paid’ or ‘recently paid’, these refers to the last dividend \( D_0 \) and words like ‘will pay’ or ‘is expected to pay’ refers to \( D_1 \).

**Assumptions:**

i. No external finance is available.

ii. \( K_e & r \) are constant.

iii. ‘\( g \)’ is the product of its Retention Ratio ‘\( b \)’ and its rate of return ‘\( r \)’

i.e. \( g = b \times r \) or \( g = RR \times ROE. \)

iv. \( K_e > g \)

**Note 1:**

\[ g = RR \times ROE \]

or

\[ g = b \times r \]

\( b = RR \) = Retention Ratio

\( r = ROE \) = Return on Equity

**Analysis:**

1. As the difference between \( K_e \) and \( g \) widens, the value of the stock falls.
2. As difference narrows, the value of stock rises.

3. Small change in the difference between $K_e$ and $g$ can cause large change in the stock value

**Optimum dividend as per Gordon Model’s**

<table>
<thead>
<tr>
<th>Category of the Firm</th>
<th>r Vs. $K_e$</th>
<th>Optimum Payout Ratio</th>
<th>Optimum Retention Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>$r &gt; K_e$</td>
<td>0 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Normal</td>
<td>$r = K_e$</td>
<td>Indifferent</td>
<td>Indifferent</td>
</tr>
<tr>
<td>Decline</td>
<td>$r &lt; K_e$</td>
<td>100 %</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Note 1:** $\text{EPS}_1 (1-b) = \text{DPS}_1$

**Proof :-**

$$\text{EPS}_1 (1-b) = \text{EPS}_1 \times \text{Dividend payout Rate}$$

$$= \text{EPS}_1 \times \frac{\text{DPS}_1}{\text{EPS}_1}$$

$$= \text{DPS}_1$$

**Note 2:** If $\text{EPS} = \text{DPS}$ & $g = 0$

$$P_0 = \frac{D_0 (1+g)}{K_e-g}$$

$$P_0 = \frac{D_0}{K_e} \text{ as } g = 0$$

$$P_0 = \frac{\text{EPS}}{K_e} \quad \text{('.' } \text{DPS} = \text{EPS})$$

**Note 3:** $P_0 = \frac{\text{DPS}_1 + \text{MPS}_1}{1 + K_e}$

Price at the beginning = PV of Dividend at end + PV of market price at end

$$P_0 = \frac{D_1 + P_1}{(1 + K_e)}$$

$$\Rightarrow P_0 + P_0 K_e = D_1 + P_0 (1 + g)$$

$$\Rightarrow P_0 + P_0 K_e - P_0 - P_0 g = D_1$$

$$\Rightarrow P_0 (K_e - g) = D_1$$
=> \( P_0 = \frac{D_1}{K_e - g} \)

**Note 4:** P / E Ratio = \( \frac{\text{Market Price per share}}{\text{Earning per share}} \)

**Note 5:** (See Concept No. 12)

\( K_e = \frac{1}{\text{P.E Ratio}} \)

**Concept No. 7: Determination of Growth rate**

The sustainable growth rate is the rate at which equity, earnings and dividends can continue to grow indefinitely assuming that ROE is constant, the dividend payout ratio is constant, and no new equity is sold.

**Method 1:** Sustainable growth (g) = (1 - Dividend payout Ratio) \( \times \) ROE

Or

\( g = RR \times ROE \)

**Method 2:**

\( D_n = D_0 (1 + g)^{n-1} \)

\( D_0 = \text{Base year dividend} \)
\( D_n = \text{Latest (Current year dividend)} \)
\( n-1 = \text{No. Of times } D_0 \text{ increases to } D_n \)

**Example: Calculate growth (g)**

<table>
<thead>
<tr>
<th>Year</th>
<th>DPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>1.1</td>
</tr>
<tr>
<td>1999</td>
<td>1.21</td>
</tr>
<tr>
<td>2000</td>
<td>1.33</td>
</tr>
<tr>
<td>2001</td>
<td>1.46</td>
</tr>
</tbody>
</table>

**Solution:**

\( D_n = D_0 (1 + g)^{n-1} \)
1.46 = 1(1 + g)^{5-1} \\
g = 10% \\

**Concept No. – 8 : MM Approach (IRRELEVANCE THEORY)**

Dividend do not play any role in determination of market value. Market value is rather affected by earnings and investment.

**Formulae** :

\[
nP_0 = \frac{(n+m)\times P_1 + E_1 - I_1}{(1 + K_e)^1}
\]

n = Existing number of equity shares at the beginning of the year \\
m = New number of equity shares, issued at year end market price \\
P_0 = Current market price as on today \\
P_1 = Market price per share at the end of year one \\
E_1 = Total earning at the end of year one \\
I_1 = Total investment at the end of year one \\
K_e = Cost of equity \\

nP_0 = Market value of the company as on today \\
n+m = Total no of equity share at the end (old + new share) \\
(n + m)P_1 = Total market value of the company at the end. \\

Amount raised by issue of new equity shares = Investment – [ Earning – Dividend ] \\

[Since dividend do not appear in the formulae], we can conclude that under MM approach, dividend do not play any role in determination of Market Value.

**Note 1:**

The Market Price of a share = PV of dividend paid at end + PV of market price at the end at the beginning of a period

\[
P_0 = \frac{P_1 + D_1}{(1 + K_e)^1}
\]

Calculate P_1 from this formulae.

**Note 2: New number of equity share**
Concept No. – 9 : Multi-stage Dividend discount Model [ If \( g > K_e \) ]

➢ Growth model is used under the assumption of \( g = \) constant.

If \( g > K_e \)

A firm may temporarily experience a growth rate that exceeds the required rate of return on firm’s equity but no firm can maintain this relationship indefinitely.

Value of a dividend-paying firm that is experiencing temporarily high growth =

(i) PV of dividends expected during high growth period.

\[
\text{Value} = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{K_e-g_c}
\]

When \( P_n = \frac{D_n(1+g_c)}{K_e-g_c} \)

Example:

Consider a stock with dividends that are expected to grow at 20% per year for four years, after which they are expected to grow at 5% per year, indefinitely. The last dividend paid was Rs.1.00, and \( K_e = 10\% \). Calculate the value of this stock using the multistage growth model.

Solution:

Calculate the dividends over the high growth period:

\[
D_1 = D_0 (1+g^*) = 1.00(1.20) = \text{Rs.}1.20.
\]

\[
D_2 = D_1 (1 + g^*) = 1.20(1.20) = 1.22 = \text{Rs.}1.44
\]

\[
D_3 = D_2 (1 + g^*) = 1.44(1.20) = 1.73 = \text{Rs.}1.73
\]

\[
D_4 = D_3 (1 + g^*) = 1.73(1.20) = 2.08 = \text{Rs.}2.08 \text{ (rounded up)}
\]

\[
P_4 = \frac{D_4(1+g^*)}{K_e-g} = \frac{D_5}{K_e-g_c} = \frac{2.08(1+0.05)}{0.10-0.05} = 43.68
\]
Finally, we can sum the present values of dividends 1, 2, 3 and 4 and of $P_4$ (price at end of year 4), to get the present value of all the expected future dividends during both the high- and constant-growth periods:

$$
\frac{1.20}{1.1} + \frac{1.44}{1.1^2} + \frac{1.73}{1.1^3} + \frac{2.08}{1.1^4} + \frac{43.68}{1.1^4} = \text{Rs.}34.84
$$

**Concept No. – 10: Present Value of Growth Opportunity (PVGO)**

PVGO = Value of firm with growth – Value of firm without growth

\[ \therefore \text{PVGO} = \frac{D_1}{K_e - g} - \frac{D_0(1+g)}{K_e - g} \text{ (when } g = 0) \]

If $DPS = EPS$ then,

\[ \text{PVGO} = \frac{D_1}{K_e - g} - \frac{EPS}{K_e} \]

**Example:**

Calculate the value of stock that paid a Rs. 2 dividend last year, if dividends are expected to grow at 5% forever and the required return on equity is 12%. How much of the estimated stock value is due to dividend growth.

**Solution:**

Determine $D_1 : D_0 (1 + g_c) = \text{Rs.} 2(1.05) = \text{Rs.} 2.10$

Calculate the stock’s value $= \frac{D_1}{K_e - g_c} = \frac{\text{Rs.} 2.10}{0.12 - 0.05} = \text{Rs.} 30.00$

The estimated stock value with a growth rate of zero is:

\[ V_0 = \frac{D_1}{K_e} = \frac{\text{Rs.} 2}{0.12} = \text{Rs.} 16.66 \]

The amount of the estimated stock value due to estimated dividend growth is:

\[ \text{Rs.} 30.00 - \text{Rs.} 16.66 = \text{Rs.} 13.33 \]

**Concept No. – 11: Application of Floating Cost**

Floating Cost are costs associated with the issue of new equity. E.g. Brokerage, Commission, underwriting expenses etc.

If floating Cost is expressed in % i.e. $P_0 (1 - f) = \frac{D_1}{K_e - g_c}$
If floating Cost is expressed in Absolute Amount i.e. 

\[ P_0 - f = \frac{D_1}{K_e - g_c} \]

**Note:**

\( K_e \) of new equity will always be greater than \( K_e \) of existing equity.

**Note:**

Floatation Cost is only applicable in case of new shares.

**Concept No. – 12 : Application of P / E Ratio**

\[ \text{P / E Ratio} = \text{Price Earning Ratio} = \frac{MPS}{EPS} \]

\& \[ \text{E / P Ratio} = \text{Earning Price Ratio} = \frac{EPS}{MPS} \]

\[ K_e = \frac{1}{\text{P/E Ratio}} = \frac{EPS}{MPS} = \text{E/P Ratio / Earning Price Ratio / Earning Yield} \]

**Proof :-**

\[ P_0 = \frac{D_0(1+g)}{K_e - g} \Rightarrow P_0 = \frac{D_0}{K_e} \quad \text{If} \ (g = 0\%) \]

\[ P_0 = \frac{EPS}{K_e} \quad \text{If} \ (EPS = \text{DPS}) \]

\[ K_e = \frac{EPS}{P_0} = \frac{EPS}{MPS} \cdot \frac{1}{\text{P/E Ratio}} \]

**Concept No. – 13 : Radical Approach**

Application of Tax under dividend policy.

**Concept No. – 14 : IRR Technique & Growth Model**

IRR is the discount rate that makes the present values of a project’s estimated cash inflows equal to the present value of the project’s estimated cash outflows.

At IRR Discount Rate \( \Rightarrow \) PV (inflows) = PV (outflows)

The IRR is also the discount rate for which NPV of a project is equal to Zero.
IRR technique is used when,

1. $K_e$ is missing.
2. More than one growth rate is given.

\[
IRR = \text{Lower Rate}_{NPV} + \frac{\text{Lower Rate}_{NPV} - \text{Higher Rate}_{NPV}}{\text{Lower Rate}_{NPV}} \times \text{Difference in Rate}
\]

**Concept No. – 15: Over – Valued & Under – Valued Shares**

<table>
<thead>
<tr>
<th>Case- I</th>
<th>Value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Market Price &gt; PV Market Price</td>
<td>Over – Valued</td>
<td>Sell</td>
</tr>
<tr>
<td>Actual Market Price &lt; PV Market Price</td>
<td>Under – Valued</td>
<td>Buy</td>
</tr>
<tr>
<td>Actual Market Price = PV Market Price</td>
<td>Correctly Valued</td>
<td>Buy / Sell</td>
</tr>
</tbody>
</table>

**Note:** CAPM Model

\[
K_e = R_f + \text{Beta} (R_m - R_f)
\]

$R_f$ = Risk free return

$R_m$ = Return Market

$(R_m - R_f)$ = Market Risk Premium

**Note:**

1. Government Securities is considered to be risk-free like U.S Treasury Securities.
2. Actual Market Price will always given then compare Actual Market Price with PV market price i.e. Calculated Market Price by CAPM or expected market price.

**Concept No. – 16: Holding Period Return (HPR)**

\[
HPR = \frac{(P_1 - P_0) + D_1}{P_0}
\]

\[
= \frac{P_1 - P_0}{P_0} + \frac{D_1}{P_0}
\]

(Capital gain Return/Yield) (Dividend Return / Yield)
Concept No. – 17: Negative Growth

If positive Growth, then
\[ P_0 = \frac{D_0(1+g)}{K_e - g} \]

If Negative Growth, then
\[ P_0 = \frac{D_0(1-g)}{K_e + g} \]

Note: We Know \( g = RR \times ROE \)

<table>
<thead>
<tr>
<th>Case I</th>
<th>EPS &gt; DPS</th>
<th>Retention is Positive</th>
<th>g = Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case II</td>
<td>EPS &lt; DPS</td>
<td>Retention is Negative</td>
<td>g = Negative</td>
</tr>
<tr>
<td>Case III</td>
<td>EPS = DPS</td>
<td>No Retention</td>
<td>g = 0</td>
</tr>
</tbody>
</table>

Concept No. – 18: Approaches to Dividend

Three types of Dividend Approach:

1. Constant Dividend Amount Approach
2. Constant Dividend Payout Approach
3. Residual Dividend Approach

1. **Constant Dividend Amount Approach**:

Under this model, a fixed amount of dividend is paid each year irrespective of the earnings. There would be no reduction in dividend even during the period of losses.

Example:
Assume Constant Dividend Amount = Rs. 4

<table>
<thead>
<tr>
<th>Year</th>
<th>EPS</th>
<th>DPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>45</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>-7</td>
<td>4</td>
</tr>
</tbody>
</table>

2. **Constant Dividend Payout Approach**:

Under this approach, Dividend Payout Ratio is kept constant. There could be zero dividends during the period of losses.

Example:
Assume Constant Dividend Payout - 50 %

<table>
<thead>
<tr>
<th>Year</th>
<th>EPS</th>
<th>DPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>12.5</td>
</tr>
<tr>
<td>3</td>
<td>45</td>
<td>22.5</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>-7</td>
<td>1</td>
</tr>
</tbody>
</table>

3. **Residual Dividend Approach**:
Under this Approach Earnings or Retained Earnings should first be used for beneficial investments and then if any amount is let should be used for paying dividend.

**Example 1:**

Earnings Available: Rs. 1,00,000; Investment Required: Rs. 20,000. Determine the amount of Dividend to be paid and external financing required under Residual Approach?

Dividend to be paid = Rs. 80,000; Amount of External Financing Required = Nil

**Example 2:**

Earnings Available: Rs. 1,00,000; Investment Required: Rs. 1,30,000. Determine the amount of Dividend to be paid and external financing required under Residual Approach?

Dividend to be paid = Nil; Amount Of External Financing Required = Rs. 30,000

**Concept No. – 19:** Calculate P/E Ratio at which Dividend payout will have no effect on the value of the share.

When \( r = K_e \), dividend payout ratio will not affect value of share.

**Example:**

If \( r = 10\% \) then \( K_e = 10\% \) and \( K_e = \frac{1}{P/ERatio} \Rightarrow 0.10 = \frac{1}{P/ERatio} \)

\( \Rightarrow P/E \) Ratio = 10 times

**Concept No. – 20:** Return on Equity

Return on Equity = \( \frac{\text{Earnings available for Equity Shareholders}}{\text{Equity shareholder's Fund}} \)

**Concept No. – 21:** Book Value Per Share (BVPS)

\( \text{BVPS} = \frac{\text{Equity Shareholder's Fund}}{\text{Total Number of Equity Share}} \) (means value of share in B/S)

**Note:** EPS = BVPS × ROE

**Concept No. – 22:** Maximum Dividend

Maximum Dividend, which can be paid by the company should be to the extent of cash available.

As per Companies Act, 1956, the Company cannot paid dividend out of capital (section 205)
Concept No. – 23: *Price at the end of each year*

\[
P_0 = \frac{P_1 + D_1}{(1 + K_e)^1}
\]

\[
P_1 = \frac{P_2 + D_2}{(1 + K_e)^1}
\]

\[
P_2 = \frac{P_3 + D_3}{(1 + K_e)^1}
\]

\[
P_3 = \frac{P_4 + D_4}{(1 + K_e)^1}
\]

So on

Concept No. – 24: *Graham & Dodd Model (traditional Approach)*

\[
P_0 = m \times \left[ \text{DPS} + \frac{\text{EPS}}{3} \right]
\]

Where \( m \) = multiplier

Concept No. – 25: *Linters Model*

We will calculate dividend to be paid by any Company.

**Assumption:**

Dividend should not fall. It may remain constant or may increase but can’t fall.

**Formula:**

\[ D_1 = D_0 + [\text{EPS}_1 \times \text{Target Dividend Payout} - D_0] \times \text{AF or } m \]

Where A For \( m \) = Adjustment factor or multiplier/ % Increase in Dividend to be maintained in future. (given in question)

\( D_0 = \) Dividend in Previous Year or Dividend Paid

\( D_1 = \) Dividend to be paid/ declared

Concept No. – 26: *Increase or Decrease in MPS due to Investment in new Project*

\[
\text{Revised MPS} = \text{Existing MPS} + \frac{\text{Total NPV}}{\text{Total number of Equity Shares}}
\]
**Example:**

Press tech is investing Rs. 500 million in new printing equipment. The present value of the future after-tax cash flows resulting from the equipment is Rs. 750 million. Press tech currently has 100 million shares outstanding, with a current market price of Rs 45 per share. Assuming that this project is new information and is independent of other expectations about the company, calculate the effect of the new equipment on the value of the company and the effect on press tech’s stock price.

**Solution:**

NVP of the new printing equipment project = Rs. 750 million – Rs. 500 million = Rs. 250 million

Value of the company prior to new equipment project

= 100 million share × Rs. 45 per share = Rs. 4.5 billion

Value of the company after new equipment project

= Rs. 45 billion + Rs.250 million = Rs. 4.75 billion

Price per share after new equipment project = Rs. 4.75 billion / 100 million share = Rs. 47.50

The stock price should increase from Rs. 45.00 per share to Rs. 47.50 per share as a result of the project.

**Concept No. – 27: Maximization of Shareholder’s Wealth**

Wealth of Shareholder’s will include following two items:

1. Value per share
2. Dividend per share

**Concept No. – 28: If \( EPS_0 \) or \( EPS_1 \) is given**

If EPS and Retention Ratio is given then use, \( P_0 = \frac{EPS_1 (1-b)}{K_e-g} \)

Read Question Carefully
Concept No. – 29: Preference Dividend Coverage Ratio & Equity Dividend Coverage Ratio

Preference Dividend Coverage Ratio = \frac{\text{Profit After Tax}}{\text{Preference Dividend}}

Equity Dividend Coverage Ratio = \frac{\text{Profit After Tax} - \text{Preference Dividend}}{\text{Dividend payable to equity share holders}}

Note:
The Higher the Better. These Ratios indicates the surplus profit left after meeting all the fixed obligation. It shows the dividend paying ability of a firm.
## BOND VALUATION

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. - 1:  Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept No. - 2: Purpose of Bond’s indenture &amp; describe affirmative and negative covenants</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 3:  Terms used in Bond Valuation</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 4:  Coupon Rate Structures</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 5:  Straight/Option – free Bonds</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 6:  Steps in the Bond – Valuation Process</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 7:  Perpetual Bond/ Irredeemable Bond/ Non – Callable Bond</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. – 8:  Valuation of Zero-Coupon Bond</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. -9:  Valuation of Bond with Changing Coupon Rate</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. – 10:  Over – Valued &amp; Under – Valued Bonds</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. - 11:  Semi – annual Coupon Bonds</td>
<td>6,7</td>
</tr>
<tr>
<td>Concept No. – 12:  Self – Amortization Bond</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. – 13:  Fair Value of Convertible Bond</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. – 14:  Calculation of Current Yield</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. – 15:  YTM (Yield to Maturity) / K_d / Cost of debt</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. – 16:  Treatment of Tax</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. – 17:  Treatment of Floating Cost</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. – 18:  Holding Period Return (HPR) for Bonds</td>
<td>14</td>
</tr>
<tr>
<td>Concept No. – 19:  Yield to call (YTC) &amp; Yield to Put (YTP)</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. – 20:  Relationship between YTM &amp; Coupon Rate</td>
<td>16</td>
</tr>
<tr>
<td>Concept No. – 21: Relationship between Bond Value &amp; YTM</td>
<td>17</td>
</tr>
<tr>
<td>Concept No. – 22: Spot Rate</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 23: Relationship between Forward Rate and Spot Rate</td>
<td>18</td>
</tr>
<tr>
<td>Concept No. – 24: Strips (Separate Trading of Registered Interest &amp; Principal Securities) Program</td>
<td>19</td>
</tr>
<tr>
<td>Concept No. – 25: Cum Interest &amp; Ex-interest Bond Value</td>
<td>20</td>
</tr>
<tr>
<td>Concept No. – 26: Credit Rating Requirement</td>
<td>21</td>
</tr>
<tr>
<td>Concept No. – 27: Relationship between Bond Value &amp; Maturity</td>
<td>22</td>
</tr>
<tr>
<td>Concept No. – 28: Duration</td>
<td>23,24</td>
</tr>
<tr>
<td>Concept No. – 29: Modified Duration/ Sensitivity/ Volatility</td>
<td>25</td>
</tr>
<tr>
<td>Concept No. – 30: Duration of a Portfolio</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 31: Callable Bond</td>
<td>26</td>
</tr>
<tr>
<td>Concept No. – 32: Downside Risk, Conversion Premium, Conversion Parity Price</td>
<td>27,28,29</td>
</tr>
<tr>
<td>Concept No. – 33: Overlapping Interest</td>
<td>30</td>
</tr>
<tr>
<td>Concept No. – 34: Yield to Worst</td>
<td>31</td>
</tr>
<tr>
<td>Concept No. – 35: Return Calculation</td>
<td>32</td>
</tr>
<tr>
<td>Concept No. – 36: Bond issued under an open ended scheme</td>
<td>33</td>
</tr>
<tr>
<td>Concept No. – 37: Bond Purchased between two coupon dates</td>
<td>34</td>
</tr>
<tr>
<td>Concept No. – 38: Types of Bond Risk</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 39: Disadvantage of callable or Pre-payable security to an investor</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 40: Common Options embedded in a bond Issue, Options benefit the issuer or the Bondholder</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 41: Calculation of After-tax yield of a taxable security &amp; tax-equivalent yield of a tax-exempt security</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 42: Re-investment income</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 43: Convexity, Positive Convexity &amp; Negative Convexity</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 44: Value of a non-callable, Non-convertible Preferred Stock</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 45: Cost of Redeemable &amp; Irredeemable Preference Share</td>
<td></td>
</tr>
<tr>
<td>Concept No. – 46: Value of the Bond at the end of each year</td>
<td></td>
</tr>
<tr>
<td>35,36</td>
<td></td>
</tr>
<tr>
<td>35,36</td>
<td></td>
</tr>
</tbody>
</table>
Concept No. - 1: Introduction (Fixed Income Security)

Bonds are the type of long term obligation which pay periodic interest & repay the principal amount on maturity.

Concept No. - 2: Purpose of Bond’s indenture & describe affirmative and negative covenants

- The contract that specifies all the rights and obligations of the issuer and the owners of a fixed income security is called the Bond indenture.
- These contract provisions are known as covenants and include both negative covenants (prohibitions on the borrower) and affirmative covenants (actions that the borrower promises to perform) sections.

i. Negative Covenants: This includes
   a) Restriction on asset sales (the company can’t sell assets that have been pledged as collateral).
   b) Negative pledge of collateral (the company can’t claim that the same assets back several debt issues simultaneously).
   c) Restriction on additional borrowings (the company can’t borrow additional money unless certain financial conditions are met).

ii. Affirmative Covenants: This includes
   a) Maintenance of certain financial ratios.
   b) Timely payment of principal and interest.

Example:

The borrower might promise to maintain the company’s current ratio at a value of two or higher. If this value of the current ratio is not maintained, then the bonds could be considered to be in (technical) default.

Concept No. – 3: Terms used in Bond Valuation

i. Face Value → Rs. 1000
ii. Maturity Year → 10 years
iii. Coupon rate → 10%
   - Coupon Rate is used to calculate Interest Amount.
   - Face Value is always used to calculate Interest Amount.

Example:

1000 X 10% = Rs. 100 p.a.
If Semi annual then 1000 X 10% = Rs. 100/2 = Rs. 50 semi-annually

iv. Current Market Price/Issue Price → Rs. 950
v. Required return of investor/ Cost of debt/ → 12%
Note:

- If Maturity Value is not given, then it is assumed to be equal to Face Value.
- If Face Value is not given, then it is assumed to be Rs. 100 or Rs. 1000 according to the Question.
- If Maturity Year is not given, then it is assumed to be equal to infinity.

Concept No. – 4: Coupon Rate Structures

i. Zero – Coupon Bond (Pure Discount Securities)
   a) They do not pay periodic interest.
   b) They pay the Par value at maturity and the interest results from the fact that Zero – Coupon Bonds are initially sold at a price below Par Value. (i.e. They are sold at a significant discount to Par Value).

ii. Step – up Notes
   a) They have coupon rates that increase over – time at a specified rate.
   b) The increase may take place one or more times during the life cycle of the issue.

iii. Deferred – Coupon Bonds
   a) They carry coupons, but the initial coupon payments are deferred for some period.
   b) The coupon payments accrue, at a compound rate, over the deferral period and are paid as a lump sum at the end of that period.
   c) After the initial deferment period has passed, these bonds pay regular coupon interest for the rest of the life of the issue (to maturity).

iv. Floating – Rate Securities
   a) These are bond for which coupon interest payments over the life of security vary based on a specified reference rate.
   b) Reference Rate may be LIBOR [London Interbank Offered Rate] or EURIBOR or any other rate and then adds or subtracts a stated margin to or from that reference rate.

   New coupon rate = Reference rate ± quoted margin

v. Inverse Floater
   This is a floating – rate security with the coupon formula that actually increases the coupon rate when a reference interest rate decreases, and vice versa.
E.g. :- **Coupon rate = 12% - reference rate accomplishes this**

vi. **Inflation – indexed Bond**

They have coupon formulas based on inflation.

E.g. :- **Coupon rate = 3% + annual change in CPI**

**Concept No. – 5: Straight/Option – free Bonds**

- This is the simplest case considered a Treasury Bond that has a 6% coupon and matures five years from today in the amount of Rs. 1000.
- This bond is a promise by the issuer to pay 6% of the Rs. 1000 Par value (i.e. Rs. 60) each year for five years and to repay the Rs. 1000 five years from today.

**Concept No. – 6: Steps in the Bond – Valuation Process**

**Step 1** : Estimates the cash flows over the Life of the bond.

Two type of Cash Flows:-

a) Coupon Payments  
b) Return of Principal

**Step 2** : Determine the appropriate discount rate.

**Step 3** : Calculate the present value of the estimated cash flow using appropriate discount rate.

\[
B_0 = \frac{\text{Interest}}{(1+\text{YTM})^1} + \frac{\text{Interest}}{(1+\text{YTM})^2} + \ldots + \frac{\text{Interest}}{(1+\text{YTM})^n} + \frac{\text{Maturity value or Par value}}{(1+\text{YTM})^n}
\]

Or

\[
\text{Interest} \times \text{PVAF (Yield \%, n year)} + \text{Maturity Value} \times \text{PVF (Yield \%, n}\text{th year)}
\]

\(n = \text{No. of years to Maturity}\)

**Concept No. 7: Perpetual Bond/ Irredeemable Bond/ Non – Callable Bond**

They are infinite bond, never redeemable, non- callable bond.

\[
\text{Value of Bond} = \frac{\text{Annual Interest}}{K_d/\text{YTM}}
\]

\(K_d= \text{Cost of debt /Yield to Maturity}\)
Concept No. – 8: Valuation of Zero-Coupon Bond

- Zero-coupon Bond has only a single payment at maturity.
- Value of Zero-Coupon Bond is simply the PV of the Par or Face Value.

\[
\text{Bond value} = \frac{\text{Maturity Value}}{(1+K_d)^n}
\]

\(K_d\) = Discount rate/ Yield to Maturity

\(n\) = No. Of years

Note :

If semi – annual coupon bond

\[
\text{Bond value} = \frac{\text{Maturity Value}}{(1+K_d/2)^{n \times 2}}
\]

Example: Valuing a Zero-coupon bond

Compute the value of a 10-year, Rs. 1000 face value zero-coupon bond with yield to maturity of 8%.

Solution:

To find the value of this bond given its yield to maturity of 8%,

We can Calculate:

\[
\text{Bond value} = \frac{1000}{(1+0.08)^{10}} = \frac{1000}{(1.08)^{10}} = \text{Rs.} \ 463.1989
\]

Concept No. -9: Valuation of Bond with Changing Coupon Rate

Coupon rate changes from one year to another year as per the terms of bond-indenture.

Concept No. – 10: Over – Valued & Under – Valued Bonds

<table>
<thead>
<tr>
<th>Case</th>
<th>Value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual MP of Bond &gt; PV of MP of Bond</td>
<td>Over – Valued</td>
<td>Sell</td>
</tr>
<tr>
<td>Actual MP of Bond &lt; PV of MP of Bond</td>
<td>Under – Valued</td>
<td>Buy</td>
</tr>
<tr>
<td>Actual MP of Bond = PV of MP of Bond</td>
<td>Correctly Valued</td>
<td>Either Buy/ Sell</td>
</tr>
</tbody>
</table>


**Concept No. - 11: Semi – annual Coupon Bonds**

i. Pay interest every six months

ii. a) \( \frac{YTM}{2} \) b) \( \frac{Coupon \ rate \ p.a.}{2} \) c) \( n \times 2 \)

YTM always given annually.

**Note:**
- If quarterly use 4 instead of 2
- If monthly use 12 instead of 2

**Concept No. – 12: Self – Amortization Bond**

They make periodic interest and principal payments over the life of the bond. i.e. at regular interval.

**Concept No. – 13: Fair Value of Convertible Bond**

- Converted into equity shares after certain period.
- When conversation value > Bond value, option can be exercised otherwise not.
- Conversation Value = No. of equity X Market value at the time of Conversion
- Conversion Ratio = No. of share Received per Convertible Bond

**Concept No. – 14: Calculation of Current Yield**

\[
\text{Current Yield} = \frac{\text{Annual Cash Coupon Payment}}{\text{Bond Price or Market Price}}
\]

**Note:** Current Yield is always calculated on per annum basis.

**Example:**

Consider a 20-year, Rs. 1000 Par value, 6% annual pay bond that is currently trading at Rs. 802.07. Calculate the current yield.

**Solution:**

The annual cash coupon payment total:
Annual cash coupon payment = par value X stated coupon rate = Rs. 1000 X 0.06 = Rs. 60

Since the bond is trading at Rs. 802.07, the current yield is:

Current Yield = \( \frac{60}{802.07} \) = 0.0748, or 7.48%

**Concept No. – 15: YTM (Yield to Maturity) / \( K_d \) / Cost of debt / Mkt rate of Interest / Mkt rate of return**

- YTM is an annualised overall return on the bond if it is held till maturity.

**Alternative 1:** By IRR technique.

\[
B_0 = \frac{\text{Interest}}{1+k_d} + \frac{\text{Interest}}{(1+k_d)^2} + \ldots + \frac{\text{Interest}}{(1+k_d)^n} + \frac{\text{Maturity value or Par value}}{(1+k_d)^n}
\]

- YTM & price contain the same information
- If YTM given, calculate Price.
- If Price given, calculate YTM.

\[
\text{YTM} = \text{Lower Rate} + \frac{\text{Lower Rate}_{\text{NPV}}}{\text{Lower Rate}_{\text{NPV}} - \text{Higher Rate}_{\text{NPV}}} \times \text{Difference in Rate}
\]

**Example:**

Consider a 20year, Rs. 1000 par value bond, with a 6% coupon rate with a full price of Rs. 802.07. Calculate the YTM.

**Solution:**

\[
802.07 = \frac{60}{(1+k_d)^1} + \frac{60}{(1+k_d)^2} + \ldots + \frac{60}{(1+k_d)^20} + \frac{1000}{(1+k_d)^20}
\]

\( K_d = 8.0188\% \)

**Alternative 2:** By approximation formula

\[
\text{YTM} = \frac{\text{Interest} + \frac{\text{Maturity Value} - B_0}{\text{Maturity Value} + B_0}}{2}
\]

- If existing bond :-
  \( B_0 = \) Current Market Price of Bond (1st preference is given to this)
  
  Or

  Present value Market Price of Bonds.

- If new bond issued :-

__iSS Rathore Institute__
__email: gjainca@gmail.com__
B₀ = Net Proceeds
    = Issue Price
    = Face value – Discount + Premium (-) Floating Cost

**Concept No. – 16: Treatment of Tax**

- Tax is an important part for our analysis, it must be considered if it is given in question.

- Two types of Tax rates are given:
  
i. **Interest Tax rate** :-

  We should take Interest Net of Tax i.e. Interest Amount \((1 – Tax)\)

  ii. **Capital Gain Tax rate** :-

  Take Maturity value after Capital Gain Tax i.e.

  Maturity Value – Capital Gain Tax Amount

**Formulae:**

\[
YTM = \frac{\text{Interest}(1–\text{Tax rate}) + \frac{\text{MV net of CG Tax} – B₀}{n} \text{MV net of CG Tax} + B₀}{\frac{n}{2}}
\]

**Concept No. – 17: Treatment of Floating Cost**

- Cost associated with the issue of new bonds.
  - e.g. Brokerage, Commission, etc

  - We should take Bond value \((B₀)\) Net of Floating Cost.

\[
YTM = \frac{\text{Interest} + \frac{\text{Maturity Value} – B₀(1–f)}{\text{Maturity Value} + B₀(1–f)}}{\frac{n}{2}}
\]

**Note:**

1. Where \((f)\) is floating cost expressed in percentage.
2. If floating cost is given in absolute amount then simply deduct floating cost from Bond Value i.e. $B_0 - f$.

**Concept No. – 18: Holding Period Return (HPR) for Bonds**

$$HPR = \frac{B_1 - B_0 + I_1}{B_0}$$

(Capital gain Return/Yield) + (Interest Yield /Current Yield)

**Note:** HPR are assumed to be per annum basis unless specified in the question.

**Concept No. – 19: Yield to call (YTC) & Yield to Put (YTP)**

i. **Yield to Call**

**Callable Bond:** When company call its bond or Re-purchase its bond prior to the date of Maturity.
**Call Price:** Price at which Bond will call by the Company.
**Call Date:** Date on which Bond is called by the Company prior to Maturity.

$$YTC = \frac{\text{Interest} + \frac{\text{Call Price} - B_0}{n}}{\frac{\text{Call Price} + B_0}{2}}$$

$n = \text{No. of Years upto Call Date.}$

ii. **Yield to Put**

**Puttable Bond:** When investor sell their bonds prior to the date of maturity to the company.
**Put Price:** Price at which Bond will put/ Sell to the Company.
**Put Date:** Date on which Bond is sold by the investor prior to Maturity.

$$YTP = \frac{\text{Interest} + \frac{\text{Put Price} - B_0}{n}}{\frac{\text{Put Price} + B_0}{2}}$$

$n = \text{No. of years upto Put Date.}$

**Concept No. 20: Relationship between YTM & Coupon Rate**

<table>
<thead>
<tr>
<th>Bonding Selling At</th>
<th>Coupon Rate = Yield to Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Par</td>
<td></td>
</tr>
</tbody>
</table>
**Concept No. – 21: Relationship between Bond Value & YTM**

- When the coupon rate on a bond is equal to its market yield, the bond will trade at its par value.

- If yield required in the market subsequently rises, the price of the bond will fall & it will trade at a discount.

- If required yield falls, the bond price will increase and bond will trade at a premium.

**Crux :**

If YTM increases, bond value decreases & vice-versa, other things remaining same.

YTM & Bond value have inverse relationship.

**Concept No. – 22: Spot Rate**

- Yield to maturity is a single discount rate that makes the present value of the bond’s promised cash flow equal to its Market Price.

- The appropriate discount rate for individual future payments are called *Spot Rate*.
Discount each cash flow using a discount rate i.e. specific to the maturity of each cash flow.

**Example**
Consider an annual-pay bond with a 10% coupon rate and three years of maturity. This bond will make three payments. For a Rs. 1000 bond these payments will be Rs. 100 in one year, Rs. 100 at the end of two years, and Rs. 100 three years from now. Suppose we are given the following spot rates:
- 1 year = 8%
- 2 year = 9%
- 3 year = 10%

**Solution**:
Discounting each promised payment by its corresponding spot rate, we can value the bond as:

\[
\frac{100}{1.08} + \frac{100}{1.09^2} + \frac{1100}{1.10^3} = 1003.21
\]

**Concept No. – 23: Relationship between Forward Rate and Spot Rate**

**Forward Rate** is a borrowing/lending rate for a loan to be made at some future date.

- \( f_0 \) = Spot Rate or Current YTM (rate of 1 year loan)
- \( f_1 \) = Rate for a 1 year loan, one year from now
- \( f_2 \) = Rate for a 1 year loan to be made two years from now

**Relationship**:

\[
(1+S_2)^2 = (1 + f_0) (1 + f_1)
\]

Or \( S_2 = \{(1 + f_0) (1 + f_1)\}^{1/2} - 1 \)

\[
(1+S_3)^3 = (1+f_0) (1 + f_1) (1 + f_2)
\]

Or \( S_3 = \{(1 + f_0) (1 + f_1) (1 + f_2)\}^{1/3} - 1 \)

**Crux**:
The idea here is that borrowing for three years at the 3-year rate or borrowing for 1 year period, three year is succession, should have the same cost.

**Example**:
Using forward rates:
The current 1-year rate \( (f_0) \) is 4%
the 1-year forward rate for lending from time =1 to time=2 is \( f_1 =5\% \), and
the 1-year forward rate for lending from time =2 to time =3 is \( f_2 =6\% \).
Calculate value of a 3-year annual-pay bond with 5% coupon and a par value of Rs. 1000.

**Solution**:
Bond value = \[ \frac{50}{(1 + \frac{1}{f_0})} + \frac{50}{(1 + \frac{1}{f_0})(1 + \frac{1}{f_1})} + \frac{1050}{(1 + \frac{1}{f_0})(1 + \frac{1}{f_1})(1 + \frac{1}{f_2})} \]

= \frac{50}{(1.04)} + \frac{50}{(1.04)(1.05)} + \frac{1050}{(1.04)(1.05)(1.06)} = \text{Rs. 1000.98}

**Concept No. – 24: Strips (Separate Trading of Registered Interest & Principal Securities)**

Program

Under this, Strip the coupons from the principal, repackage the cash flows and sell them separately as Zero – Coupon Bonds, at discount.

![Diagram of Bond Strip]

| Bond Strip | Coupon Strip | Principal Strip |

Value of Bond = \[ \frac{\text{Interest}}{(1+k_d)^1} + \frac{\text{Interest}}{(1+k_d)^2} + \ldots + \frac{\text{Interest}}{(1+k_d)^n} + \frac{\text{Maturity value}}{(1+k_d)^n} \]

| Coupon Strips | Principal Strips |

**Concept No. – 25: Cum Interest & Ex-interest Bond Value**

- When Bond value include amount of interest it is known as **Cum-Interest Bond Value**, otherwise not.

- If question is Silent, we will always assume ex-interest.

- Assume value of Bond \( (B_0) \) as ex – interest.

- If it is given Cum-Interest then deduct Interest and proceeds your calculations.

**Concept No. – 26: Credit Rating Requirement**

- As per SEBI regulation, no public or right issue of debt/bond instruments shall be made unless credit rating from credit rating agency has been obtained and disclosed in the offer document.

- Rating is based on the track record, financial statement, profitability ratios, debt – servicing capacity ratios, credit worthiness & risk associated with the company.
Concept No. – 27: Relationship between Bond Value & Maturity

- Prior to Maturity, a bond can be selling at significant discount or premium to Par value.
- Regardless of its required yield, the price will converge to par value as Maturity approaches.
- Value of premium bond decrease to par value, value of Discount bond increases to Par value.
- Premium and discount vanishes.

Example:

Consider Rs 1000 par value bond, 3 year life, paying 6% semi annual coupons. The bond value corresponding to required yields of 3,6,12% as the bond approaches maturity are present in the table below:

<table>
<thead>
<tr>
<th>Time to Maturity</th>
<th>YTM = 3%</th>
<th>YTM = 6%</th>
<th>YTM = 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 years</td>
<td>Rs. 1085.40</td>
<td>Rs. 1000.00</td>
<td>Rs.852.48</td>
</tr>
<tr>
<td>2.5</td>
<td>1071.74</td>
<td>1000.00</td>
<td>873.63</td>
</tr>
<tr>
<td>2.0</td>
<td>1057.82</td>
<td>1000.00</td>
<td>896.05</td>
</tr>
<tr>
<td>1.5</td>
<td>1043.68</td>
<td>1000.00</td>
<td>919.81</td>
</tr>
<tr>
<td>1.0</td>
<td>1029.34</td>
<td>1000.00</td>
<td>945.00</td>
</tr>
<tr>
<td>0.5</td>
<td>1014.78</td>
<td>1000.00</td>
<td>971.69</td>
</tr>
<tr>
<td>0.0</td>
<td>1000.00</td>
<td>1000.00</td>
<td>1000.00</td>
</tr>
</tbody>
</table>

Concept No. – 28: Duration (Macaulay Duration)

- Duration of the bond is a weighted average of the time (in years) until each cash flow will be received i.e. interest & Principal repayment is fully recovered.
Duration of bond will always be less than or equal to maturity years.

**Formulae**

\[
\text{Duration} = \frac{1}{B_0} \left[ 1 \times \frac{\text{Interest}}{(1+k_d)^1} + 2 \times \frac{\text{Interest}}{(1+k_d)^2} + \ldots + n \times \frac{\text{Interest}}{(1+k_d)^n} + n \times \frac{\text{Maturity value}}{(1+k_d)^n} \right]
\]

**Concept No. – 29: Modified Duration/ Sensitivity/ Volatility**

Modified Duration = \( \frac{\text{Macaulay Duration}}{1 + YTM} \)

Modified duration will always be lower than Macaulay’s Duration.

**Concept No. – 30: Duration of a Portfolio**

It is simply the weighted average of the durations of the individual securities in the Portfolio.

\[
\text{Portfolio Duration} = W_1D_1 + W_2D_2 + W_3D_3 + \ldots + W_nD_n
\]

\[
W_i = \frac{\text{Market value of bond } i}{\text{Market value of Portfolio}}
\]

\[
D_i = \text{Duration of bond } (i)
\]

\[
N = \text{No. Of bonds in the Portfolio}
\]

**Example : Calculating portfolio duration**

Suppose you have two-security portfolio containing Bonds A and B. The market value of bond A is Rs. 6000, and the Market Value of Bond B is Rs. 4000. The duration of Bond A is 8.5, and the duration of Bond B is 4.0. Calculate the duration of portfolio.

**Solution :**

First, calculating the weights of each bond. Since market value of the portfolio is Rs.10,000 (6000 + 4000), the weight of each security bond is:

\[
\text{Weight in Bond A} = \frac{6000}{10,000} = 60%
\]

\[
\text{Weight in Bond B} = \frac{4000}{10,000} = 40%
\]

Portfolio Duration = \((0.6 \times 8.5) + (0.4 \times 4.0) = 6.7\)

**Concept No. – 31: Callable Bond**

Those bonds which can be called before the date of Maturity.
Step 1: Calculate Net Initial Outflow.
Step 2: Calculate Tax Saving on Call Premium & Unamortised Issue Cost.
Step 3: Calculate Net Annual Cash Outflow.
Step 4: Calculate Present Value of Total Net Savings by replacing Outstanding Bonds with New Bonds.

Concept No. – 32: Downside Risk, Conversion Premium, Conversion Parity Price

Downside Risk reflects the extent of decline in market value of convertible bonds at which conversion option become worthless.

i. Downside Risk or Premium over Non-Convertible Bond
   \[
   = \frac{\text{Market value of Convertible bond}}{\text{Market value of Non-Convertible bond}}
   \]

   \[
   \% \text{ Downside Risk/ \% Price Decline} = \frac{\text{Downside Risk}}{\text{Market value of Non-Convertible bond}}
   \]

ii. Conversion Premium/ Premium over Conversion Value
    \[
    = \frac{\text{Market value of Convertible bond}}{\text{Fair value of Convertible bond (No. of Shares × MPS)}}
    \]

   \[
   \% \text{ Conversion Premium} = \frac{\text{Conversion Premium}}{\text{Fair value convertible bond}}
   \]

iii. Conversion Parity Price/ No Gain No Loss
    \[
    = \frac{\text{Market value of Convertible bond}}{\text{No. of equity share issued on Conversion}}
    \]

iv. Floor Value: Floor Value is the minimum of:
   (i) Market Value of Convertible Bond.
   (ii) Market Value of Non-Convertible Bond.

Note: Market Value of Convertible Bond (Assume 5 Years)
\[
= \frac{\text{Interest}}{(1+\text{YTM})^1} + \frac{\text{Interest}}{(1+\text{YTM})^2} + \ldots + \frac{\text{Interest}}{(1+\text{YTM})^5} + \frac{\text{Conversion Value (CV}_5)}{(1+\text{YTM})^5}
\]

CV_5 = MPS at the end of Year 5 × No. of Shares.

Concept No. – 33: Overlapping Interest

Refer Question No. 30
**Concept No. – 34: Yield to Worst**

- It is the lowest yield between YTM, YTC, YTP, Yield to first call.

- Yield to worst is lowest among all.

**Concept No. – 35: Return Calculation**

- When bonds are purchased and sold within time frame.

**Concept No. – 36: Bond issued under an open ended scheme**

Refer Question No. 33

**Concept No. – 37: Bond Purchased between two coupon dates**

Refer Question No. 34

**Concept No. – 38: Types of Bond Risk**

(i) **Interest Rate Risk:**

- This refers to the effect of change in the prevailing market rate of interest on bond values.

- When interest rate rise, bond values fall.

- This is the source of interest rate risk which is approximately by a measure called Duration.

(ii) **Call Risk:**

- It arises from the fact that when interest rate fall, a callable bond investor’s principal may be returned and must be reinvested at the new lower rates.

- Bonds that are not callable have no call risk, and call protection reduces call risk.

- When interest rates are more volatile, callable bonds have relatively more call risk because of an increased probability of yields falling to a level where the bonds will be called.

(iii) **Re-investment Risk:**

- This refers to the fact that when market rate fall, the cash flow (both interest and principal) from fixed-income securities must be reinvested at lower rates, reducing the returns an investor will earn.

- Note that reinvestment risk is related to call risk and pre-payment risk.
In both of these cases, it is the reinvestment of principal cash flows at lower than were expected that negatively impacts the investors.

Coupon bonds that contain neither call nor prepayment provisions will also be subject to reinvestment risk, since the coupon interest payments must be reinvested as they are received.

(iv) **Credit Risk/Default Risk**

- The Bond Rating is used to indicate its relative probability of default, which is the probability of its issuer not making timely interest and principal payment as promised in the bond indenture. Lower-rated bonds have more default risk.
- Lower-rated issue must promise a higher yield to compensate investors for taking on greater probability of default.
- Difference between the yield on a Government security, which is assumed to be default risk free, and the yield on a similar maturity bond with a lower rating is termed the *Credit Spread*.

\[ \text{yield on a risky bond} = \text{yield on a default-free bond} + \text{credit spread} \]

- An increase in credit spread increases the required yield and decreases the price of a bond.

(v) **Exchange-rate Risk**:

- If a U.S. investor purchases a bond that makes payments in a foreign currency, dollar returns on the investment will depend on the exchange rate between the dollar and the foreign currency.
- A depreciation (decrease in value) of the foreign currency will reduce the return to a dollar-based investors.
- *Exchange rate risk* is the risk that the actual cash flows from the investment may be worth less in domestic currency than was expected when the bond was purchased.

(vi) **Inflation Risk**:

- *Inflation risk* refers to the possibility that price of goods and services in general will increase more than expected.
- When expected inflation increases, the resulting increase in nominal rates and required yields will decrease the value of previously issued fixed-income securities.

(vii) **Liquidity Risk**:

- This has to do with the risk that the sales of a fixed-income security must be made at the price less than fair market value because of a lack of liquidity for a particular issue.
- Government bonds have excellent liquidity, so selling a few million Rupees worth at the prevailing market price can be easily and quickly accomplished.
At the other end of the liquidity spectrum, a valuable painting, collectible antique automobile, or unique and expensive home may be quite difficult to sell quickly at fair market value.

Since, investors prefer more liquidity to less, a decrease in security’s liquidity will decrease its price, as the required yield will be higher.

**Concept No. – 39: Disadvantage of callable or Pre-payable security to an investor**

i. The uncertainty about the timing of cash flows is one disadvantage of callable or pre-payable securities.

ii. Second disadvantage is the Re-investment Risk.

iii. The third disadvantage is that the potential price appreciation of callable and pre-payable securities from decrease in market yields is less than that of option-free securities of like maturity. For a currently-callable bond, the call price puts an upper limit on the bond’s price appreciation.

**Concept No. – 40: Common Options embedded in a bond Issue, Options benefit the issuer or the Bondholder**

i. **Security owner options** :
   A) Conversion option
   B) Put provision
   C) Floors set a minimum on the coupon rate

ii. **Security issuer option** :
   A) Call provisions
   B) Prepayment options
   C) Accelerated sinking fund provisions
   D) Caps set a maximum on the coupon rate

**Concept No. – 41: Calculation of After-tax yield of a taxable security & tax-equivalent yield of a tax-exempt security**

After-tax yield = taxable yield × (1 – marginal tax rate)

Taxable-equivalent yield is the yield a particular investor must earn on a taxable bond to have the same after-tax return they would receive from a particular tax-exempt issue.

Taxable-equivalent yield = \[
\frac{\text{tax–free yield}}{(1-\text{marginal tax rate})}
\]

Example: Taxable-equivalent Yield
Consider a municipal bond that offers a yield of 4.5%. If an investor is considering buying a fully taxable Government security offering a 6.75% yield, should she buy the Government security or the municipal bond, given that her marginal tax rate is 35%?

**Solution**: 

We can approach this problem from two perspectives. First, the taxable equivalent yield on municipal bond is 

\[
\frac{4.5\%}{1 - 0.35} = 6.92\%,
\]

which is higher than the taxable yield, so the municipal bond is preferred.

Alternatively, the after-tax return on the taxable bond is 0.0675 \times (1 - 0.35) = 4.39\%.

Thus, the after-tax return on the municipal bond (4.5\%) is greater than the after-tax yield on the taxable bond (4.39\%), and the municipal bond is preferred.

Either approach gives the same answer; She should buy the municipal bond.

**Concept No. – 42: Re-investment income**

- Reinvestment income is important because if the reinvestment rate is less than the YTM, the realized yield on the bond will be less than the YTM.

- If a bond holder holds a bond until maturity and reinvests all coupon interest payments at YTM, the total amount generated by the bond over its life has three components:

  1. Bond Principal
  2. Coupon interest
  3. Interest on reinvested coupons

- Once we calculate the total amount needed for a particular level of compound return over a bond’s life, we can subtract the principal and coupon payments to determine the amount of reinvestment income necessary to achieve the target yield.

**Example**: Calculating required reinvestment income for a bond.

If you purchased a 6%, 10-year Government bond at par, how much reinvestment income must be generated over its life to provide the investor with a compound return of 6% on a Semi annual basis?

**Answer**:

Assuming the bond has par value of Rs. 100, we first calculate the total value that must be generated ten years (20 semi annual periods) from now as:

\[
P(1 + r)^n = 100(1.03)^{20} = Rs. 180.61
\]

There are 20 bond coupons of Rs. 3 each, totalling Rs. 60, and a payment of Rs.100 of principal at maturity.

Therefore, the required reinvestment income over the life of the bond is:
Concept No. – 43: Convexity, Positive Convexity & Negative Convexity

Convexity is the measure of the curvature of the price-yield curve. The more curved the price-yield relation is, the greater the convexity. A straight line has a convexity of Zero.

Positive Convexity

1. The price-yield relationship is negatively sloped, so the price falls as the yield rises.
2. The curve is convex (towards the origin), the option-free bond has positive convexity.
3. The price of the option-free bond increases more when yields fall than it decreases when yield rise.
4. If price-yield relationship were a straight line, there would be no difference between the price increase and the price decline in response to equal decreases and increases in yields.

Negative Convexity

1. With a callable bond, upside price appreciation in response to decreasing yields is limited.
2. As the yield falls and price approaches to call price, the price yield curve rises more slowly than that of an identical but non-callable bond.
3. When price begins to rise at a decreasing rate in response to further decreases in yield, the price-yield curve “bends over” to the left and exhibits negative convexity.
Concept No. – 44: Value of a non-callable, Non-convertible Preferred Stock

- Preferred stock pays a dividend that is usually fixed, and usually has an indefinite maturity.
- When the dividend is fixed and the stream of dividends is finite, the infinite period dividend discount model reduces to simple ratio:

\[
\text{Preferred stock value} = \frac{D_p}{K_p}
\]

Example:
A company’s Rs. 100 par preferred stock pays a Rs. 5.00 annual dividend and has a required return of 8%. Calculate the value of the preferred stock.

Solution:

\[
\text{Value of preferred stock} = \frac{D_p}{K_p} = \frac{\text{Rs. 5.00}}{0.08} = \text{Rs. 62.50}
\]

Concept No. – 45: Cost of Redeemable & Irredeemable Preference Share

Redeemable Preference Shares:

\[
K_p = \frac{\text{Dividend} + \frac{\text{Maturity Value} - (\text{Issue Price} - \text{Floating Cost})}{2}}{\text{Maturity Value} + (\text{Issue Price} - \text{Floating Cost})}^n
\]

Irredeemable Preference Shares:

\[
K_p = \frac{\text{Dividend}}{\text{Issue Price} - \text{Floating Cost}}
\]

Concept No. – 46: Value of the Bond at the end of each Year

\[
B_0 = \frac{B_1 + I_1}{(1+YTM)^1}
\]
## MUTUAL FUND

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept-1:  What is Mutual Fund</td>
<td></td>
</tr>
<tr>
<td>Concept-2:  NAV</td>
<td>1</td>
</tr>
<tr>
<td>Concept-3:  Valuation Rule</td>
<td>2</td>
</tr>
<tr>
<td>Concept-4:  Holding Period Return</td>
<td>3</td>
</tr>
<tr>
<td>Concept-5:  Expense Ratio</td>
<td>4</td>
</tr>
<tr>
<td>Concept-6:  Relationship between Return of Mutual Fund, Recurring expenses, Initial expense &amp; return desired by Investors</td>
<td>5</td>
</tr>
<tr>
<td>Concept-7:  Entry Load &amp; Exit Load</td>
<td>6</td>
</tr>
<tr>
<td>Concept-8:  Discount &amp; Premium</td>
<td>7</td>
</tr>
<tr>
<td>Concept-9:  Different Plans under Mutual Fund</td>
<td>8</td>
</tr>
<tr>
<td>Concept-10: Fall in NAV After Dividend Distribution</td>
<td>9</td>
</tr>
</tbody>
</table>
**Concept-1: What is Mutual Fund**

- A mutual fund is a common pool of money into which investors place their contributions that are to be invested in accordance with a stated objective.

- A Mutual Fund is the most suitable investment for the cautious investors as it offers an opportunity to invest in a diversified professionally managed basket of securities at a relatively low cost.

- Mutual fund is a type of passive investment. If investors directly investment in market is known as *active investment*.

**Concept-2: NAV (Net Asset Value) per unit**

- As per SEBI Regulation, every mutual fund company should calculate its NAV on a daily basis (excluding holidays)

\[
\text{NAV} = \frac{\text{Net Assets of the Scheme}}{\text{No. of units Outstanding}}
\]

- NAV signifies the realisable value that the investor will get for each unit that one is holding, if the scheme is liquidated on that date.

\[
\text{NAV per unit} = \frac{\text{Total Assets} - \text{Total External Liabilities}}{\text{number of units outstanding}}
\]

*Note:*
Net Assets i.e. Total Assets – Total External Liabilities

\[
= \left[ \text{Market Value of Investments + Receivables + Accrued Income + Other Assets} \right] - \left[ \text{Accrued Expenses + Payables + Other liabilities} \right]
\]

**Concept-3: Valuation Rule**

**(1) Asset Values : Valuation Rule**

<table>
<thead>
<tr>
<th>Nature of Asset</th>
<th>Valuation Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Assets e.g. cash held</td>
<td>As per Books</td>
</tr>
<tr>
<td>All listed and traded securities</td>
<td>Closing Market price</td>
</tr>
<tr>
<td>(other than those held as not for sale)</td>
<td></td>
</tr>
<tr>
<td>Debentures and Bonds</td>
<td>Closing traded price or yield</td>
</tr>
<tr>
<td>Illiquid shares and debentures</td>
<td>Last available price or book value whichever is lower. Estimated Market Price approach to be adopted if suitable benchmark is available.</td>
</tr>
<tr>
<td>Fixed Income Securities</td>
<td>Current Yield.</td>
</tr>
</tbody>
</table>

**(2) Netting the Asset Values**

The Asset values obtained from above have to be adjusted as follows:

<table>
<thead>
<tr>
<th>Additions</th>
<th>Deductions for Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividends and Interest</td>
<td>Expenses accrued</td>
</tr>
<tr>
<td>Other receivable considered good</td>
<td>Liabilities towards unpaid assets</td>
</tr>
<tr>
<td>Other assets (owned assets)</td>
<td>Other short term or long term liabilities</td>
</tr>
</tbody>
</table>

- While using NAV, we should always give preference to market value, If market value is not given then use book value.

**Concept-4: Calculation of Return (HPR)**

Investors derive three type of Return :-

(i) Cash Dividend
(ii) Capital Gain Disbursements
(iii) Change in the Fund’s NAV per unit (Unrealised Capital Gain)

\[
\text{Return} = \frac{\text{Closing NAV} - \text{Opening NAV}}{\text{Opening NAV}} \times 100
\]

**Concept -5: Expense Ratio**

\[
\text{Expense ratio} = \frac{\text{Expense}}{\text{Average value of Portfolio}}
\]

Or

\[
\text{Expense ratio} = \frac{\text{Expense Incurred per unit}}{\text{Average NAV}}
\]

Note:

\[
\text{Average NAV} = \frac{\text{Opening NAV} + \text{Closing NAV}}{2}
\]

**Concept -6: Relationship between Return of Mutual fund, Recurring Expenses, Issue Expenses & Return Desire by Investors**

Required return by investors

\[
= \left( \text{Return of Mutual fund} - \text{Recurring Expenses} \right) \times \left( 1 - \text{Issue Expenses} \right)
\]

**Concept -7: Entry Load & Exit Load**

*Entry Load* is paid by the investor at the time of purchase of Mutual Fund unit.

\[
\text{Sale Price of NAV} = \text{NAV} (1 + \text{Entry Load})
\]

*Exit Load* is paid by the investor at the time of selling of mutual fund units.

\[
\text{Realized value of NAV when Exit load Exists/ Total amount received by the investor on sale of units} = \text{NAV} (1 - \text{Exit Load})
\]

**Concept -8: Discount & Premium**

For Closed Ended Fund :- Premium or Discount is Calculated as
Concept -9: Different Plans Under Mutual Fund

- **Dividend Plan/Scheme**: Fixed amount of dividend is paid to the investor at regular interval.

- **Dividend Payout Plan**: Fixed amount of dividend payout is distributed as dividend.

- **Bonus Plan**: Free units are distributed to investors like bonus shares.

- **Growth Plan**: Neither dividend is distributed Nor bonus units are given. NAV will be increase to the intent of growth.

- **Dividend Re-investment Plan**: Although dividend is declared but it is not paid. Amount of dividend is again re-invested at the ex-Dividend NAV price prevailing at the time of declaration.

Concept -10: Fall in NAV after Dividend Distribution

NAV will fall by the amount of dividend distribution by the Mutual fund.

**Example**:

Current NAV = Rs. 20/unit

Dividend Pay = Rs. 2/unit

Revised NAV = Rs. 20 -2

= Rs.18/unit
# PORTFOLIO MANAGEMENT

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No.1 : Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept No. 2 : Types of investment management clients and the distinctive characteristics and need of each</td>
<td></td>
</tr>
<tr>
<td>Concept No. 3 : Steps in Portfolio Management Process</td>
<td></td>
</tr>
<tr>
<td>Concept No.4 : Major return Measures</td>
<td></td>
</tr>
<tr>
<td>Concept No.5 : Calculation of Return of an individual security</td>
<td></td>
</tr>
<tr>
<td>Concept No.6 Calculation of Risk of an individual security</td>
<td></td>
</tr>
<tr>
<td>Concept No. 7: Rules for Selection of a Security</td>
<td></td>
</tr>
<tr>
<td>Concept No.8 : Calculation of Return, Variance &amp; Risk of a Portfolio of assets</td>
<td>1,2</td>
</tr>
<tr>
<td>Concept No.9: Portfolio risk ad Correlation varies</td>
<td>3</td>
</tr>
<tr>
<td>Concept No.10: CAPM (Capital Asset Pricing Model)</td>
<td>4</td>
</tr>
<tr>
<td>Concept No.11 : Decision Based on CAPM</td>
<td>5</td>
</tr>
<tr>
<td>Concept No.12: Systematic Risk, Unsystematic risk &amp; Total Risk</td>
<td></td>
</tr>
<tr>
<td>Concept No.13: Interpret Beta/ Beta co-efficient Market sensitivity Index</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 14 : Beta of a portfolio</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 15 : Overall Beta/ Asset Beta/ Project Beta/ Firm Beta</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 16 : Overall Cost of Capital/ Discount Rate</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 17: Standard-deviation of a 3-asset Portfolio</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 18 :Arbitrage Pricing Theory/ Stephen Ross’s Apt Model</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. 19 :SML (Security Market Line)</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. 20: Application of the CAPM and SML</td>
<td></td>
</tr>
<tr>
<td>Concept No.</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>21</td>
<td>Capital Market Line (CML)</td>
</tr>
<tr>
<td>22</td>
<td>Portfolio risk and return with borrowing and lending</td>
</tr>
<tr>
<td>23</td>
<td>Optimum Weights</td>
</tr>
<tr>
<td>24</td>
<td>Co-variance of an Asset with itself is its Variance</td>
</tr>
<tr>
<td>25</td>
<td>Also used in Mutual Fund: Evaluation the performance of a Portfolio</td>
</tr>
<tr>
<td>26</td>
<td>Modern Portfolio Theory/ Markowitz Portfolio Theory</td>
</tr>
<tr>
<td>27</td>
<td>When two risk-free returns are given</td>
</tr>
<tr>
<td>28</td>
<td>Characteristic Line (CL)</td>
</tr>
<tr>
<td>29</td>
<td>Beta of Security with Regression Formula</td>
</tr>
<tr>
<td>30</td>
<td>Effect of Increase &amp; Decrease in Inflation Rates</td>
</tr>
<tr>
<td>31</td>
<td>Beta of the security Based on Return Changes</td>
</tr>
<tr>
<td>32</td>
<td>FAMA’s Net Selectivity Model</td>
</tr>
<tr>
<td>33</td>
<td>Single Index Model / Single Factor Model / Sharpe Index Model</td>
</tr>
<tr>
<td>34</td>
<td>Co-efficient of Determination</td>
</tr>
<tr>
<td>35</td>
<td>Portfolio Rebalancing</td>
</tr>
<tr>
<td>36</td>
<td>Estimating the project Discount Rate (Pure Play Technique)</td>
</tr>
</tbody>
</table>
Concept No. 1: Introduction

- **Portfolio** means combination of various underlying assets like bonds, shares, commodities, etc.

- **Portfolio Management** refers to the process of selection of a bundle of securities with an objective of maximization of return & minimization of risk.

- **Portfolio perspective** refers to evaluating individual investment by their contribution to the risk and return of an investor’s portfolio.

- An investor who holds all his wealth in a single stock because he believes it to be the best stock available - his portfolio is very risky compared to holding a diversified portfolio of stocks.

- Diversification allows an investor to reduce portfolio risk without necessarily reducing the portfolio’s expected return.

Concept No. 2: Types of investment management clients and the distinctive characteristics and need of each

<table>
<thead>
<tr>
<th>Investor</th>
<th>Risk Tolerance</th>
<th>Investment Horizon</th>
<th>Liquidity Needs</th>
<th>Income Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>Depends on Individuals</td>
<td>Depends on Individuals</td>
<td>Depends on Individuals</td>
<td>Depends on Individuals</td>
</tr>
<tr>
<td>Pension Funds</td>
<td>High</td>
<td>Long</td>
<td>Low</td>
<td>Depends on Age</td>
</tr>
<tr>
<td>Banks</td>
<td>Low</td>
<td>Short</td>
<td>High</td>
<td>Pay interest</td>
</tr>
<tr>
<td>Endowment Fund</td>
<td>High</td>
<td>Long</td>
<td>Low</td>
<td>Spending Level</td>
</tr>
<tr>
<td>Insurance</td>
<td>Low</td>
<td>Long-Life General</td>
<td>High</td>
<td>Pay Claims</td>
</tr>
<tr>
<td>Mutual Funds</td>
<td>Depends on Fund</td>
<td>Depends on Fund</td>
<td>High</td>
<td>Depends on Fund</td>
</tr>
</tbody>
</table>

Concept No. 3: Steps in Portfolio Management Process

- **Planning**: Determine Client needs and circumstances, including the client’s return objectives, risk tolerance, constraints and preferences. Create, and then periodically review and Update, an investment policy statement (IPS) that spells out these needs and Circumstances.

- **Execution**: Construct the client portfolio by determining suitable allocations to various asset
classes and on expectations about macroeconomic variables such as inflation, interest rates and GDP Growth (top-down analysis). Identify attractive price securities within an asset class for client portfolios based on valuation estimates from security analysis (bottom-up analysis).

➤ **Feedback:** Monitor and rebalance the portfolio to adjust asset class allocations and securities holdings in response to market performance. Measure & report performance relative to the performance benchmark specified in the IPS.

**Concept No.4 : Major return Measures**

(i) **Holding Period Return (HPR) :-**

HPR is simply the percentage increase in the value of an investment over a given time period.

\[
HPR = \frac{\text{Price at the end} - \text{price at the beggining} + \text{Dividend}}{\text{price at the beggining}}
\]

(ii) **Average Return:**

(a) **Arithmetic Mean Return :-**

It is the simple average of a series of periodic returns.

\[
\text{Average Return} = \frac{R_1 + R_2 + R_3 + R_4 + \ldots + R_n}{n}
\]

(b) **Geometric Mean Return :-**

It is a compound annual rate. When periodic rate of return vary from period to period. The GM return will have value less than arithmetic mean return.

Like, For return \( R_t \) over three annual periods.

\[
\text{GM return} = \sqrt[3]{(1 + R_1)(1 + R_2)(1 + R_3) - 1}
\]

**Example:**

An investor purchased $1,000 of a mutual fund’s shares. The fund had the following total returns over a 3-year period: +5%, -8%, +12%. Calculate the value at the end of the 3-year period, the holding period return, the mean annual return and the geometric mean annual return.

**Solution:**

Ending value = (1,000) (1.05)(0.92)(1.12) = $ 1,081.92

Holding period return = 1,081.92 / 1000 -1 = 8.192/ 3 = 2.73%

Arithmetic mean return = (5% - 8% + 12%) / 3 = 3%
Geometric mean return = \( \sqrt[3]{(1 + 0.05)(1 - 0.08)(1 + 0.12)} - 1 \)

\[= 0.02659 = 2.66\%\]

**Concept No.5 : Calculation of Return of an individual security**

**Return**

![Diagram](https://via.placeholder.com/150)

- Average Return
  - Based on Past Data
- Expected Return
  - Based on probability

**Average Return :-**

**Step 1:** Calculate HPR for different years, if it is not directly given in the Question.

**Step 2:** Calculate Average Return i.e. \( \frac{\sum x}{n} \)

**Example:**

Calculate Average Return.

<table>
<thead>
<tr>
<th>Year</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>30</td>
</tr>
<tr>
<td>2006</td>
<td>40</td>
</tr>
<tr>
<td>2007</td>
<td>70</td>
</tr>
<tr>
<td>2008</td>
<td>90</td>
</tr>
<tr>
<td>2009</td>
<td>100</td>
</tr>
</tbody>
</table>

Average Return = \( \frac{30 + 40 + 70 + 90 + 100}{5} \) = 66

**Expected Return (Expected Value) :-**

The Expected value is the **weighted average** of the possible outcomes of a random variable, where the weights are the probabilities that the outcome will occur.

\[ E(x) = \sum P_{Xt} X_t = P_{X1} X_1 + P_{X2} X_2 + P_{X3} X_3 + \ldots + P_{Xn} X_n \]

**Example:**

<table>
<thead>
<tr>
<th>Probability</th>
<th>Earning per Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>1.8</td>
</tr>
<tr>
<td>20%</td>
<td>1.6</td>
</tr>
<tr>
<td>40%</td>
<td>1.2</td>
</tr>
</tbody>
</table>

iSS Rathore Institute iSS

email: gjainca@gmail.com
Solution:

<table>
<thead>
<tr>
<th>EPS</th>
<th>Probability</th>
<th>Probability × EPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8</td>
<td>0.10</td>
<td>0.18</td>
</tr>
<tr>
<td>1.6</td>
<td>0.20</td>
<td>0.32</td>
</tr>
<tr>
<td>1.2</td>
<td>0.40</td>
<td>0.48</td>
</tr>
<tr>
<td>1</td>
<td>0.30</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Expected EPS = $1.28$

**Concept No.6 Calculation of Risk of an individual security**

Risk of a security will cover under 4 heads:

1) **Standard Deviation of Security (S.D):** (S.D) or $\sigma$ (sigma) is a measure of total risk / investment risk.

   **Based on Past Data:**

   $$\sigma = \sqrt{\frac{\sum (X-\overline{X})^2}{n}}$$

   $x =$ Given Data

   $\overline{X} =$ Average Return

   $n =$ No. of events/year

   **Note: For sample data, we may use (n-1) instead of n in some cases.**

   **Based on Probability:**

   $$S.D \ (\sigma) = \sqrt{\sum \text{probability}(X - \overline{X})^2}$$

   Where $\overline{X} =$ Expected Return

   ➢ S.D can never be negative. It can be zero or greater than zero.

   ➢ S.D of risk-free securities or government securities or U.S treasury securities is always assumed to be zero.

2) **Variance**

   $$\text{Variance} = (S.D)^2 = (\sigma)^2$$

   Formula Variance = $\frac{\sum (X-\overline{X})^2}{n}$
Base on Probability:-

\[ \text{Variance} = \sum \text{Probability} (X - \bar{X})^2 \]

3) Co-efficient of Variation (CV) :-
CV is used to measure the risk (variable) per unit of expected return (mean)

Formula:

\[ CV = \frac{\text{Standard Deviation of } X}{\text{Average/Expected value of } X} \]

Decision :- Lower the CV, lower the risk & vice-versa

4) Range:-
The Range is the difference between the “Highest and Lowest Expected Return.”

Example:
Possible return of the securities are 10%, 11%, 12%, 13% and 14%.

Solution:
Range = 14% - 10% = 4%

Decision: Lower the S.D/ Variance/ CV/ Range, Lower will be the Risk of Security.

**Concept No. 7: Rules for Selection of a Security**

Rule No. 1:

\[
\begin{array}{c|c|c}
\text{X Ltd.} & \text{Y Ltd} \\
\hline
\sigma & 5 & 5 \\
\text{Return} & 10 & 15 \\
\end{array}
\]

Decision :- Select Y. Ltd.

- For a given 2 securities, given same S.D or Risk, select that security which gives higher return.

Rule No. 2 :

\[
\begin{array}{c|c|c}
\text{X Ltd.} & \text{Y Ltd} \\
\hline
\sigma & 5 & 10 \\
\text{Return} & 15 & 15 \\
\end{array}
\]

Decision :- Select X. Ltd.

- For a given 2 securities, given same return, select which is having lower risk in comparison to other.
Rule No. 3 :

<table>
<thead>
<tr>
<th></th>
<th>X Ltd.</th>
<th>Y Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>σ</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Return</td>
<td>10</td>
<td>25</td>
</tr>
</tbody>
</table>

**Decision** :- Based on CV (Coefficient of Variation).

- When Risk and return are different, decision is based on CV.

\[
CV_x = \frac{5}{10} = 0.50 \\
CV_y = \frac{10}{25} = 0.40
\]

Select Y Ltd.

**Note:**
The above rules can’t be applied to Portfolio selection. It can only be applied in case of selection of individual securities. i.e. whether select Security X or Security Y.

**Concept No.8 : Calculation of Return, Variance & Risk of a Portfolio of assets**

**Portfolio Return :-**

It is the weighted average return of the individual assets/securities.

Where, \( W_1 = \frac{\text{Market Value of investments in asset}}{\text{Market Value of the Portfolio}} \)

**Formula :**

\[
\text{Portfolio Return} =\frac{\text{Average Return}}{\text{Expected return}} \times \text{Weight}_{X \text{ Ltd.}} + \frac{\text{Average Return}}{\text{Expected return}} \times \text{Weight}_{Y \text{ Ltd.}}
\]

- Sum of the weights must always =1 i.e. \( W_x + W_y = 1 \)

**Portfolio Risk :-**

Risk of a Portfolio of securities will be understood under the following heads.

1) **Standard Deviation**

**Note:**

Standard Deviation of Portfolio is NOT weighted average Standard Deviation of Individual securities.

**Example:** **WRONG PROCEDURE**
Standard Deviation of a Two-Asset Portfolio

\[
\sigma_{1,2} = \sqrt{\sigma_1^2 w_1^2 + \sigma_2^2 w_2^2 + 2\sigma_1 \sigma_2 w_1 w_2 \rho_{1,2}}
\]

where \( \rho_{1,2} = \text{Co-efficient of Co-relation} \)
\( \sigma_1 = \text{S.D of Security 1} \)
\( \sigma_2 = \text{S.D of Security 2} \)
\( w_1 = \text{Weight of Security 1} \)
\( w_2 = \text{Weight of Security 2} \)

2) **Co-efficient of Correlation**

Formulas:

\[
\rho_{1,2} = \frac{\text{COV}_{1,2}}{\sigma_1 \sigma_2}
\]

Or write as \( \text{COV}_{1,2} = \rho_{1,2} \sigma_1 \sigma_2 \)

So, S.D of two-asset Portfolio \((\sigma_{1,2}) = \sqrt{\sigma_1^2 w_1^2 + \sigma_2^2 w_2^2 + 2\sigma_1 \sigma_2 w_1 w_2 \text{COV}_{1,2}}\)

- The correlation co-efficient has no units. It is a pure measure of co-movement of the two stock’s return and is bounded by -1 and +1.
- +1 means that deviations from the mean or expected return are always proportional in the same direction. They are perfectly Positively Correlated. It is a case of maximum Portfolio risk.
- -1 means that deviation from the mean or expected values are always proportional in opposite directions. They are perfectly negatively correlated. It is a case of minimum portfolio risk.
- A correlation coefficient of ZERO means no linear relationship between the two stock’s return.

3) **Co-Variance**

Co-variance measures the extent to which two variables move together over time.

- A +ve co-variance’s means variable (e.g. Rates of return on two stocks) are trend to move together.
- Negative co-variance means that the two variables trend to move in opposite directions.

<table>
<thead>
<tr>
<th>X Ltd.</th>
<th>Y Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\sigma)</td>
<td>5</td>
</tr>
<tr>
<td>(w)</td>
<td>0.50</td>
</tr>
</tbody>
</table>
A co-variance of Zero means there is no linear relationship between the two variables.

Formula :-

**Based on Past Data**

\[
\text{Co-variance}_{1,2} = \frac{\sum (x_1 - \bar{x}_1) (x_2 - \bar{x}_2)}{n}
\]

**Based on Probability:**

\[
\text{Co-variance}_{1,2} = \sum \text{probability} (x_1 - \bar{x}_1)(x_2 - \bar{x}_2)
\]

\(x_1 = \text{Return on Asset 1}\)

\(\bar{x}_1 = \text{mean return on Asset 1}\)

\(x_2 = \text{Return on Asset 2}\)

\(\bar{x}_2 = \text{mean return on Asset 2}\)

\(n = \text{No. of Period}\)

**Note:** Co-Variance or Co-efficient of Co-relation between risk-free security & risky security will always be zero.

**Concept No.9: Portfolio risk as Correlation varies**

**Example:**

Consider 2 risky assets that have return variance of 0.0625 and 0.0324, respectively. The assets standard deviation of returns are then 25% and 18%, respectively. Calculate standard deviations of portfolio returns for an equal weighted portfolio of the two assets when their contribution of return is 1, 0.5, 0, -0.5, -1.

**Solution:**

\[
\sigma_{\text{portfolio}} = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1w_2 \sigma_1 \sigma_2 \rho_{1,2}} = \sqrt{(\sigma_1 w_1 + \sigma_2 w_2)^2}
\]

\(\rho = \text{correlation} = +1\)

\(\sigma_{\text{portfolio}} = w_1 \sigma_1 + w_2 \sigma_2\)

\(\sigma = \text{portfolio standard deviation} = 0.5(25\%) + 0.5(18\%) = 21.5\%\)

\(\rho = \text{correlation} = 0.5\)

\(\sigma = \sqrt{(0.5)2 \cdot 0.0625 + (0.5)2 \cdot 0.0324 + 2(0.5)(0.5)(0.5)(0.25)(0.18)}\)

\(\sigma = 18.70\%\)
\[ \rho = \text{correlation} = 0 \]
\[ \sigma = \sqrt{(0.5)^2 \times 0.0625 + (0.5)^2 \times 0.0324} \sigma \]
\[ = 15.40\% \]
\[ \rho = \text{correlation} = (-)0.5 \]
\[ \sigma = \sqrt{(0.5)^2 \times 0.0625 + (0.5)^2 \times 0.324 + 2(0.5)(0.5)(-0.5)(0.25)(0.18)} \]
\[ = 11.17\% \]
\[ \rho = \text{correlation} = -1 \]
\[ \sigma_{\text{portfolio}} = w_1 \sigma_1 - w_2 \sigma_2 \]
\[ \sigma = \text{portfolio standard deviation} = 0.5(25\%) - 0.5(18\%) = 3.5\% \]

**Note:**
- The portfolio risk falls as the correlation between the asset’s return decreases.
- The lower the correlation of assets return, the greater the risk reduction (diversification) benefit of combining assets in a portfolio.
- If assets return when perfectly negatively correlated, portfolio risk could be minimum.

**Concept No.10: CAPM (Capital Asset Pricing Model)**

The relationship between Beta (Systematic Risk) and expected return is known as **CAPM**.

**Required return/ Expected Return**

\[ = \text{Risk-free Return} + \frac{\text{Beta security}}{\text{Beta Market}} (\text{Return Market} - \text{Risk free return}) \]
\[ = R_F + B_s (R_m - R_F) \]

- Market Beta is always assumed to be 1.
- Market Beta is a benchmark against which we can compare beta for different securities and portfolio.
- Beta of risk free security is assumed to be Zero(0).
- \( R_m - R_F = \text{Market Risk Premium} \).
- If Return Market (R_M) is missing in equation, it can be calculated through HPR (Holding Period Return)
- **Security Risk Premium** = \( \beta \) (\( R_m - R_F \))
Concept No.11: Decision Based on CAPM

<table>
<thead>
<tr>
<th>Case</th>
<th>Decision</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPM Return &gt; Estimated Return/ HPR</td>
<td>Over-Valued</td>
<td>Sell</td>
</tr>
<tr>
<td>CAPM Return &lt; Estimated Return/ HPR</td>
<td>Under-Valued</td>
<td>Buy</td>
</tr>
<tr>
<td>CAPM Return = Estimated Return/ HPR</td>
<td>Correctly Valued</td>
<td>Buy, Sell or Ignore</td>
</tr>
</tbody>
</table>

- CAPM return need to be calculated by formula,
  \[ R_F + B (R_m - R_F) \]

- Actual return / Estimated return can be calculated through HPR

Concept No.12: Systematic Risk, Unsystematic risk & Total Risk

Total Risk \((\sigma)\) = Systematic Risk\((\beta)\) + Unsystematic Risk

Unsystematic Risk :-

- The risk that is eliminated by diversification is called Unsystematic Risk (also called unique, firm-specific risk or diversified risk). They can be controlled by the management of entity. E.g. Strikes, Change in management, etc.

Systematic risk:-

- The risk that remains can’t be diversified away is called systematic risk (also called market risk \((\beta)\) or non-diversifiable risk). This risk affects all companies operating in the market.
They are beyond the control of management. E.g. Interest rate, Inflation, Taxation, Credit Policy

**Concept No.13: Interpret Beta/ Beta co-efficient / Market sensitivity Index**

The sensitivity of an asset’s return to the return on the market index in the context of the market model is referred to as its Beta.

\[
\beta = \frac{\text{Covariance of Asset } i\text{’s return with the market return}}{\text{Variance of the Market Return}}
\]

\[
= \frac{COV_{i,m}}{\sigma_m^2}
\]

We know that Correlation Co-efficient \((\rho_{im}) = \frac{COV_{i,m}}{\sigma_i \sigma_m}\)

to get \(COV_{im} = \rho_{im} \sigma_i \sigma_m\)

Substitute \(COV_{im}\) in \(\beta\) equation, We get

\[
\beta_i = \rho_{im} \frac{\sigma_i}{\sigma_m} = \frac{\rho_{im} \sigma_i \sigma_m}{\sigma_m^2} = \rho_{im} \frac{\sigma_i}{\sigma_m}
\]

**Example: Calculation of Beta**

The standard deviation of the return on the market index is estimated as 20%.

1. If Asset A’s standard deviation is 30% and its correlation of return with the market index is 0.8, what is Asset A’s beta?

   Using formula \(\beta_i = \rho_{im} \frac{\sigma_i}{\sigma_m}\), we have: \(\beta_i = 0.8 \times \frac{0.30}{0.20} = 1.2\)

2. If the covariance of Asset A’s return with the returns on market index is 0.048, what is the beta of Asset A?

   Using formula \(\beta_i = \frac{COV_{i,m}}{\sigma_m^2}\), we have \(\beta_i = \frac{0.048}{0.2^2} = 1.2\)

**Concept No. 14 : Beta of a portfolio**

It is the weighted average beta of individual security.

Formula:
Beta of Portfolio = Beta_{X\, Ltd.} \times W_{X\, Ltd} + Beta_{Y\, Ltd.} \times W_{Y\, Ltd}

**Concept No. 15 : Overall Beta/ Asset Beta & Project Beta/ Firm Beta**

Overall Beta =

\[
\text{equity Beta} \times \frac{\text{Equity}}{\text{Equity} + \text{Debt} \times (1 - \text{tax})} + \text{Debt Beta} \times \frac{\text{Debt} \times (1 - \text{tax})}{\text{Equity} + \text{Debt} \times (1 - \text{tax})}
\]

- Overall Beta of the companies belonging to the same industry/sector, always remain same.
- Equity Beta and debt Beta may change with the change in Capital structure.
- Return on assets will always remain same, due to change in capital structure

**Concept No. 16 : Overall Cost of Capital/ Discount Rate**

Cost of Capital = K_e W_e + K_d W_d

\[
K_e = R_f + \beta_{\text{equity}} (R_m - R_f)
\]

\[
K_d = R_f + \beta_{\text{debt}} (R_m - R_f)
\]

Or

\[
K_d = \text{Interest} \times (1 - \text{tax rate})
\]

- If interest rate is not given, it is assumed to be equal to risk-free rate.
- If Beta Debt is not given, it is assumed to be equal to Zero

**Note1:**

If debt = 0
Overall Beta = Equity Beta
i.e. for 100% equity firm overall beta & equity beta is same

**Note2:**

\[
\text{Debt Equity Ratio} = \frac{\text{Debt}}{\text{Equity}}
\]

\[
\text{Debt Ratio} = \frac{\text{Debt}}{\text{Debt} + \text{Equity}}
\]

**Example :**

If Debt-Equity Ratio = 2. Calculate weight of Debt and Equity.

**Solution :**
Debt Equity Ratio = 2

\[
\frac{Debt}{Equity} = \frac{2}{1}
\]

Debt\(_w\) = \(\frac{D}{D+E}\) = \(\frac{2}{2+1}\) = \(\frac{2}{3}\)

Equity\(_w\) = \(\frac{E}{D+E}\) = \(\frac{1}{2+1}\) = \(\frac{1}{3}\)

**Concept No. 17: Standard-deviation of a 3-asset Portfolio**

\[
\sigma_{1,2,3} = \sqrt{W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + W_3^2\sigma_3^2 + 2 W_1 W_2 \sigma_1 \sigma_2 \rho_{1,2} + 2 W_1 W_3 \sigma_1 \sigma_3 \rho_{1,3} + 2 W_2 W_3 \sigma_2 \sigma_3 \rho_{2,3}}
\]

Or

\[
\sigma_{1,2,3} = \sqrt{W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + W_3^2\sigma_3^2 + 2 W_1 W_2 \text{COV}_{1,2} + 2 W_1 W_3 \text{COV}_{1,3} + 2 W_2 W_3 \text{COV}_{2,3}}
\]

**Concept No. 18: Arbitrage Pricing Theory/ Stephen Ross’s Apt Model**

Arbitrage Priming Theory breaks the systematic risk into several parts such as Interest Rate, Inflation, Gross National Product, Balance of Payment, Foreign Exchange, Fluctuations, etc.

Equations:

\[
\text{Overall Return} = \text{Risk free Return} + \{\text{Beta Inflation} \times \text{Inflation differential or factor risk Premium}\} + \{\text{Beta GNP} \times \text{GNP differential or Premium}\}...... & \text{So on.}
\]

Where, Differential or Premium = \([\text{Actual Values} – \text{Expected Values}]\)

**Concept No. 19 : SML (Security Market Line)**

- SML reflects the relationship between expected return and systematic risk (\(\beta\))

\[
E(R_i) = RFR + \frac{E(R_{market}) – RFR}{\sigma_{market}^2} (\text{COV}_{i,Market})
\]

Rearranged as,
Concept No. 20: Application of the CAPM and SML

- Analysts compare their calculated security’s return with its expected returns based on its beta risk (as per CAPM).
Example:

The information based on analyst’s calculations for 3 stocks. Assume risk-free rate if of 7% and a market return of 15%. Compute the security returns based on HPR and expected return on each stock based on CAPM, determine whether each stock is undervalued, overvalued, or properly valued, and outline an appropriate reading strategy.

Security Data

<table>
<thead>
<tr>
<th>Stock</th>
<th>Price Today</th>
<th>End Year Price</th>
<th>Dividend</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>25</td>
<td>27</td>
<td>1.00</td>
<td>1.0</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>45</td>
<td>2.00</td>
<td>0.8</td>
</tr>
<tr>
<td>C</td>
<td>15</td>
<td>17</td>
<td>0.50</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Solution:

Calculated Vs. Required Return

<table>
<thead>
<tr>
<th>Stock</th>
<th>Calculated return</th>
<th>Required Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(27 – 25 +1)/25 = 12.0%</td>
<td>0.07 + (1.0)(0.15 – 0.07) = 15.0%</td>
</tr>
<tr>
<td>B</td>
<td>(45 – 40 +2)/40 = 17.5%</td>
<td>0.07 + (0.8)(0.15 – 0.07) = 13.4%</td>
</tr>
<tr>
<td>C</td>
<td>(17 – 15 + 0.5) / 15 =16.6%</td>
<td>0.07 + (1.2)(0.15 – 0.07) = 16.6%</td>
</tr>
</tbody>
</table>

Identifying Mispriced Securities

- Stock A is **Overvalued**. Calculated returns < Required Return/ Market Return. It plots **below** the SML.
- Stock B is **Undervalued**. Calculated returns > Required Return/ Market Return. It plots **above** the SML.
- Stock C is **properly valued**. Calculated returns = Required Return/ Market Return. It plots **on** the SML.
The appropriate trading strategy is:

- Short Sell Stock A.
- Buy Stock B.
- Buy or Sell Stock C.

We can do this same analysis Graphically.

**Concept No. 21: Capital Market Line (CML)**

The line of possible portfolio risk and Return combinations given the risk-free rate and the risk and return of a portfolio of risky assets is referred to as the Capital Allocation Line.

- Under the assumption of homogenous expectations, the optimal CAL for investors is termed the Capital Market Line (CML).

- CML reflect the relationship between the expected return & total risk (σ).

Equation of this line:

\[
E(R_p) = R_F + \frac{\sigma_p}{\sigma_m} \left[ E(R_M) - R_F \right]
\]

Where \([E(R_M) - R_F]\) is Market Risk Premium

**Concept No.22: Portfolio risk and return with borrowing and lending**

- Under this we will construct a portfolio using risk-free securities and market securities.
Case 1: Investment 100% in risk-free (R_f) & 0% in Market

Risk = 0% [ S.D of risk free security is always 0(Zero).]

Return = risk-free return

Case 2: Investment 0% in risk-free (R_f) & 100% in Market

Risk = \sigma_m

Return = R_m

Case 3: Invest part of the money in Market & part of the money in Risk-free

Return = R_m W_m + R_f W_{RF}

Risk of the portfolio = \sigma_m \times W_m \quad (\sigma \text{ of } R_f = 0)

Case 4 : Invest more than 100% in market portfolio (risk free borrowing). Addition amount should be borrowed at risk-free rate.

Let the additional amount borrowed weight = x

Return of Portfolio = R_m \times (1+x) – R_f \times x

Risk of Portfolio = \sigma_m \times (1+x)

Example:

Assume that the risk-free rate, R_f is 5%; the expected rate of return on the market, E(R_M), is 11%; and that the standard deviation of returns on the market portfolio, \sigma_M, is 20%. Calculate the expected return and standard deviation of returns for portfolios that are 25%, 75% and 125% invested in the market portfolio.

We will use R_M to represent these portfolio weights.

Solution:

Expected portfolio returns are calculated as  E(R_p) = (1- W_M) \times R_f + W_M E(R_M), So we have following:

W_M : E(R_p) = 0.75 \times 5\% + 0.25 \times 11\% = 6.5\%

W_M : E(R_p) = 0.25 \times 5\% + 0.75 \times 11\% = 9.5\%

W_M : E(R_p) = -0.25 \times 5\% + 1.25 \times 11\% = 12.5\%

Portfolio standard deviation is calculated as \sigma_p=W_M \times \sigma_M and \sigma \text{ of risk-free}=0, so we have the following:

\sigma_p = 0.25 \times 20\% = 5\%

\sigma_p = 0.75 \times 20\% = 15\%

\sigma_p = 1.25 \times 20\% = 25\%
Note:

➢ With a weight of 125% in the market portfolio, the investor borrows an amount equal to 25% of his portfolio assets at 5%.

➢ An investor with Rs. 10,000 would then borrow Rs. 2,500 and invest a total of Rs. 12,500 in the market portfolio. This leveraged portfolio will have an expected return of 12.5% and standard deviation of 25%.

**Concept No. 23 : Optimum Weights**

For Risk minimization, we will calculate optimum weights.

Formula :

\[ W_A = \frac{\sigma_B^2 - Covariance (A,B)}{\sigma_A^2 + \sigma_B^2 - 2 \times Covariance (A,B)} \]

\[ W_B = 1 - W_A \text{ (Since } W_A + W_B = 1) \]

We know that

Covariance (A,B) = \( \rho_{A,B} \times \sigma_A \times \sigma_B \)

**Concept No.24 : Co-variance of an Asset with itself is its Variance**

\( COV_{(m,m)} = \text{Variance}_m \)

Note:

New Formula for Co-Variance between 2 Stocks = \( \beta_1 \times \beta_2 \times \sigma^2_m \)

Example:

Assume you have a portfolio that consists of Stock S and Stock O. The weights are \( W_S = 0.90 \) and \( W_O = 0.10 \). Using the covariance matrix provided in the following table, calculate the variance of the return for the portfolio.

Return Covariance for Stock S and Stock O

**Covariance Matrix**

<table>
<thead>
<tr>
<th>Returns Covariance</th>
<th>( R_S )</th>
<th>( R_O )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_S )</td>
<td>0.0011</td>
<td>-0.0036</td>
</tr>
<tr>
<td>( R_O )</td>
<td>-0.0036</td>
<td>0.016</td>
</tr>
</tbody>
</table>
Solution:

Recall that **The covariance of an asset with itself is its variance**, Thus the terms along the diagonal in the Covariance Matrix are return variances.

The portfolio return variance can be computed as:

\[ \text{Var} (R_P) = (0.90)^2(0.0011) + (0.10)^2(0.016) + 2 (0.90)(0.10)(-0.0036) \]

\[ = 0.000403 \]

**Concept No.25 : Also used in Mutual Fund :- Evaluation the performance of a Portfolio**

Techniques used for evaluation of the performance of a Portfolio:

1. **Sharpe’s Ratio**:
   - It is excess return over risk-free return per unit of total portfolio risk.
   - Higher Sharpe Ratio indicate better risk-adjusted portfolio performance.

Formula:

\[ \frac{R_P - R_F}{\sigma_P} \]

Where \( R_P \) = Return Portfolio

\( \sigma_P \) = S.D of Portfolio

**Note 1:**

Sharpe Ratio is useful when Standard Deviation is an appropriate measure of Risk.

**Note 2:**

The value of the Sharpe Ratio is only useful for comparison with the Sharpe Ratio of another Portfolio.

2. **Treynor’s Ratio**:
   - Excess return over risk-free return per unit of Systematic Risk (\( \beta \))

Formula :

\[ \frac{R_P - R_F}{\beta_P} \]

Decision : Higher the ratio, Better the performance.

3. **Jenson’s Measure/Alpha**:
   - This is the difference between a fund’s actual return & CAPM return
Formula:

\[ \alpha_P = R_P - (R_F + \beta (R_m - R_F)) \]

Or

Alpha = Actual Return – CAPM Return

It is excess return over CAPM return.

➢ If Alpha is +ve, performance is better.

➢ If Alpha is -ve, performance is not better.

4. Market Risk-return trade-off:

➢ Excess return of market over risk-free return per unit of market risk.

Formula:

\[ \frac{R_M - R_F}{\sigma_M} \]

Decision: Higher is better.

**Concept No.26: Modern Portfolio Theory/Markowitz Portfolio Theory**

Under this theory, we will select the best portfolio with the help of efficient frontier.

**Efficient Frontier:**
Those portfolios that have the greatest expected return for each level of risk make up the efficient frontier.

All portfolios which lie on efficient frontier are efficient portfolios.

**Efficient Portfolios:**

- a. Those portfolios having same risk but given higher return.
- b. Those portfolios having same return but having lower risk.
- c. Those Portfolio having lower risk and also given higher returns.
- d. Those portfolios undertaking higher risk and also given higher return.

**In-efficient Portfolios:**

Which don’t lie on efficient frontier.

**Solution Criteria:**

For selection of best portfolio out of the efficient portfolios, we must consider the risk-return preference of an individual investor.

- If investors want to take risk, Invest in the Upper End of efficient frontier portfolios.
- If investors don’t want to take risk, Invest in the Lower End of efficient frontier portfolios.

*Concept No.27: When two risk-free returns are given*

We are taking the Average of two Rates.

*Concept No. 28: Characteristic Line (CL)*

Characteristic Line represents the relationship between Asset excess return and Market Excess return.

Equation of Characteristic Line:

\[ Y = \alpha + b \times x \]

Where

- \( Y \) = Average return of Security
- \( x \) = Average Return of Market
- \( \alpha \) = Intercept i.e. expected return of an security when the return from the market portfolio is ZERO, which can be calculated as \( Y - \beta \times X = \alpha \)
- \( b \) = Beta of Security

**Note:**

The slope of a Characteristic Line is \( \frac{COV_{i,M}}{\sigma^2_M} \) i.e. Beta
Concept No. 29: Beta of Security with Regression Formula

Formula:

$$\beta = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$$

x = Market Return

y = Security Return

Note: Advisable to use Co-Variance formula to calculate Beta.

Concept No. 30: Effect of Increase & Decrease in Inflation Rates

Increase in Inflation Rates:

Revised $R_F = R_F +$ Increased Rate

Revised $R_M = R_M +$ Increased Rate

Decrease in Inflation Rates:

Revised $R_F = R_F -$ Decreased Rate

Revised $R_M = R_M -$ Decreased Rate

Concept No. 31: Beta of the security Based on Return Changes

$$\text{Beta} = \frac{\text{Change in Security Return}}{\text{Change in Market Return}}$$
Note: This equation is normally applicable when two return data is given.

**Concept No. 32: FAMA’s Net Selectivity Model**

\[
\text{FAMA’s Net Selectivity} = R_P - \left( RF + \frac{\sigma_P}{\sigma_m} \left[ E(R_M) - R_F \right] \right)
\]

= Actual Return – CML Returns

**Concept No. 33: Single Index Model / Single Factor Model / Sharpe Index Model**

For a Security:
Total Risk/ Total Variance = \( \sigma_s^2 \)
Systematic Risk of a security = \( \sigma_m^2 \times \beta_s^2 \)
Unsystematic Risk of a security = Total risk – Systematic Risk
= \( \sigma_s^2 - \sigma_m^2 \times \beta_s^2 \)

For A Portfolio:
Total Risk/ Total Variance = \( \sigma_p^2 \) or \( \sum W_i \beta_i^2 \sigma_m^2 + \sum W_i \sigma_i^2 \text{USR}_i \)
Systematic Risk of a Portfolio = \( \sigma_m^2 \times \beta_p^2 \)
Unsystematic Risk of a Portfolio = Total risk – Systematic Risk
= \( \sigma_p^2 - \sigma_m^2 \times \beta_p^2 \) or \( \sum W_i \sigma_i^2 \text{USR}_i \)

**Concept No. 34: Co-efficient of Determination**

Co-efficient of Determination = \((\text{Co-efficient of co-relation})^2 = r^2 \)

Co-efficient of determination \( (r^2) \) gives the percentage of variation in the security’s return i.e. explained by the variation of the market index return.

**Example:**

If \( r^2 = 18\% \)
In the X company’s stock return, 18% of the variation is explained by the variation of the index and 82% is not explained by the index.

According to Sharpe, the variance explained by the index is the systematic risk. The unexplained variance or the residual variance is the Unsystematic Risk.

**Use of Co-efficient of Determination in Calculating Systematic Risk & Unsystematic Risk:**

1. **Explained by Index[Systematic Risk]**
   = Variance of Security Return \times Co-efficient of Determination of Security
2. Not Explained by Index [Unsystematic Risk]

\[ \text{Variance of Security Return} \times (1 - \text{Co-efficient of Determination of Security}) \]

\[ \text{i.e. } \sigma_i^2 \times (1 - r^2) \]

**Concept No. 35: Portfolio Rebalancing**

- Portfolio re-balancing means balancing the value of portfolio according to the market condition.

- Three policy of portfolio rebalancing:

Value of Equity (Stock) = \( m \times [\text{Portfolio Value} - \text{Floor Value}] \)
Where \( m \) = multiplier

![Diagram showing CPPI, Buy & Hold, and Constant Mix Policy](image)

The performance feature of the three policies may be summed up as follows:

(a) Buy and Hold Policy
   - (i) Gives rise to a straight line pay off.
   - (ii) Provides a definite downside protection.
   - (iii) Performance between Constant mix policy and CPPI policy.

(b) Constant Mix Policy
   - (i) Gives rise to concave pay off drive.
   - (ii) Doesn’t provide much downward protection and tends to do relatively poor in the up market.
   - (iii) Tends to do very well in flat but fluctuating market.

(c) CPPI Policy
   - (i) Gives rise to a convex pay off drive.
(ii) Provides good downside protection and performance well in up market.
(iii) Tends to do very poorly in flat but in fluctuating market.

**Note:**
1. If Stock market moves only in one direction, then the best policy is CPPI policy and worst policy is Constant Mix Policy and between lies buy & hold policy.
2. If Stock market is fluctuating, constant mix policy sums to be superior to other policies.

**Example 1:**
Consider a payoff from initial investment of 100000 when the market moves from 100 to 80 and back to 100 under three policies:

(a) Buy and hold policy under which the initial stock bond mix is 50:50.
(b) Constant mix policy under which the stock bond mix is 50:50
(c) A CPPI policy which takes to form investment in stock = 2 (Portfolio value - 75000 i.e. floor value)

Compute the value of equity and bond at each state

**Solution:**
1. **Buy and Hold Policy**

   **When Market is at 100**
   
<table>
<thead>
<tr>
<th>Stock</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>1,00,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

   **When Market Falls from 100 to 80 i.e. 20% decrease**
   
<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 40,000</td>
<td>Equity 40,000</td>
</tr>
<tr>
<td>Bond 50,000</td>
<td>Bond 50,000</td>
</tr>
<tr>
<td><strong>90,000</strong></td>
<td><strong>90,000</strong></td>
</tr>
</tbody>
</table>

   **When Market rises from 80 to 100 i.e. 25% increase**
   
<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 50,000</td>
<td>Equity 50,000</td>
</tr>
<tr>
<td>Bond 50,000</td>
<td>Bond 50,000</td>
</tr>
<tr>
<td><strong>1,00,000</strong></td>
<td><strong>1,00,000</strong></td>
</tr>
</tbody>
</table>

2. **Constant Mix Policy**

   **When Market is at 100**
   
<table>
<thead>
<tr>
<th>Stock</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>1,00,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

   **When Market Falls from 100 to 80 i.e. 20% decrease**
   
<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 40,000</td>
<td>Equity 45,000</td>
</tr>
<tr>
<td>Bond 50,000</td>
<td>Bond 45,000</td>
</tr>
<tr>
<td><strong>95,000</strong></td>
<td><strong>95,000</strong></td>
</tr>
</tbody>
</table>
Action: Sell Bond & Buy Stock of Rs. 5000

When Market rises from 80 to 100 i.e. 25% increase

<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 56,250</td>
<td>Equity 50,625</td>
</tr>
<tr>
<td>Bond 45,000</td>
<td>Bond 50,625</td>
</tr>
<tr>
<td>1,01,250</td>
<td>1,01,250</td>
</tr>
</tbody>
</table>

Action: Sell Stock & Buy Bond of Rs. 5625

3. CPPI Policy

When Market is at 100

Stock = 2 × [1,00,000 – 75,000] = 50,000
Bond = 50,000
1,00,000

When Market Falls from 100 to 80 i.e. 20% decrease

<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 40,000</td>
<td>Equity 2 × [90,000 – 75,000] = 30,000</td>
</tr>
<tr>
<td>Bond 50,000</td>
<td>Bond(Balance) = 60,000</td>
</tr>
<tr>
<td>90,000</td>
<td>90,000</td>
</tr>
</tbody>
</table>

Action: Sell Stock & Buy Bond Rs. 10,000

When Market rises from 80 to 100 i.e. 25% increase

<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 37,500</td>
<td>Equity 2 × [97,500 – 75,000] = 45000</td>
</tr>
<tr>
<td>Bond 60,000</td>
<td>Bond = 52,500</td>
</tr>
<tr>
<td>97,500</td>
<td>97,500</td>
</tr>
</tbody>
</table>

Action: Buy Equity & sell Bond of Rs. 7500

Example 2:

If one has wealth of 100000 and Floor of 75000 and multiplier of 2 the pattern of investment associated with such a policy may be illustrated in the following manner.

Solution:

Initial Value of Equity & Debts

Equity = 2 × [1,00,000 – 75,000] = 50,000
Debt(Balance) = 50,000
1,00,000

When Market Falls from 100 to 80 i.e. 20% decrease

<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 40,000</td>
<td>Equity 2 × [90,000 – 75,000] = 30,000</td>
</tr>
<tr>
<td>Bond 50,000</td>
<td>Bond(Balance) = 60,000</td>
</tr>
<tr>
<td>90,000</td>
<td>90,000</td>
</tr>
</tbody>
</table>
**Action:** Sell Stock & Buy Bond Rs. 10,000

**When Market Rises from 100 to 150 i.e. 50% increase**

<table>
<thead>
<tr>
<th>Before Re-balancing</th>
<th>After Re-balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity 75,000</td>
<td>Equity 2× [1,25,000 – 75,000] = 1,00,000</td>
</tr>
<tr>
<td>Bond 50,000</td>
<td>Bond(Balance) = 25,000</td>
</tr>
<tr>
<td>1,25,000</td>
<td>1,25,000</td>
</tr>
</tbody>
</table>

**Concept No. 36: Estimating the project Discount Rate (Pure Play Technique)**

CAPM can be used to arrive at the project discount rate by taking the following steps:

1. Estimate the project beta.
2. Putting the value of Beta computed above into the Capital Asset Pricing Model (CAPM) to arrive at the cost of equity.
3. Estimate the cost of debt.
4. Calculate the WACC for the project.

\[
B_{\text{Asset}} = \beta_{\text{equity}} \left(1 + \left(1 - t \right) \frac{D}{E}\right)
\]

Where, D/E is the comparable company debt to equity ratio & t is the marginal tax rate.

\[
\beta_{\text{equity}} = B_{\text{Asset}} \left[1 + \left(1 - t \right) \frac{D}{E}\right]
\]

To get the equity beta for the project, use subject’s firm tax rate & debt to equity ratio.

**Example:**

Acme Inc. is considering a project in the food distribution business. It has a D/E ratio of 2, Marginal tax rate of 40%, and its debt currently has a yield of 14%. Balfor, a publicly traded firm that operates only in the food distribution business has a D/E ratio of 1.5, a marginal tax rate of 30% and an equity beta of 0.9. The risk free rate is 5% and expected market return = 12%. Calculate Balfor’s asset beta, the projects equity beta and the appropriate WACC to use in evaluating the project.

**Solution:**

Balfor’s Asset Beta (Overall Beta)

\[
B_{\text{Asset}} = 0.9 \left(\frac{1}{1 + [(1 - 0.3)(1.5)]}\right) = 0.439
\]

Equity Beta for the Project

\[
\beta_{\text{equity}} = 0.439 \left[1 + \left[(1 - 0.4)2\right]\right] = 0.966
\]

Project’s cost of Equity \((K_e) = 5\% + 0.966 [12\% - 5\%] = 11.762\%

Weights D/E = 2 then , D = 2/3 and E = 1/3

\[
WACC = \frac{1}{3} \times 11.762\% + \frac{2}{3} \times 14\% (1 - 0.4) = 9.52\%
\]
## Futures

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. 1: Introduction/ Why Future Contracts?</td>
<td></td>
</tr>
<tr>
<td>Concept No. 2: Concept of EAR</td>
<td></td>
</tr>
<tr>
<td>Concept No. 3: Fair future price of security with no income</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 4: Fair Future Price of Security with Dividend Income</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 5: Fair Future Price of security with percentage income/ or known yield</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 6: Fair Future Price of Commodity with storage cost</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. 7: Fair Future Price of securities with Convenience yield expressed in %</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. 8: Gain or Loss</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 9: Arbitrage Opportunity in Future Market</td>
<td>7</td>
</tr>
<tr>
<td>Concept No. 10: Relation Between Spot Price and Expected Future Price in terms of Contango and Backwardation</td>
<td></td>
</tr>
<tr>
<td>Concept No. 11: Difference between Margin in the securities market and Margin in the future markets and Explain the role of initial margin, maintenance margin</td>
<td></td>
</tr>
<tr>
<td>Concept No. 12: Process of Marking the Market, and calculate and interpret the margin balance, given the previous day’s balance and the change in the future price</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 13: Calculation of Rate of Return</td>
<td></td>
</tr>
<tr>
<td>Concept No. 14: Hedging by using Index Futures &amp; Beta</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 15: Partial Hedge</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 16: Open Interest</td>
<td></td>
</tr>
<tr>
<td>Concept No. 17: Value of Hedging for Increasing &amp; Reducing Beta to a Desired Level</td>
<td>11</td>
</tr>
</tbody>
</table>
Concept No. 1: Introduction/ Why Future Contracts?

They are entered today for buying and selling as on today and selling at some future date.

Define Forward Contract, Future Contract and Swap.

- **Forward Contract**, In Forward Contract one party agrees to buy, and the counterparty to sell, a physical asset or a security at a specific price on a specific date in the future. If the future price of the assets increases, the buyer (at the older, lower price) has a gain, and the seller a loss.

- **Futures Contract** is a standardized and exchange-traded. The main difference with forwards are that futures are traded in an active secondary market, are regulated, backed by the clearing house and require a daily settlement of gains and losses.

- **Swap** is a series of forward contracts. In a simplest swap, one party agrees to pay the short-term (floating) rate of interest on some principal amount, and the counterparty agrees to pay a certain (fixed) rate of interest in return. Swaps of different currencies and equity returns are also common.

Note:
- Long- Position => Buying position
- Short- Position => Selling position

Future Contracts differ from Forward Contracts in the following ways:

1. Futures contracts trade on organized exchange. Forwards are private contracts and do not trade.

2. Future contracts are **highly standardized**. Forwards are customized contracts satisfying the needs of the parties involved.
3. A single clearinghouse is the counterparty to all futures contracts. Forwards are contract with the originating counterparty.

4. The government regulates future markets. Forward contracts are usually not regulated.

**How Future Contract can be terminated at or prior to expiration?**

1. A short can terminate the contract by delivering the goods, and a long can terminate the contract by accepting delivery and paying the contract price to the short. This is called Delivery. The location for delivery (for physical assets), terms of delivery, and details of exactly what is to be delivered are all specified in the contract.

2. In a cash-settlement contract, delivery is not an option. The futures account is marked-to-market based on the settlement price on the last day of trading.

3. You may make a reverse, or offsetting, trade in the future market. With futures, however, the other side of your position is held by the clearinghouse- if you make an exact opposite trade(maturity, quantity, and good) to your current position, the clearinghouse will net your positions out, leaving you with a zero balance. This is how most futures positions are settled.

**Note:**

- Future Contracts can be taken for any number of periods like in currency future we can take 12 months Contract.

Current Month + 11 months

**Concept No. 2: Concept of EAR**

- The rate of interest that investor actually realize as a result of compounding is known as the Effective Annual Rate(EAR).

- EAR represents the annual rate of return actually being earn after adjustments have been made for different compounding periods.

\[
EAR = (1 + \text{periodic rate})^m - 1
\]

Where:

Periodic rate = \( \frac{\text{stated annual rate}}{m} \)

\( m \) = the number of compounding periods per year

- Greater the compounding Frequency, the greater the EAR will be in comparison to stated rate.

**Concept of e^rt & e^{-rt}**
FV = PV(1+r)^n

⇒ *If interest rate is compounded annually then*  
FV = PV(1+r)^1

⇒ *If interest rate is compounded semi-annually then*  
FV = PV \left(1 + \frac{r}{2}\right)^{1 \times 2}

⇒ *If interest rate is compounded Quarterly then*  
FV = PV \left(1 + \frac{r}{4}\right)^{1 \times 4}

⇒ *If interest rate is compounded monthly then*  
FV = PV \left(1 + \frac{r}{12}\right)^{1 \times 12}

⇒ *If interest rate is compounded Daily then*  
FV = PV \left(1 + \frac{r}{365}\right)^{1 \times 365}

⇒ *If interest rate is compounded Continuously (infinite times) then*  
\[ FV = PV \left(1 + \frac{r}{\alpha}\right)^{\alpha} \]
\[ FV = PV \times e^{rt} \]
Or present value = \( \frac{FV}{e^{rt}} \)
Or \( PV = FV \times e^{-rt} \)

Where \( r \) = rate of interest p.a
\( t \) = time period
If \( t = 6 \) months then \( 6/12 = 0.50 \) years

**NOTE:**
In Future & Options chapter, use **Continuous Compounding**. But if value of \( e \) is not given or table is not provided, use **Normal Compounding**.

**Difference between Normal Compounding and Continuous Compounding?**

**Example:** Computing EARs for Range of compounding frequency.
Using a stated rate of 6%, compute EARs for semiannual, quarterly, monthly and daily compounding.

**Solution:**
EAR with:
- Semiannual Compounding = \((1+0.03)^2 - 1\) = 1.06090 – 1 = 0.06090 = 6.090%
- Quarterly compounding = \((1+0.015)^4 - 1\) = 1.06136 – 1 = 0.06136 = 6.136%
- Monthly Compounding = \((1+0.005)^{12} - 1\) = 1.06168 – 1 = 0.06168 = 6.168%
- Daily Compounding = \((1+0.00016438)^{365} - 1\) = 1.06183 – 1 = 0.06183 = 6.183%
Notice here that the \textit{EAR increases as the compounding frequency increases.}

\textit{How to Calculate} $e^{rt}$ \& $e^{-rt}$

\begin{itemize}
  \item \textbf{By Using Table:}
  \item \textbf{Example :}
    
    \begin{align*}
    e^{0} &= 1 \\
    e^{.20} &= 1.22140 \\
    e^{-35} & = 0.70469 \\
    e^{-27} & = 1.30996 \\
    e^{-33} & = 0.71892
    
    \textbf{Example:} \ e^{-.205} \\
    e^{-20} &= 1.22140 \\
    e^{-21} & = 1.23368 \\
    \Rightarrow \frac{1.22140 + 1.23368}{2} &= 1.22754
    
    \textbf{Example:} \ e^{335} \\
    e^{33} &= 1.39097 \\
    e^{34} & = 1.40495 \\
    \Rightarrow \frac{1.39097 + 1.40495}{2} &= 1.39796
    
    \textbf{Example:} \ e^{-.405} \\
    e^{-40} &= 0.67032 \\
    e^{-41} & = 0.66365 \\
    \Rightarrow \frac{0.67032 + 0.66365}{2} &= 0.666985
    
    \textbf{Example:} \ e^{237} \\
    e^{23} &= 1.25860 \\
    e^{24} & = 1.27125 \\
    .01 & \quad 0.01265 \\
    1 & \quad 0.01265 \\
    .007 & \quad 0.00886 \\
    \frac{0.01265 \times 0.007}{0.01} &= 0.00886
    
    1.25860 + 0.00886 = 1.26746
    
    e^{237} = 1.26746
    \end{align*}
\end{itemize}

\textbf{NOTE:}

\textbf{Steps to calculate} $a^b$

\textbf{Step 1:} $\sqrt[a]{a} = 12 \text{ times}$
Step 2: $-1$

Step 3: $x \times b$

Step 4: $+1$

Step 5: $x = 12\ times.$

**Example:**

$$\left(1 + K_d\right)^{365} = 20$$
$$\left(1 + K_d\right) = \sqrt[365]{20}$$
$$= (20)^{\frac{1}{365}}$$
$$= (20)^{.00274}$$
$$\Rightarrow 1 + kd = 1.008245$$
$$\Rightarrow Kd = .008245$$

**Concept No. 3: Fair future price of security with no income**

**In case of Normal Compounding**

Fair future price = Spot Price $(1+r)^n$

**In case of Continuous Compounding**

Fair future price = Spot Price $\times e^{rt}$

Where $r =$ risk free interest p.a. with Continuous Compounding.
$t =$ time to maturity in years/ days. (No. of days / 365) or (No. of months / 12)

**Concept No. 4: Fair Future Price of Security with Dividend Income**

**In case of Normal Compounding**

Fair Future Price = $[\text{Spot Price} – \text{PV of Expected Dividend}] \times (1+r)^n$

**In case of Continuous Compounding**

Fair Future Price = $[\text{Spot Price} – \text{PV of Expected Dividend}] \times e^{rt}$

$\text{PV of DI} = \text{Present Value of Dividend Income} = \text{Dividend} \times e^{-rt}$

Where $t =$ period of dividend payments

**Note:**

$\Rightarrow$ If time period income is not given, in this case simply deduct Dividend Income from CMP.
Concept No. 5: Fair Future Price of security with percentage income/ or known yield

In case of Normal Compounding
Fair Future Price = Spot Price \[1+(r-y)]^n

In case of Continuous Compounding
Fair Future Price = Spot Price \times e^{-r(y)t}
Where y = income expressed in % or dividend Yield

Note:
If %age income is given, it is assumed to be given on per annum basis.

Concept No. 6: Fair Future Price of Commodity with storage cost

It is applicable in case of Commodity futures.

In case of Normal Compounding
Fair Future Price = [Spot Price + PV of S.C ] (1+r)^n

In case of Continuous Compounding
Fair Future Price = [Spot Price + PV of S.C ] \times e^{-r}
Where PV of S.C = Present Value of Storage Cost

Concept No. 7: Fair Future Price of securities with Convenience yield expressed in % (Similar to Dividend Yield)

Applicable in case of Commodity futures.

The benefit or premium associated with holding an underlying product or physical good rather than contract or derivative product i.e. extra benefit that an investor receives for holding a commodity.

In case of Continuous Compounding
Fair Future Price = Spot Price \times e^{(r-c)t}

Concept No. 8: Gain or Loss

Rightarrow Future contract may result into Gain or Loss to both \Rightarrow Buyers & Sellers.

<table>
<thead>
<tr>
<th>Position</th>
<th>If Price on Maturity</th>
<th>Gain/Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Position</td>
<td>Increase</td>
<td>Gain</td>
</tr>
</tbody>
</table>
Short Position | Increase | Loss
Long Position  | Decrease | Loss
Short Position | Decrease | Gain

Gain/Loss is net of brokerage charge. Brokerage is paid on both buying & selling.

Security Deposit is not considered while calculating Profit & Loss A/c.

Interest paid on Borrowed amount must be deducted while calculating Profit & Loss.

Note:
A Future contract is ZERO-SUM Game. Profit of one party is the loss of other party.

Concept No. 9: Arbitrage Opportunity in Future Market

Arbitrage is an important concept in valuing (Pricing) derivative securities. In its Purest sense, arbitrage is riskless.

Arbitrage opportunities arise when assets are mispriced. Trading by Arbitrageurs will continue until they effect supply and demand enough to bring asset prices to efficient (no arbitrage) levels.

Arbitrage is based on “Law of one price”. Two securities or portfolios that have identical cash flows in future, should have the same price. If A and B have the identical future pay offs and A is priced lower than B, buy A and sell B. You have an immediate profit.

Difference between Actual Future Price and Fair Future Price?

Fair Future Price is calculated by using the concept of Present Value & Future Value.

Actual Future Price is actually prevailing in the market.

<table>
<thead>
<tr>
<th>Case</th>
<th>Value</th>
<th>Future Market</th>
<th>Cash Market</th>
<th>Borrow/ Invest</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFP &gt; FFP</td>
<td>Over-Valued</td>
<td>Sell</td>
<td>Buy</td>
<td>Borrow</td>
</tr>
<tr>
<td>AFP &lt; FFP</td>
<td>Under-Valued</td>
<td>Buy</td>
<td>Sell #</td>
<td>Investment</td>
</tr>
</tbody>
</table>

Here we assume that Arbitrager hold shares.

Concept No. 10: Relation Between Spot Price and Expected Future Price in terms of Contango and Backwardation

Contango refers to a situation in commodity future contracts when the future price is above the spot price or the price of current purchase or delivery of the security.

When an end user of a commodity buys future contracts to protect against unexpected future price increases, they are hedging commodity price risk with long-position.
⇒ **Backwardation** refers to a situation in commodities future contract where the future price is below the Spot price.

If the dominant traders in a commodity future are producers, they hedging their exposure to finance loss arising from unexpected price declines in the future.

**Concept No. 11: Difference between Margin in the securities market and Margin in the future markets and Explain the role of initial margin, maintenance margin**

In **Security Market**, margin on a stock or bond purchase is 100% of the market value of the asset.

**Example:**

Initially, 50% of the stock purchase amount may be borrowed and the remaining amount must be paid in cash (Initial margin).

There is interest changed on the borrowed amount.

In **Future Markets**, margin is a performance guarantee i.e. security provided by the client to the exchange. It is money deposited by both the long and the short. There is no loan involved and consequently, no interest charges.

The exchange requires traders to post margin and settle their account on a daily basis.

1. **Initial Margin**
   - It is the money that must be deposited in a futures account before any trading takes place.
   - It is set for each type of underlying asset.
   - Initial Margin per contract is relatively low and equals about one day’s maximum price fluctuation on the total value of the contract.

2. **Maintenance Margin**
   - It is the amount of margin that must be maintained in a futures account.
   - If the initial margin balance in the account falls below the maintenance margin due to the change in the contract price, additional fund must be deposited to bring the margin balance back-up to the initial margin requirement.

**Note:**

Any amount, over & above initial margin amount can be withdraw, if question is clear about it.

**Example:**

Initial Margin Amount = 10,000
Maintenance Margin = 5,000

Mark to Market
(i) – 3,000
(ii) – 6,000
(iii) + 2,000

Determine the amount to be deposit/withdrawal in margin Account.

**Solution:**

<table>
<thead>
<tr>
<th>Required Deposit</th>
<th>Gain/ Loss</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>(3,000)</td>
<td>7,000</td>
</tr>
<tr>
<td>-</td>
<td>(6,000)</td>
<td>1,000</td>
</tr>
<tr>
<td>9,000</td>
<td>2,000</td>
<td>12,000</td>
</tr>
</tbody>
</table>

**Note:**

Deposit of Rs. 9,000 is required to bring the margin back to the initial margin level of Rs. 10,000

**Concept No. 12: Process of Marking To Market, and calculate and interpret the margin balance, given the previous day’s balance and the change in the future price**

Marking the Market is the process of adjusting the margin balance in a future account each day for the change in the value of the contract assets from the previous trading day, **based on the new settlement price**.

**Example:**

Consider a long position of five July wheat contracts, each of which covers 5,000 bushels. Assume that the contract price is $2.00 and that each contract requires an initial margin deposit of $150 and a maintenance margin of $100. The total initial margin required for the 5-contract trade is $750. The maintenance margin for the account is $500. Compute the margin balance for this position after a 2-cent decrease in price on Day 1, a 1-cent increase in price on Day 2, and a 1-cent decrease in price on Day 3.

**Solution:**

Each contract is for 5,000 bushels so that a price change of $0.01 per bushel changes the contract value by $50, or $250 for the five contracts: (0.01) (5) (5,000) = $250.00

**Margin Balances**

<table>
<thead>
<tr>
<th>Day</th>
<th>Required Deposit</th>
<th>Price / Bushel</th>
<th>Daily Change</th>
<th>Gain / Loss</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (Purchase)</td>
<td>$750</td>
<td>$2.00</td>
<td>0</td>
<td>0</td>
<td>$750</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>$1.98</td>
<td>- $0.02</td>
<td>- $500</td>
<td>$250</td>
</tr>
<tr>
<td>2</td>
<td>$500</td>
<td>$1.99</td>
<td>+ $0.01</td>
<td>+ $250</td>
<td>$1,000</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>$1.98</td>
<td>- $0.01</td>
<td>- $250</td>
<td>$750</td>
</tr>
</tbody>
</table>
At the close of Day 1, the marginal balance has gone below the minimum or maintenance margin level of $500. Therefore, a deposit of $500 is required to bring the margin back to the initial margin level of $750.

**Concept No. 13: Calculation of Rate of Return**

\[ \text{Rate of return:} \quad \frac{\text{Net Amount Received}}{\text{Total Initial Equity Investment}} \times 100 \]

**Example:**

- Shares purchased: 1,000
- Purchase price per share: $100
- Annual dividend per share: $2.00
- Initial margin requirement: 40%
- Call money rate: 4%
- Commission per share: $0.05
- Stock price after one year: $110

Calculate the investor’s return on the margin transaction (return on equity) if the stock is sold at the end of one year.

**Solution:**

The total purchase price is $1,000 \times $100 = $100,000. The investor must post initial margin of 40\% \times $100,000 = $40,000. The remaining $60,000 is borrowed. The commission on the purchase is 1,000 \times $0.05 = $50. Thus, the total initial equity investment is $40,050.

At the end of one year, the sales proceeds are 1,000 \times $110 = $110,000 for a gain of $10,000. Dividends received are 1,000 \times $2.00 = $2,000. Interest paid is $60,000 \times 4\% = $2,400. The commission on the sale is 1,000 \times $0.05 = $50.

The gain on the transaction in one year is $10,000 + $2,000 - $2,400 - $50 = $9,550. The return on the equity investment is $9,550 / $40,050 = 23.85\%.

**Concept No. 14: Hedging by using Index futures & Beta**

Hedging is the process of taking an opposite position in order to reduce loss.

1. **Equal Position to be taken**

   Position should be hedged by taking opposite position of equal amount through **index futures**.
2. **Different Value of Position to be taken**

Different Value of Position for Complete hedge should be taken on the basis of **Beta** through index futures.

**Value of Position for Complete Hedge = Current Value of Portfolio**

\[
\times \frac{\text{Value of Transaction}}{\text{Existing Stock Beta}}
\]

**Example:**

If beta = 2, it means if Market increases by 10%, price of the share increase by 20% i.e. 2 times & Vice-versa

**Example:**

If X Ltd. has taken long position in Reliance Industries stock cash Market of Rs. 1,000, Beta = 2 for reliance Industries. Now X Ltd. want to hedge their position.

**Solution:**

**Equal Position to be taken:**

Short Position in Index

**Different Value of Position to be Taken:**

Current Value Of Portfolio × Beta

1000 × 2 = Rs. 2000

**Note:**

Short Position in security → Long Position in Index Futures
Long Position in Security → Short Position in Index Futures

**Concept No. 15: Partial Hedge**

\[
\text{Value of existing Portfolio} \times \text{Existing beta} \times \% \text{age to be Hedge}
\]

- It result into Over-Hedged or Under-Hedged Position
- There may be profit or loss depending upon the situation.

**Concept No. 16: Open Interest**

Open Interest means **Number of Contract still outstanding** i.e. Open Interest is total number of long position or total number of short position, that has not been exercised, closed or expired

**Note:**
**On Maturity OI is Zero**

**Example:**

**Day 1**: Mr. A enters into a future contract of buying Infosys Ltd. Stock from Mr. B.

**Day 2**: Mr. C enters into a future contract of buying Infosys Ltd. Stock from Mr. D.

**Solution:**

\[ A_+ \quad C_+ \quad OI = 2 \]

\[ B_- \quad D_- \]

**Day 3**: Mr. G enters into a future contract of buying Infosys Ltd. Stock from Mr. A.

**Solution:**

\[ A_+ \quad C_+ \quad OI = 2 \]

\[ B_- \quad D_- \]

\[ G_+ \quad A_- \]

**Day 4**: Mr. B enters into a future contract of buying Infosys Ltd. Stock from Mr. G.

**Solution:**

\[ C_+ \quad D_- \quad OI = 1 \]

\[ A_+ \quad A_- \]

\[ B_- \quad G_+ \]

**Concept No. 17: Value of Hedging for Increasing & Reducing Beta to a Desired Level (Assume Long Position)**

**Case I: When Existing Beta > Desired Beta**

Objective: Reducing Risk

Amount of Hedging Required = Value of Existing Portfolio × [Existing Beta – Desired Beta]

**Action**: Take Short Position in Index & keep your current position unchanged.

**Case II: When Existing Beta < Desired Beta**

Objective: Increase Risk

Amount of Hedging Required = Value of Existing Portfolio × [Desired Beta – Existing Beta]
**Action:** Take Long Position in Index & keep your current position unchanged

**Note:**

**No. of future contracts to be sold or purchased for increasing or reducing Beta to a Desired Level using Index Futures.**

\[
\text{No. of Future Contract to be taken} = \frac{\text{Value of Future Contract Position}}{\text{Value of one Future Contract}}
\]

**Example:**

Current Value of Portfolio = 1,00,000  
Existing Beta = 2  
Desired Beta = 0  
Nifty Point = 500  
Lot Size = 100

Determine No. of Contract to be taken

**Solution:**

Value of Future Contract = 1,00,000 \times 2 = 2,00,000  
Value of one Future Contract = 500 \times 100 = 50,000

No. of Future Contract = \frac{2,00,000}{50,000} = 4 \text{ Contract}

**NOTE:**

**LOT SIZE**

In Future & Options, we always trade in lots not 1 or 2 shares. Lot size is set by the exchange & Lot size differs from stock to stock.

**Example:**

Lot Size of NIFTY = 100  
If NIFTY is traded at 5250, then the value of one NIFTY contract is Rs. 5,25,000.
# Options

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. 1: Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 2: European &amp; American Options</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 3: Concept of Moneyness of an Option</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 4: Profit or Loss/ Pay-off of call Option &amp; Put Option</td>
<td>4, 5</td>
</tr>
<tr>
<td>Concept No. 5: Break-even Market Price for call &amp; Put option</td>
<td>6, 7</td>
</tr>
<tr>
<td>Concept No. 6: Action to be taken under Option Market</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 7: Fair value or Premium or Price of call on Expiration</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 8: Fair Premium/Value/Price of Put on Expiry</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 9: Fair/Theoretical Value or Premium or Price of Call before expiry i.e. at the time of entering into the contract or as on Today</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. 10: Fair/Theoretical Price or Premium or Value of Put before expiry i.e. at the time of entering into the contract or as on Today</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. 11: Arbitrage Opportunity on Call :- As on Expiry</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. 12: Arbitrage Opportunity for Put :- As on Expiry</td>
<td>14</td>
</tr>
<tr>
<td>Concept No. 13: Put-Call Ratio</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. 14: Binomial Model for Call Option</td>
<td>16</td>
</tr>
<tr>
<td>Concept No. 15: Risk Neutral Approach for Call &amp; Put</td>
<td>17</td>
</tr>
<tr>
<td>Concept No. 16: Put Call Parity Theory (PCPT)</td>
<td>18</td>
</tr>
<tr>
<td>Concept No. 17: Change In Terms of Option Contract due to Bonus, Split Share &amp; Dividend</td>
<td></td>
</tr>
<tr>
<td>Concept No. 18: Expected Gain Approach</td>
<td>19</td>
</tr>
<tr>
<td>Concept No. 19: Chain Rule (Two period Binomial Model)</td>
<td>20</td>
</tr>
<tr>
<td>Concept No. 20: Construction of Binomial Tree &amp; Calculation of Option</td>
<td>21</td>
</tr>
<tr>
<td>Premium at each nodes</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Concept No. 21: High Profit &amp; High Losses under Future &amp; Option</td>
<td>22</td>
</tr>
<tr>
<td>Concept No. 22: Intrinsic Value &amp; Time Value of Option</td>
<td>23</td>
</tr>
<tr>
<td>Concept No. 23: Interest Rate Caps, Floor &amp; Collar</td>
<td>24</td>
</tr>
<tr>
<td>Concept No. 24: Option Strategies/ Combination</td>
<td>25</td>
</tr>
<tr>
<td>Concept No. 25: Calculation of $N(d_1)$ &amp; $N(d_2)$</td>
<td></td>
</tr>
<tr>
<td>Concept No. 26: Calculation of Natural log(Base)</td>
<td></td>
</tr>
<tr>
<td>Concept No. 27: Black &amp; Scholes Model</td>
<td>26</td>
</tr>
<tr>
<td>Concept No. 28: Put-Call Parity Theory -&gt; ARBITRAGE</td>
<td>27</td>
</tr>
<tr>
<td>Concept No. 29: Value of Equity &amp; Debt by using BSM Method</td>
<td></td>
</tr>
<tr>
<td>Concept No. 30: Butterfly Spread</td>
<td>28</td>
</tr>
</tbody>
</table>
**Concept No. 1: Introduction**

**Option Contract:**
An option contract gives its owner *the right, but not the legal obligation*, to conduct a transaction involving an underlying asset at a pre-determined future date (the exercise date) and at a pre-determined price (the exercise price or strike price).

**Related terms:**

- The **Owner of a call option** has the *right to purchase* the underlying asset at a specific price for a specified period.

- The **Owner of a put option** has the *right to sell* the underlying asset at a specific price for a specified time period.

- The **seller of the option** is also called the option writer. The seller of the option has the *obligation to perform* if the buyer exercise the option. They have no right but obligation to perform their contract if the buyer decided to exercise the right.

There are four possible options position

1. **Long call**: The buyer of a call option ⇒ has the *right to buy* an underlying asset.

2. **Short call**: The writer (seller) of a call option ⇒ has the *obligation to sell* the underlying asset.

3. **Long put**: The buyer of a put option ⇒ has the *right to sell* the underlying asset.

4. **Short put**: The writer (seller) of a put option ⇒ has *the obligation to buy* the underlying asset.

**Exercise Price/ Strike Price:**
The fixed price at which buyer of the option can exercise his option to buy/ sell an underlying asset. It always remain constant throughout the life of contract period.
**Option Premium:**

To acquire these rights, owner of options must buy them by paying a price called the Option premium to the seller of the option.

**Note:**

- The option holder will only exercise their right to act if it is profitable to do so.
- The owner of the Option is the one who decides whether to exercise the Option or not.

**Note:**

When Call Option Contract are exercised:

- When CMP > Strike Price → Call Buyer Exercise the Option.
- When CMP < Strike Price → Call Buyer will not Exercise the Option.

**Example of Call Option:**

Mr. X want to buy a right to buy Reliance Industries Ltd. stock from Mr. Y at Rs. 100 by paying Rs. 10

Mr. X → Call Buyer

Mr. Y → Call Seller

Reliance Ltd. → Underlying Asset

Rs. 100 → Exercise Price/Strike Price

Rs. 10 → Option Premium

**If on Maturity, actual Market Price:**

<table>
<thead>
<tr>
<th>Case</th>
<th>AMP(S)</th>
<th>Action</th>
<th>In/Out/At</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>80</td>
<td>Not Exercise (lapse) (S – X) &lt; 0</td>
<td>Out of the money</td>
</tr>
<tr>
<td>II</td>
<td>100</td>
<td>Indifferent (S – X) = 0</td>
<td>At the money</td>
</tr>
<tr>
<td>III</td>
<td>120</td>
<td>Exercise (S – X) &gt; 0</td>
<td>In the money</td>
</tr>
</tbody>
</table>
### Gross profit in each case | Net Profit in each case
---|---
AMP | GP | NP |
Case I | 80 | 0 | -10 |
Case II | 100 | 0 | -10 |
Case III | 120 | 20 | 10 |

i.e. \((S - X)\)  
\((S - X - OP) = (120 - 100 - 10)\)

**Note:**

1. Maximum loss to the call buyer will be equal to option premium paid.
2. Maximum profit for the call Writer/Seller will be only option premium received.
3. Maximum profit for call buyer will be unlimited.
4. Maximum loss for call seller will be unlimited.
5. Break-even point for the buyer and seller is the price at which profit and loss will be zero.  
   \[\text{Break-even Market Price} = \text{Exercise Price} + \text{Option Premium}\]
6. The call holder will exercise the option whenever the stock’s price exceeds the strike price at the expiration date.
7. The sum of the profits between the Buyer and Seller of the call option is always Zero. Thus, Option trading is ZERO-SUM GAME. The long profits equal to the short losses.

**Example:**

Exercise Price = 50  
Option Premium = 5  
AMP(Actual market Price) = 200  

**Case I**  
Action: Exercise the Option  

In/Out/At: In-the-money  

Gross Profit: 200 - 50 = 150  
Net Profit = 200 - 50 - 5 = 145  
Maximum Loss = 5
Maximum Profit = Unlimited

Break-even Market Price = EP + OP

\[ = 50 + 5 = 55 \]

**Case II: AMP = 40**

Action: Not Exercise

In/Out/At: Out-of-money

Gross Profit: 0

Net Profit: -5

Maximum Loss = 5

Maximum Profit = Unlimited

Break-even Market Price = 50 + 5 = 55

**Note:**

When Put Option Contract are exercised:

- When CMP > Strike Price → Put Buyer will not Exercise the Option.
- When CMP < Strike Price → Put Buyer will Exercise the Option.

**Example of Put Option:**

Mr. X want to buy a right to sell Reliance Industries Ltd. stock from Mr. Y at Rs. 100 by paying Rs. 10

Mr. X -> Put Buyer

Mr. Y -> Put Seller

Reliance Ltd. -> Underlying Asset

Rs. 100 -> Exercise Price/Strike Price

Rs. 10 -> Option Premium/Option Price/Option Value

**If on Expiry, actual Market Price is:**

<table>
<thead>
<tr>
<th>Case</th>
<th>AMP(s)</th>
<th>Action</th>
<th>In/Out/At</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>80</td>
<td>Exercise</td>
<td>In the money</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(X – S) &gt; 0</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>100</td>
<td>Indifferent</td>
<td>At the money</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(X – S) = 0</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>120</td>
<td>Not Exercise</td>
<td>Out of the money</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(X – S) &lt; 0</td>
<td></td>
</tr>
</tbody>
</table>
### Gross profit in each case

<table>
<thead>
<tr>
<th>AMP</th>
<th>GP</th>
<th>NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>20</td>
<td>(100 – 80 – 10) = 10</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
<td>(100 – 100 – 10) = -10</td>
</tr>
<tr>
<td>120</td>
<td>0</td>
<td>-10</td>
</tr>
</tbody>
</table>

Not exercise

### Net Profit in each case

<table>
<thead>
<tr>
<th>Put Buyer</th>
<th>Put Seller</th>
</tr>
</thead>
<tbody>
<tr>
<td>(EP – OP)</td>
<td>Option Premium</td>
</tr>
<tr>
<td>Maximum Profit</td>
<td>Maximum Loss</td>
</tr>
<tr>
<td>Option Premium</td>
<td>(EP – OP)</td>
</tr>
</tbody>
</table>

### Note:

1. If Actual Market Price falls to Zero, NP = X – S – OP i.e. X – 0 – OP
   Maximum Profit = EP – OP

2. Put Buyer will only exercise the option when actual market price is less the exercise price.


### Example:

Suppose that both a Call an a Put option have been written on a stock with an exercise price of $40. The current stock price is $42, and the call and put premiums are $3 and $0.75, respectively.

Calculate the profit to the long and short positions for both the put and the call with an expiry day stock price of $35 and with a price at expiration of $43.

### Solution:

Profit will be computed as ending option valuation- initial option cost.

#### Stock at $35:

- Long Call: $0 - $3 = - $3. The option finished out-of-the-money, so the premium is lost.

- Short Call: $3 - $0 = $3. Since the option finished out-of-the-money, the call writer’s gain equals the premium.

- Long Put: $5 - $0.75 = $4.25. You paid $0.75 for an option that is now worth $5

- Short Put: $0.75 - $5 = -$4.25. you received $0.75 for writing the option but you face a $5 loss
- because the option is in-the-money.

**Stock at $43:**
- Long Call: - $3 + $3 = $0. You paid $3 for the option, and it is now worth $3. Hence, your net profit is Zero.
- Short Call: $3 - $3 = $0. You received $3 for writing the option and now face a -$3 valuation for net profit of Zero.
- Long Put: -$0.75 - $0 = -$0.75. You paid $0.75 for the put option and the option is now worthless. Your net profit is -$0.75
- Short Put: $0.75 - $0 = $0.75. You received $0.75 for writing the option and keep the premium because the option finished out-of-the-money.

**Concept No. 2: European & American Options**

**American Option**: American Option may be exercised at any time up to and including the contract’s expiration date.

**European Option**: European Options can be exercised only on the contract’s expiration date.

**Note:**
1. If two options are identical (maturity, underlying stock, strike price, etc.) in all ways, except that one is a European Option and the other is an American Option, the value of American Option will equal or exceed the value of European Option.

   Why? The early exercise feature of the American Option gives it more flexibility, so it should be worth at least as much and possibly more.

2. The name of the Option does not imply where the option trades – they are just names.

**Concept No. 3: Concept of Moneyness of an Option**

Moneyness refers to whether an option is In-the money or Out-of the money.

**Case I**
- If immediate exercise of the option would generate a positive pay-off, it is in the money

**Case II**
- If immediate exercise would result in loss (negative pay-off), it is out of the money.
**Case III**

- When current Asset Price = Exercise Price, exercise will generate neither gain nor loss and the option is at the money.

**Call Option:**

**Case I: In-the-Money Call Option**

If $S - X > 0$

Where $S$= Stock Price

$X$ = Exercise Price

**Case II: Out-of-the-Money Call Option**

If $S - X < 0$

**Case III: At-the-Money Call Option**

If $S = X$

**Put Option:**

**Case I: In-the-Money put Option**

If $X - S > 0$

**Case II: Out-of-the-Money put Option**

If $X - S < 0$

**Case III: At-the-Money put Option**

If $X = S$

**Note:**

Do not consider option premium while Calculating Moneyness of the Option.

**Example:**

Consider a July 40 call and a July 40 Put, both on a stock that is currently selling for $37/share. Calculate how much these options are in or out of the money

**Solution:**

The call is $3 out of money because $S - X = -$ 3.00. The Put is $3 in the money because $X - S = $3.00
Concept No. 4: Profit or Loss/ Pay-off of call Option & Put Option

While calculating profit or loss, always consider option Premium,

**Call Buyers:**

- **If \( S - X > 0 \)**
  - Exercise the option
  - Net Profit = \( S - X - OP \)
- **If \( S - X < 0 \)**
  - Not Exercise
  - Loss = Amount of Premium

**Put Buyers:**

- **If \( X - S > 0 \)**
  - Exercise the option
  - Net Profit = \( X - S - OP \)
- **If \( X - S < 0 \)**
  - Not Exercise
  - Loss = Amount of Premium

Concept No. 5: Break-even Market Price for call & Put option

Break – even Market Price is the price at which Profit & loss is Zero.

**For Call Buyer & Call Seller**

Net Profit = \( S - X - OP \)

Where \( S \) = Stock Price

\( X \) = Exercise Price

\( OP \) = Option Premium

If \( NP = 0 \)

\[ 0 = S - X - OP \]

\( S = X + OP \)

**For Put Buyer & Put Seller**

Net Profit = \( X - S - OP \)
If NP = 0

\[ S = X - OP \]

Call Option value at expiration is \( \text{Max} (0, S - X) \) and profit (loss) is \( \text{Max} (0, S - X) - \text{option Cost} \).

<table>
<thead>
<tr>
<th></th>
<th>Maximum Loss</th>
<th>Maximum Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buyer (Long)</td>
<td>Option Cost</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Seller (Short)</td>
<td>Unlimited</td>
<td>Option Cost</td>
</tr>
</tbody>
</table>

**Breakeven**

\[ X + \text{Option Cost} \]

Put value at expiration is \( \text{Max} (0, X - S) \) and profit (loss) is \( \text{Max} (0, X - S) - \text{Option Cost} \).

<table>
<thead>
<tr>
<th></th>
<th>Maximum Loss</th>
<th>Maximum Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buyer (Long)</td>
<td>Option Cost</td>
<td>X - Option Cost</td>
</tr>
<tr>
<td>Seller (Short)</td>
<td>X - Option Cost</td>
<td>Option Cost</td>
</tr>
</tbody>
</table>

**Breakeven**

\[ X - \text{Option Cost} \]

**Concept No. 6: Action to be taken under Option Market**

If expected Market Price is

- Going to rise: Long Call, Short Put
- Going to fall: Short Call, Long Put

**Note**

If question is Silent always assume buyer position.

**Concept No. 7: Fair Premium/Value/Price of call on Expiration**

Fair Premium of Call on Expiry:

\[ = \text{Maximum of } [(S - X),0] \]

**Note:**

Option Premium can never be Negative. It can be Zero or greater than Zero.

**Concept No. 8: Fair Premium/Value/Price of Put on Expiry**

Fair Premium of Put on Expiry

\[ = \text{Maximum of } [(X - S), 0] \]
Concept No. 9: Fair/Theoretical Value or Premium or Price of Call before expiry i.e. at the time of entering into the contract or as on Today

Premium of Call = Current Market Price – Present Value of Exercise Price

Or

\[ = S - \frac{x}{(1+RFR)^T} \]

RFR = Risk-free rate

T = Time to expiration

Or \[ = S - X e^{-\tau} \]

Concept No. 10: Fair/Theoretical Price or Premium or Value of Put before expiry i.e. at the time of entering into the contract or as on Today

Premium of Put = Present Value of Exercise Price - Current Market Price

Or

\[ = \frac{x}{(1+RFR)^T} - S \]

Or

\[ X \times e^{-\tau} - S \]

Concept No. 11: Arbitrage Opportunity on Call :- As on Expiry

<table>
<thead>
<tr>
<th>Case</th>
<th>Value</th>
<th>Option Market</th>
<th>Cash Market</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP &gt; FP</td>
<td>Over-Valued</td>
<td>Short Call</td>
<td>Buy</td>
<td>Borrow</td>
</tr>
<tr>
<td>AP &lt; FP</td>
<td>Under-Valued</td>
<td>Long Call</td>
<td>Sell</td>
<td>Invest</td>
</tr>
</tbody>
</table>

Concept No. 12: Arbitrage Opportunity for Put :- As on Expiry

<table>
<thead>
<tr>
<th>Case</th>
<th>Value</th>
<th>Option Market</th>
<th>Cash Market</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP &gt; FP</td>
<td>Over-Valued</td>
<td>Short Put</td>
<td>Sell</td>
<td>Invest</td>
</tr>
<tr>
<td>AP &lt; FP</td>
<td>Under-Valued</td>
<td>Long Put</td>
<td>Buy</td>
<td>Borrow</td>
</tr>
</tbody>
</table>
Concept No. 13: Put-Call Ratio

Put-Call Ratio = \frac{\text{Volume of Put Traded}}{\text{Volume of Call Traded}}

⇒ The ratio of the volume of put options traded to the volume of call options traded, which is used as an indicator of investor’s sentiment (bullish or bearish)

⇒ The put-call Ratio to determine the market sentiments, with high ratio indicating a bearish sentiment and a low ratio indicating a bullish sentiment.

Concept No. 14: Binomial Model for Call Option

⇒ Under this concept, we will calculate option premium for call option.

⇒ It is assumed that expected price on expiry may be greater than current market price or less than current market price.

On Maturity

\[ S_1 \text{ (High Price)} \]

\[ S_2 \text{ (Low Price)} \]

This model involves 3 Steps:

Step 1: Buy ‘Delta’ No. of shares ‘\Delta’ at current market price as on today. Delta ‘\Delta’ also known as hedge ratio.

Hedge Ratio or ‘\Delta’ = \frac{\text{Change in Option Premium}}{\text{Change in Price of Underlying Asset}}

OR

\[ = \frac{\text{Value of call on expiry at High Price} - \text{Value of call on expiry at Low Price}}{\text{High Price} - \text{Low Price}} \]

\[ = \frac{C_1 - C_2}{S_1 - S_2} \]
Step 2: Sell one call option i.e. Short Call and receive the amount of premium.

Step 3: Net Amount required for the above steps should be borrowed.

\[ B = \frac{1}{1+r} \left[ \Delta \times S_2 - C_2 \right] \]

Or

\[ B = \frac{1}{1+r} \left[ \Delta \times S_1 - C_1 \right] \]

Where \( r \) = rate of interest adjusted for period

Step 4: Borrowed Amount = Amount required to purchase of share – Option Premium Received

\[ B = \Delta \times \text{CMP} - \text{OP} \]

Or

\[ \text{(Option Premium} = \Delta \times \text{CMP} - \text{Borrowed Amount}) \]

Note: Calculation of Cash flow Position/ Value of holding after 1 year

\[ \Rightarrow \text{Amount received by selling} - \text{Value of call on expiry} \]
\[ \Delta \text{share on expiry} \text{ (or loss on call written)} \]

Note: Meaning of perfectly hedge position under binomial model

Perfectly hedge position means Profit or Loss will be Zero or NIL. It can be achieved by buying \( \Delta \) shares, sell one call option and borrowing the required amount.

Note:

Delta is the number of shares which makes the portfolio perfectly hedged i.e. whether the stock price on maturity goes up or decline, the value of portfolio doesn’t vary i.e.our profit and loss position will be Zero.

Concept No. 15: Risk Neutral Approach for Call & Put

Step 1: Calculate Value of Call or Put as on expiry at high price & low price

Value of Call as on expiry = \( \text{Max} \left[(S - X), 0\right] \)

Value of Put as on expiry = \( \text{Max} \left[(X - S), 0\right] \)

Step 2: Calculate Probability of High Price & Low Price

Method 1:

Probability = \( \frac{\text{CMP} (1+r) - S_2}{S_1 - S_2} \)
Method 2:

\[ \text{CMP as on Today} = \frac{\text{Expected MPS on expiry}}{1+r} \]

Or

\[ \text{P}_0 = \frac{\text{High Price} \times \text{Probability} + \text{Low Price} \times (1 - \text{Probability})}{1+r} \]

Method 3:

Rate of return Adjusted per period

\[ = \% \text{age Increase in Price} \times \text{Probability} - \% \text{age Decrease in Price} \times (1 - P) \]

Step 3: Calculate expected Value/ Premium as on expiry by using Probability

Step 4: Calculate Premium as on Today

By Using normal Compounding

\[ = \frac{\text{Expected Premium as on expiry}}{1+r} \]

By Using Continuous Compounding

\[ = \text{Premium as on expiry} \times e^{-rt} \]

Concept No. 16: Put Call Parity Theory (PCPT)

Put Call Parity is based on Pay-offs of two portfolio combination, a fiduciary call and a protective put.

Fiduciary Call

A Fiduciary Call is a combination of a pure-discount, riskless bond that pays X at maturity and a Call.

\[ \left( S - \frac{X}{1 + RFR} \right) + \frac{X}{1 + RFR} \]

Protective Put

A Protective Put is a share of stock together with a put option on the stock.

\[ \left( \frac{X}{1 + RFR} - S \right) + S \]

PCPT => Value of Call + \[ \frac{X}{(1+RFR)^t} \] = Value of Put + S
Through this theory, we can calculate either Value of Call or Value of Put provided other information is given.

**Assumptions:**

1. Exercise Price of both Call & Put Option are same.

2. Maturity Period of both Call & Put are Same.

**Put-Call Parity relationship can be expressed as:**

\[ S = C - P + \frac{X}{(1+RFR)^T} \]

Or

\[ P = C - S + \frac{X}{(1+RFR)^T} \]

Or

\[ C = S + P - \frac{X}{(1+RFR)^T} \]

Or

\[ \frac{X}{(1+RFR)^T} = S + P - C \]

**Example:**

Suppose that the current stock price is $52 and the risk-free rate is 5%. You have found a quote for 3-month put option with an exercise price of $50. The put price is $1.50, but due to light trading in the call options, there was not a listed quote for the 3-month, $50 call. Estimate the price of the 3-month call option.

**Solution:**

Rearranging put-call parity, we find that the call price is:

\[ \text{Call} = S + \text{Put} - \text{present value}(X) \]

\[ \text{Call} = $1.50 + $52 - \frac{$50}{1.05^{0.25}} = $4.11 \]

This means that if a 3-month, $50 call is available, it should be priced at $4.11 per share.

**Concept No. 17: Change In Terms of Option Contract due to Bonus, Split Share & Dividend**

1. **Bonus share:** Strike Price will be change due to Bonus Shares.
Example:

10% Bonus Share, Strike Price = 245

Existing No. of Share = 500

Revised Position = 500 + 500 × 10% = 550

500 × 245 = 1,22,500

550 × x = 1,22,500

x = \frac{1,22,500}{550} = 222.73

2. **Dividend**: No Change in terms of Option Contract due to Dividend.

3. **Stock Split**: 4 for 1 Split.

Example:

500 × 4 = 2000 Share

Strike Price = \frac{245}{4} = 61.25

**Concept No. 18: Expected Gain Approach**

We will calculate the amount of Option premium on the basis of Probability.

**Concept No. 19: Chain Rule (Two Period Binomial Model)**

**Concept No. 20: Construction of Binomial Tree & Calculation of Option Premium at each nodes**

**Concept No. 21: High Profit & High Losses under Future & Option**

By investing in Future & Options we have huge profits with low initial investments in comparison to cash markets but at the same time we can also have huge losses.

**Concept No. 22: Intrinsic Value & Time Value of Option**

Option value (Premium) can be divided into two parts:-

1. Intrinsic Value
2. Time Value of an Option

Option Premium = Intrinsic Value + Time Value of Option

iSS Rathore Institute iSS
email: gjainca@gmail.com
1. **Intrinsic Value:**

- An Option’s intrinsic Value is the amount by which the option is In-the-money. It is the amount that the option owner would receive if the option were exercised.

- An Option has ZERO Intrinsic Value if it is At-the-Money or Out-of-the-Money, regardless of whether it is a call or a Put Option.

- The Intrinsic Value of a Call Option is the greater of \( S - X \) or 0. That is
  \[
  C = \text{Max} \[0, S - X\]
  \]

- Similarly, the Intrinsic Value of a Put Option is \( X - S \) or 0. Whichever is greater. That is:
  \[
  P = \text{Max} \[0, X - S\]
  \]

**Example:**

Consider a call option with strike price of $50. Compute the intrinsic value of this option for stock price of $55, $50, and $45.

**Solution:**

- Stock Price = $55: \( C = \text{Max} \[0, 55 - 50\] = \$5 \)
- Stock Price = $50: \( C = \text{Max} \[0, 50 - 50\] = \$0 \)
- Stock Price = $45: \( C = \text{Max} \[0, 45 - 50\] = \$0 \)

Notice that at expiration, if the stock is worth $50 or below, the call option is worth $0. Why? Because a rational option holder will not exercise the call option and take the loss.

2. **Time Value of an Option:**

- The Time Value of an Option is the amount by which the option premium exceeds the intrinsic Value.

  **Time Value of Option = Option Premium – Intrinsic Value**

- When an Option reaches expiration there is no “Time” remaining and the time value is ZERO.

- The longer the time to expiration, the greater the time value and, other things equal, the greater the option’s Premium (price).
Concept No. 23: Interest Rate Caps, Floor & Collar

Interest Rate Cap:

- It is a series of interest rate Call options with strike rates equal to the Cap rate.
- Caps pay when rate rises above the cap rate.

Interest Rate Floor:

- It is a series of Interest rate put Options with strike rates equal to the floor rate.

Interest Rate Collar:

- It is a combination of a Cap and a Floor.

Concept No. 24: Option Strategies/Combination

- Combination of Call & Put is known as OPTION STRATEGIES.

Types of Option Strategies:

1. Straddle Position:
Straddle may be of 2 types:-

⇒ **Long Straddle:**
Buy a Call and Buy a Put on the same stock with both the options having the same exercise price.

**Option:** Buy One Call and Buy One Put

**Exercise Date:** Same of Both

**Strike Price/ Exercise Price:** Same of Both

**Note:**
A Long Straddle investor pays premium on both, Call & Put.

⇒ **Short Straddle:**
Sell a Call and Sell a Put with same exercise price and same exercise date.

**Option:** Sell One Call and Sell One Put

**Exercise Date:** Same of Both

**Strike Price/ Exercise Price:** Same of Both

**Note:**
1. A Short Straddle investor receive premium on both Call and Put.
2. When an investor is not sure whether the price will go up or go down, then in such case we should create a straddle position.
3. If Question is Silent, always assume Long Straddle.

2. **Strip Strategy (Bear Strategy):**

- Buy Two Put and Buy One Call Option of the same stock at the same exercise price and for the same period.

- Strip Position is applicable when decrease in price is more likely than increase.

**Option:** Buy One Call and Buy Two Put

**Exercise Date:** Same of Both

**Strike Price/ Exercise Price:** Same of Both

3. **Strap Strategy (Bull Strategy):**
Buy Two Calls and Buy One Put when the buyer feels that the stock is more likely to rise steeply than to fall

**Option**: Buy Two Calls and Buy One Put

**Exercise Date**: Same of Both

**Strike Price/Exercise Price**: Same of Both

**Steps taken to solve these kind of problems:**

**Step 1**: Identify the position which are taken in the given strategy.

**Step 2**: Calculate Profit & Loss of each position separately.

**For Calls**:

**If Exercise**:
Net Profit = \( S - X - \text{Option Premium} \)

**If not exercised**:
Loss = option Premium

**For Put**

**If Exercise**:
Net Profit = \( X - S - \text{Option Premium} \)

**If not exercised**:
Loss = option Premium

**Step 3**: Calculate Overall Profit & Loss for given Strategy.

**Concept No. 25: Calculation of \( N(d_1) \) & \( N(d_2) \)**

**Method 1**: Using Tables

**Example 1**:

\( d_1 = 0.70 \), \( d_2 = 0.50 \)

\( N(d_1) = N(0.70) = 0.758036 \)

\( N(d_2) = N(0.50) = 0.691462 \)
\[ d_1 = -1.31 \quad , \quad d_2 = -1.49 \]

\[ N(d_1) = N(-1.31) = 0.095098 \]
\[ N(d_2) = N(-1.49) = 0.068112 \]

**Example 3:**

\[ d_1 = 0.4539 \quad , \quad d_2 = 0.4744 \]

\[ d_1 = 0.4539 \]

\[ 0.45 = 0.673645 \]
\[ 0.46 = 0.677242 \]

When \( d_1 \) increases by 0.01, the value increases by 0.003597

When \( d_1 \) increases by 1, the value increases by \[ \frac{0.003597}{0.01} \]

When \( d_1 \) increases by 0.0039, the value increases by \[ \frac{0.003597}{0.01} \times 0.0039 = 0.00140283 \]

\[ N(d_1) = N(0.4539) \]

\[ = 0.673645 + 0.00140283 \]
\[ = 0.675047 \]

Similarly, \( d_2 = 0.4744 \)

\[ \begin{array}{c}
0.47 \\
\downarrow \\
0.680822
\end{array} \]

\[ \begin{array}{c}
0.48 \\
\downarrow \\
0.684386
\end{array} \]

\[ \frac{0.00356}{0.01} \times 0.0049 = 0.00157 \]

\[ N(d_2) = N(0.4744) \]

\[ = 0.680822 + 0.00157 \]
\[ = 0.68239 \]

**Method 2:** Using Normal Distribution Table or Z-Table
Example 1:

\[ d_1 = 0.70, \quad d_2 = 0.50 \]

\[ d_1 = 0.70 \]

Z-value of 0.70 (Through table) = 0.258036

\[ N(d_1) = N(0.70) = 0.50 + 0.258036 \]
\[ = 0.758036 \]

Z-value of 0.50 = 0.191462

\[ N(d_2) = N(0.50) = 0.50 + 0.191462 \]
\[ = 0.691462 \]

Example 2:

\[ d_1 = -1.31, \quad d_2 = -1.49 \]

\[ d_1 = -1.31 \]

Z-value of -1.31 (Through table) = 0.404902

\[ N(d_1) = N(-1.31) = 0.50 - 0.404902 \]
\[ = 0.095098 \]

\[ d_2 = -1.49 \]

Z-value of -1.49 (Through table) = 0.431888

\[ N(d_2) = N(-1.49) = 0.50 - 0.431888 \]
\[ = 0.068112 \]
Concept No. 26: Calculation of Natural log (Base)

1. 0.75

Natural log (0.75)

\[ \ln(0.75) = -0.28768 \]

2. 1.24

\[ \ln(1.24) = 0.21511 \]

Concept No. 27: Black & Scholes Model

For Call:

Value of a Call Option/ Premium on Call = \( S \times N(d_1) - \frac{X}{e^{rt}} \times N(d_2) \)

Where \( N(d_1) \) and \( N(d_2) \) are statistical term which takes into account standard deviation, logarithm (\( \ln \)) and other relevant factors.

\( N(d_1) \) and \( N(d_2) \) can be calculated by Using \( d_1 \) and \( d_2 \)

Calculation of \( d_1 \) and \( d_2 \):

\[
d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left[r + 0.50\sigma^2\right] \times t}{\sigma \times \sqrt{t}}
\]

where \( S = \) Current Market Price

\( X = \) Exercise Price

\( r = \) risk-free interest rate

\( t = \) time until option expiration

\( \sigma = \) Standard Deviation of Continuously Compounded annual return

\[
d_2 = d_1 - \sigma \sqrt{t}
\]

Or

\[
d_2 = \frac{\ln\left(\frac{S}{X}\right) + \left[r - 0.50\sigma^2\right] \times t}{\sigma \times \sqrt{t}}
\]

For Put:

Value of a Put Option/ Premium on Put = \( \frac{X}{e^{rt}} \times [1 - N(d_2)] - S \times [1 - N(d_1)] \)
where \( S \) = Current Market Price
\( X \) = Exercise Price

Note:
Value or Premium of Put can either be calculated by using PCPT or BSM. However if value of Call is given or calculated, then in such case PCPT is preferred.

Concept No. 28: Put-Call Parity Theory \( \rightarrow \) ARBITRAGE

As per PCPT,

\[
\text{Value of Call} + \frac{X}{(1+RFR)^T} = \text{Value of Put} + S
\]

LHS \( \rightarrow \) RHS

Case I
If LHS = RHS, no arbitrage is possible.

Case II
If LHS \( \neq \) RHS, arbitrage is possible.

A. If LHS > RHS, Call is Over-Valued & Put is Under-Valued

Option Market:

a) Short Call i.e. Obligation to sell shares & receive Option Premium

b) Long Put i.e. right to sell share

Cash Market:
Buy one stock in Cash Market as on today.

Borrow:
Borrow the net required amount.

B. If LHS < RHS, Call is Under-Valued & Put is Over-Valued

Option Market:

a) Long Call i.e. right to buy share & pay Option Premium

b) Short Put i.e. obligation to buy share & receive Option Premium.
Cash Market:
Sell the required stock in Cash Market as on Today

Invest:
Invest the net required amount available.

Concept No. 29: Value of Equity & Debt by using Black Scholes Model

Current Value of the equity = \( N(d_1) \times \text{Current Value} - \text{Present value of Business} \)

\[- N(d_2) \times \text{value of debt} e^{-rt} \]

\[ d_1 = \frac{\ln \left( \frac{\text{Value of Business}}{\text{Value of Debt}} \right) + \left[ r + 0.50 \sigma^2 \right] \times t}{\sigma \times \sqrt{t}} \]

\[ d_2 = d_1 - \sigma \sqrt{t} \]

Note: This concept is similar to Normal BSM Method. The only difference is that instead of current Market Price We use Current Value of Business and in case of exercise price we use Value of Debt here.

Example:
X Ltd. Has a current value of Rs. 1,000. The face value of its outstanding bonds too is Rs. 1,000. These are 1 year discount bonds with an obligation of 1,000 in year 1. RFR = 12% and the variance of continuously compounded rate of return on the firm’s assets is 16%. What is the present value of X Ltd. equity and debt?

Solution:
Value of Equity = \( N(d_1) \times \text{Current Value or Present Value of Business} - N(d_2) \times \text{Present Value of Debt.} \)

\[ = 0.6915 \times 1,000 - 0.5393 \times 1,000 \times 0.12 \times 1 \]

\[ = 212.7 \]

Value of Debt = Value of Business – Value of Equity

\[ = 1,000 - 212.7 \]

\[ = 783.3 \]

Working Note:

\[ d_1 = \frac{\ln \left( \frac{\text{Value of Business}}{\text{Value of Debt}} \right) + \left[ r + 0.50 \sigma^2 \right] \times t}{0.4 \times \sqrt{1}} \]

\[ = 0.6915 \]

\[ d_2 = d_1 - \sigma \sqrt{t} = 0.50 - 0.4 \sqrt{1} \]

\[ = 0.5398 \]
Concept No. 30: Butterfly Spread

It can be constructed in following manner:
- Buy One Call Option at High exercise Price \( (S_1) \)
- Buy One Call Option at Low exercise Price \( (S_2) \)
- Sell two Call Option \( \left( \frac{S_1 + S_2}{2} \right) \)

Note:
Hence we can say that under butterfly spread position, an investor will undertake 4 call option with respect to 3 different strike price.
# Foreign Exchange Risk Management (FOREX)

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. 1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept No. 2: Home Currency &amp; Foreign Currency</td>
<td></td>
</tr>
<tr>
<td>Concept No. 3: Spot Rate &amp; Forward Rate</td>
<td></td>
</tr>
<tr>
<td>Concept No. 4: Direct Quote &amp; Indirect Quote</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 5: Bid &amp; Ask Rate</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 6: Swap Point</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 7: Cross Rate</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. 8: Exchange Margin</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. 9: Forward Contract</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 10: Forward Rate Agreement (FRA)</td>
<td>7</td>
</tr>
<tr>
<td>Concept No. 11: Purchase Price Parity Theory (PPPT)</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 12: Interest Rate Parity Theory</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 13: Geographical Arbitrage</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 14: Leading &amp; Lagging</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. 15: Covered Interest Arbitrage</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. 16: Foreign Capital Budgeting</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. 17: Cross Rate Arbitrage</td>
<td>14</td>
</tr>
<tr>
<td>Concept No. 18: Return Under FOREX</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. 19: Premium or Discount</td>
<td>16</td>
</tr>
<tr>
<td>Concept No. 20: Money Market Operations</td>
<td>17,18</td>
</tr>
<tr>
<td>Concept No. 21: Exposure Netting</td>
<td>19</td>
</tr>
<tr>
<td>Concept No. 22: Currency SWAP</td>
<td>20</td>
</tr>
<tr>
<td>Concept No.</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>23</td>
<td>Standard Deviation under FOREX</td>
</tr>
<tr>
<td>24</td>
<td>Net Exposure</td>
</tr>
<tr>
<td>25</td>
<td>Treatment of withholding Tax</td>
</tr>
<tr>
<td>26</td>
<td>Currency Futures</td>
</tr>
<tr>
<td>27</td>
<td>Currency Option</td>
</tr>
<tr>
<td>28</td>
<td>Implied Differential in Interest Rate</td>
</tr>
<tr>
<td>29</td>
<td>Different Types of Risk Under Foreign Exchange Market</td>
</tr>
<tr>
<td>30</td>
<td>Forward Premium Paid or Additional cost while taking Forward Contracts</td>
</tr>
<tr>
<td>31</td>
<td>Modification under Forward Contract</td>
</tr>
<tr>
<td>32</td>
<td>Extension of Forward Contract</td>
</tr>
<tr>
<td>33</td>
<td>Partial Honour of Contract</td>
</tr>
<tr>
<td>34</td>
<td>International Fisher Effect</td>
</tr>
<tr>
<td>35</td>
<td>Interest Rate Swap</td>
</tr>
<tr>
<td>36</td>
<td>Covered Interest Arbitrage</td>
</tr>
<tr>
<td>37</td>
<td>International Working Capital</td>
</tr>
<tr>
<td>38</td>
<td>Savings due to Time Value (Discount) &amp; Currency Fluctuation</td>
</tr>
<tr>
<td>39</td>
<td>Currency Pairs</td>
</tr>
<tr>
<td>40</td>
<td>Expected Spot Rate</td>
</tr>
<tr>
<td>41</td>
<td>Centralized Cash Management &amp; Decentralized Cash Management System</td>
</tr>
<tr>
<td>42</td>
<td>Broken Date Contracts</td>
</tr>
<tr>
<td>43</td>
<td>Letter of Credit</td>
</tr>
<tr>
<td>44</td>
<td>Gain/Loss under FOREX</td>
</tr>
<tr>
<td>45</td>
<td>Contribution to Sales Ratio</td>
</tr>
<tr>
<td>46</td>
<td>Miscellaneous Concepts</td>
</tr>
</tbody>
</table>
Concept No. 1: Introduction

Globalization of Business

1. Raising of Capital from International Capital Markets.

2. Open Economy to Foreign Investments, Exports, Imports and making investments in Indian Economy like Infrastructure sector, medical science, etc.

3. Trade tie-ups between countries.

➢ Different countries have different currencies and the different currencies have different values, so there is a need of the rule for currency conversions for Global Business and Investments.

What is Exchange Rate?

The rate of conversion is the Exchange Rate.

Or

An exchange rate is the price of one country’s currency expressed in terms of the currency of another country. E.g. A rate of Rs. 50 per US $ implies that one US $ costs Rs. 50.

Example:

<table>
<thead>
<tr>
<th>Home Country</th>
<th>Currency</th>
<th>Currency Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>Rupee</td>
<td>INR/Rs.</td>
</tr>
<tr>
<td>USA</td>
<td>Dollar</td>
<td>$</td>
</tr>
<tr>
<td>UK</td>
<td>Pound</td>
<td>£</td>
</tr>
<tr>
<td>Japan</td>
<td>Yen</td>
<td>¥</td>
</tr>
<tr>
<td>Germany</td>
<td>Euro</td>
<td>€</td>
</tr>
<tr>
<td>France</td>
<td>Euro</td>
<td>€</td>
</tr>
<tr>
<td>China</td>
<td>Yuan</td>
<td>CNY</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Swiss Franc</td>
<td>CHF</td>
</tr>
<tr>
<td>Canada</td>
<td>Canadian $</td>
<td>CAD</td>
</tr>
<tr>
<td>Sweden</td>
<td>Swedish Krona</td>
<td>SEK</td>
</tr>
</tbody>
</table>

➢ In India, Foreign Exchange Market is regulated by RBI & FEMA.

Concept No. 2: Home Currency & Foreign Currency

Home Currency: Country’s own currency.

Example:

For India ‘Rs./INR is home currency
For USA ‘US $’ or ‘Dollar’ is a home currency

For UK ‘£’ or ‘Pound’ or ‘GBP’ is home currency

**Foreign Currency** : Any currency other than home currency will be a Foreign Currency

**Example:**

For India, $, £, etc. will be a foreign currency.

For US ‘Rs.’, £ will be foreign currency.

**NOTE:**

In this chapter, while using exchange rate, we must take 4 or 5 digits after decimal point.

**Concept No. 3: Spot Rate & Forward Rate**

*Spot Rate*: Rate used for buying & selling of foreign currency at *As on Today or Immediately*.

*Forward rate*: Rate used for buying & selling of foreign currency at *some future Date* i.e. Forward rate is the rate contracted today for exchange of currencies at a specified future date.

**Concept No. 4: Direct Quote & Indirect Quote**

**Direct Quote**: Home Currency Price for 1 unit of foreign currency.

**Example**: 1$ = Rs. 50 is DQ for Rupee.

**Indirect Quote**: Foreign Currency Price for 1 unit of Home Currency.

**Example**: 1Re = .2000$ is IDQ for Rupee.

**NOTE:**

If a given quotation is direct for one country, then the same quotation will be indirect for another country and vice-versa.

**Example**: 1$ = Rs. 50

⇒ This is Direct Quote for India and Indirect Quote for USA.

**Methods for Conversion of Direct Quote into Indirect Quote and vice-versa**

**Method 1: When bid & ask rates are same**

Direct Quote can be converted into indirect quote by taking the reciprocal of direct quote.

\[ IDQ = \frac{1}{DQ} \]
Example: $1 = Rs. 50

Find DQ & IDQ for India, DQ and IDQ for USA.

Solution:

DQ for India => 1$ = Rs. 50

IDQ for India => 1 Re. = $ \frac{1}{50}$

DQ for USA => Re. 1 = $ \frac{1}{50}$

IDQ for USA => 1 $ = Rs. 50

Method 2: When bid & ask rates are separately given

Direct Quote (DQ) can be converted into Indirect Quote (IDQ) by taking the reciprocal of direct quote and switching the position.

Example: $1 = Rs. 50 --- Rs. 55

Find DQ & IDQ for India.

Solution:

DQ for India => 1$ = Rs. 50 --- Rs. 55

IDQ for India => 1 Re. = $ \frac{1}{50} \frac{1}{55}

$1 \frac{55}{50} \frac{50}{55}$

1 Re. = $ \frac{1}{55} \frac{1}{50}$

Concept No. 5: Bid & Ask Rate

Bid Rate: Rate at which bank BUYS left hand side currency.

Ask Rate: Rate at which bank SELLS left hand side currency.

Example:

$1 = \text{Rs.} 50 \text{---} \text{Rs.} 55$

---

Left Hand Side Currency

Bid Rate/ Bank Buying rate of left hand currency

Ask Rate/ Bank Selling rate of left hand currency
NOTE:

➤ Difference between Bid & Ask rate represents Profit Margin for the bank.

➤ Bid & Ask rate or Exchange Rate is always quoted from the point of view of bank.

➤ Bid Rate must always be less than Ask Rate.

Or

Ask Rate must always be greater than Bid Rate.

➤ Always solve question from the point of view of investor/ Customer.

➤ The difference between the Ask & Bid rates is called Spread, representing the profit margin of dealer.

\[
\text{Spread} = \text{Ask Rate} - \text{Bid Rate}
\]

**Concept No. 6: SWAP POINTS/ Forward Margin/ Forward-Spot Differential**

Difference between Forward Rate and Spot Rate is known as Swap Points.

**Calculation of Forward rate using Swap Points:**

**Method 1: When Swap Points are increasing:**

➤ It indicates premium on left hand currency.

➤ In this case, we will add swap points with spot rates to calculate forward rates.

**Example:**

SR => 1$ = 45.4500 ---- 45.4580
2 months Swap Point = 30/42
Calculate Forward Rate?

**Solution:**

\[
\begin{align*}
1$ &= 45.4500 ---- 45.4580 \\
+ 00.0030 &= 00.0042 \\
\text{FR} 1$ &= 45.4530 ---- 45.4622
\end{align*}
\]

**Method 2: When Swap Points are decreasing:**

➤ It indicates discount on left hand currency.

➤ In this case, we will deduct swap points from Spot Rate to calculate forward rates.

**Example:**

SR => 1£ = $ 1.4510 ---- 1.4620
1 months Swap Point = 55/44
Calculate Forward Rate?
Solution:

\[ 1£ = $ 1.4510 ---- 1.4620 \]
\[ ( - ) 0.0055 ---- 0.0044 \]
\[ FR 1£ = $ 1.4455 ---- 1.4576 \]

**NOTE:**

- Swap Points normally do not carry ‘+’ or ‘-’ sign or decimal point.
- Add or Deduct Swap points from the last decimal point in the reverse order.

**Concept No. 7: Cross Rate**

*Cross Rate* is the product of two or more than two exchange rate.

**NOTE:**

Cross Rate is normally used in finding out any missing exchange rate.

**Concept No. 8: Exchange Margin**

*Exchange Margin* is the extra amount or percentage charged by the bank over and above the rate quoted by it. Eg. Commission, transaction expenses, etc.

- **Actual Selling Rate of Bank:** (Add Exchange Margin)
  
  = Ask Rate \((1 + \text{Exchange Margin})\)

- **Actual Buying Rate of Bank:** (Deduct Exchange Margin)
  
  = Bid Rate \((1 - \text{Exchange Margin})\)

**Concept No. 9: Forward Contract**

Forward Contracts are those contracts, which are ENTERED TODAY for buying & selling of foreign currency at some FUTURE DATE.

- Purpose of Forward Contract is to hedge their position against currency fluctuations.
- LIBOR (London Inter Bank Offering Rate). It is a benchmark rate. It is always quoted or given as per annual basis.

**Concept No. 10: Forward Rate Agreement (FRA)**

- A forward rate Agreement can be viewed as a forward contract to borrow/lend money at a certain rate at some future date.
These Contracts settle in cash.

The long position in an FRA is the party that would borrow the money. If the floating rate at contract expiration is above the rate specified in the forward agreement, the long position in the contract can be viewed as the right to borrow at below market rates & the long will receive a payment.

If reference rate at the expiration date is below the contract rate, the short will receive a cash from the long.

FRA helps borrower to eliminate interest rate risk associated with borrowing or investing funds.

Adverse movement in the interest rates will not affect liability of the borrower.

**Payment to the long at settlement is:**

\[ \text{National Principal} \times \frac{[\text{Floating (LIBOR)} - \text{Forward Rate}] \times \frac{\text{days}}{360}}{1 + \text{Floating rate (LIBOR)} \times \frac{\text{days}}{360}} \]

**Example 1:**
I want to take loan after 3 months for 6 months contract a FRA.

- **Contract Date** (Today)
- **Settlement Date or Requirement of Loan**
- **Maturity Period**

3 Months \hspace{1cm} 6 Months

9 Months

**FRA = 3 \times 9**

**Example 2:**
Consider an FRA that:
- Expires/Settles in 30 days.
- Is based on notional principal amount of $1 million.
- Is based on 90 days LIBOR.
- Specifies a forward Rate of 5%

Assume that actual 90 days LIBOR 30 days from now (at expiration) is 6%. Compute the cash settlement payment at expiration and identify at which party makes the payment.

**Solution:**
If the long could borrow at contract rate of 5% rather than the market rate of 6%, the interest saved on a 90 day $1 million loan would be:

\[(0.06 - 0.05) \times \frac{90}{360} \times 1\text{ million} = 0.0025 \times 1\text{ million} = \$2,500\]
The $2,500 in interest savings would not come until the end of the 90 days loan period. The value at settlement is the present value of these savings. **The correct discount rate to use is the actual rate at settlement, 6%, not the contract rate of 5%.**

The payment at settlement date from the short to the long is:

\[
\frac{2500}{1 + (0.06) \times \frac{90}{360}} = \$2,463.05
\]

**Concept No. 11: Purchase Price Parity Theory (PPPT)**

- PPPT is based on the concept of ‘Law of One Price’.
- PPPT is based on the fact that price of a commodity in two different market will always be same.
- If Price of a commodity in two different market are not same, there will be an arbitrage opportunity exists in the market.
- Suppose Price of a Commodity in India is Rs. X & In USA is $Y. Spot Rate is 1$ = Rs. S

Then \( X = Y \times S \)

\[ S = \frac{X}{Y} \]

\[ \text{Spot Rate (Rs. / $)} = \frac{\text{Current Price (Rs.)}}{\text{Current Price ($)}} \]

- PPPT is also applicable in case of inflation. Suppose Inflation Rate of India is \( I_{Rs} \) and in US is \( I_{$} \)

Forward Rate 1$ = Rs. F. Now as per PPPT, we have after 1 year:

\[ X \left(1 + I_{Rs}\right) = y \left(1 + I_{$}\right) \times F \]

\[ F = \frac{X \left(1 + I_{Rs}\right)}{Y \left(1 + I_{$}\right)} \]

\[ F = S \times \frac{1 + I_{Rs}}{1 + I_{$}} \]

\[ \text{FR (Rs.$)} = \frac{1+\text{Rupee Inflation}}{1+\text{Dollar ($) Inflation}} \]

\[ \text{SR (Rs.$)} = \frac{1+\text{Dollar ($) Inflation}}{1+\text{Rupee Inflation}} \]

**NOTE:**

- The above equation is applicable for any two given currency.
- If Inflation Rate of a country is higher, then the currency of that Country will be at a discount in future and Vice- Versa.
- Inflation rate in above equation must be adjusted according to forward period.

**Case 1: When Period is less than 1 Year.**
Case 2: When Period is more than 1 Year.

\[
\frac{FR \ (Rs./$)}{SR \ (Rs./$)} = \frac{(1 + \text{Inflation Rate (Rs.)})^n}{(1 + \text{Inflation Rate ($)})^n}
\]

\(n = \text{No. of Years}\)

**Concept No. 12: Interest Rate Parity Theory (IRPT)**

IRPT states that exchange rate between currencies is directly affected by their Interest Rate.

**Assumption:** Investment opportunity in any two different market is same.

**Formulae:**

\[
\frac{FR \ (Rs./$)}{SR \ (Rs./$)} = \frac{1 + \text{Interest Rate (Rs.)}}{1 + \text{Interest Rate ($)}}
\]

**NOTE:**

- The above equation is applicable for any two given currency.
- Interest Rate should be adjusted according to forward period.

Case 1: When Period is less than 1 Year.

\[
\frac{FR \ (Rs./$)}{SR \ (Rs./$)} = \frac{1 + \text{Periodic Interest Rate (Rs.)}}{1 + \text{Periodic Interest Rate ($)}}
\]

Case 2: When Period is more than 1 Year.

\[
\frac{FR \ (Rs./$)}{SR \ (Rs./$)} = \frac{(1 + \text{Interest Rate (Rs.)})^n}{(1 + \text{Interest Rate ($)})^n}
\]

\(n = \text{Number of years}\)

**NOTE:**

- If Interest rate of a country is higher, than the currency of that country will be at a discount in future and vice-versa.
- If IRPT holds, arbitrage is not possible. In that case, it doesn’t matter whether you invest in domestic country or foreign country, your rate of return will be same.
Concept No. 13: Geographical Arbitrage

- Geography Arbitrage refers to a situation in which a currency is cheaper in one foreign exchange market and costlier in other market.
- It refers to a situation, where price of a commodity/ currency in two different markets are different.
- Rule -> “Buy low & Sell high”.

Example:

In New York: 1£ = 1.9650 $ ---- 1.9670
In London : 1£ = 1.9550 $ ---- 1.9560

Solution:

Buy 1£ from London @ 1.9560
Sell 1£ to New York @ 1.9650
0.0090 (Arbitrage Profit)

- When Purchase Price Parity Theory is not applicable, arbitrage opportunity is possible.

Concept No. 14: Leading & Lagging

- Leading means advancing the timing of payments and receipts.
- Lagging means postponing or delaying the timing of payments and receipts.

NOTE:

While deciding regarding leading and lagging, we must consider “Opportunity cost of interest” if given in question.

Concept No. 15: Covered Interest Arbitrage

- When Investment opportunity in any two given countries are different.
- When IRPT is not applicable, then covered interest arbitrage will be applicable.
- Suppose Interest Rate of India is INTRs. And USA is INT$. Spot Rate is 1$ = Rs. S, Forward Rate => 1S = Rs. F

Let assume Investor is having Rs. A for investment

Option 1: When investor invest Rs. A in India:

Amount of Rs. Received after one year

\[ A_1 = A(1 + INT_{Rs}) \]
Option 2: When investor invest Rs. A in USA:

Amount of Equivalent Rs. Received after one year

\[ A_2 = \left( \frac{A}{S} \times (1 + INT_s) \right) \times F \]

Three cases will emerge:

Case 1: \( A_1 = A_2 \)

\( \Rightarrow \) No arbitrage opportunity

Proof: \( A_1 = A_2 \)

\[ A (1 + INT_{Rs.}) = \left( \frac{A}{S} \times (1 + INT_s) \right) \times F \]

\[ \frac{F}{S} = \frac{1 + INT_{Rs.}}{1 + INT_s} \]

Case 2: \( A_1 > A_2 \)

\( \Rightarrow \) Arbitrage Opportunity is Possible.

\( \Rightarrow \) Arbitrager should invest in India (Home Country) & borrow from USA (Foreign Country)

Proof: \( A_1 > A_2 \)

\[ A (1 + INT_{Rs.}) > \left( \frac{A}{S} \times (1 + INT_s) \right) \times F \]

Case 3: \( A_1 < A_2 \)

\( \Rightarrow \) Arbitrage opportunity is possible.

\( \Rightarrow \) Arbitrager should invest in USA (Foreign Country) & borrow from India (Home Country)

Proof: \( A_1 < A_2 \)

\[ A (1 + INT_{Rs.}) < \left( \frac{A}{S} \times (1 + INT_s) \right) \times F \]

Recognition of Arbitrage Opportunity:

Calculate Theoretical Interest Rate of Home Country

Case

<table>
<thead>
<tr>
<th>Actual Interest Rate = Theoretical Interest Rate</th>
<th>No Arbitrage Opportunity exists.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Interest Rate &gt; Theoretical Interest Rate</td>
<td>Arbitrage Opportunity Exists Invest in India (Home country)</td>
</tr>
</tbody>
</table>
| Actual Interest Rate< Theoretical Interest Rate | Arbitrage Opportunity Exists  
Invest in USA (Foreign Country)  
Borrow in India (Home country) |

**NOTE 1:**

Theoretical interest rate may be calculated by using IRPT equation. Actual Interest Rate will be given in the question.

**NOTE 2:**

The above concept is not applicable in Case:

i. Investment & Borrowing rates are different in the same country.

ii. Bid and Ask rates are separately given in the question.

---

**Concept No. 16: Foreign Capital Budgeting**

Two approaches are followed in case investment is undertaken in foreign country:

i. Home Currency Approach

ii. Foreign Currency Approach

**Home Currency Approach:**

**Step 1:** Compute all cash inflows & outflows arising in foreign currency.

**Step 2:** Convert these cash Inflows & outflows into home currency by using appropriate exchange rates (i.e. Forward Rate) *(Calculate through Swap Point or IRPT)*

**Step 3:** Compute a suitable discount rate. (Calculate through DDM or CAPM)

**Step 4:** Compute Home Currency (NPV)

**Foreign Currency Approach:**

**Step 1:** Compute all cash inflows & outflows arising in foreign currency.

**Step 2:** Compute a suitable discount rate.

**Step 3:** Compute Foreign Currency (NPV)

**Step 4:** Convert foreign currency NPV into Home currency by using Spot Rate

**NOTE 1:** Answer by both concepts will be same.

**NOTE 2:** Appropriate exchange rate can be calculated either by using IRPT or PPPT
NOTE 3: Discount Rate to be used should be risk-adjusted discount rate (RADR), Since foreign project involves risk.

\[(1 + \text{RADR}) = (1 + \text{Risk-free rate}) (1 + \text{Risk Premium})\]

NOTE 4: Discount Rate or RADR of both the country are different.

NOTE 5: Risk Premium of both home country and foreign country are assumed to be same.

**Concept No. 17: Cross Rate Arbitrage**

**Concept No. 18: Calculation of Return under FOREX**

Return (In terms of Home Currency) = 1 + \([\frac{P_1 - P_0 + 1}{P_0}] (1 + C) - 1\)

\(P_0\) = Price at the beginning

\(P_1\) = Price at the End

\(I\) = Income from Interest/Dividend

\(C\) = Change in exchange rate.

**Concept No. 19: Premium or Discount**

**Premium:** If the currency is costlier in future as compared to spot it is said to be at a premium.

\(\text{SR} \Rightarrow 1\text{$} = \text{Rs. 45}\)

\(\text{FR} \Rightarrow 1\text{$} = \text{Rs. 50}\)

In the above quote $ is at Premium.

**Discount:** If the currency is Cheaper in future as compared to spot it is said to be at a discount.

\(\text{SR} \Rightarrow 1\text{Re.} = \frac{1}{45} \text{$} = 0.0222\)

\(\text{FR} \Rightarrow 1\text{Re.} = \frac{1}{50} \text{$} = 0.02\)

We can say that rupee is at discount.

**NOTE:** If one currency is at premium than another currency must be at discount & Vice-versa.

**Calculation of Premium or Discount**

\[\left[\frac{\text{FR} - \text{SR}}{\text{SR}}\right] \times \frac{12}{\text{Forward Period}} \times 100\]

**NOTE:** This formula is applicable only for left hand currency

**Example:**
SR 1 $ = Rs. 50
12 month forward rate => 1 $ = Rs. 55

Calculate rate of premium and rate of discount for $ & Rs?

Solution:

**Premium of $**

\[
\text{Premium of $} = \left[ \frac{\text{FR-SR}}{\text{SR}} \right] \times \frac{12}{12} \times 100
\]

\[
= \left[ \frac{55-50}{50} \right] \times \frac{12}{12} \times 100 = 10\%
\]

SR => 1Re. = \(\frac{1}{50}\) $ = 0.02 $

12 month FR => 1Re. = \(\frac{1}{55}\) $ = 0.01818 $

**Discount of Rs.**

\[
\text{Discount of Rs.} = \left[ \frac{\text{FR-SR}}{\text{SR}} \right] \times \frac{12}{\text{Forward Period}} \times 100
\]

\[
= \left[ \frac{0.01818-0.02}{0.02} \right] \times \frac{12}{12} \times 100 = -9.10\%
\]

**Conclusion:**

If one currency is at a premium, then another currency must be at a discount. However, the rate of premium may not be equal to the rate of discount.

**Concept No. 20: Money Market Operations**

**Case I: If Foreign Currency is to be received in future:**

**Step 1: Borrow in Foreign Currency:**

Amount of borrowing should be such that Amount Borrowed + Interest on it becomes equal to the amount to be received.

**Step 2:**

Convert the borrowed foreign currency into home currency by using spot Rate.

**Step 3:**

Invest this home currency amount for the required period.

**Step 4:**

Pay the borrowed amount of foreign currency with interest using the amount to be received in foreign currency. [ May be Ignored]
Example:

SR:  1£ = $ 1.5865 -- $1.5905
FR:  1£ = $ 1.5505 -- $1.5545

If customer want to sell $1,00,000 as on today, what amount of pound (£) he will receive?

Solution:

SR:  1£ = $ 1.5865 -- $1.5905

=> 1$ = \( \frac{1}{1.5905} \) £  \\
Amount of £ received = $ 1,00,000 \times \frac{1}{1.5905} = £ 62873.3102

Example 2:

Amount to be paid in £ if he want to buy $ 3,50,000? Use forward rate

Solution:

FR:  1£ = $ 1.5505 -- $1.5545

=> 1$ = \( \frac{1}{1.5505} \) £  \\
Amount of £ Paid = $ 3, 50,000 \times \frac{1}{1.5505} = £ 2, 25,733.63

Case II: Money Market Operation:- When foreign currency is to be paid in future

Step 1:

Invest in Foreign currency. Amount of investment should be such that, “Amount Invested + Interest on it” becomes equal to amount to be paid

Step 2:

Borrow in Home Currency, equivalent amount which is to be invested in foreign currency using Spot rate.

Step 3:

Pay the borrowed amount with interest in Home Currency on Maturity.

Step 4:

Pay the outstanding amount with the amount received from investment. [May be Ignored]

Concept No. 21: Exposure Netting

Neting means adjusting receivable and payables (or inflows & Outflows)
Two conditions must be fulfilled:

1. Netting can be done for same currency.
2. Netting can be done for same period.

Example 1:

$\text{to be received after 3 months} = +5,00,000$

$\text{to be paid after 3 months} = -2,00,000$

How many forward contracts are required?

Solution:

Netting: Net amount to be received = $5,00,000 - $2,00,000 = $3,00,000$

No. of Forward Contract = 1

Amount of forward Contract = $3,00,000$

Example 2:

$\text{to be received after 3 months} = +5,00,000$

$\text{to be paid after 2 months} = -1,00,000$

Solution:

No. of Forward Contracts = 2

One for 3 months -> $5,00,000$

One for 2 months -> $1,00,000$

Example 3:

$\text{to be received after 3 months} = +5,00,000$

£\text{to be paid after 3 months} = -2,00,000$

Solution:

No. of Forward Contracts = 2

One for 3 months -> $5,00,000$

One for 3 months -> £2,00,000

NOTE: In case of Netting, No. of forward contracts can be reduced.
Concept No. 22: Currency SWAP

Swap Initiation

The Australian firm wants USD
Has or can Borrow AUD

Swap AUD for USD

The U.S firm wants AUD
Has or can Borrow USD

Swap USD for AUD

Swap Interest Payments

The Australian firm has use of the USD

Australian pays USD interest

U.S firm pays AUD interest

The U.S firm has use of the AUD

Swap Termination

The Australian firm returns the USD borrowed

AUD returned

The U.S firm returns the AUD borrowed

Example: Fixed-for-fixed currency swap

BB can borrow in the U.S. for 9%, while AA has to pay 10% to borrow in the U.S.S. AA can borrow in Australia for 7%, while BB has to pay 8% to borrow in Australian $. BB will be doing business in Australia and needs AUD, while AA will be doing business in the United States and needs USD. The exchange rate is 2AUD/USD. AA needs USD 1.0 million and BB needs AUD 2.0 million. They decide to borrow the funds locally and swap the borrowed funds, charging each other the rate the other party would have paid had they borrowed in the foreign market. The swap period is for five years. Calculate the cash flows for the swap.

Solution:

AA and BB each go their own domestic bank:

- AA borrows AUD 2.0 million, agreeing to pay bank 7%, or AUD 140,000 annually.
- BB borrows USD 1.0 million, agreeing to pay bank 9%, or USD 90,000 annually.

AA and BB swap currencies:

- AA gets USD 1.0 million, agreeing to pay BB 10% interest in USD annually.
- BB gets AUD 2.0 million, agreeing to pay AA 8% interest in AUD annually.
They pay each other the annual interest:

- AA owes BB UDS 100,000 in interest to be paid on each settlement date.
- BB owes AA AUD 160,000 in interest to be paid on each settlement date.

They each owe their own bank the annual interest payment:

- AA pays the Australian bank AUD 140,000 (but gets AUD 160,000 from BB, an AUD 20,000 gain).
- BB pays the U.S. bank USD 90,000 (but gets USD 100,000 from AA, an USD 10,000 gain).
- They both gain swapping (AA is ahead AUD 20,000 and BB is ahead USD 10,000).

In Five years, they reverse the Swap. They return the notation principal.

- AA gets AUD 2.0 million from BB and then pays back the Australian bank.
- BB gets USD 1.0 million from AA and then pays back the U.S. bank.

Concept No. 23: Standard Deviation under FOREX

\[
S.D. \text{ under two asset model} = \sqrt{(SD_1)^2 + (SD_2)^2 + 2 SD_1 SD_2 Cor_{12}}
\]

SD_1 = Standard Deviation of Security
SD_2 = Standard Deviation of Exchange Rate
Cor_{12} = Co-efficient of correlation between Return of security and Exchange rate.

Concept No. 24: Net Exposure

Net Exposure means advantage of using Forward Contract over Spot Contract

\[\Rightarrow\] Net Exposure = Net Cash Flow at Forward Rate – Net Cash Flow at Spot Rate

Or

Net Cash Flow (Forward rate – Spot Rate)

Or

Net Cash Flow × Swap Point

Concept No. 25: Treatment of withholding Tax

\[\Rightarrow\] When a foreign company invests in the home country, the home country charges an additional tax known as Withholding Tax.
Withholding Tax is applicable on surplus amount (profit) which is taken back by foreign company to their own country.

**Concept No. 26: Currency Futures**

- Same as stock future or Commodity futures. In currency futures, underlying asset is currency.

**Concept No. 27: Currency Option**

- Same as Stock Option.

**Concept No. 28: Implied Differential in Interest Rate**

- Interest rate is just another name of premium or discount of one country currency in relation to another country currency.

**Equation:**

\[
\frac{FR (Rs./$) - SR (Rs./$)}{SR} \times \frac{12}{\text{Forward Period}} \times 100 = \text{Interest Rate (Rs.) – Interest Rate($)}
\]

**Concept No. 29: Different Types of Risk Under Foreign Exchange Market**

(a) **Political Risks:** This represents the financial risk that a country’s government will suddenly changes its policies.

(b) **Economic Risks:** It refers to the extent to which the economic value of a company can decline due to change in exchange rate. It is the over all impact of exchange rate change on the value of the firm.

(c) **Translation Risks:** Also known as Accounting Exposure, it refers to gains or losses caused by the translation of foreign currency assets and liabilities into the currency of the parent company for accounting purposes.

(d) **Transaction Risks:** It measures the effect of an exchange rate change on outstanding obligation that existed before exchange rates changed but were settled after the exchange rate changes.

- Amount paid or received before exchange rate change: XXX
- Amount paid or received after exchange rate change: XXX
- Transaction Loss or Gain due to Currency fluctuation: XXX

(e) **Country Risk:** It refers to the risk that a country would not be able to honour its financial commitments.
Concept No. 30: Forward Premium Paid or Additional cost while taking Forward Contracts

Concept No. 31: Modification under Forward Contract

- Forward Contract are legal binding contracts, which must be fulfilled by each and every party.
- In case of cancellation of Forward Contracts, following rules must be followed:

I. How to cancel Forward Contract

- Forward Contracts must be cancelled by entering into a reverse contract.
- Buying Forward Contract must be cancelled by Selling Contract.
- Selling Forward Contract must be cancelled by Buying Contract.

II. Rate at which contract needs to be Cancelled

Case

a) Cancelled before due date : Forward Rate prevailing as on today for due date.

b) Cancelled on due date : Spot Rate of Due Date.

c) Cancelled after Due Date : Spot Rate of the date when customer contracted with the bank.

d) Automatic Cancellation : Spot Rate prevailing on 15th day i.e. when grace period ends.

NOTE:

A grace period of 15 days after due date is given to the customer so that forward contract may be cancelled. However, at the end of the grace period, contract will be automatically cancelled by the bank.

III. Settlement of Profit/Loss:

Case

a) Cancel on or before due date : Customer will be eligible for both profit/Loss.

b) Cancel after due date or Automatic Cancellation : Customer will be eligible only for Loss

Concept No. 32: Extension of Forward Contract

Step 1: Cancellation of original Contract

Step 2: Entering into a new forward contract for the extended period.

Concept No. 33: Partial Honour of Contract

The part of the forward contract which can’t be honored, must be cancelled as per the rules of cancellation.
Concept No. 34: International Fisher Effect

- International Fisher Effect reflect the relationship between real interest rate, inflation rate and nominal interest rate.

Equation:

\[(1 + \text{Nominal Interest Rate}) = (1 + \text{Real Interest Rate}) (1 + \text{Inflation Rate})\]

Concept No. 35: Interest Rate Swap [Two Party]

- Two parties exchange their interest rate obligation.
- The plain vanilla interest rate swap involves trading fixed interest rate payments for floating rate payments.
- The party who wants fixed-rate interest payments agrees to pay fixed-rate interest.
- The Counter party, who receives the fixed payments agrees to pay variable-rate interest/floating rate interest.
- The difference between the fixed rate payment and the floating rate payment is calculated and paid to the appropriate counterparty.
- Net interest is paid by the one who owes it.
- Swaps are zero-sum game. What one party gains, the other party losses.

The Net formulae for the Fixed-Rate payer, based on a 360-day year and a floating rate of LIBOR is:

\[ (\text{Net Fixed Rate Payment})_t = [\text{Swap Fixed Rate} - \text{LIBOR}_t] \left[ \frac{\text{No.of Days}}{360} \right] \times \text{National Principal} \]

NOTE:

If this number is positive, fixed-rate payer pays a net payment to the floating-rate party.

If this number is negative, then the fixed-rate payer receives a net flow from the floating rate payer.

Example: Calculating the payments on an interest rate Swap

Bank A enters into a $1,000,000 quarterly-pay plain vanilla interest rate swap as the fixed-rate payer at a fixed rate of 6% based on a 360-day year. The floating-rate payer agrees to pay 90-day LIBOR plus a 1% margin; 90-day LIBOR is currently 4%.

90-day LIBOR rates are: 4.5% 60 days from now 5.0% 180 days from now 5.5% 270 days from now 6.0% 360 days from now
Calculate the amount Bank A pays or receives 90, 270, 360 days from now.

**Solution:**
The payment 90 days from now depends on current LIBOR and the fixed rate (don’t forget the 1% margin)

Fixed-rate payer pays:

\[
0.06 \left( \frac{90}{360} \right) - (0.04 + 0.01) \left( \frac{90}{360} \right) \times 1,000,000 = 2,500
\]

270 days from now the payment is based on LIBOR 180 days from now, which is 5%. Adding the 1% margin makes the floating-rate 6%, which is equal to the fixed rate, so there is no net third quarterly payment.

The Bank’s “payment” 360 days from now is:

\[
0.06 \left( \frac{90}{360} \right) - (0.055 + 0.01) \left( \frac{90}{360} \right) \times 1,000,000 = 1,250
\]

Since the floating-rate payment exceeds the fixed-rate payment, Bank A will receive $1,250 at the fourth payment date.

**NOTE:**

Net Interest Burden for each party = Cost Under each Choice – Savings Due to Swap

**Concept No. 36: Covered Interest Arbitrage**

➔ If Bid & Ask rates are given separately.
➔ Investment & Borrowing rate of a given currency is separately given.

**Example:**

SR: 1$ = Rs. 45.00 ---- Rs, 45.45

3M FR: 1$ = Rs. 46.00 ---- Rs, 46.10

<table>
<thead>
<tr>
<th>Interest Rate</th>
<th>India</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borrowing</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Deposit</td>
<td>6%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Calculate Covered Interest Arbitrage?

**Solution:**

Let we borrow Rs. 1000 from India for 3 months.

Amount to be paid with Interest after 3 Months = \( 1000 + 1000 \times \frac{3}{12} \times \frac{8}{100} = Rs. 1020 \)

Converting Rs. 1000 in $ we get,
Required Amount = 1000 × \(\frac{1}{45.45}\) = 22.0022 $

**Hint:** SR 1 $ = 45 ---- 45.45

\[
1 \text{ Re.} = \frac{1}{45.45} - \frac{1}{45}
\]

Investing $22.0022 for 3 months we get,
\[
= 22.0022 + 22.0022 \times \frac{3}{12} \times \frac{4}{100} = $22.2222
\]

Reconverting $22.2222 into Rs. After 3 months we get,
\[
= 22.2222 \times 46 = Rs. 1022.12
\]

[FR: 1$ = Rs. 46 – 46.10]

Arbitrage Profit = 1022.12 – 1020
\[
= 2.12
\]

**Concept No. 37: International Working Capital**

**Concept No. 38: Savings due to Time Value (Discount) & Currency Fluctuation**

If the firm decides to pay today rather than in future he may get two types of benefits:

1. Benefit on account of discount for pre-payment.
2. Benefit on account of currency fluctuation.

**Concept No. 39: Currency Pairs**

- The L.H.S currency is called “Base Currency” and the R.H.S currency is called “Quote Currency”.
- The currency pair shows how much of the quote currency is needed to purchase one unit of the base currency.

**Example:**

A price quote of EUR/USD at 1.30851 means

1 Euro = 1.30851 $

**Concept No. 40: Expected Spot Rate**

Spot Rates × Probability = Expected Spot Rate
**Concept No. 41: Centralized Cash Management & Decentralized Cash Management System**

- Under *Decentralized Cash Management*, every branch is viewed as separate undertaking. Cash Surplus and Cash Deficit of each branch should not be adjusted.

- Under *Centralized Cash Management*, every branch cash position is managed by single centralized authority. Hence, Cash Surplus and Cash Deficit of each branch with each other is accordingly adjusted.

**Concept No. 42: Broken Date Contracts**

- A Broken Date Contract is a forward contract for which quotation is not readily available.

**Example:**

If quotes are available for 1 month and 3 months but a customer wants a quote for 2 months, it will be a Broken Date Contract.

- It can be calculated by interpolating between the available quotes for the preceding and Succeeding maturities.

**Concept No. 43: Letter of Credit**

**Concept No. 44: Gain/Loss under FOREX**

*When Foreign Currency is to be paid:*

**Case I: When Forward Contract is taken**

<table>
<thead>
<tr>
<th>Amount to be paid at Forward Rate</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount to be paid at Spot Rate</td>
<td>XXX</td>
</tr>
<tr>
<td>Gain/Loss</td>
<td>XXX</td>
</tr>
</tbody>
</table>

**Case II: When Forward Contract is not taken**

<table>
<thead>
<tr>
<th>Amount to be paid at Expected Spot Rate</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount to be paid at Spot Rate</td>
<td>XXX</td>
</tr>
<tr>
<td>Gain/Loss</td>
<td>XXX</td>
</tr>
</tbody>
</table>

**NOTE:**

In the same way, you can calculate Gain/Loss in case of *Foreign Currency is to be received*

**Concept No. 45: Contribution to Sales Ratio**

\[
\text{Contribution to Sales Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100
\]
Concept No. 46: Miscellaneous Concepts

NOTE 1:
If SR: 1$ = Rs. 45.40 ---- Rs. 45.60
6 months Swap Ratio 130/105
Calculate 6 months Forward Rate?

Solution:
| SR: 1$ = | Rs. 45.40 ---- Rs. 45.60 |
| Less SP | 1.30  1.05 |
| 6 months FR = | 44.10  44.55 |

NOTE 2:
If SR: 1$ = Rs. 50 ---- Rs. 55
12 months FR: 1$ = Rs. 54 ---- Rs. 57
Calculate premium of $?

Solution:
Premium of $ = \left(\frac{FR-SP}{SR}\right) \times \frac{12}{\text{Forward Period}} \times 100

Bid Rate = \left(\frac{54-50}{50}\right) \times \frac{12}{12} \times 100 = 8\%

Ask- Rate = \left(\frac{57-55}{55}\right) \times \frac{12}{12} \times 100 = 3.64\%

NOTE:
If nothing is specified. Calculate using both Bid and Ask Rate.

NOTE 3:
- Exporter will always expect foreign currency to appreciate (i.e. at a premium)
- Importer will always expect to desire foreign currency to depreciate(i.e. at a discount)

NOTE:
If question is silent, always assume exporter to receive foreign currency and importer to pay foreign currency.

NOTE 4:
Spread = Ask Rate – (minus) Bid Rate.
Spread % = \frac{\text{Ask Rate} - \text{Bid Rate}}{\text{Ask Rate}}

**NOTE 5:**
When quotations are received from two banks, customer should select that quotation which is more beneficial to him.

**NOTE 6:**
Squaring or Settling in foreign currency means a buying position is to be settled by selling position and vice-versa to calculate Profit and Loss.
## Valuation of Business

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. 1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept No.2: Dividend Yield Valuation Method</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 3: Earning Yield Valuation Method</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 4: P/E Ratio Valuation Model</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 5: Value Based on Future Maintainable Profits (FMP)</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. 6: Net Asset Valuation Method</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. 7: Market Value Added (MVA)</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 8: Economic Value Added (EVA)</td>
<td>7,8</td>
</tr>
<tr>
<td>Concept No. 9: Terminal Value / Continuing Value</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 10: Discounted Cash Flow approach or Free Cash Flow Approach</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 11: Value based on Operating Assets (Profits) &amp; Value-based on Non-Operating Assets (Profit)</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. 12: Walter’s Model</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. 13: Growth Model</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. 14: MM Approach</td>
<td>14</td>
</tr>
<tr>
<td>Concept No. 15: Fair Price / Value of Share</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. 16: valuation of Sick Companies (As per BIFR)</td>
<td>16</td>
</tr>
<tr>
<td>Concept No. 17: Present Value of EVA</td>
<td>17</td>
</tr>
<tr>
<td>Concept No. 18: Financial Restructuring/ Internal Re-Construction</td>
<td>18</td>
</tr>
<tr>
<td>Concept No. 19: Chop-Shop Method</td>
<td>19</td>
</tr>
</tbody>
</table>


**Concept No. 1: Introduction**

To determine the True/Fair value of any company for any purpose.

Example: Merge Acquisition, Amalgamation, take-over

**Concept No.2: Dividend Yield Valuation Method**

\[
\text{Dividend Yield} = \frac{\text{DPS}}{\text{MPS}}
\]

\[
\text{MPS} = \frac{\text{DPS}}{\text{Dividend Yield}}
\]

Where MPS = Market Price per share

DPS = Dividend Per share

**Note:**

\[
\text{DPS} = \frac{\text{Total dividend paid}}{\text{Total number of equity shares}}
\]

**Formula:**

\[
\text{Total Market Value} = \text{MPS} \times \text{Total Number of Equity share}
\]

**Concept No.3: Earning Yield Valuation Method**

\[
\text{Earning Yield} = \frac{\text{EPS}}{\text{MPS}}
\]

\[
\Rightarrow \text{MPS} = \frac{\text{EPS}}{\text{Earning Yield}}
\]

Therefore, \[
\text{EPS} = \frac{\text{Earning available to Equity Share holders}}{\text{Total number of equity shares}}
\]

**Concept No.4: P/E Ratio Valuation Model**

\[
\text{P / E Ratio} = \frac{\text{MPS}}{\text{EPS}}
\]

\[
\text{MPS} = \text{EPS} \times \text{P/E Ratio}
\]
Concept No. 5: Value Based on Future Maintainable Profits (FMP’s)

Value of Business = \[
\frac{\text{Future Maintainable Profit}}{\text{Relevant Capitalisation Rate}}
\]

Calculation of Future Maintainable Profits:

Average Past Year Profits

Add:

i. All Profit likely to arise in Future

ii. All Actual Expenses & Losses not likely to occur in future

Less:

i. All Profit not likely to occur in Future

ii. All Expenses & Losses expected to arise in future

Future Maintainable Profits (FMP’s)

Concept No. 6: Net Asset Valuation Method (For Equity)

NAV per Share = \[
\frac{\text{Total Assets} - \text{Total External Liability}}{\text{Total number of equity shares}}
\]

Note: The following external liabilities should be deducted

(a) All short term (Current Liabilities) and Long Term Liabilities (Debenture, Loans, etc) including outstanding and accrued interest.

(b) Provision for Taxation

(c) Liabilities not provided for in the accounts i.e. Contingent Liabilities which have crystallized now.

(d) Liabilities arising out of prior period adjustment

(e) Preference Share Capital including Arrears of dividend and proposed preferred Dividend

(f) Proposed Equity Dividend (If the objective is to determine ex-dividend value of equity share). If silence we always calculate as the case may be.

Book Value (BV): The BV of an asset is an accounting concept based on the historical data given in the balance sheet of the firm.

Market Value (MV): The MV of an asset is defined as the price which is prevailing on the market.
Liquidating Value (LV): The LV refers to the net difference between the realizable value of all assets and the sum total of external liabilities. This net difference belongs to the owners/shareholders and is known as LV.

Note: The fictitious assets [Misc Expenditure not written off] are not included in the above valuation.

Concept No. 7: Market Value Added (MVA)

From Equity Point of View

\[
MVA = \left[ \frac{\text{Value of company} - \text{value of the Company as per market}}{\text{as per Books of A/c's}} \right] \text{ for equity shareholders}
\]

\Rightarrow MPS \times \text{No. of Equity share} - \text{Equity Shareholder’s Fund.}

Note: Equity shareholder’s Fund

Equity share Capital

Add Reserves & Surplus

(+) P&L

Less Miscellaneous Expenditure

(–) P&L (Dr. Balance)

From Overall company’s Point of View

\[
MVA = \text{Value of the company based Free Cash Flows} - \text{Total Capital Employed}
\]

Concept No. 8: Economic Value Added (EVA)

EVA = NOPAT – K_0 \times \text{Average Capital Employed}

It is excess return over minimum return which is expected by the company on its Capital employed.

Calculation of NOPAT:
NOPAT means, Net Operating Profit After Tax but before any distribution of Interest, Preference Dividend and Equity Dividend.

i.e. NOPAT = EBIT (1 – Tax Rate)

Calculation of Cost of Overall Capital:
K_0 = \text{Cost of Overall Capital} = \text{WACC} = \text{Weight Average Cost of Capital}

\Rightarrow K_e W_e + K_r W_r + K_D W_D + K_P W_P

Note 1: K_d = \text{Interest (1- Tax Rate)}
Note 2: Cost of $r_e$ i.e. retained earning, if not given assume equal to $K_e$ i.e. Cost of Equity

Note 3:

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

Or

$$K_e = \frac{D_1}{P_0} + g$$

Note 4:

$$K_p = \frac{\text{Preference Dividend}}{P_0}$$

Calculation of Average Capital Employed:

$$\text{Capital at the beginning} + \text{Capital at the End of Year} \div 2$$

- If Opening and Closing Balances are not given, we will take Capital Employed.

Calculation of Capital Employed:

Capital Employed = Equity share capital

Add Preference share capital

+ Reserve & Surplus
+ Debenture/Bonds
+ Long-Term Loan

Less P/L (Dr. Balance)

– Preliminary Expenses
– Miscellaneous Expenditure

Note:

Financial Leverage = \(\frac{\text{EBIT}}{\text{EBT}}\)

Or

$$= \frac{\text{EBIT}}{\text{EBIT} - \text{Interest}}$$

Concept No.9: Terminal Value / Continuing Value Approach

Terminal Value is calculated at the end of the Project Life or at the end of the forecasted period.

Note 1: Given in the Question
**Note 2:** Assumption of Growth Model (Assuming Growing Cash Flow after 3 Years)

\[
P_0 = \frac{CF_1}{(1+K_e)^1} + \frac{CF_2}{(1+K_e)^2} + \frac{CF_3}{(1+K_e)^3} + \frac{CF_4}{(1+K_e)^3}
\]

**Note 3:** Assumption of Constant Model/Perpetuity Approach (Assuming Constant Cash Flow after 3 Years)

\[
P_0 = \frac{CF_1}{(1+K_e)^1} + \frac{CF_2}{(1+K_e)^2} + \frac{CF_3}{(1+K_e)^3} + \frac{CF_4}{K_e} \cdot \frac{1}{(1+K_e)^3}
\]

**Note 4:**

- Continuing value/Terminal Value is calculated because it is not easy to estimate realistic cash flows, so we take uniform assumption of Constant Model or Growth Model.

- If \(K_0\) is given then we give first preference to \(K_0\), because here we calculate overall value of a Company.

**Concept No.10 : Discounted Cash Flow approach or Free Cash Flow Approach**

**Step 1:** Calculation of Cash Flow of each year or Free Cash Flow of each Year.

**Step 2:** Calculate Terminal Value at the end of forecast period.

**Step 3:** Compute Discount Rate

**Step 4:** Calculate Present Value of Business by discounting the Cash Flows & Terminal Value.

**Calculation of Free Cash Flows :**

- EBITDA 
- Depreciation
- Interest
- EBT
- Tax
- EAT
- + Depreciation

**Less :**
- Increase in Working Capital

**Add :**
- Decrease in Working Capital

**Less :**
- Capital Expenditure
- Free Cash Flow
**Concept No.11: Value based on Operating Assets (Profits) & Value-based on Non-Operating Assets (Profit)**

Value of Business = Value based on Operating Assets (Profits)

+ Value based on Non-Operating Assets (Profits)

Note:

EBIT XXX
Less Non-Operating Profit XXX
Operating Profit XXX
Less Tax XXX
NOPAT XXX
Add Depreciation XXX
Operating Cash Flows XXX
\( \div \) Discount Rate XXX
Value of the Operating Assets XXX
Add Value of Non-Operating Assets XXX
Total Value of the firm XXX

**Concept No.12: Walter’s Model**

\[
MPS = \frac{DPS}{K_e} + \frac{r}{K_e} (EPS - DPS) / K_e
\]

**Concept No.13: Growth Model**

\[
MPS_0 \text{ or } P_0 = \frac{D_0 (1+g)}{K_e - g} \text{ or } \frac{D_1}{K_e - g} \text{ or } \frac{E_1 (1-b)}{K_e - g}
\]

**Concept No.14: MM Approach**

\[
nMPS_0 = \frac{(n + m) \times P_1 + E_1 - I_1}{(1 + K_e)^1}
\]

**Concept No.15: Fair Price / Fair Value of Share**

\[
\text{Fair Price of Share} = \frac{\text{Value as per Net Asset Value} + \text{Value as per profit Earning capacity Method/FMP}}{2}
\]

iSS Rathore Institute iSS
email: gjainca@gmail.com
Concept No. 16: Valuation of Sick Companies (As per BIFR)

BIFR = Board for Industrial & Financial Reconstruction

Value of a Sick Company:

Realizable Value of All Assets of Sick Company


Concept No. 17: Present Value of EVA (Economic Value Added)

\[ \text{PV of EVA} = \frac{\text{EVA}}{K_0} \]

Concept No. 18: Financial Restructuring/ Internal Re-Construction

Financial restructuring refers to a kind of internal changes made by the management in Assets and Liabilities of a company with the consent of its various stakeholders. This is a suitable mode of restructuring for corporate entities who have suffered from sizeable losses over a period of time. Consequent upon losses the share capital or net worth of such companies get substantially eroded. In fact, in some cases, the accumulated losses are even more than the share capital and thus leading to negative net worth, putting the firm on the verge of liquidation.

In order to revive such firms, financial restructuring is one of the techniques to bring into health such firms who are having potential and promise for better financial performance in the years to come. To achieve this desired objective, such firms need to re-start with a fresh balance sheet free from losses and fictitious assets and show share capital at its real true worth.

Concept No. 19: Chop-Shop Method

This approach attempts to identify multi-industry companies that are undervalued and would have more value if separated from each other. In other words as per this approach an attempt is made to buy assets below their replacement value. This approach involves following three steps:

Step 1: Identify the firm’s various business segments and calculate the average capitalization ratios for firms in those industries.

Step 2: Calculate a “theoretical” market value based upon each of the average capitalization ratios.

Step 3: Average the “theoretical” market values to determine the “chop-shop” value of the firm.
# MERGER AND ACQUISITION

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No. 1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept no. 2: Share Exchange Ratio/ Swap Ratio</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 3: Maximum Exchange Ratio and Minimum Exchange Ratio</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 4: Gain or Loss</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 5: Purchase Consideration / Cost of Acquisition</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. 6: Calculation of Merger &amp; Acquisition for individual Company</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. 7: Cost of Benefit of Merger</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 8: Free Float Market Capitalization (Value)</td>
<td>7</td>
</tr>
<tr>
<td>Concept No. 9: Deferred Payment Plan</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 10: Different forms of Market or Efficient Market Hypothesis (EMH)</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 11: ( \text{EPS}_{A+B} ) when cash is paid out of borrowed money</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 12: ( \text{EPS}_{A+B} ) when growth rate is given</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. 13: Minimum Combined P/E Ratio (( \text{P/E}_{A+B} ))</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. 14: Purchase Price Premium</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. 15: Demerger</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. 16: ( \text{EPS}_{A+B} ) if merger is financed by cash using Business Money</td>
<td>16</td>
</tr>
<tr>
<td>Concept No. 17: Components of MPS</td>
<td>14</td>
</tr>
</tbody>
</table>
Concept No. 1: Introduction

a. The term Merger includes consolidation, amalgamation and absorption.

b. It refers to a situation when two or more existing companies combine together and form a new entity.

c. Either a new company can be incorporated for the purpose or one existing company survives and another existing company is merged into it.

d. If new company is incorporated, it is a case of amalgamation/Consolidation.

e. If an existing company is merge into another existing Company, it is known as Absorption.

Note:
AS-14 is not applicable

Concept no. 2: Share Exchange Ratio/ Swap Ratio

Swap Ratio may be defined as No. of equity shares issued by Acquiring Company to Targed Company for every one share held by Target Company.

Example:
If Swap Ratio = 2, it means that for every 1 share held by Target company, Acquiring Company will issue 2 shares.

Methods of Calculating the Swap Ratio:

i. On the basis of MPS

\[
\text{Swap Ratio} = \frac{\text{MPS of Target Company}}{\text{MPS of Acquiring Company}}
\]

ii. On the basis of EPS

\[
\text{Swap Ratio} = \frac{\text{EPS of Target Company}}{\text{EPS of Acquiring Company}}
\]

iii. On the basis of NAV

\[
\text{Swap Ratio} = \frac{\text{NAV of Target Company}}{\text{NAV of Acquiring Company}}
\]

iv. On the basis of Book Value per share

\[
\text{Swap Ratio} = \frac{\text{BVPS of Target Company}}{\text{BVPS of Acquiring Company}}
\]
Note:

\[
\text{EPS} = \frac{\text{Earning available to Equity Shareholder}}{\text{Total number of equity shares}}
\]

\[
\text{NAV} = \frac{\text{Total Assets} - \text{Total External Liability}}{\text{Total number of equity shares}}
\]

\[
\text{P} / \text{E Ratio} = \frac{\text{Market Price per Share}}{\text{Earning Price per Share}}
\]

**Concept No. 3: Maximum Exchange Ratio and Minimum Exchange Ratio**

A = Acquiring Company \(\rightarrow\) will try to keep exchange ratio as low as possible. Hence, we calculate maximum ER for acquiring company.

B = Target Company \(\rightarrow\) will try to keep exchange ratio as high as possible. Hence, we calculate minimum ER for Target company.

**Case 1: On the basis of EPS:**

\text{a) Maximum Exchange rate for A Ltd.}

\[
\text{EPS before Merger} = \text{EPS after Merger}
\]

\[
\text{EPS}_A = \text{EPS}_{A + B}
\]

\[
\text{EPS}_A = \frac{\text{Total Earning available for Equity Shareholder after Merger}}{\text{Total number of equity shares after Merger}}
\]

\[
\text{EPS}_A = \frac{E_A + E_B + \text{Synergy Gain}}{N_A + N_B \times \text{Exchange Ratio (ER)}}
\]

Synergy Gain mean extra benefits due to merger.

Now solve for Exchange Ratio (ER), we get the maximum exchange ratio/ swap ratio which acquiring company can give to prevent dilution of EPS. Any lower ER will increase the EPS of acquiring company after merger.

\text{b) Minimum Exchange rate for B Ltd.}

\[
\text{EPS before Merger} = \text{Equivalent EPS after Merger}
\]

\[
\text{EPS}_B = \text{EPS}_{A + B} \times \text{ER}
\]

\[
\text{ESP}_B = \left[ \frac{E_A + E_B + \text{Synergy Gain}}{N_A + N_B \times \text{Exchange Ratio (ER)}} \right] \text{ER}
\]
Now solve for ER, we get minimum Exchange ratio.

**Case 2: On the basis of MPS (If P/E Ratio after merge is given i.e. P/E_{(A+B)} is given)**

a) **Maximum Exchange rate for A Ltd.**

MPS before Merger = MPS after Merger

\[
MPS_A = MPS_{A+B}
\]

\[
MPS_A = EPS_{A+B} \times \frac{P/E_{(A+B)}}{
\frac{E_A + E_B + \text{Synergy Gain}}{N_A + N_B \times \text{Exchange Ratio (ER)}}}
\]

Now solve for ER, we get maximum exchange ratio.

b) **Minimum Exchange rate for B Ltd.**

MPS before Merger = Equivalent MPS after Merger

\[
MPS_B = MPS_{A+B} \times ER
\]

\[
MPS_B = \left[ EPS_{A+B} \times \frac{P/E_{(A+B)}}{P/E_{(A+B)} \times \text{ER}} \right] \times \frac{P/E_{(A+B)} \times \text{ER}}{
\frac{E_A + E_B + \text{Synergy Gain}}{N_A + N_B \times \text{Exchange Ratio (ER)}}}
\]

Now solve for ER, we get minimum exchange ratio for B Ltd.

**Case 3: On the basis of MPS (If P/E Ratio after merge is not given):**

a) **Maximum Exchange rate for A Ltd.**

\[
MPS_A = MPS_{A+B}
\]

\[
MPS_A = \frac{\text{Total Market Value after Merger}}{\text{Total number of equity shares after Merger}}
\]

\[
MPS_A = \frac{MV_A + MV_B + \text{Synergy Gain}}{N_A + N_B \times \text{Exchange Ratio (ER)}}
\]

Now solve for ER, we get maximum exchange ratio.

b) **Minimum Exchange rate for B Ltd.**

MPS before merger = Equivalent MPS after merger
\[ MPS_B = MPS_A + B \times ER \]

\[ MPS_B = \left( \frac{MV_A + MV_B + \text{Synergy Gain}}{N_A + N_B \times \text{Exchange Ratio (ER)}} \right) \times ER \]

- First try for case 2
- Then for case 1
- Then for case 3

**Concept No. 4: Gain or Loss**

**On the basis of EPS/MPS**

<table>
<thead>
<tr>
<th>A Ltd.</th>
<th>B Ltd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPS/EPS after Merger</td>
<td>XXX</td>
</tr>
<tr>
<td>MPS/EPS before Merger</td>
<td>XXX</td>
</tr>
<tr>
<td>Gain/ Loss</td>
<td>XXX</td>
</tr>
</tbody>
</table>

**Note:** If question is silent use any Method.

**Note:** If in question Total Earning or Total Market Value is given, use either EPS or MPS.

**Concept No. 5: Purchase Consideration / Cost of Acquisition**

**Calculation of PC/ COA**

- Market Value of Equity Shares Issued by A Ltd. to B Ltd. XXX
- (+) Debentures, Preference shares Capital Issued by A Ltd. to B Ltd. XXX
- (+) Current Liability paid or Taken over XXX
- (+) Any other expenses incurred XXX
- (-) Cash in hand or Bank XXX
- (-) Sale of any other asset not required in business XXX

**Cost of Acquisition / Purchase Consideration** XXX

**Note:** Cash and current Liabilities must be taken, even if question is Silent.

**Note:** Sale of any other asset not required should be taken only if clear indication in the Question.
Concept No. 6: Calculation for Merger & Acquisition

For individual Company

\[ \text{EPS}_A = \frac{E_A}{N_A} \]

\[ \text{PE}_A = \frac{\text{MPS}_A}{\text{EPS}_A} \]

\[ \text{MPS}_A = \text{EPS}_A \times \text{PE}_A \]

Or \[ \frac{\text{MV}_A}{N_A} \]

For Merged Company

\[ \text{EPS}_{A+B} = \left[ \frac{E_A + E_B + \text{Synergy Gain}}{N_A + N_B \times \text{ER}} \right] \]

\[ \text{PE}_{A+B} = \frac{\text{MPS}_{A+B}}{\text{EPS}_{A+B}} \]

\[ \text{MPS}_{A+B} = \text{EPS}_{A+B} \times \text{PE}_{A+B} \]

\[ \text{MPS}_{A+B} = \left[ \frac{\text{MV}_A + \text{MV}_B + \text{Synergy Gain}}{N_A + N_B \times \text{ER}} \right] \]

Equivalent EPS of B Ltd. = \[ \text{EPS}_{A+B} \times \text{ER} \]

Equivalent MPS of B Ltd. = \[ \text{MPS}_{A+B} \times \text{ER} \]

Total No. of Equity share after Merger = \[ N_A + N_B \times \text{ER} \]

Concept No. 7: Cost & Benefit of Merger

Case 1: When Merger is Financed by Cash

For Acquiring company (A Ltd.)

Cost to A Ltd. = Cash paid to B Ltd. – MV of B Ltd received

Benefit of Merger (Synergy Gain) = \[ \text{MV}_{A+B} - (\text{MV}_A + \text{MV}_B) \]

Net Benefit (NPV) = Benefit – Cost

For Target Company (B Ltd.)
Benefit (Net Benefit) = Cash Received – MV_B sacrificed

**Case 2: When Merger is Financed by Stock (Equity)**

**For Acquiring company (A Ltd.)**

Cost to A Ltd. = MV_{A+B} × % Holding of B Ltd. – MV_B received

Benefit of Merger (Synergy Gain) = MV_{A+B} – (MV_A + MV_B)

Net Benefit (NPV) = Benefit – Cost

**For Target Company (B Ltd.)**

Benefit (Net Benefit) = MV_{A+B} × % Holding of B Ltd. – MV_B sacrificed

**Note 1:** Cost of A Ltd. = Benefit for B Ltd.

**Note 2:** MPS_{A+B} in case of Cash Take Over

\[
= \frac{MV_A + MV_B + \text{Synergy} – \text{Cash Paid}}{N_A}
\]

**Note 3:** MPS_{A+B} in case Merger is financed by Stock

\[
= \frac{MV_A + MV_B + \text{Synergy Gain}}{N_A + N_B \times ER}
\]

**Note 4:** Calculation of % of Holding

For A Ltd. = \[
\frac{\text{Total Number of shares of A Ltd.}}{\text{Total Number of shares of A Ltd.} + \text{Total Number of Shares issued to B Ltd.}}
\]

For B Ltd. = \[
\frac{\text{Total Number of shares of B Ltd.}}{\text{Total Number of shares of A Ltd.} + \text{Total Number of Shares issued to B Ltd.}}
\]

**Concept No. 8: Free Float Market Capitalization (Value)**

“Free Float” means shares which are freely available or freely tradable in the market. Shares held by promoters are not freely tradable in the market. There shares are subject to certain restrictions as placed by SEBI.

A Firm’s market float is the total value of the shares that are actually available to the investing public and excludes the value of shares held by controlling shareholders because they are unlikely to sell their shares.

**EXAMPLE:**
Total number of equity shares of X Ltd. is 5 Lacs. Promoters’ holding is 20%. MPS is Rs. 25. Calculate the Market Value and free float market value of X Ltd.

Solution:

Total Market Value = \(5,00,000 \times 25 = 1,25,00,000\)

Total Free Float = \(5,00,000 \times 80\% \times 25 = 1,00,00,000\)

=> Sensex and Nifty is based on Free-Float market Capitalization.

**Concept No. 9: Deferred Payment Plan**

- Under this payment plan, additional number of equity shares are issued on the basis of the additional earnings over the base year earnings.
- Additional no. of equity share is calculated as:

\[
\frac{\text{Next year Earning} \times \text{P/E Ratio}}{\text{MPS}}
\]

**Concept No. 10: Different forms of Market or Efficient Market Hypothesis (EMH)**

1. **Weak form Market efficiency**
   - The weak form of EMH states that current security prices fully reflected all currently available security market data like past price, volume information.
   - The investor can’t achieve positive risk-adjusted returns on average by using technical analysis.

2. **Semi-strong form market efficiency**
   - It holds that security price rapidly adjust without bias to the arrival of all new public information.
   - Current security price fully reflect past data as well as all publicly available information.
   - The implication is that an investor can’t achieve positive risk-adjusted returns on average by using fundamental analysis.

3. **Strong-form market efficiency**
   - It states that security price fully reflect all information from both public and private sources.
   - It includes all type of information:
     a. Past Security Market Information
b. Public and Private(inside) Information

**Concept No. 11: EPS\(_{A+B}\) when cash is paid out of borrowed money**

\[
EPS_{A+B} = \frac{E_A + E_B + Synergy\ Gain - Interest\ (1-tax)}{N_A}
\]

**Concept No. 12: EPS\(_{A+B}\) when growth rate is given**

**Concept No. 13: Minimum Combined P/E Ratio (P/E\(_{A+B}\))**

\[
P/E_{A+B} = \frac{\text{MPS}_{A+B}}{EPS_{A+B}}
\]

Or

\[
\frac{\text{MV}_{A+B}}{\text{Total\ Earnings}_{A+B}}
\]

**Concept No. 14: Purchase Price Premium**

Purchase Price Premium = \(\frac{\text{Offer\ Price\ to\ B\ Ltd.} - \text{MPS\ of\ B\ Ltd.\ before\ Merger}}{\text{MPS\ of\ B\ Ltd.\ before\ Merger}}\)

**Concept No. 15: Demerger**

A Corporate strategy to sell-off subsidiaries or divisions of a company. The act of splitting off a part of an existing company to become a new company, which operates completely separate from the original company.

Shareholder’s of the original company are usually given an equivalent stake of ownership in the new company.

A demerger is often done to help each of the segments operate more smoothly, as they can now focus on a more specific task.

**Concept No. 16: EPS\(_{A+B}\) if merger is financed by cash using Business Money**

\[
EPS_{A+B} = \frac{E_A + E_B + Synergy\ Gain - Cash\ Paid \times Opportunity\ cost\ of\ interest}{N_A}
\]
Concept No. 17: Components of MPS

MPS

EPS

\[ \frac{\text{Earnings for Equity shareholders}}{\text{No. of Equity Share}} \]

P/E Ratio

\[ \frac{\text{MPS}}{\text{EPS}} \]

ROE

(Return On Equity)

\[ \frac{\text{Earnings for Equity shareholders}}{\text{Equity Share holder’s fund}} \]

BVPS

(Book Value per Share)

\[ \frac{\text{Equity Shareholder’s fund}}{\text{Total No. of Equity Shares}} \]
# LEASING

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No.1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept no. 2: Treatment of Depreciation</td>
<td></td>
</tr>
<tr>
<td>Concept No.3: Treatment of Salvage Value</td>
<td></td>
</tr>
<tr>
<td>Concept no. 4: Evaluation from the Point-of-view of Lessee</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 5: Evaluation from the point of view of Lessor</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 6: Break-even lease rentals</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 7: IRR Technique</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. 8: Equated Annual loan repayment inclusive of interest/equated Annual Instalment (EAI)</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. 9: Net Advantage of Leasing (NAL)</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 10: Different Plans under lease Rentals</td>
<td>7</td>
</tr>
<tr>
<td>Concept No. 11: Lease Vs Purchase Option</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 12: Equated Annual Loan Repayment of Interest (Instalment made at the beginning of each year)(annuity date)</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 13: Hire Purchase Agreement</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 14: Miscellaneous Concept</td>
<td></td>
</tr>
</tbody>
</table>
Concept No.1: Introduction

- Leasing is an important source of medium-term financing or leasing is the process of financing the cost of an asset.

- It is an arrangement under which an asset is financed and owned by one party but possessed and used by the other.

 Parties to the lease agreement:

1. **LESSOR:**
The OWNER of the asset is known as lessor-who gives assets on lease.

2. **LESSEE:**
The USER of the asset is known as lessee-who takes asset on lease.

- The lease agreement details out the specified period and timing of the sequential payments to be made by the lessee to the lessor as consideration for the use of the asset. It also incorporates repayment schedule.

Note 1:
Cash inflows & Cash outflows should be taken Net of Tax provided cash inflows & outflows are part of the profit & loss account.

Note 2:
Tax savings should be taken as cash inflows like tax savings on depreciation, tax savings due to loss on sale of asset.

Concept no. 2: Treatment of Depreciation

- Depreciation is always charged by lessor (i.e. owner of the asset)
➢ In case of Purchase option (Loan Option), depreciation is charged by borrower.

➢ Depreciation is a non-cash item, it should not be considered while calculating cash flows.

➢ Tax savings on depreciation should be taken as cash inflows.

Formulae:

Depreciation Amount \times \text{Tax Rate}

Methods of Depreciation:

i. **Straight-line Depreciation Method:**
   Straight-line depreciation allocates an equal amount of depreciation each year over the asset’s useful life.

   \[
   \text{Depreciation p.a.} = \frac{\text{Original Cost} - \text{Salvage Value/Residual Value}}{\text{Life of the asset}}
   \]

   **Note:**
   If question is silent, always use straight-line method of depreciation.

ii. **Written-down value Depreciation Method:**

   \[\text{WDV Depreciation} = \left|\text{Cost-Accumulated Depreciation}\right| \times \% \text{ of Depreciation}\]

   ➢ We recognize more depreciation expense in early years of the asset’s life and less depreciation expense in the later year’s of life.

   ➢ Total depreciation expense over the life of the asset will be same as it would be if straight-line depreciation were used.

iii. **Sum of Years Digit Method of Depreciation:**

   **Example:**
   Cost of Asset = 100
   Life = 5 Years
   Salvage Value = 10
   Calculate Depreciation.

   **Solution:**
   Amount to be depreciated
=100-10

=90

Life= 5 years

Sum=1+2+3+4+5=15

<table>
<thead>
<tr>
<th>Years</th>
<th>Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90×5/15=30</td>
</tr>
<tr>
<td>2</td>
<td>90×4/15=24</td>
</tr>
<tr>
<td>3</td>
<td>90×3/15=18</td>
</tr>
<tr>
<td>4</td>
<td>90×2/15=12</td>
</tr>
<tr>
<td>5</td>
<td>90×1/15=6</td>
</tr>
</tbody>
</table>

**Concept No.3: Treatment of Salvage Value**

**Example A:**

Cost of Asset  =1,00,000

WDV Dep.  =10%

Life  =5 Years

Tax@  50%

Salvage Value  =70,000

Calculate Cash inflows & outflows for each year.

**Solution:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(1,00,000)</td>
</tr>
<tr>
<td>1</td>
<td>+5000</td>
</tr>
<tr>
<td>2</td>
<td>+4500</td>
</tr>
<tr>
<td>3</td>
<td>+4050</td>
</tr>
<tr>
<td>4</td>
<td>+3645</td>
</tr>
<tr>
<td>5</td>
<td>+3280.5+(70,000-5475.5)=67,805</td>
</tr>
</tbody>
</table>
**W.No.1: Calculation of Depreciation:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Opening Balance</th>
<th>WDV@10%</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100000</td>
<td>10000</td>
<td>90000</td>
</tr>
<tr>
<td>2</td>
<td>90000</td>
<td>9000</td>
<td>81000</td>
</tr>
<tr>
<td>3</td>
<td>81000</td>
<td>8100</td>
<td>72900</td>
</tr>
<tr>
<td>4</td>
<td>72900</td>
<td>7290</td>
<td>65910</td>
</tr>
<tr>
<td>5</td>
<td>65610</td>
<td>6561</td>
<td>59049</td>
</tr>
</tbody>
</table>

**W No.2: Calculation of Profit & Loss on Sale of Asset:**

Original Cost = 1,00,000

Less: Depreciation till date = 40,951

WDV = 59,049

Less: Salvage Value = 70,000

Profit on sale = 10,951

Tax Payment on Profit on Sale of Asset@50% = 5,475.50

**Example B:**

If Salvage Value is 35,000

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(100000)</td>
</tr>
<tr>
<td>1</td>
<td>+5000</td>
</tr>
<tr>
<td>2</td>
<td>+4500</td>
</tr>
<tr>
<td>3</td>
<td>+4050</td>
</tr>
<tr>
<td>4</td>
<td>+3645</td>
</tr>
<tr>
<td>5</td>
<td>+3280.5+(35000+12024.5)=50305</td>
</tr>
</tbody>
</table>

**Working Note: Calculation of Profit & Loss on Sale of Asset:**

Original Cost = 1,00,000

Less: Depreciation till date = 40,951

WDV = 59,049
Less: Salvage Value 35,000
Loss on sale =24,049
Tax Saving on Loss on Sale of Asset@50% 12,024.50

Concept no. 4: Evaluation from the Point-of-view of Lessee/ Lease or Borrow & Buy Decision(A Financing Decision)

Decision:-“Whether to take asset on lease or to take asset on loan.”

Step 1:-Calculate inflow and outflow under each alternative.

Case I: Take Asset on Lease: (Lessee)

Outflows:-

i) Lease Rent paid Net of Tax

Inflows:-

i) No inflows

Case II: Buy Asset & Take Loan:

Outflows:-

i) Interest paid Net of Tax
   ii) Principal Repayment

Inflows:-

i) Tax savings on Depreciation
   ii) Salvage Value adjusted for tax whenever applicable

Step 2:-Compute Suitable Discount Rate

\[ K_d = \text{Cost of Debt} = \text{Interest} (1-\text{Tax rate}) \]

Step 3:-Calculate Present Value of Net Outflow under both options using discount rate calculated in step-2

Decision: Select the option which gives least outflow.

Note:- Treatment of Tax if cash flows arises at the beginning of each year.

Example:-
Training expense incurred at the beginning of the Year 1 Rs.10,000. Tax Rate@40%. Calculate Inflow & outflow for each year.

Solution:
Alternative 1:
Treatment of Tax in year 0

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-10,000 + 4,000 = 6,000</td>
</tr>
<tr>
<td>1</td>
<td>Nil</td>
</tr>
</tbody>
</table>

**Alternative 2:**

Treatment of Tax at year end

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-10,000</td>
</tr>
<tr>
<td>1</td>
<td>+4,000</td>
</tr>
</tbody>
</table>

**Note:**
Common items under lease option and loan option can be ignored.

---

**Concept No. 5: Evaluation from the point of view of Lessor (Investment Decision)**

**Decision:** “Whether to purchase asset and give asset on lease rent or Not”

**Steps for Evaluation**

**Step 1:** Calculate all cash inflows and all cash outflows of lessor.

**Inflows of Lessor:**

i) Lease Rent received net of Tax.
ii) Tax Savings on Depreciation.
iii) Salvage Value adjusted for Tax.

**Out Flows for Lessor:**

i) Cost of Asset Purchased.

**Step 2:** Compute a suitable Discount Rate.

\[ K_0 = \text{Cost of Capital} \]

**Step 3:** Compute NPV (Net Present Value)

**Decision:** If NPV is Positive, lessor should lease the asset.

---

**Concept No. 6: Break-even lease rentals**

Break-even lease rentals are those rentals at which:

\[ PV \text{ of outflow under Loan Option} = PV \text{ of outflow under Lease Option} \]
**Concept No. 7: IRR Technique/Implied Interest Cost of Lease for Lessor**

- IRR is the Discount at which NPV is Zero.
- Or

$$\text{IRR} = \text{Lower Rate} + \left[ \frac{\text{Lower rate NPV}}{\text{Lower rate NPV} - \text{Higher rate NPV}} \right] \times \text{Difference in Rate} \ [HR \ - \ LR]$$

**Concept No. 8: Equated Annual loan repayment inclusive of interest/equated Annual Instalment (EAI)**

**Step 1:** Equated annual loan repayment inclusive of interest (paid at the end of each year)

$$\text{EAI} = \frac{\text{Amount of loan}}{\text{PVAF}(r\%,n \text{ years})}$$

Where,
- $r\% = \text{rate of interest before Tax (Charged by bank)}$
- $n = \text{Period of Loan}$

**Step 2:** Calculate Principal Repayment amount and interest amount from the total equated Annual Instalment

**Step 3:** Calculate Interest Net of Tax.

**NOTE:**

- Lease Rentals are either paid in advance or in arrears:
  - “In advance” means that the rental are paid at the beginning of the each year.
  - “In Arrears” means rentals are paid at the end of each year.
- If silent, we will assume that rental are paid at the end of each year.

**Concept No. 9: Net Advantage of Leasing (NAL)**

- NAL is the Net Advantage of Leasing over & above the purchase option.

$$\text{NAL} = \text{Outflow under Loan Option} - \text{Outflow under Lease Option}$$

- If NAL is positive, lease should be preferred, otherwise purchase (loan option) should be preferred.

**Concept No. 10: Different Plans under lease Rentals**

Different plans are offered by lessor to lessee. Some of these are follows:
i. **Equal Annual Lease Plans**
   In this plan, equal amount of lease rentals are paid every year.

ii. **Stepped-up lease plan**
   Under this plan lease rentals are increased by a particular percentage every year.

iii. **Deferred Payment Plan**
   Under this, lease rentals are deferred for some year (i.e. not paid for few years) and after that it will be paid according to the terms of the contract.

iv. **Ballooned Payment plan**
   Under this plan, low amount lease rentals are paid for few years.
   At the end of the lease term, a huge amount is paid which is known as **Ballooned Payment**.

*Concept No. 11: Lease Vs Purchase Option*

<table>
<thead>
<tr>
<th>Finance Department</th>
<th>Investment Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leasing =&gt; Lessee</td>
<td>Leasing =&gt; Lessor</td>
</tr>
<tr>
<td>Purchase Decision</td>
<td>Capital Budgeting</td>
</tr>
<tr>
<td>Loan Option</td>
<td>Investment</td>
</tr>
</tbody>
</table>

*Concept No. 12: Equated Annual Loan Repayment inclusive of Interest (Instalment made at the beginning of each year)(annuity due)*

Equated Annual Installment = \( \frac{\text{Amount of Loan}}{1 + \text{PVAF} \times (r\% \times (n-1)\text{years})} \)

*Concept No. 13: Hire Purchase Agreement*

- Hire Purchase is the owner/user of the asset.
- Show Asset in his Balance Sheet.
- Claim Depreciation for tax purpose. Hence, Tax savings should be calculated on depreciation to calculate cash flows.
- Interest Net Tax should be calculated for Cash Outflows.
- Salvage Value of the asset should be adjusted for tax purpose.

*Concept No. 14: Miscellaneous Concept*

**Note 1: Confusing regarding Discount Rate**

**Lessee & Borrower**

\( K_d = \text{Interest (1-Tax)} \), even if cost of capital is separately given in the question.
Lessor
$K_0 = \text{Cost of Capital}$

**Exception:**

1) If discount rate is separately given in the question.
2) If PVF table is given in the question.

- $K_0, K_d & \text{discount rates given in the question are always Net of Tax.}$
- Target Rate of Return are always after Tax.

**Note 2: Property Tax, Insurance etc.**

![Property Tax, Insurance etc.
(i.e. expense related to assets)](image)

- **Loan Option**
  - Borrower (Owner)
- **Lease Option**
  - Lessor (Owner)

**Note 3: Operating Expenses**

![Operating Expense](image)

- **Loan option**
  - Borrower (User)
- **Lease Option**
  - Lessee (User)

**Note 5: Common Items**
Preferred to ignore common items

**Note 6: Salvage Value adjusted for Tax in case of WDV**

Preferred to be taken.

**Note 7: Calculate Lease Rentals by using desired return of Lessor on the basis of Gross Value of Asset**

**Example:**
Suppose leasing company desire a return of 10% on the gross value of the asset. Lease Rental from beginning of each year. Cost of the asset is 2,65,000. Life 5 years. Compute Lease Rentals?

**Solution:**

\[
\text{Computation of Annual Lease Rental} = \frac{\text{Cost of Asset}}{1 + \text{PVAF (10\% (5−1) years)}}
\]

\[
= \frac{2,65,000}{1 + 3.170} = 63,549.16
\]

**Note 8: Calculation of Cost of Asset**

**Example:**
Equate Annual Installment = Rs. 2,65,000
Life 5 years, Interest Rate = 14%. Payment starts from the beginning of each year. Calculate Cost of Asset?

**Solution:**

\[
2,65,000 = \frac{\text{Cost of Asset}}{1 + \text{PVAF (14\% (5−1) years)}}
\]

Cost of Asset = 2,65,000 × 3.9137 = 10,37,130
## Capital Budgeting

<table>
<thead>
<tr>
<th>Lists of Concepts</th>
<th>Related Question Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No.1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Concept No. 2: Net Present Value (NPV)</td>
<td></td>
</tr>
<tr>
<td>Concept No. 3: Profitability Index (PI)/ Benefit lost Ratio/ Desirability Factor</td>
<td></td>
</tr>
<tr>
<td>Concept No. 4: Pay-Back Period Method (PBP)</td>
<td></td>
</tr>
<tr>
<td>Concept No. 5: Discount pay-back period</td>
<td></td>
</tr>
<tr>
<td>Concept No. 6: IRR Techniques (internal Rate of Return)</td>
<td></td>
</tr>
<tr>
<td>Concept No. 7: Accounting Rate of Return:</td>
<td></td>
</tr>
<tr>
<td>Concept No. 8: Net Profitability Index or Net PI</td>
<td></td>
</tr>
<tr>
<td>Concept No. 9: Risk-Adjusted Discount Rate Method (RADR)</td>
<td>1</td>
</tr>
<tr>
<td>Concept No. 10: Certainty Equivalent Co-efficient (CEC) Method</td>
<td>2</td>
</tr>
<tr>
<td>Concept No. 11: Unequal Life/ Equated Annual Amount</td>
<td>3</td>
</tr>
<tr>
<td>Concept No. 12: Replacement Decision</td>
<td>4</td>
</tr>
<tr>
<td>Concept No. 13: Abandon/ Discard Decision</td>
<td>5</td>
</tr>
<tr>
<td>Concept No. 14: Project NPV/ IRR &amp; Equity NPV/IRR</td>
<td>6</td>
</tr>
<tr>
<td>Concept No. 15: Modified NPV &amp; Modified IRR</td>
<td>7</td>
</tr>
<tr>
<td>Concept No. 16: Inflation under Capital Budgeting</td>
<td>8</td>
</tr>
<tr>
<td>Concept No. 17: Probability Distribution Approach</td>
<td>9</td>
</tr>
<tr>
<td>Concept No. 18: Sensitivity Analysis</td>
<td>10</td>
</tr>
<tr>
<td>Concept No. 19: Decision Tree Approach</td>
<td>11</td>
</tr>
<tr>
<td>Concept No. 20: Decision Tree approach (Backward Method)</td>
<td>12</td>
</tr>
<tr>
<td>Concept No. 21: Capital Rationing</td>
<td>13</td>
</tr>
<tr>
<td>Concept No. 22: Joint Probability</td>
<td>14</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>Concept No. 23: Probability of Occurrence</td>
<td>15</td>
</tr>
<tr>
<td>Concept No. 24: Changing Inflation Rate from one year to another</td>
<td>16</td>
</tr>
</tbody>
</table>
Concept No. 1: Introduction:

- Capital Budgeting is the process of **Identifying & Evaluating** capital projects i.e. projects where the cash flows to the firm will be received over a period longer than a year.

- Any corporate decisions with an **IMPACT ON FUTURE EARNINGS** can be examined using capital budgeting framework.

- **Decisions like:**
  a. Whether to buy a new machine
  b. Expand business in another geographical area,
  c. Move the corporate headquarter to another place,
  d. Replace a delivery truck etc.

- **Capital Budgeting decisions are important due to following reasons:**
  i. It involves the purchase of costly long-term assets with lives of many years, the decisions made may determine the future success of the firm.

  ii. Capital Budgeting principals also apply to other corporate decisions, such as working capital management and making strategic mergers and acquisitions.

  iii. Making good capital budgeting decisions is consistent with management’s primary goal of maximizing shareholder’s wealth.

- **Categories of Capital Budgeting Projects:**
  i. Replacement projects to maintain the business
  ii. Replacement projects for cost reduction
  iii. Expansion projects
  iv. New product or market development
  v. Mandatory projects

- The Capital Budgeting process involves the following **key principles:**
  i. **Decisions are based on cash flows, not accounting income:**

     - Consider **INCREMENTAL CASH FLOWS**, the change in cash flows that will occur if the project is undertaken.

     - Sunk costs should not be included in the analysis. These costs are not effected by the accept/reject decisions. Eg. Consulting fees paid to a marketing research firm to estimate demand for a new product prior to a decision on the project.

     - When considering the full implication of a new project, loss in sales of existing products should be taken into account & also consider positive effects on sale of a firm’s other product line.
ii. **Cash flows are based on Opportunity Costs:**
Opportunity costs should be included in projects costs. Eg. Land cost should be charged to the project.

iii. **The timing of cash flows is important:**
Cash flows received earlier are worth more than cash flows to be received later.

iv. **Cash flows are analyzed on an after-tax basis:**

v. **Financing costs are reflected in the project’s required rate of return:**
- Do not consider financing costs specific to the project when estimating incremental cash flow.
- The discount rate used is the firm’s cost of capital.
- Only projects that are expected to return more than the cost of the capital needed to fund them will increase the value of the firm.

**Types of Capital Budgeting Proposals:**

1. **Mutually Exclusive Proposals:** when acceptance of one proposal implies the automatic rejection of the other proposal.

2. **Complementary Proposals:** when the acceptance of one proposal implies the acceptance of other proposal complementary to it, rejection of one implies rejection of all complementary proposals.

3. **Independent Proposals:** when the acceptance/rejection of one proposal doesn’t affect the acceptance/rejection of other proposal.

**Concept No. 2: Net Present Value (NPV)**

\[
NPV = \text{PV of Cash Inflows} - \text{PV of Cash Outflows}
\]

**Decision:** If NPV is

- **+ve** Accept the project- increase shareholder’s wealth
- **-ve** Reject the project-decrease shareholder’s wealth
- **Zero** Indifferent-No effect on shareholder’s wealth

\[
NPV = - CF_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}
\]

Where,

- \( CF_0 \) = the initial investment outlay.
- \( CF_t \) = after-tax cash flow at time \( t \)
K = required rate of return for project.

**Concept No. 3: Profitability Index (PI)/ Benefit cost Ratio/ Desirability Factor/Present Value Index**

\[
PI = \frac{\text{PV of Future Cash Inflows}}{\text{CF}_0 \text{ or Present value of Outflows}}
\]

\(\text{CF}_0\) = Initial Cash Out Flows

**Note:**

\(\text{NPV} = -\text{CF}_0 + \text{PV of future Cash In Flows}\)

\(\text{CF}_0 + \text{NPV} = \text{PV of Future Cash In Flows}\)

**If NPV is given, then**

Add Initial outlay in NPV to get, PV of Cash inflows.

**Decision:**

If NPV is Positive, the PI will be greater than One.

If NPV is Negative, the PI will be Less than One.

**Rule:**

If \(\text{PI} > 1\), Accept the project

\(\text{PI} < 1\), Reject the project

\(\text{PI} = 1\), Indifferent

**Concept No. 4: Pay-Back Period Method (PBP)**

The pay-back period (PBP) is the number of years it takes to recover the initial cost of an investment.

**Case I: When Cash inflows are Constant/ equal**

**Example:**

<table>
<thead>
<tr>
<th>Year</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(100)</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
</tr>
</tbody>
</table>
Pay-back Period = \frac{\text{Initial Investment/ outflow}}{\text{Annual Cash Inflow}}

= \frac{100}{20} = 5 \text{ years}

Case II: When Cash inflows are unequal

Example:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(100)</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
</tr>
</tbody>
</table>

Solution:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flows</th>
<th>Cumulative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>190</td>
</tr>
</tbody>
</table>

\text{Pay-back Period} = \text{Full years until recovery} + \frac{\text{Unrecovered Cost}}{\text{Cash Flow during next Year}}

= 3 + \frac{20}{40} = 3.5 \text{ years}

Decision:

Shorter the PBP, better the project.

Drawback:

PBP does not take into account the time value of money and cash flows beyond the payback period.

Benefit:

The main benefit of the pay-back period is that it is a good measure of project liquidity.

Concept No. 5: Discount pay-back period

- The discounted payback period uses the present value (PV) of project’s estimated Cash flows.
- It is the number of years it takes a project to recover its initial investment in present value terms.
- Discounted pay-back period must be greater than simple pay-back period.
Concept No. 6: IRR Techniques (Internal Rate of Return)

- IRR is the discount rate that makes the PV of a project’s estimated cash inflows equal to the PV of the project’s estimated cash outflows.

- i.e. IRR is the discount rate that makes the following relationship:

\[
PV \text{ (Inflows)} = PV \text{ (Outflows)}
\]

- IRR is also the discount rate for which the NPV of a project is equal to ZERO.

- IRR = Lower Rate + \( \frac{\text{Lower Rate NPV}}{\text{Lower Rate NPV} - \text{Higher Rate NPV}} \) \times \text{Difference in Rate (HR-LR)}

How to find the starting rate for calculation of IRR:

Step-1: Calculate Fake Pay-back period:

\[
\text{Fake Pay-back Period} = \frac{\text{Initial Investment}}{\text{Average Annual Cash Flow}}
\]

Step-2: Locate the above figure in Present Value Annuity Factor Table and take this discount rate to start the calculation of IRR.

Accept/Reject Criteria:

- IRR > Cost of Capital: Accept the Proposal
- IRR = Cost of Capital: Indifferent
- IRR< Cost of Capital: Reject the Proposal

Concept No. 7: Accounting Rate of Return:

\[
\text{ARR} = \frac{\text{Average Net Profit}}{\text{Initial Investment}}
\]

Note:

- \( \text{Average Net Profit} = \frac{\text{NP}_1 + \text{NP}_2 + \text{NP}_3 \ldots \ldots \text{NP}_n}{n} \)

Note:

1. It ignores time value of money.
2. It takes into account accounting profits rather than cash flows.

Concept No. 8: Net Profitability Index or Net PI

\[
\text{Net PI} = \frac{\text{NPV}}{\frac{\text{Initial Investment}}{ \text{Present Value of Outflows}}}
\]
Decision: Higher the Better.

**Concept No. 9: Risk-Adjusted Discount Rate Method (RADR)**

\[
(1 + \text{RADR}) = (1 + \text{Risk-free rate})(1 + \text{Risk Premium})
\]

Under this method,

- Project should be discounted using risk-adjusted discount rate rather than risk-free discount rate.

**Note:**
Higher the risk of the project, higher should be the discount rate/required rate of return.

**Concept No. 10: Certainty Equivalent Co-efficient (CEC) Method**

It involves discounting of certain Cash Flows instead of Total Cash Flows.

**Steps involved:**

**Step 1:** Calculate all cash flows arising from the project.

**Step 2:** Calculate certain cash flow by using CEC (Certainty Equivalent Co-efficient)

\[
\text{Certain Cash Flow} = \text{Cash Flow} \times \text{CEC}
\]

**Step 3:** Compute NPV by taking certain Cash Flow and risk-free discount rate.

**Note 1:** Higher the CEC, lower the risk and vice-versa.

**Note 2:** CEC of cash flow arising in year 0 will always be One.

**Concept No. 11: Unequal Life/Equated Annual Amount**

- Normally, when two projects are evaluated, life of both the project must be same. If two projects have unequal life, then these projects are not comparable.

- Sometimes, life of 2 projects are not same. In this case, calculate equated Annual Amount.

**Steps Involved:**

**Step 1:** Calculate NPV or PV of cash inflow or PV of cash outflow of each project.

**Step 2:** Calculate equated annual amount by using this formulae:

\[
\text{Equated Annual Amount} = \frac{\text{NPV or PV of cash outflow or PV value of cash Inflow}}{\text{PVAF (k\%, n years)}}
\]
**Concept No. 12: Replacement Decision**

**Decision:**

“Whether to replace the existing machine and buy new machine”  
Or  
“Whether to repair existing machine”

**Concept No. 13: Abandon/Discard Decision**

**Concept No. 14: Project NPV/IRR & Equity NPV/IRR**

> **Project may be evaluated:**

1. From the point of view of Equity-share holders.

2. From the point of view of overall project (i.e. Total Fund Approach)

<table>
<thead>
<tr>
<th></th>
<th>Equity Approach</th>
<th>Total Fund Approach / Overall Project Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discount Rate</strong></td>
<td>$K_e$</td>
<td>$K_0$</td>
</tr>
</tbody>
</table>
| **Cash Outflow**        | Equity Share Capital (Fund) | Equity – Share Capital (Fund) + Debeture + Long-term Loan + Preference Share Capital  
Or  
Total Cost of Project |
| **Cash Inflow**         | Cash Inflow available for equity | Cash Inflow available for overall project |
| **NPV**                 | NPV that a project earns for the equity share holders | NPV that a project earns for the company as a whole. |

**Note 1: Calculation of Equity Cash Inflow**

- EBITDA
- (-)Depreciation
- (-)Interest on Short-term Loans
- (-)Interest on Long-term Loans
- EBT
- (-)Tax
- EAT
+ Depreciation
- (-)Preference Dividend
- (-)Increase in working Capital

---

iSS Rathore Institute iSS  
email: gjainca@gmail.com
+ Decrease in working Capital XXX
(-) Repayment of Loan
→ Short-term Loan XXX
→ Long-term loan XXX XXX
(-) Redemption of Debentures XXX
(-) Redemption of Preference Share XXX
(-) Capital Expenditure (if any) XXX
Equity Cash Inflow/ XXX

Free Cash Flow to Equity (FCFE)

**Note 2: Calculation of Project Cash Inflow**

EBITDA XXX
(-) Depreciation XXX
(-) Interest on Short-term Loans XXX
EBT XXX
(-) Tax XXX
EAT XXX
+ Depreciation XXX
(-) Increase in working Capital XXX
+ Decrease in working Capital XXX
(-) Repayment of Loan
→ Short-term Loan XXX
(-) Capital Expenditure (if any) XXX
Project Cash Inflow / XXX
Free Cash Flow to Firm (FCFF)

**Note 1:**
While calculating Project Cash Flow, we must consider Tax Saving (inflow) on Long-term loan Interest.

**Note 2:**
It Tax rate is given, we prefer WDV method of depreciation.

**Note 3:**
Increase in W/C should be treated as Outflow.
Decrease in W/C should be treated as Inflow.

**Note 4:**
- **Equity IRR** is the discount rate at which equity NPV is Zero. It reflects a rate of return a project earns for the equity share holders.
- **Project IRR** is the discount rate at which Project NPV is Zero. It reflects the rate of return earned by the project (both for equity share holders & Loan holders).

**Concept No. 15: Modified NPV & Modified IRR**

- When Cost of Capital & Re-investment rate are separately given, then we calculate Modified NPV.
Steps Involved:

**Step 1:** Calculate all cash inflow and cash outflow, arising from the project.

**Step 2:** Calculate P.V of Cash outflow by using Cost of Capital.

**Step 3:** Calculate future Value of Cash Inflow by using re-investment rate. We call it “Terminal Value of All Cash inflows.”

**Step 4:** Calculate PV of Terminal Value by using Cost of Capital, i.e. PV of Cash inflows.

**Step 5:** Calculate Modified NPV

\[ \text{Modified NPV} = \text{Step 4} - \text{Step 2} \]

i.e. \[ \frac{\text{Terminal Value}}{(1+K_0)^n} - \text{PV of Cash Outflow} \]

**Modified IRR:** It is the discount rate at which Modified NPV is Zero.

i.e. Modified NPV = \[ \frac{\text{Terminal Value}}{(1+K_0)^n} - \text{PV of Cash Outflow} \]

- \[ 0 = \frac{\text{Terminal Value}}{(1+K_0)^n} - \text{PV of Cash Outflow} \]
- \[ \text{PV of cash outflow} = \frac{\text{Terminal Value}}{(1+K_0)^n} \]

Calculate \( K_0 \) from this equation.

**Concept No. 16: Inflation under Capital Budgeting**

- Inflation may effects the capital budgeting decisions, so it should be considered for our analysis.

- Inflation rate effects 3 things:

  I. **Cash Flow:**
     a) Cash Flow inclusive of Inflation i.e. Money Cash Flow or Nominal Cash Flow.
     b) Cash Flow exclusive of Inflation i.e. Real Cash Flow

  **Conversion of Real Cash Flow into Money Cash Flow & Vice-versa**

  Money Cash Flow = Real Cash Flow \((1 + \text{Inflation Rate})^n\)

  Or

  Real Cash Flow = \( \frac{\text{Money Cash Flow}}{(1+\text{Inflation Rate})^n} \)
II. Discount Rate:
   a) Discount Rate may be inclusive of Inflation i.e. Money/Nominal Discount Rate
   b) Discount Rate may be exclusive of Inflation i.e. Real Discount Rate

Conversion of Real Discount Rate into Money Discount Rate & Vice-versa

\[(1 + \text{Money Discount Rate}) = (1 + \text{Real Discount Rate}) (1 + \text{Inflation Rate})\]

Note:
When discount rate is silent in question:

Assumption:
1. If Cash Flow is Real Cash Flow, then assume Discount Rate to be Money Discount Rate.
2. If Cash Flow is Money Cash Flow, then assume Discount Rate to be Real Discount Rate.

III. NPV : NPV may either be calculated:
   a) By discounting real cash flow by real discount rate.
   b) By discounting money cash flow by money discount rate.

Note:
- Answer in both the case will be same.
- If question says that value are given at “Current Price” it means that these prices are given without taking the effect of inflation.
- Depreciation is not affected by inflation rate as depreciation is changed on the book value of the asset & not market value.

**Concept No. 17: Probability Distribution Approach**

1) Expected NPV/ Expected Cash Flow / Expected Value
Example:

<table>
<thead>
<tr>
<th>NPV</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>0.20</td>
</tr>
<tr>
<td>35,000</td>
<td>0.50</td>
</tr>
<tr>
<td>50,000</td>
<td>0.10</td>
</tr>
<tr>
<td>70,000</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Calculate Expected NPV?

Solution:
Expected NPV = 20,000 \times .20 + 35,000 \times 0.50 + 50,000 \times .10 + 70,000 \times .20 = 40,500

2) Standard Deviation:

\[
\sigma = \sqrt{\sum [\text{probability} \times (\text{Given NPV} - \text{Expected NPV})^2]}
\]
3) Co-efficient of Variation (CV):

\[ CV = \frac{\text{Standard Deviation}}{\text{Expected NPV}} \]

Lower the CV, lower the risk & vice-versa

**Concept No. 18: Sensitivity Analysis**

- Also known as “What if” Analysis
- Sensitivity Analysis is a tool in the hand of firms to **analyze change in the project’s NPV or IRR for a given change in one of the variables**.
- It provides different cash flow estimates under the following assumption:
  1. Pessimistic
  2. Expected
  3. Optimistic
- It directs the management to pay **maximum attention towards the factor where minimum percentage of adverse changes causes maximum adverse effect**.
- If NPV is to become Zero with 5% change in initial investment relative to 10% change in cash inflows, project is said to be more sensitive to initial investment then to cash inflows.

**Steps Involved:**

**Step 1:** identify the variables which have an effect on projects NPV or IRR.

**Step 2:** Define the mathematical relationship between the variables

Formula:

\[ \text{Sensitivity} = \frac{\text{Change}}{\text{Base}} \times 100 \]

**Step 3:** Analyze the implementation to change in each of the variables on the projects NPV or IRR

- Key factors which are used to calculate NPV are as follows:

  **Inverse Effect**
  
  i) Cash Inflows  **Decrease**
  ii) Cash Outflows  **Increase**
  iii) Discount Rate  **Increase**
  iv) Life of the project  **Decrease**

**Note:**
Sensitivity Analysis is calculated for each factor separately, keeping other factors constant.

**Sensitivity Analysis using % Adverse Variation in Factors**
Under this method Sensitivity is calculated by taking adverse changes by a specific % which may be indicated in question.

The adverse factor for which % fall in NPV is maximum is considered to be most sensitive.

\[ \% \text{ Fall In NPV} = \frac{\text{Revised NPV} - \text{Original NPV}}{\text{Original NPV}} \times 100 \]

**Concept No. 19: Decision Tree Approach**

- Decision Tree Approach is a graphical Representation of the various alternatives available to an investment decision.

**Concept No. 20: Decision Tree approach (Backward Method)**

**Concept No. 21: Capital Rationing**

- Capital rationing is the situation under which company is not able to undertake all +ve NPV projects due to lack of funds.

- Firm must prioritize its capital expenditure with the goal of achieving the maximum increase in value for shareholders.

- If the firm has unlimited access to capital, the firm can undertake all projects with +ve NPV.

**Divisible Projects**

Those projects which can be taken in parts e.g. Construction of Flats.

**Indivisible Projects**

Those projects which cannot be taken in parts e.g. Construction of Ship.

**Case I: Divisible Project & Single Period Capital Rationing**

**Steps Involved:**

**Step 1:** Calculate NPV of each project.

**Step 2:** Identify whether capital rationing exists.

**Step 3:** Calculate Net Profitability Index or Profitability Index (PI) for each project.

**Step 4:** Rank the project
Step 5: Allocate money according to rank.

**Case II: Indivisible Project & Single Period Capital Rationing**

**Steps Involved:**

**Step 1:** Calculate NPV of each project.

**Step 2:** Identify whether capital rationing exists.

**Step 3:** Take possible combinations of projects taking into consideration limitation of funds.

**Step 4:** Select that combination which gives highest NPV.

**Concept No. 22: Joint Probability**

- Joint probability is the product of two or more than two dependent probability.

- Total of joint probability will always be 1.

**Concept No. 23: Probability of Occurrence**

Probability of Occurrence if the Cash Flows are:

a) Perfectly Dependent Overtime

b) Independent Overtime.

**Concept No. 24: Changing Inflation Rate from one year to another**
# Miscellaneous

<table>
<thead>
<tr>
<th>Concept No. 1:</th>
<th>Buy Back of shares/Repurchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept No.2:</td>
<td>Money Market Instruments</td>
</tr>
<tr>
<td>Concept No.3:</td>
<td>Factoring</td>
</tr>
<tr>
<td>Concept No.4:</td>
<td>Effective Yield under Money Market Operations</td>
</tr>
<tr>
<td>Concept No. 5:</td>
<td>ADR &amp; GDR</td>
</tr>
<tr>
<td>Concept No. 6:</td>
<td>Right Shares</td>
</tr>
<tr>
<td>Concept No. 7:</td>
<td>Calculation of EMI(Equated Monthly Installment)</td>
</tr>
<tr>
<td>Concept No. 8:</td>
<td>Consumer Finance</td>
</tr>
<tr>
<td>Concept No. 9:</td>
<td>Housing Loan</td>
</tr>
<tr>
<td>Concept No. 10:</td>
<td>Venture Capital Investing</td>
</tr>
<tr>
<td>Concept No. 11:</td>
<td>Moving Averages</td>
</tr>
<tr>
<td>Concept No. 12:</td>
<td>Bollinger Bands</td>
</tr>
<tr>
<td>Concept No. 13:</td>
<td>MM Arbitrage</td>
</tr>
<tr>
<td>Concept No. 14:</td>
<td>Index Formation</td>
</tr>
</tbody>
</table>
Concept No. 1: Buy Back of shares/Repurchase

- Buyback is reverse of issue of shares of a company where the company offers to take back its share owned by the investors at a specified price.

Abhishek Ltd. has a surplus cash of Rs. 90 lakhs and wants to distribute 30% of it to the shareholders. The Company decides to buyback shares. The Finance Manager of the Company estimates that its share price after re-purchase is likely to be 10% above the buyback price; if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is Rs. 3. Calculate
(a) The price at which the shares can be repurchased, if the market capitalization of the company should be Rs. 200 lakhs after buyback.
(b) The number of shares that can be re-purchased.
(c) The impact of share re-purchase on the EPS, assuming the net income is same.

Solution:
(a) Price At Which the Shares Can Be Repurchased:
Let P be the buyback price decided by Abhishek Ltd.
MPS After Buyback x No. of shares After Buyback = 200,00,000.
=> 1.1 x P x [Existing Number of Share - Buy Back Share] = 200,00,000
=> 1.1 x P x [10,00,000 – Buy Back price] = 200,00,000
=> 1.1 x P x [10,00,000 – 30% of 90,00,000] = 200,00,000
=> P = 20.88

(b) Number of shares to be bought back:
= 27 / 20.88 = 1.29 Lakhs (approx)

(c) EPS After Buy back:
New Equity Shares i.e Equity Share After Buy back = (10-1.29) lakhs = 8.71 lakhs
EPS after Buy Back = (3 x 10) / 8.71 = 3.44

Concept No.2: Money Market Instruments

They are those instruments which are available for a period of less than one year.

Example: Certificate of deposit, Commercial Paper, T-Bills, etc.

Example 1:(CA Final Nov. 2003)(RTP Nov 08)
M Ltd. has to make a payment on 30th March 04 of Rs. 80 lakhs. It has surplus cash today, i.e. 31st Dec 03 & has decided to invest sufficient cash in a bank's Certificate of Deposit scheme offering an yield of 8% p.a. on simple interest basis. What is the amount to be invested now? Take 91 days of investment.

Solutions:
Calculation of Investment Amount
Let the amount to be invested now be Rs. X
Then we have 
\[ X + X \times \frac{8}{100} \times \frac{91}{365} = Rs. 80,00,000 \]  
=> X = Rs. 7843558.61187

Example 2: (CA Final May, 2005)
RBI sold a 91 day T Bill of face value of Rs. 100 at a yield of 6%. What was the issue price?

Solutions:
Let the issue price be X. Now we have,
\[ X + X \times \frac{6}{100} \times \frac{91}{365} = Rs. 100 \]  
=> X = Rs. 98.526

Note: (i) The maturity value of treasury bill is always equal to face value. (ii) Treasury bills are always issued at a discount.

Example 3: (CA Final May 1998)(CS Final June 2007, 5 Marks)
X Ltd. issued commercial paper as per following detail: Date of issue: 17th January, 1998; Date of Maturity: 17th April, 1998; No. of days 90; Interest Rate: 11.25% p.a. What was the net amount received by the company on issue of commercial paper? Assume Maturity Value or Face Value to be 500 lakhs.

Solutions:
Let the net amount received by the company be X.

Then we have, 
\[ X + X \times \frac{11.25}{100} \times \frac{90}{365} = Rs. 500,00,000 \]  
=> x = Rs. 48650449.85

Concept No. 3: Factoring
Factoring is a new concept in financing of accounts receivables. This refers to outright sale of accounts receivables to a factor or a financial agency.
A factor is a firm that acquires the receivables of other firms. The factoring agency bears the right of collection and services the accounts for a fee.

Types of Factoring:
Non Recourse Factoring & Recourse Factoring
a) Non Recourse Factoring: Normally, factoring is the arrangement on a non-recourse basis where in the event of default the loss is borne by the factor. i.e if there are bad debts, it will be borne by the factor.
b) Recourse Factoring: In this type of factoring, the risk of bad debt is borne by the client and not factor.

There are a number of financial distributors providing factoring services in India. Some commercial banks and other financial agencies also provide this service.

Example 1: (CA Final May 06, 5 Marks)
A company is considering to engage a factor, the following information is available
(i) The current average collection period for the Company’s debtors is 80 days and 1/2 % of debtors default. The factor has agreed to pay money due after 60 days and will take the responsibility of any loss on account of bad debts.
(ii) The annual charge for the factoring is 2 % of turnover payable annually in arrears. Administration cost saving is likely to be Rs. 1,00,000 per annum.
(iii) Annual sales, all on credit, are Rs. 1,00,00,000. Variable Cost is 80% of sales price. The company cost of borrowing is 15% p.a. Assume the year is consisting of 365 days. Should the company enter into a factoring agreement?
Solution:
Annual saving in cash flows 1,00,000
Existing Debtors
\[1,00,00,000 \times \frac{80}{365} = 21,91,781\]
\[1,00,00,000 \times \frac{60}{365} = 16,43,836\]
Reduction in Debtors 5,47,945
Cost @ 80% 4,38,356

Add: Interest Saving @ 15% p.a of 4,38,356 65,755
Add: Bad-debts saved 1/2 % of 1,00,00,000 50,000

Less: Annual Charges @ 2% of 1,00,00,000 2,00,000

Example 2: (CA Final Nov 2008)(8 Marks)(CA Final May 2002)(6 Marks)
X Ltd. has a total sales of Rs. 4 crores and its' average collection period is 90 days. The past experience indicates that bad-debt losses are 1.5% on Sales. The expenditure incurred by the firm in administering its receivable collection efforts are Rs. 6,00,000. A factor is prepared to buy the firm's receivables by charging 2% Commission. The factor will pay advance on receivables to the firm at an interest rate of 18% p.a. after withholding 10% as reserve, other required commission & interest. Calculate the effective cost of factoring to the Firm.

Solution:
Position for 90 days:
Average level of sales = 4,00,00,000 \times \frac{90}{360} 1,00,00,000
Factor Commission = 1,00,00,000 \times 2% 2,00,000
Reserve @ 10% = 1,00,00,000 \times 10% 10,00,000
Amount available for advance = 1,00,00,000 – [2,00,000 + 10,00,000] 88,00,000
Factor will deduct his interest @ 18% p.a. \[\frac{88,00,000 \times 18 \times 90}{100 \times 360}\] 3,96,000
Advance to be paid = 88,00,000 – 3,96,000 84,04,000

Annual Cost:
Commission = 4,00,00,000 \times 2% 8,00,000
+ Interest = \[\frac{3,96,000}{90} \times 360\] 15,84,000

23,84,000
Cost Saved:
Admin Cost 6,00,000
Bad debts 1.5% of 4,00,00,000 6,00,000
12,00,000

Net Cost = 23,84,000 – 12,00,000 = 11,84,000

Effective Interest Rate = \(\frac{11,84,000 \times 100}{84,04,000}\) = 14.09%

**Concept No.4: Effective Yield under Money Market Operations**

Effective Rate of Interest = \(\frac{FV - \text{Issue Price}}{\text{Issue Price}} \times \frac{12}{\text{Required Period}} \times 100\)

**Cost of Funds:**

- Effective rate of Interest p.a
- + Brokerage p.a
- + Rating Charges p.a
- + Stamp Duty p.a
- = Total cost of Funds p.a

**Example:** (CA Final May 06 5Marks )(CA Final SFM, Nov 2010)(5 Marks)
From the following particulars, calculate the effective interest p.a. as well as the total cost of funds of ABC Ltd., which is planning a CP issue:
Issue price of CP -► Rs. 97,350; Face Value -► Rs. 1,00,000; Maturity period -► 3 months
Issue Expenses : Brokerage : 0.125% for 3 months; Rating Charges: 0.5% p.a.; Stamp Duty: 0.125% for 3 months.

**Solution:**

Effective Rate of Interest = \(\frac{FV - \text{Issue Price}}{\text{Issue Price}} \times \frac{12}{\text{Required Period}} \times 100\)

\[= \frac{100,000 - 97,350}{97,350} \times \frac{12}{3} \times 100 = 10.89 \text{ p.a}\]

Cost of fund to the Company:

- Effective Interest 10.89
- Brokerage (.125 \times 12/3) 0.50
- Rating Charges 0.50
- Stamp Duty(.125 \times 12/3) 0.50
- 12.39%

**Concept No.5: ADR & GDR**

GDR & ADR
- ADR stands for American Depository Receipts
- GDR stands for Global Depository Receipts
• Difference Between ADR & GDR

**ADR**
(i) The depository receipts in US market is ADR
(ii) Issued in accordance with the provision of SEC (Securities & Exchange Commission) of USA.
(iii) It has very strict provision regarding disclosure & Accounting norms
(iv) Cost of issuing ADR is high
(v) It is not so popular among Indian companies.
(vi) ADR are listed only in American Stock Exchange (ASE)

**GDR**
The depository receipts in world market is GDR
Not to comply with any of the condition of SEC of USA.
Disclosure requirement is less stringent.
Cost is not high
It is much preferable than ADR
Listed in any foreign stock exchange other than the American Stock Exchange.
Example: London Stock Exchange

**Example:**
AR Ltd. has proposed to expand its operations for which it requires funds of $4.02 crore net of issue expenses. It proposed to raise the required funds through a GDR issue. It considers the following factors in pricing the issue:
(i) The expected market price of the company's equity share in the domestic market is Rs. 180. (Face value Rs. 10 each)
(ii) 6 shares should consists each GDR.
(iii) The underlying shares are priced at a discount of 10% to the market price.
(iv) The expected exchange rate is Rs. 42 per $.
(v) Dividend expected on the equity share is 15% with a growth of 8% p.a. forever.
(vi) The issue cost amount to 2% of the issue size.
Compute the number of GDRs that have to be issued and also the cost of GDR to the company.

**Solution:**
It is given that one GDR constitute = 6 equity share
Therefore market value of one GDR = 6 x 180 = 1080 (Since Market Price of one Equity Share is Rs. 180)
Now as per question GDR is to be issued at 10% discount,
Therefore issue value of one GDR considering discount = 90% of 1080 = Rs. 972
Required fund $ 4.02 crore, In Equivalent Rupee = 4.02 x 42 = 168.84 crore rupees.

Since issue expense is 2% Therefore Amount for which GDR will be Issued = (168.84)/0.98 = 172.29
Number of GDR to be issued = 172.29 / 972 = 17,72,787

Cost of GDR ignoring issue expenses: \( P_0 (1 - f) = D_0 (1 + g) / K_e - g \Rightarrow K_e = 9.02\% \)

Working Notes:
Calculation of \( D_1 \) or \( D_0 (1 + g) \)
Dividend on one equity share (\( D_0 \)): 15% of Rs.10 Face Value = 1.5;
Therefore \( D_1 = D_0 (1 + g) = 1.5(1 + 0.08) = 1.62 \)
Similarly \( D \) for one GDR = 1.62 x 6 = 9.72 (Since one GDR constitute of 6 Share)

**Concept No. 6: Right Shares**

Right Shares are those shares which are issued to existing shareholders at a price which is normally less than Current Market Price.

<table>
<thead>
<tr>
<th>Choice before Shareholder in respect of Right Issue</th>
<th>Effect on Shareholder’s wealth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise his rights and subscribe for Right</td>
<td>No change in wealth</td>
</tr>
</tbody>
</table>

iSS Rathore Institute iSS
email: gjainca@gmail.com
<table>
<thead>
<tr>
<th>Action</th>
<th>Effect of Wealth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Do not exercise</td>
<td>Decrease in Wealth</td>
</tr>
<tr>
<td>3. Sell the rights in the market.</td>
<td>No change in wealth</td>
</tr>
<tr>
<td>4. Exercise his right for few shares and sell the balance rights in the market.</td>
<td>No change in wealth</td>
</tr>
</tbody>
</table>

Theoretical Post Right (Ex-Right) Price per share =

\[
\frac{\text{MPS Cum Right} \times \text{Existing No. of Shares} + \text{Right Share price/ Offer Price} \times \text{No. of Right Share issued}}{\text{Existing No. of Equity Shares} + \text{New No. of Right Shares issued}}
\]

**Example 1:** (CA Final May. 2003) (RTP Nov 08)
Pragya Limited has issued 75,000 equity shares of Rs. 10 each. The current market price per share is Rs. 24. The company has a plan to make a right issue of one new equity share at a price of Rs. 16 for every four share held. You are required to:
(i) Calculate the theoretical post right price per share;
(ii) Calculate the theoretical value of the right alone;
(iii) Discuss the effect of the rights issue on the wealth of a shareholder, who has 1,000 shares assuming he sells the entire rights;
(iv) State the effect, if the same shareholder does not take any action and ignores the issue.
(v) State the effect, if the same shareholder subscribe for the entire issue.
(vi) State the effect, if the same shareholder exercise 60% of the right and sell 40% of his rights.

**Solution:**
(i) Calculation of Theoretical Post(rights(ex-right) price per share:

\[
\frac{24 \times 75000 + 16 \times 18750}{75000 + 18750} = 22.40
\]

Working Note:
Number of Right share to be issued: \(\frac{75000}{4} = 18750\)

(ii) Calculation of theoretical value of the rights alone:

\[
= \text{Ex-right price} - \text{Cost of rights share}
= \text{Rs. 22.40} - \text{Rs. 16} = \text{Rs. 6.40}
\]

(iii) Calculation of effect of the rights issue on the wealth of a shareholder who has 1,000 shares assuming he sells the entire rights:

(a) Value of shares before right issue

\[
(1,000 \text{ shares} \times \text{Rs. 24}) = 24,000
\]

(b) Value of shares after right issue

\[
(1,000 \text{ shares} \times \text{Rs. 22.40}) = 22,400
\]

Add: Sale proceeds of rights renunciation

\[
(250 \text{ shares} \times \text{Rs. 6.40}) = 1,600
\]

\[
24,000
\]

There is no change in the wealth of the shareholder if he sells the entire rights.

(iv) Calculation of effect if the shareholder does not take any action and ignores the issue:

Value of shares before right issue

\[
(1,000 \text{ shares} \times \text{Rs. 24}) = 24,000
\]

Less: Value of shares after right issue

\[
(1,000 \text{ shares} \times \text{Rs. 22.40}) = 22,400
\]

Loss of wealth to shareholders, if rights ignored

\[
1,600
\]
(v)
Value of shares before right issue (1,000 shares x Rs. 24) 24,000
Value of shares after right issue
• Value of Existing Shares 1000 x 22.40 = 22,400
• Value of Right Share Received 1000/4 x 22.4 = 5,600
• Payment for Right share 1000/4 x 16.0 = (4,000)

There is no change in the wealth of the shareholder.

(vi)
Value of shares before right issue (1,000 shares x Rs. 24) 24,000
Value of shares after right issue
• Value of Existing Shares 1000 x 22.40 = 22,400
• Value of Right Share Received 1000/4 x 60% x 22.4 = 3,360
• Payment for Right share 1000/4 x 60% x 16 = (2,400)
• Value Received for Right Sold 1000/4 x 40% x 6.40 = 640

There is no change in the wealth of the shareholder.

Example 2: (CA Final November 2004 6 Marks) (RTP Nov 08)
ABC Limited's shares are currently selling at Rs. 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise Rs. 20 lakhs to finance a new project.
Required: What is the ex-right price of shares and the value of a right, if
(i) The firm offers one right share for every two shares held.
(ii) The firm offers one right share for every four shares held.
(iii) How does the shareholders' wealth change from (i) to (ii)? How does right issue increases shareholders' wealth?

Solution:
(i) Calculation of Theoretical Post-rights (ex-right) price per share:
\[
\text{Theoretical Post Rights (Ex-right) Price Per Share} = \frac{13 \times 10,00,000 + 4 \times 5,00,000}{10,00,000 + 5,00,000} = 10
\]

Theoretical Value of Right = Ex Right Price - Cost of Right Share = 10 - 4 = 6 OR
Theoretical Value of Right Per share = \(\frac{6}{2}\) = 3

Working Note: Number of right shares to be issued = \(\frac{10,00,000}{2}\) = 5,00,000 shares

Subscription Amount or Right Share Price = \(\frac{20,00,000}{5,00,000}\) = Rs. 4

(ii) Theoretical Post Right (Ex. Right) Price Per Share;

\[
\text{Theoretical Post Right (Ex. Right) Price Per Share} = \frac{13 \times 10,00,000 + 8 \times 2,50,000}{10,00,000 + 2,50,000} = 12
\]

Theoretical Value of Right = Ex Right Price - Cost of Right Share = 12 - 8 = 4 OR
Theoretical Value of Right Per share = \(\frac{4}{4}\) = 1
Working Note: Number of right shares to be issued = \( \frac{10,00,000}{4} = 2,50,000 \) shares

Subscription Amount or Right Share Price = \( \frac{20,00,000}{2,50,000} = \text{Rs. 8} \)

(iii) How does the shareholders' wealth change from (i) to (ii) Since Right issue is constructed in such a way that shareholders proportionate share will remain unchanged, shareholders' wealth does not change from (i) to (ii) i.e. shareholder's wealth remain constant by issuing of Right Share.

Additional Analysis: (Assuming Shareholder holds 1000 shares)

(i) Before
Value before Right = 1000 \times 13 = 13,000
After
Value including Right share = 1500 \times 10 = 15,000
Less: Subscription Price = 500 \times 4 = 2000
Value after Right = 13,000
(ii) Before
Value before Right = 1000 \times 13 = 13,000
After
Value including Right share = 1250 \times 12 = 15,000
Less: Subscription Price = 250 \times 8 = 2000
Value after Right = 13,000

How does the right issue increases shareholders wealth: Right issue increases shareholders wealth because of the saving cost on account of public issue.

Additional Analysis: As such right issue do not increase the wealth of the shares. Shareholder's Value remain same before and after the right issue. But when the cost of issuing right shares is compared with the cost of issuing public issue, then we can say that cost of issuing right shares is much lower than the cost of public issue. Hence in that manner It can increase the shareholder's wealth to that extent

**Example 3:**
The stock of the A Ltd. is selling for £50 per common stock. The company then issue * right s to subscribe to one new share at £40 for each five rights held.
(a) What is the theoretical value of a right when the stock is selling rights-on?
(b) What is the theoretical value of one share of stock when it goes ex-rights?
(c) What is the theoretical value of a right when the stock sells ex-rights at £50?
(d) John has £1,000 at the time A Ltd. goes ex-rights at £50 per common stock. He feels that the price of the stock will rise to £60 by the time the rights expire. Compute his return on his £1,000 if he (1) buys Soni plc stock at £50, or (2) buys the rights as the price computed in part c. assuming his price expectations are valid.

**Solution:**
(a) Theoretical value of a right when the stock is selling rights-on = \( \frac{\text{MPS cum Right–Offer Price}}{\text{Existing Share+Right Share}} \)
\[ = \frac{50 - 40}{5+1} = 1.67 \]
(b) Theoretical value of one share of stock when it goes ex-rights
\[
\text{MPS cum Right} \times \text{Existing Share} + \text{Offer Price} \times \text{New right shares} = \frac{50 \times 5 + 40 \times 1}{5 + 1} = 48.33
\]

c) Theoretical value of a right when the stock sells ex-rights at £50 = \[
\frac{\text{MPS cum Right} - \text{Offer Price}}{\text{Existing Share}} = \frac{50 - 40}{5} = 2.00
\]

d) (1) No. of Shares Purchased = £1,000/£50 = 20 shares
Increase in Initial Investment when price rises to 60 = 20 x £60 = £1,200
Return = £1,200 - £1,000 = £200
(2) No. of Right Shares Purchased = £1,000 / £2 = 500 rights
Increase in the value of Right = 500 X £4* = £2,000
Return = £2,000 - £1,000 = £1,000
Working Notes: Theoretical Value of Right when stock sells at £50 = (£60 - £40)/5 = £4

Example 4: (RTP)
Monopolo Ltd. has a paid-up ordinary share capital of Rs. 2,00,00,000 represented by 4,00,000 shares of Rs. 50 each. Earnings after tax in the most recent year were Rs. 75,00,000 of which Rs. 25,00,000 was distributed as dividend. The current price/earnings ratio of these shares, as normally reported in the financial press, is 8. The company is planning a major investment that will cost Rs. 2,02,50,000 and is expected to produce additional after tax earnings over the foreseeable future at the rate of 15% on the amount invested. It was proposed by CFO of the company to raise necessary finance by a rights issue to the existing shareholders at a price 25% below the current market price of the company’s shares.

(a) You have been appointed as financial consultant of the company and are required to calculate:
(i) The current market price of shares already in issue;
(ii) The price at which the rights issue will be made;
(iii) The number of new shares that will be issued;
(iv) The price at which the shares of the entity should theoretically be quoted on completion of the rights issue (i.e. the ‘ex- rights price’), assuming no incidental costs and that the market accepts the entity’s forecast of incremental earnings.

(b) It has been said that, provided the required amount of money is raised and that the market is made aware of the earning power of the new investment, the financial position of existing shareholders should be the same whether or not they decide to subscribe for the rights they are offered. You are required to illustrate that there will be no change in the existing shareholder's wealth.

Solution:
Q.4(a)

(i) Current market price of shares already in issue;
Earnings Per Share = 75,00,000/4,00,000 = Rs. 18.75
P/E Ratio = Market Price Per Share/Earnings Per Share = 8

Market price per share = 8 x Rs. 18.75 = Rs. 150

(ii) Price at which rights issue will be made: Rs. 150 x 75% = Rs. 112.50

(iii) Number of new shares will be issued: 202,50,000/112.50 = 1,80,000

(iv) Ex-rights price is
Rs. 150 \times 4,00,000 \div 5,80,000 + 112.50 \times 1,80,000 \div 5,80,000 = Rs. 145.34  
* The price/earnings ratio is given as 8. This would imply an earnings yield of \( \frac{1}{8} = 12.5\% \). This is assumed to be the yield or rate of return on existing funds.

(b) Assume that a shareholder holds 20 shares, the rights issue means addition of another 9 shares. Theoretical, the selling price of the right to purchase one share will be (Rs. 145.34 - Rs. 112.50), that is Rs. 32.84. Let us discuss the two cases first if he opt for taking the right and second if he does not taking the right but selling it.

(i) Taking up the rights:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market value of 29 shares at Rs. 145.34 each</td>
<td>4,214.86</td>
</tr>
<tr>
<td>Less: Cost of taking up rights of nine new shares at Rs. 112.50 each</td>
<td>1,012.50</td>
</tr>
<tr>
<td></td>
<td>3,202.36</td>
</tr>
</tbody>
</table>

(ii) Selling the rights:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market value of 20 shares at Rs. 145.34 each</td>
<td>2,906.80</td>
</tr>
<tr>
<td>Add: Sale of 9 rights at Rs. 32.84 each</td>
<td>295.56</td>
</tr>
<tr>
<td></td>
<td>3,202.36</td>
</tr>
</tbody>
</table>

**Concept No. 7: Calculation of EMI (Equated Monthly Installment)**

EMI, if installment is paid at the end of each month = \( \frac{\text{Amount of loan}}{\text{PVAF} \left( \frac{r \times n \times 12}{r \times n \times 12} \right)} \)

EMI, if installment is paid at the beginning of each month = \( \frac{\text{Amount of loan}}{1 + \text{PVAF} \left( \frac{r \times n \times 12 - 1}{r \times n \times 12} \right)} \)

**Example:** (SFM Study Material)

Fixed Interest rates quoted on housing loans by a nationalized bank for three different maturity periods are as follows. Compute EMI for a loan of Rs. 72,500 for each of the maturities.

<table>
<thead>
<tr>
<th>Option</th>
<th>Interest rate</th>
<th>Loan Period</th>
<th>Interest Rate adjusted on One month basis</th>
<th>Loan Amount</th>
<th>PVAF for 36/60/120 months</th>
<th>EMI = Loan Amount / PVAF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option I</td>
<td>10% (3 years)</td>
<td>3 years</td>
<td>0.833</td>
<td>Rs. 72,500</td>
<td>30.99</td>
<td>Rs. 2339.46</td>
</tr>
<tr>
<td>Option II</td>
<td>11% (5 years)</td>
<td>5 years</td>
<td>0.916</td>
<td>Rs. 72,500</td>
<td>45.99</td>
<td>Rs. 1576.43</td>
</tr>
<tr>
<td>Option III</td>
<td>12% (10 years)</td>
<td>10 years</td>
<td>1.000</td>
<td>Rs. 72,500</td>
<td>69.70</td>
<td>Rs. 1040.17</td>
</tr>
</tbody>
</table>

**Concept No. 8: Consumer Finance**

**Example:** (SFM Study Material)

Lenders and Company has come up with a special offer for its customers, for purchase of TVs, Refrigerators, Electronic equipment and other home appliance. A visit to their store and discussions with sales persons reveal the following:
*The offer is available for a minimum purchase of items for list price of Rs. 18,000. The purchase price can be paid in 12 equal monthly installments. The first payment is to be made on the date of purchase and the remaining 11 installments are payable each of the following months, on the same calendar date of purchase.
* If the buyers opt to pay in cash, they can get a steep discount of Rs. 1173 for each lot of purchases worth Rs. 18,000.
(a) Is there an interest element involved in Zero interest offer?
(b) If yes, what is the rate?
(c) Which offer would you prefer?

**Solution:**

Since Lenders and Company are ready to sell the item, with a discount of Rs. 1,173 for each lot of Rs. 18,000, the cash price for the goods is equal to Rs. 16,827 [18000-1173]
The implicit rate in the offer is the rate at which present value of all the installments equals the cash price of Rs. 16,827.

<table>
<thead>
<tr>
<th>Cash Price</th>
<th>Rs. 16,827</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outflow if instalment payments are accepted</td>
<td>Rs. 18,000</td>
</tr>
<tr>
<td>First instalment being paid on day Zero</td>
<td>Rs. 1,500</td>
</tr>
<tr>
<td>Balance in 11 instalments</td>
<td>Rs. 16,500</td>
</tr>
</tbody>
</table>

Therefore we have, 16827 = 1500 x [ 1 + PVAF (r %, 12-1 periods)]

=>PVAF(r %, 12-1 periods) = 10.218

Looking at PVAF Table we find that value 10.218 be between 1 % & 2%.

At 1% PVAF is 10.3676; At 2% PVAF is 9.7868

Therefore we have, (10.3676 – 10.218) / (9.7868 – 10.218) = 1 – x / 2- x => x = 1.25%

(a) Yes, there is an interest element involved.
(b) If yes, the rate is 1.25% p.a.
(c) If the customer can borrow from an alternative source at 15% or less, he should borrow and buy.
Otherwise, he should accept instalment credit

**Concept No. 9: Housing Loan**

**Example 1:** (SFM Study Material)

Mr. A has secured loan from a housing bank, a six year housing loan of Rs. 12,00,000. The loan was structured as follows:

<table>
<thead>
<tr>
<th>Loan Amount</th>
<th>Rs. 12,00,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repayment</td>
<td>Six equated annual instalments, payable in arrears</td>
</tr>
<tr>
<td>Reference Base</td>
<td>Prime Lending Rate</td>
</tr>
<tr>
<td>Reference Rate</td>
<td>9% on the date of loan</td>
</tr>
<tr>
<td>Interest on Loan</td>
<td>1 percentage point over reference rate of 9%</td>
</tr>
<tr>
<td>Annual Instalment</td>
<td>Rs 275530</td>
</tr>
</tbody>
</table>

Two years after the loan was granted, the prime rate moves down to 8% and the effective rate on the loan automatically stood revise to 9%. What action can the bank take? Also Required (1) Determination of Unpaid principal (2) Re-Computation of Equated Annual Method for revised period at revised rate.

**Solution:**

<table>
<thead>
<tr>
<th>Opening Balance</th>
<th>Interest@10%</th>
<th>Installment</th>
<th>Principal</th>
<th>Closing Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,00,000</td>
<td>1,20,000</td>
<td>2,75,530</td>
<td>1,55,530</td>
<td>10,44,470</td>
</tr>
<tr>
<td>10,44,470</td>
<td>1,04,447</td>
<td>2,75,530</td>
<td>1,71,083</td>
<td>8,73,387</td>
</tr>
</tbody>
</table>

Period = 4 years
8% + 1% = 9%
PVAF @ 9% for 4 years = 3.240

Revised Installment = \( \frac{8,73,387}{3.240} = 2,69,564 \)

**Example 2:** (SFM Study Material) You have a housing loan with one of India’s top housing finance companies. The amount outstanding is Rs. 1,89,540. You have now paid an instalment. Your next instalment falls due a year later. There are five more instalments to go, each being Rs. 50,000. Another housing finance company has offered to take over this loan on a seven year repayment basis. You will be required to pay Rs. 36,408 p a with the first instalment falling a year later. The processing fee is 3% of amount taken over. For swapping you will have to pay Rs. 12,000 to the first company. Should you swap the loan?

**Solution:**

**Present Interest Rate**

Amount Outstanding = 1,89,540  
Interest = 50,000

\[ \frac{1,89,540}{50,000} = 3.791 \text{ PVAF} \]

Looking for 5 years in PVAF table = 10%

**New Interest rate**

Installment = 36,408

\[ \frac{1,89,540}{36,408} = 5.206 \text{ PVAF} = 7 \text{ Years} = 8\% \]

Swap Charge = 12,000

Processing Fees = 3% of 1,89,540 = 5686

1,89,540 = 36,408 \times PVAF @ r\%, 7 years + 17,686

PVAF (7 years, r\%) = 4.7202

By Interpolation = r = 10.947%

**Concept No. 10: Venture Capital Investing**

- Venture Capital Investments are private, non-exchange-traded equity investments in a Business Venture.
- Investments are usually made through limited partnerships, with investors anticipating relatively high returns in exchange for the illiquidity and high-risk profile of a venture capital investments.

**Stages of Venture Capital Investing:**

1. **Seed Stage:** Investors are providing Capital in the early stage of the business and may help fund research and development of product ideas.
2. **Early Stage:**
   
a) **Start-up Financing** refers to Capital use to complete Product Development and fund initial marketing Efforts.

   b) **First-Stage Financing** refers to funding to commercial production and sales of the product.

3. **Later Stage:** Major Expansion of the Company.

**Example:**
A venture capital fund manager is considering investing $25,00,000 in a new project that he believes will pay $1,20,00,000 at the end of the 5th years. The cost of equity for the investors is 15%, and the estimated probability of failure is presented in the figure below. These are conditional probabilities since they represent the probability of failure in year N, given that the firm has survived to year N.

### Estimated Probability of Failure

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure Probability</td>
<td>0.20</td>
<td>0.20</td>
<td>0.17</td>
<td>0.15</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Calculate NPV of the Potential investment.

**Solution:**
The probability that the venture survives for five years is calculated as:

\[
(1 – 0.20) (1 – 0.20) (1 – 0.17) (1 – 0.15) (1 – 0.15) = 0.3838 = 38.38\%
\]

The present value of Expected Payoff in year 5 is

\[
= \frac{0.3838 \times $1,20,00,000}{1.15^5} = $22,89,797.
\]

The NPV is simply $22,89,797 - $25,00,000 = -$2,10,203.

The Fund manager would not invest in the new project due to negative expected NPV.

### Concept No. 11: Moving Averages

Two types of moving Average are:

1. **AMA (Arithmetic Moving Average)**
2. **EMA (Exponential Moving Average)**

**AMA**

**Example:**

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Closing Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>39</td>
</tr>
<tr>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>5</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>43</td>
</tr>
<tr>
<td>7</td>
<td>52</td>
</tr>
<tr>
<td>8</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>45</td>
</tr>
</tbody>
</table>
Calculate 5 day’s AMA?

**Solution:**

<table>
<thead>
<tr>
<th>Day</th>
<th>Closing Price</th>
<th>5 Days AMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>39</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>42</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>48</td>
<td>42.80</td>
</tr>
<tr>
<td>6</td>
<td>43</td>
<td>43.40</td>
</tr>
<tr>
<td>7</td>
<td>52</td>
<td>44.80</td>
</tr>
<tr>
<td>8</td>
<td>47</td>
<td>46.40</td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>47</td>
</tr>
<tr>
<td>10</td>
<td>38</td>
<td>45</td>
</tr>
</tbody>
</table>

**EMA**

EMA today = EMA _Yesterday_ + a × [Price today - EMA _Yesterday_]

**Note:**

- a = Exponent/ Multiplier/ Smoothing Constant.
- ‘a’ will always be given in question, however ‘a’ can also be calculated by using following relation:

  \[
  a = \frac{2}{1 + \text{Period}}
  \]

**Example 1** (CA Final SFM Nov 2009, 6 Marks)

Closing values of BSE Sensex from 6th to 17th day of the month of January of the year 200X were as follows:

<table>
<thead>
<tr>
<th>Days</th>
<th>Date</th>
<th>Day</th>
<th>Sensex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>THU</td>
<td>14522</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>FRI</td>
<td>14925</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>SAT</td>
<td>No Trading</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>SUN</td>
<td>No Trading</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>MON</td>
<td>15222</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>TUE</td>
<td>16000</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>WED</td>
<td>16400</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>THU</td>
<td>17000</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>FRI</td>
<td>No Trading</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>SAT</td>
<td>No Trading</td>
</tr>
<tr>
<td>11</td>
<td>16</td>
<td>SUN</td>
<td>No Trading</td>
</tr>
<tr>
<td>12</td>
<td>17</td>
<td>MON</td>
<td>18000</td>
</tr>
</tbody>
</table>

Calculate Exponential moving Average (EMA) of Sensex during the above period. The 30 days simple moving average of Sensex can be assumed as 15,000. The Value of exponent for 30 days EMA is 0.062. Give detailed analysis on the basis of your calculations.

**Solution:**

EMA of each day can be calculated by using following equation

EMA Today = EMA of previous day + Exponent x [ Sensex Price Today - EMA of previous day ]
<table>
<thead>
<tr>
<th>Date</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sensex</td>
<td>EMA For Previous Day</td>
<td>(1 – 2)</td>
<td>3 × 0.062</td>
<td>2 ± 4</td>
</tr>
<tr>
<td>6</td>
<td>14522</td>
<td>15000</td>
<td>(478)</td>
<td>(29.636)</td>
<td>14970.364</td>
</tr>
<tr>
<td>7</td>
<td>14925</td>
<td>14970.364</td>
<td>(45.364)</td>
<td>(2.812)</td>
<td>14967.55</td>
</tr>
<tr>
<td>10</td>
<td>15222</td>
<td>14967.55</td>
<td>254.45</td>
<td>15.776</td>
<td>14983.32</td>
</tr>
<tr>
<td>11</td>
<td>16000</td>
<td>14983.32</td>
<td>1016.68</td>
<td>63.034</td>
<td>15046.354</td>
</tr>
<tr>
<td>12</td>
<td>16400</td>
<td>15046.354</td>
<td>1353.646</td>
<td>83.926</td>
<td>15130.28</td>
</tr>
<tr>
<td>13</td>
<td>17000</td>
<td>15130.28</td>
<td>1869.72</td>
<td>115.922</td>
<td>15246.203</td>
</tr>
<tr>
<td>17</td>
<td>18000</td>
<td>15246.203</td>
<td>2753.797</td>
<td>170.735</td>
<td>15416.938</td>
</tr>
</tbody>
</table>

Conclusion - The market is bullish. The market is likely to remain bullish for short term to medium term if other factors remain the same. On the basis of this indicator (EMA) the investors/brokers can take long position.

**Concept No. 12: Bollinger Bands**

It consists of three components:

1. Upper Band.
2. Middle Band.
3. Lower Band.

- Bollinger bands are constructed based on the standard deviation of the closing prices over the last n periods. An analyst can draw high and low bands a chosen no. of standard deviation(typically two) above and below the n-period moving average(SMA/EMA).

- The bands move away from one another when price volatility increases and move closer together when prices are less volatile.

- Prices at or above the upper Bollinger band may be viewed as indicating an Overbought Market.

- Prices at or below the lower Bollinger band may be viewed as indicating an Oversold Market.

- A possible trading strategy using Bollinger Bands is to buy when the price is at lower band or sell when the price is at above band.

Middle Band = MA
Upper Band = MA + 2 σ
Lower Band = MA - 2 σ

Example:

<table>
<thead>
<tr>
<th>Day</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>
Calculate 5 days Bollinger Bands?

Solution:

<table>
<thead>
<tr>
<th>Day</th>
<th>Price (x)</th>
<th>((X - \bar{X})^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>((15 - 24)^2 = 81)</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>((20 - 24)^2 = 16)</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>((25 - 24)^2 = 1)</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>((20 - 24)^2 = 16)</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>((40 - 24)^2 = 256)</td>
</tr>
</tbody>
</table>

\[
\sigma = \sqrt{\frac{370}{5}} = 8.60233
\]

Middle Band = 24(SMA)
Upper Band = 24 + 2 × 8.60233 = 41.20465
Lower Band = 24 - 2 × 8.60233 = 6.79534

Concept No. 13: MM Arbitrage

Example:
The following is the data regarding two Companies ‘X’, and ‘Y’ belonging to the same equivalent risk class:

<table>
<thead>
<tr>
<th></th>
<th>Company X</th>
<th>Company Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ordinary shares</td>
<td>90,000</td>
<td>1,50,000</td>
</tr>
<tr>
<td>Market price per share</td>
<td>Rs. 1.20</td>
<td>Re. 1.00</td>
</tr>
<tr>
<td>6% Debentures</td>
<td>60,000</td>
<td>–</td>
</tr>
<tr>
<td>Profit before interest</td>
<td>Rs. 18,000</td>
<td>Rs. 18,000</td>
</tr>
</tbody>
</table>

All profits after debenture interest are distributed as dividends.

You are required to:

(a) Explain how under Modigliani & Miller approach, an investor holding 10% of shares in Company ‘X’ will be better off in switching his holding to Company ‘Y’.
(b) List the assumptions implicit in your answer to ‘a’ above.

Solution:

Working Notes:

<table>
<thead>
<tr>
<th></th>
<th>Company X</th>
<th>Company Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit before interest</td>
<td>18,000</td>
<td>18,000</td>
</tr>
<tr>
<td>Less: Interest</td>
<td>3,600</td>
<td>–</td>
</tr>
<tr>
<td>Net Profit</td>
<td>14,400</td>
<td>18,000</td>
</tr>
</tbody>
</table>

All profits after debenture interest are distributed as dividends.

Dividend per share

\[
\frac{90,000}{1,50,000} = \text{Re. 0.16} \quad \frac{18,000}{1,50,000} = \text{Re. 0.12}
\]
M & M approach by applying arbitrage process:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Market value of Equity shares</td>
<td>1,08,000</td>
<td>1,50,000</td>
</tr>
<tr>
<td></td>
<td>(90,000 × 1.20)</td>
<td>(1,50,000 × 1.00)</td>
</tr>
<tr>
<td>(ii) Market value of Debentures</td>
<td>60,000</td>
<td>–</td>
</tr>
<tr>
<td>Value of Firm</td>
<td>1,68,000</td>
<td>1,50,000</td>
</tr>
</tbody>
</table>

According to MM’s approach, the marginal investor would switch from overvalued to undervalued firm by selling his holdings in the firm X (levered one and overvalued one) and would buy the same percentage of shares of the firm Y. The arbitrage process will work out as follows:

Investor will dispose 10% of shares in Company X and realise
9,000 shares at Rs. 1.20 each = 10,800
Add: He will borrow 10% of
60,000 debt at 6% interest = 6,000
Total amount = 16,800

With this amount, the investor will buy 16,800 shares in Company Y at Re. 1.00 each. Then compare the resultant income as follows:

Present income in X (as worked out above) = 1,440
Proposed income in Y:
1,50,000 shares
16,800 shares ?
\[
\frac{16,800}{1,50,000} \times 18,000 = Rs. 2016
\]
Less: Interest on
debt 6,000 × 6% = Rs. 360
Net Income Rs. 1656

This shows that the investor will be better off in switching his holdings to Company Y.

Notes:
(i) When the investor sells equity in Company X and buys equity in company Y with personal leverage, the market value of equity of Company X tends to decline and the market value of equity of company Y tends to rise. This process will continue till the market values of both the companies are in equilibrium.
(ii) The borrowings of Rs. 6,000 has to be taken on the same terms and conditions as corporate borrowing. Hence, 6% interest rate has been adopted.
(iii) Companies should belong to the same equivalent risk class.
(iv) Taxes do not exist and hence tax has not been taken into account.

**Concept No. 14: Index Formation**

**Market Capitalization Weighting:**

iSS Rathore Institute iSS
email: gjainca@gmail.com
A market Capitalization weighted index is calculated by summing the total value (Current stock price times the no. of shares outstanding) of all the stocks in the index.

- This sum is then divided by a similar sum calculated during the selected base period.
- The ratio is then multiplied by the indexer’s base value (typically 100).

**Current Index Value**

\[
\text{Current Index Value} = \frac{\text{Current Total Market Value of Index stock}}{\text{Base year total Market value of index stock}} \times \text{Base year index value}
\]

**Example:**
If the total market value of the index portfolio on Dec. 31\(^{st}\) and Jan 31\(^{st}\) are $80 million, and $95 million, respectively, the index value at the end of January is

\[
\frac{95}{80} \times 100 = 118.75
\]

Thus, the market capitalization – weighted index percentage return is

\[
\frac{118.75-100}{100} \times 100 = 18.75\%
\]
PAPER - 2 : STRATEGIC FINANCIAL MANAGEMENT (May -2011)

Question No. 1 is compulsory.

Attempt any five questions from the rest.

Working notes should form part of the answer.

Question 1

(a) Mr. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Beta</th>
<th>Expected value in %</th>
<th>Actual value in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNP</td>
<td>1.20</td>
<td>7.70</td>
<td>7.70</td>
</tr>
<tr>
<td>Inflation</td>
<td>1.75</td>
<td>5.50</td>
<td>7.00</td>
</tr>
<tr>
<td>Interest rate</td>
<td>1.30</td>
<td>7.75</td>
<td>9.00</td>
</tr>
<tr>
<td>Stock market index</td>
<td>1.70</td>
<td>10.00</td>
<td>12.0</td>
</tr>
<tr>
<td>Industrial production</td>
<td>1.00</td>
<td>7.00</td>
<td>7.50</td>
</tr>
</tbody>
</table>

If the risk free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory? (5 Marks)

(b) The current market price of an equity share of Penchant Ltd is `420. Within a period of 3 months, the maximum and minimum price of it is expected to be `500 and `400 respectively. If the risk free rate of interest be 8% p.a., what should be the value of a 3 months Call option under the “Risk Neutral” method at the strike rate of `450? Given $e^{0.02} = 1.0202$ (5 Marks)

(c) A Mutual Fund is holding the following assets in `Crores:

| Investments in diversified equity shares | 90.00 |
| Cash and Bank Balances                  | 10.00 |
| Total                                     | 100.00 |

The Beta of the portfolio is 1.1. The index future is selling at 4300 level. The Fund Manager apprehends that the index will fall at the most by 10%. How many index futures should he short for perfect hedging so that the portfolio beta is reduced to 1.00? One index future consists of 50 units. Substantiate your answer assuming the Fund Manager's apprehension will materialize. (5 Marks)

(d) Mr. Tempest has the following portfolio of four shares:

<table>
<thead>
<tr>
<th>Name</th>
<th>Beta</th>
<th>Investment ` Lac.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxy Rin Ltd.</td>
<td>0.45</td>
<td>0.80</td>
</tr>
<tr>
<td>Boxed Ltd.</td>
<td>0.35</td>
<td>1.50</td>
</tr>
<tr>
<td>Square Ltd.</td>
<td>1.15</td>
<td>2.25</td>
</tr>
<tr>
<td>Ellipse Ltd.</td>
<td>1.85</td>
<td>4.50</td>
</tr>
</tbody>
</table>

The risk free rate of return is 7% and the market rate of return is 14%.

Required.

(i) Determine the portfolio return. (ii) Calculate the portfolio Beta. (5 Marks)

Question 2

(a) X Ltd. had only one water pollution control machine in this type of block of asset with no book value under the provisions of the Income Tax Act, 1961 as it was subject to rate of depreciation of 100% in the very first year of installation.
Due to funds crunch, X Ltd. decided to sell the machine which can be sold in the market to anyone for `5,00,000 easily.

Understanding this from a reliable source, Y Ltd. came forward to buy the machine for `5,00,000 and lease it to X Ltd. for lease rental of `90,000 p.a. for 5 years. X Ltd. decided to invest the net sale proceed in a risk free deposit, fetching yearly interest of 8.75% to generate some cash flow. It also decided to relook the entire issue afresh after the said period of 5 years.

Another company, Z Ltd. also approached X Ltd. proposing to sell a similar machine for `4,00,000 to the latter and undertook to buy it back at the end of 5 years for `1,00,000 provided the maintenance were entrusted to Z Ltd. for yearly charge of `15,000. X Ltd. would utilise the net sale proceeds of the old machine to fund this machine also should it accept this offer.

The marginal rate of tax of X Ltd. is 34% and its weighted average cost of capital is 12%. Which Alternative would you recommend? (8 Marks)

Discounting Factors @ 12%

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.893</td>
<td>0.797</td>
<td>0.712</td>
<td>0.636</td>
<td>0.567</td>
</tr>
</tbody>
</table>

(b) A Inc. and B Inc. intend to borrow $200,000 and $200,000 in ¥ respectively for a time horizon of one year. The prevalent interest rates are as follows:

<table>
<thead>
<tr>
<th>Company</th>
<th>¥ Loan</th>
<th>$ Loan</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Inc</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>B Inc</td>
<td>8%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The prevalent exchange rate is $1 = ¥120.

They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ¥ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

**Question 3**

Abhiman Ltd. is a subsidiary of Janam Ltd. and is acquiring Swabhiman Ltd. which is also a subsidiary of Janam Ltd.

The following information is given:

<table>
<thead>
<tr>
<th></th>
<th>Abhiman Ltd.(Rs.)</th>
<th>Swabhiman Ltd.(Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Shareholding of promoter</td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>Share capital</td>
<td>200 lacs</td>
<td>100 lacs</td>
</tr>
<tr>
<td>Free Reserves and surplus</td>
<td>900 lacs</td>
<td>600 lacs</td>
</tr>
<tr>
<td>Paid up value per share</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Free float market capitalization</td>
<td>500 lacs</td>
<td>156 lacs</td>
</tr>
<tr>
<td>P/E Ratio (times)</td>
<td>10</td>
<td>4</td>
</tr>
</tbody>
</table>

Janam Ltd., is interested in doing justice to both companies. The following parameters have been assigned by the Board of Janam Ltd., for determining the swap ratio:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book value</td>
<td>25%</td>
</tr>
<tr>
<td>Earning per share</td>
<td>50%</td>
</tr>
<tr>
<td>Market price</td>
<td>25%</td>
</tr>
</tbody>
</table>

You are required to compute

(i) The swap ratio.
(ii) The Book Value, Earning Per Share and Expected Market Price of Swabhiman Ltd. (assuming P/E Ratio of Abhiman ratio remains the same and all assets and liabilities of Swabhiman Ltd. are taken over at book value.) (8 Marks)

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

<table>
<thead>
<tr>
<th>Cash Flow in Rs.</th>
<th>-15000</th>
<th>-10000</th>
<th>-40000</th>
<th>15000</th>
<th>10000</th>
<th>5000</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td>-100</td>
<td>-60</td>
<td>-30</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

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

**Project A**

<table>
<thead>
<tr>
<th>Cash Flow (Rs.)</th>
<th>-15000</th>
<th>-10000</th>
<th>15000</th>
<th>10000</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.10</td>
<td>0.20</td>
<td>0.40</td>
<td>0.20</td>
<td>0.10</td>
</tr>
</tbody>
</table>

**Project B**

<table>
<thead>
<tr>
<th>Cash Flow (Rs.)</th>
<th>-10000</th>
<th>-40000</th>
<th>15000</th>
<th>5000</th>
<th>10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.10</td>
<td>0.15</td>
<td>0.40</td>
<td>0.25</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Which project should be selected and why? (8 Marks)

**Question 4**

(a) Shares of Voyage Ltd. are being quoted at a price-earning ratio of 8 times. The company retains 45% of its earnings which are Rs. 5 per share.

You are required to compute

1. The cost of equity to the company if the market expects a growth rate of 15% p.a.
2. If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.
3. If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share. (3+3+2=8 Marks)

(b) An investor purchased 300 units of a Mutual Fund at Rs. 12.25 per unit on 31st December, 2009. As on 31st December, 2010 he has received Rs. 1.25 as dividend and Rs. 1.00 as capital gains distribution per unit.

Required:

(i) The return on the investment if the NAV as on 31st December, 2010 is Rs. 13.00.

(ii) The return on the investment as on 31st December, 2010 if all dividends and capital gains distributions are reinvested into additional units of the fund at Rs. 12.50 per unit. (8 Marks)

**Question 5**

(a) Simple Ltd. and Dimple Ltd. are planning to merge. The total value of the companies are dependent on the fluctuating business conditions. The following information is given for the total value (debt + equity) structure of each of the two companies.
Business Condition | Probability | Simple Ltd. Rs. Lacs | Dimple Ltd. Rs. Lacs
---|---|---|---
High Growth | 0.20 | 820 | 1050
Medium Growth | 0.60 | 550 | 825
Slow Growth | 0.20 | 410 | 590

The current debt of Dimple Ltd. is Rs 65 lacs and of Simple Ltd. is Rs. 460 lacs. Calculate the expected value of debt and equity separately for the merged entity. (8 Marks)

(b) Tender Ltd has earned a net profit of Rs. 15 lacs after tax at 30%. Interest cost charged by financial institutions was Rs. 10 lacs. The invested capital is Rs. 95 lacs of which 55% is debt. The company maintains a weighted average cost of capital of 13%.

Required,
(a) Compute the operating income.
(b) Compute the Economic Value Added (EVA).
(c) Tender Ltd. Has 6 lac equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining? (8 Marks)

**Question 6**

(a) The following information is given for QB Ltd.

<table>
<thead>
<tr>
<th></th>
<th>(\text{Rs. } 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earning per share</td>
<td>(\text{Rs. } 12)</td>
</tr>
<tr>
<td>Dividend per share</td>
<td>(\text{Rs. } 3)</td>
</tr>
<tr>
<td>Cost of capital</td>
<td>(18%)</td>
</tr>
<tr>
<td>Internal Rate of Return on investment</td>
<td>(22%)</td>
</tr>
<tr>
<td>Retention Ratio</td>
<td>(40%)</td>
</tr>
</tbody>
</table>

Calculate the market price per share using

(i) Gordons formula

(ii) Walters formula (8 Marks)

(b) (i) Mention the functions of a stock exchange.

(ii) Mention the various techniques used in economic analysis. (4+4=8 Marks)

**Question 7**

Answer any four from the following:
(a) Explain the significance of LIBOR in international financial transactions.
(b) Discuss how the risk associated with securities is effected by Government policy.
(c) What is the meaning of:
(i) Interest Rate Parity and
(ii) Purchasing Power Parity?
(d) What is the significance of an underlying in relation to a derivative instrument?
(e) What are the steps for simulation analysis? (4 x 4=16 Marks)
JAC

Answers to questions are to be given only in English except in the case of candidates who have opted for Hindi Medium. If a candidate has not opted for Hindi medium, his answers in Hindi will not be valued.

Question No. 1 is compulsory.

Answer any five questions from the remaining six questions.

Working notes should form part of the answer.

1. (a) Orange purchased 200 units of Oxygen Mutual Fund at ₹ 45 per unit on 31st December, 2009. In 2010, he received ₹ 1.00 as dividend per unit and a capital gains distribution of ₹ 2 per unit.

Required :
(i) Calculate the return for the period of one year assuming that the NAV as on 31st December 2010 was ₹ 48 per unit.
(ii) Calculate the return for the period of one year assuming that the NAV as on 31st December 2010 was ₹ 48 per unit and all dividends and capital gains distributions have been reinvested at an average price of ₹ 46.00 per unit.

Ignore taxation.

(b) An importer is due to pay the exporter on 28th January 2010, Singapore Dollars of 25,00,000 under an irrevocable letter of credit. It directed the bank to pay the amount on the due date.

Due to go-slow and strike procedures adopted by its staff, the bank was not in a position to remit the amount due. The amount was actually remitted on 4th February 2010.

On the transaction, the bank wants to retain an exchange margin of 0.125 per cent.

P.T.O.
The following were the rates prevalent in the exchange market on the relevant dates:

- **28\(^{th}\) January**
  - Rupee/US $1: ₹43.85 / 45.90
  - London Pound/Dollars: $1.7840 / 1.7850
  - Pound/Sing: $3.1575 / 3.1590

- **4\(^{th}\) February**
  - Rupee/US $1: ₹45.91 / 45.97
  - London Pound/Dollars: $1.7765 / 1.7775
  - Pound/Sing: $3.1380 / 3.1390

What is the effect on account of the delay in remittance? Calculate rate in multiples of 0.0001.

(c) A company has a book value per share of ₹137.80. Its return on equity is 15% and follows a policy of retaining 60% percent of its annual earnings. If the opportunity cost of capital is 18 percent, what is the price of its share? [Adopt the perpetual growth model to arrive at your solution].

(d) The six months forward price of a security is ₹208.18. The rate of borrowing is 8 percent per annum payable at monthly rates. What will be the spot price?

2. (a) Using the chop-shop approach (or Break-up value approach), assign a value for Cranberry Ltd. whose stock is currently trading at a total market price of €4 million. For Cranberry Ltd, the accounting data set forth three business segments: consumer wholesale, retail and general centers. Data for the firm's three segments are as follows:

<table>
<thead>
<tr>
<th>Business Segment</th>
<th>Segment Sales</th>
<th>Segment Assets</th>
<th>Segment Operating Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale</td>
<td>€225,000</td>
<td>€600,000</td>
<td>€75,000</td>
</tr>
<tr>
<td>Retail</td>
<td>€720,000</td>
<td>€500,000</td>
<td>€150,000</td>
</tr>
<tr>
<td>General</td>
<td>€2,500,000</td>
<td>€4,000,000</td>
<td>€700,000</td>
</tr>
</tbody>
</table>

Industry data for “pure-play” firms have been compiled and are summarized as follows:

<table>
<thead>
<tr>
<th>Business Segment</th>
<th>Capitalization/ Sales</th>
<th>Capitalization/ Assets</th>
<th>Capitalization/ Operating Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale</td>
<td>0.85</td>
<td>0.7</td>
<td>9</td>
</tr>
<tr>
<td>Retail</td>
<td>1.2</td>
<td>0.7</td>
<td>8</td>
</tr>
<tr>
<td>General</td>
<td>0.8</td>
<td>0.7</td>
<td>4</td>
</tr>
</tbody>
</table>

JAC
(b) Nitrogen Ltd, a UK company is in the process of negotiating an order amounting to €4 million with a large German retailer on 6 months credit. If successful, this will be the first time that Nitrogen Ltd has exported goods into the highly competitive German market. The following three alternatives are being considered for managing the transaction risk before the order is finalized.

(i) Invoice the German firm in Sterling using the current exchange rate to calculate the invoice amount.

(ii) Alternative of invoicing the German firm in € and using a forward foreign exchange contract to hedge the transaction risk.

(iii) Invoice the German firm in € and use sufficient 6 months sterling future contracts (to the nearly whole number) to hedge the transaction risk.

Following data is available:

<table>
<thead>
<tr>
<th>Spot Rate</th>
<th>€1.1750 - €1.1770/£</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months forward premium</td>
<td>0.60-0.55 Euro Cents</td>
</tr>
<tr>
<td>6 months further contract is currently trading at</td>
<td>€1.1760/£</td>
</tr>
<tr>
<td>6 months future contract size is</td>
<td>£ 62500</td>
</tr>
<tr>
<td>Spot rate and 6 months future rate</td>
<td>€1.1785/£</td>
</tr>
</tbody>
</table>

Required:

(a) Calculate to the nearest £ the receipt for Nitrogen Ltd, under each of the three proposals.

(b) In your opinion, which alternative would you consider to be the most appropriate and the reason therefor.

JAC

P.T.O.
Helium Ltd has evolved a new sales strategy for the next 4 years. The following information is given:

### Income Statement

<table>
<thead>
<tr>
<th>Description</th>
<th>₹ in thousands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>40,000</td>
</tr>
<tr>
<td>Gross Margin at 30%</td>
<td>12,000</td>
</tr>
<tr>
<td>Accounting, administration and distribution expense at 15%</td>
<td>6,000</td>
</tr>
<tr>
<td>Profit before tax</td>
<td>6,000</td>
</tr>
<tr>
<td>Tax at 30%</td>
<td>1,800</td>
</tr>
<tr>
<td>Profit after tax</td>
<td>4,200</td>
</tr>
</tbody>
</table>

**Balance sheet information**

<table>
<thead>
<tr>
<th>Description</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Assets</td>
<td>10,000</td>
</tr>
<tr>
<td>Current Assets</td>
<td>6,000</td>
</tr>
<tr>
<td>Equity</td>
<td>15,000</td>
</tr>
</tbody>
</table>

As per the new strategy, sales will grow at 30 percent per year for the next four years. The gross margin ratio will increase to 35 percent. The Assets turnover ratio and income tax rate will remain unchanged.

Depreciation is to be at 15 percent on the value of the net fixed assets at the beginning of the year.

Company's target rate of return is 14%.

Determine if the strategy is financially viable giving detailed workings.

Pineapple Ltd has issued fully convertible 12 percent debentures of ₹ 5,000 face value, convertible into 10 equity shares. The current market price of the debentures is ₹ 5,400. The present market price of equity shares is ₹ 430.

Calculate:

(i) the conversion percentage premium, and
(ii) the conversion value.
Based on the credit rating of the bonds, A has decided to apply the following discount rates for valuing bonds:

<table>
<thead>
<tr>
<th>Credit rating</th>
<th>Discount rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>364-day T-bill rate + 3% spread</td>
</tr>
<tr>
<td>AA</td>
<td>AAA + 2% spread</td>
</tr>
<tr>
<td>A</td>
<td>AAA + 3% spread</td>
</tr>
</tbody>
</table>

He is considering to invest in a AA rated ₹ 1,000 face value bond currently selling at ₹ 1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% per annum payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364-day T-bill rate to be 9 percent).

You are required to:

(i) Calculate the intrinsic value of the bond for A. Should he invest in the bond?

(ii) Calculate the Current Yield (CY) and the Yield to Maturity (YTM) of the bond.

(b) XYZ Ltd. is considering to acquire an additional computer to supplement its time-share computer services to its clients. It has two options:

(i) To purchase the computer for ₹ 22,00,000

(ii) To lease the computer for three years from a leasing company for ₹ 5,00,000 as annual lease rent plus 10 percent of gross time-share service revenue. The agreement also requires an additional payment of ₹ 6,00,000 at the end of the third year. Lease rent is payable at the year end, and the computer reverts to the lessor after the contract period.

The company estimates that the computer under review now will be worth ₹ 10,00,000 at the end of third year. Forecast revenues are:

<table>
<thead>
<tr>
<th>Year</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22,50,000</td>
</tr>
<tr>
<td>2</td>
<td>25,00,000</td>
</tr>
<tr>
<td>3</td>
<td>27,50,000</td>
</tr>
</tbody>
</table>

JAC

P.T.O.
Annual operating costs (excluding depreciation/lease rent of computer) are estimated at ₹ 9,00,000 with an additional ₹ 1,00,000 for start-up and training cost at the beginning of the first year. These costs are to be borne by the lessee. XYZ Ltd. will borrow at 16% interest to finance acquisition of computer; repayments are to be made according to the following schedule:

<table>
<thead>
<tr>
<th>Year-end</th>
<th>Principal (₹)</th>
<th>Interest (₹)</th>
<th>Total (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5,00,000</td>
<td>3,52,000</td>
<td>8,52,000</td>
</tr>
<tr>
<td>2</td>
<td>8,50,000</td>
<td>2,72,000</td>
<td>11,22,000</td>
</tr>
<tr>
<td>3</td>
<td>8,50,000</td>
<td>1,36,000</td>
<td>9,86,000</td>
</tr>
</tbody>
</table>

The company uses straight line method to depreciate its assets and pays 50% percent tax on its income.

The management of XYZ Ltd. approaches you for advice. Which alternative would you recommend and why?

5. The following is the Balance-sheet of Grape Fruit Company Ltd as at March 31st, 2011.

<table>
<thead>
<tr>
<th>Liabilities</th>
<th>₹ in lakhs</th>
<th>Assets</th>
<th>₹ in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity shares of ₹ 100 each</td>
<td>600</td>
<td>Land and Building</td>
<td>200</td>
</tr>
<tr>
<td>14% preference shares of ₹ 100/- each</td>
<td>200</td>
<td>Plant and Machinery</td>
<td>300</td>
</tr>
<tr>
<td>13% Debentures</td>
<td>200</td>
<td>Furniture and Fixtures</td>
<td>50</td>
</tr>
<tr>
<td>Debenture interest accrued and payable</td>
<td>26</td>
<td>Inventory</td>
<td>150</td>
</tr>
<tr>
<td>Loan from bank</td>
<td>74</td>
<td>Sundry debtors</td>
<td>70</td>
</tr>
<tr>
<td>Trade creditors</td>
<td>340</td>
<td>Cash at bank</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preliminary expenses</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost of issue of debentures</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Profit and Loss Account</td>
<td>525</td>
</tr>
<tr>
<td></td>
<td>1440</td>
<td>1440</td>
<td></td>
</tr>
</tbody>
</table>
The Company did not perform well and has suffered sizable losses during the last few years. However, it is felt that the company could be nursed back to health by proper financial restructuring. Consequently the following scheme of reconstruction has been drawn up:

(a) Equity shares are to be reduced to ₹ 25/- per share, fully paid up;
(b) Preference shares are to be reduced (with coupon rate of 10%) to equal number of shares of ₹ 50 each, fully paid up.
(c) Debenture holders have agreed to forgo the accrued interest due to them. In the future, the rate of interest on debentures is to be reduced to 9 percent.
(d) Trade creditors will forego 25 percent of the amount due to them.
(e) The company issues 6 lakh of equity shares at ₹ 25 each and the entire sum was to be paid on application. The entire amount was fully subscribed by promoters.
(f) Land and Building was to be revalued at ₹ 450 lakhs, Plant and Machinery was to be written down by ₹ 120 lakhs and a provision of ₹ 15 lakhs had to be made for bad and doubtful debts.

Required:
(i) Show the impact of financial restructuring on the company’s activities. 6
(ii) Prepare the fresh balance sheet after the reconstruction is completed on the basis of the above proposals. 4

(b) An Indian importer has to settle an import bill for $1,30,000. The exporter has given the Indian exporter two options:
(i) Pay immediately without any interest charges.
(ii) Pay after three months with interest at 5 percent per annum.
The importer’s bank charges 15 percent per annum on overdrafts. The exchange rates in the market are as follows:
Spot rate (₹ /$): 48.35 / 48.36
3-Months forward rate (₹ /$): 48.81 / 48.83

The importer seeks your advice. Give your advice.
6. (a) A Portfolio Manager (PM) has the following four stocks in his portfolio:

<table>
<thead>
<tr>
<th>Security</th>
<th>No. of Shares</th>
<th>Market Price Per Share (₹)</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSL</td>
<td>10,000</td>
<td>50</td>
<td>0.9</td>
</tr>
<tr>
<td>CSL</td>
<td>5,000</td>
<td>20</td>
<td>1.0</td>
</tr>
<tr>
<td>SML</td>
<td>8,000</td>
<td>25</td>
<td>1.5</td>
</tr>
<tr>
<td>APL</td>
<td>2,000</td>
<td>200</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Compute the following:
(i) Portfolio beta.
(ii) If the PM seeks to reduce the beta to 0.8, how much risk free investment should he bring in?
(iii) If the PM seeks to increase the beta to 1.2, how much risk free investment should he bring in?

(b) ABC established the following spread on the Delta Corporation’s stock:
(i) Purchased one 3-month call option with a premium of ₹ 30 and an exercise price of ₹ 550.
(ii) Purchased one 3-month put option with a premium of ₹ 5 and an exercise price of ₹ 450.

The current price of Delta Corporation’s stock is ₹ 500. Determine ABC’s profit or loss if the price of Delta Corporation’s stock.
(a) stays at ₹ 500 after 3 months.
(b) falls to ₹ 350 after 3 months.
(c) rises to ₹ 600.

7. Write short notes on any four of the followings:
(a) Capital Rationing
(b) Embedded derivatives
(c) Depository participant
(d) Money market mutual fund
(e) Leading and lagging
(f) Take over by reverse bid