EARNING PER SHARE (EPS)

\[ \text{Earning Per Share (EPS)} = \frac{\text{Total Earnings Available for Equity Shareholders}}{\text{Total Numbers of Equity Shares}} \]

DIVIDEND PER SHARE (DPS)

\[ \text{Dividend Per Share (DPS)} = \frac{\text{Total Dividend Paid To Equity Shareholder}}{\text{Total Number of Equity Shares}} \]

MARKET PRICE PER SHARE (MPS)

\[ \text{Market Price Per Share (MPS)} = \frac{\text{Total Market Value / Market Capitalization / Market Cap}}{\text{Total Number of Equity Shares}} \]

DIVIDEND RATE

\[ \text{Dividend Rate} = \frac{\text{Dividend Per Share}}{\text{Face Value}} \times 100 \]

DIVIDEND YIELD (RETURN)

\[ \text{Dividend Yield (Return)} = \frac{\text{Dividend Per Share}}{\text{Market Price Per Share}} \times 100 \]

DIVIDEND PAYOUT RATIO (D/P RATIO)

\[ \text{Dividend Payout Ratio} = \frac{\text{Dividend Per Share}}{\text{Earning Per Share}} \times 100 \]

RETENTION RATIO

\[ \text{Retention Ratio} = \left[ \frac{\text{EPS - DPS}}{\text{EPS}} \right] \times 100 \text{ or } (1 - \text{Dividend Payout Ratio}) \text{ or } \left[ \frac{\text{Retained Earning Per Share}}{\text{EPS}} \right] \times 100 \]

EARNING YIELD (EY)

\[ \text{Earning Yield} = \frac{\text{Earnings Per Share}}{\text{Market Price Per Share}} \]

WALTER'S MODEL

\[ \text{Symbolically : Po} = \frac{\text{DPS}}{\text{Ke}} + \frac{r}{\text{Ke}} \left( \frac{\text{EPS} - \text{DPS}}{\text{Ke}} \right) \]

OPTIMUM DIVIDEND PAYOUT OR OPTIMUM RETENTION RATIO

\[ \text{Walter suggested that optimum dividend payout ratio or optimum retention ratio depends on the relationship of Ke & r} \]

<table>
<thead>
<tr>
<th>Nature of Firm</th>
<th>Relation</th>
<th>Dividend Payout</th>
<th>Retention Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth Company</td>
<td>Ke &lt; r</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Declining Company</td>
<td>Ke &gt; r</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Normal Company</td>
<td>Ke = r</td>
<td>Indifferent</td>
<td>Indifferent</td>
</tr>
</tbody>
</table>

GORDON'S GROWTH MODEL

\[ \text{Symbolically : Po} = \frac{\text{DPS}_1}{\text{Ke}_g} \text{ or } \text{Po} = \frac{\text{DPS}_0 (1 + g)}{\text{Ke}_g} \text{ or } \text{Po} = \frac{\text{EPS}(1 - b)}{\text{Ke}_g} \text{ or } \text{If EPS}(1-b) \text{ is considered as D1} \text{ [Preferred]} \]

\[ \text{Po} = \frac{\text{EPS}(1 - b)(1 + g)}{\text{Ke}_g} \text{ [If EPS}(1-b) \text{ is considered as Do]} \text{ Where } b = \text{Retention Ratio} (%) \]
PRICE/EARNING RATIO

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

RELATIONSHIP BETWEEN GROWTH RATE; RETURN ON EQUITY; RETENTION RATIO

\[ g = b \times r \]

Note: Other things remaining constant "g" and "b" are directly related to each other

DETERMINATION OF GROWTH RATE (g)

\( g \) Assuming growth rate to be constant, we can find the growth rate by using any of the following two relations:

(a) \[ g = b \times r \]

(b) \[ D_{\text{Latest or Current}} = D_{\text{Base}}(1+g)^{n-1} \]

ZERO GROWTH RATE

\( g \) When company is distributing all its earnings as dividend i.e when EPS = DPS [i.e no retention], growth rate will be NIL.

In such case growth model will become:

\[ P_0 = \frac{\text{EPS}}{K_e} \]

VALUE OF DECLINING FIRM/NEGATIVE GROWTH FIRM

\( P_0 \) Market Price Per Share of a firm whose dividend is declining at a constant rate p.a forever is given by

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

UNEQUAL GROWTH RATE/VARIABLE GROWTH RATE CONCEPT

\( P_0 \) Dividend Growth Model cannot be applied directly in case where dividend is not growing at a constant rate from year 1 onwards. In such case we will modify Dividend Growth Model and calculate Current Market Price in the following manner

\[ P_0 = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} + \frac{D_4}{(1+K_e)^4} + \left( \frac{D_5}{K_e - g} \right) \times \frac{1}{(1+K_e)^4} \]

OVERVALUED & UNDervalued SHARES

\( K_e \) When Current Market Price [i.e price prevailing in stock market] and Theoretical (Fair OR Present Value) Market Price [i.e price which we calculate by applying present value concept] are not same we will undertake following decision:

<table>
<thead>
<tr>
<th>Case</th>
<th>Valuation</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>If Current Market Price &gt; Present Value Market Price</td>
<td>Overvalued</td>
<td>Sell</td>
</tr>
<tr>
<td>If Current Market Price &lt; Present Value Market Price</td>
<td>Undervalued</td>
<td>Buy</td>
</tr>
<tr>
<td>If Current Market Price = Present Value Market Price</td>
<td>Correctly Valued</td>
<td>Hold</td>
</tr>
</tbody>
</table>

RELATIONSHIP BETWEEN KE & PE RATIO

\[ K_e = \frac{1}{\text{P/E Ratio}} \]

ASSET TURNOVER RATIO (ATR)

\[ \text{Asset Turnover Ratio} = \frac{\text{Net Sales}}{\text{Total Asset}} \]

Decision: Higher the better

RETURN ON EQUITY (ROE)

\[ \text{Return On Equity (ROE) } (r) = \frac{\text{Total Earnings Available For Equity Shareholder}}{\text{Total Equity Shareholder’s Fund}} \times 100 \]
BOOK VALUE PER SHARE (BVPS)

Book Value Per Share (BVPS) = \frac{\text{Total Equity Shareholder's Fund}}{\text{Total Number Of Equity Share}}

RELATIONSHIP BETWEEN ROE, BVPS & EPS

EPS = Book Value Per Share \times \text{Return on Equity}

CALCULATION OF HOLDING PERIOD RETURN (HPR)

Holding Period Return or Total Yield = \frac{D_1 + (P_1 - P_0)}{P_0} = \frac{D_1}{P_0} + \frac{P_1 - P_0}{P_0} = \text{Dividend Yield} + \text{Capital Gain Yield}

CAPITAL GAIN YIELD

Capital Gain Yield = \frac{P_1 - P_0}{P_0} \times 100

PRICE AT THE END OF YEAR 1

P_1 \text{ is normally calculated by using the } \frac{P_1 - P_0}{P_0} \times 100

STRATEGY WHEN INVESTOR IS ALREADY HOLDING SHARES

Actual Po > Fair Po - Overvalued \hspace{1cm} \text{Sell}
Actual Po < Fair Po - Undervalued \hspace{1cm} \text{Hold}

E/P RATIO OR EARNING PRICE OR YIELD RATIO

\frac{\text{Earnings Per Share}}{\text{Market Price Per Share}}

VALUE AS PER PE MULTIPLE APPROACH AND EARNING GROWTH MODE

Value of stock under the PE Multiple Approach

Market Price per Share = EPS \times PE
Where PE Multiple = \frac{1}{\text{Return on Equity}}

Value of the Stock under the Earnings Growth Model

Market Price per Share = \frac{\text{EPS}(1 + g)}{K_e - g}

VALUE AT THE END OF "N" YEAR FROM WHERE GROWTH RATE BECOMES CONSTANT

Assuming that growth rate becomes constant after 3 years price will be:

P_3 = \frac{D_4}{K_e - g}

VALUE OF STRAIGHT COUPON BOND OR EQUAL COUPON BOND

Value of Bond (B_0) = \frac{\text{Interest}}{(1 + \text{Yield})^1} + \frac{\text{Interest}}{(1 + \text{Yield})^2} + \ldots + \frac{\text{Interest}}{(1 + \text{Yield})^n} + \frac{\text{Maturity Value}}{(1 + \text{Yield})^n}

= \text{Interest} \times \text{PVAF (Yield %, n years)} + \text{Maturity Value} \times \text{PVF (Yield %, n years)}
Where n = \text{Number of Years to Maturity}

VALUE OF PERPETUAL BOND OR IRREDEEMABLE BOND

Value Of Bond (B_0) = \frac{\text{Annual Interest}}{\text{Yield}}

VALUE OF ZERO COUPON BOND OR DEEP DISCOUNT BOND

\frac{\text{Maturity Value}}{(1 + \text{Yield})^n}
**Meaning**: Semi Annual Interest Bonds are those bonds which pay interest semiannually.

To value such bonds we have to make three changes:

1. **Annual Interest Amount**:\[
\frac{1}{2}
\]
2. **Years To Maturity**:\[\times 2\]
3. **Yield p.a**:\[\frac{1}{2}\]

**HOLDING PERIOD RETURN (HPR)**

Holding Period Return (R) or Total Return = \(\frac{I_1 + (B_1 - B_0)}{B_0}\) or \(\frac{I_1}{B_0} + \frac{B_1 - B_0}{B_0}\) or Current Interest Yield + Capital Gain Yield

Where \(B_0\) is the Price of bond as on today, and \(B_1\) is the price of the bond at the end of the holding period.

**Note**: The holding period is generally assumed to be of one year period unless otherwise specially stated.

**CAPITAL GAIN YIELD**

Capital Gain Yield = \(\frac{(B_1 - B_0)}{B_0} \times 100\)

**CURRENT YIELD/FLAT YIELD/CURRENT INTEREST YIELD/BASIC YIELD**

Current Yield = \(\frac{I_1}{B_0}\) Where \(I_1\) = Interest To Be Paid at Year End 1

**YIELD (K_d) OR YIELD TO MATURITY (YTM) OR COST OF DEBT**

Symbolically: It can be calculated by using two method:

- **Trial n Error Method**: Value of Bond \(B_0\) = Interest \(\frac{(1 + YTM)^1}{(1 + YTM)^1}\) + Interest \(\frac{(1 + YTM)^2}{(1 + YTM)^2}\) + \(\ldots \ldots\) + Interest \(\frac{(1 + YTM)^n}{(1 + YTM)^n}\) + Maturity Value \(\frac{(1 + YTM)^n}{(1 + YTM)^n}\)

Now for finding Yield we should use IRR Technique:

\(K_d = \text{Lower Rate} + \frac{\text{Lower Rate NPV}}{\text{Lower Rate NPV} - \text{Higher Rate NPV}} \times \text{Difference in Rates}\)

- **Approximation Method**: \(K_d \text{ p.a} = \frac{\text{Interest p.a}}{\text{Maturity Value + Issue Value}} + \frac{\text{Maturity Value} - \text{Bo}}{\text{n}}\)

Where \(Bo\) is current value of bond in case of existing bond or issue price or new proceeds in case of new issue of bond.

**RELATIONSHIP BETWEEN BOND VALUE AND YTM**

YTM and the Bond Value has inverse relationship.

**RELATIONSHIP BETWEEN YTM AND COUPON RATE**

**Case** | **Nature Of Bond**
--- | ---
Coupon Rate = YTM | Par Value Bond i.e Bo = Par Value
Coupon Rate > YTM | Premium Bond i.e Bo > Par Value
Coupon Rate < YTM | Discount Bond i.e Bo < Par Value

**TAXATION EFFECT ON INTEREST INCOME**

If income tax rate is given in question then Interest should be taken after tax.

**TAXATION EFFECT ON CAPITAL GAIN INCOME**

If Capital Gain Tax Rate is given then Maturity Value should be taken after tax i.e after adjusting it for Capital Gain Tax.

**DURATION OF PERPETUAL BOND**

Duration Of Perpetual Bond = \(\frac{1 + \text{YTM}}{\text{YTM}}\)
YIELD TO CALL (YTC)

\[ YTC = \frac{\text{Interest} + \left( \frac{\text{Call Value} - B_0}{\text{Call Years}} \right)}{\frac{\text{Call Value} + B_0}{2}} \]

YIELD TO PUT (YTP)

\[ YTP = \frac{\text{Interest} + \left( \frac{\text{Put Value} - B_0}{\text{Put Years}} \right)}{\frac{\text{Put Value} + B_0}{2}} \]

KD OF PERPETUAL BOND

\[ \text{Yield or Kd} = \frac{\text{Annual Interest}}{B_0} \]

DURATION OF NORMAL BOND OR FREDRICK MACAULAY’S DURATION

Symbolically: Duration \[= \frac{1}{B_0} \left[ \frac{\text{Interest}}{(1 + \text{Kd})^1} + \frac{2 \times \text{Interest}}{(1 + \text{Kd})^2} + \ldots \ldots \ldots \text{n} \times \frac{\text{Interest}}{(1 + \text{Kd})^n} + n \times \frac{\text{Maturity Value}}{(1 + \text{Kd})^n} \right] \]

Short Cut Formula:
Duration \[= \frac{1 + \text{YTM} + (1 + \text{YTM}) \times n \times (\text{Coupon Rate} - \text{YTM})}{\text{YTM} \times \text{Coupon Rate} \times [(1 + \text{YTM})^n - 1] + \text{YTM}} \]

DURATION OF A ZERO COUPON BOND

For a zero coupon bond, the duration is simply equal to the maturity of the bond.
While the duration of a normal coupon bond will always be less than the maturity.

VOLATILITY/SENSITIVITY/MODIFIED DURATION

Meaning: Modified Duration is a measure of volatility. In other words, Modified Duration is a measure of % change in bond value for every 1 % change in Yield to Maturity.

Symbolically: Volatility or Modified Duration or Sensitivity [ % ] \[= \left( \frac{\text{Duration Of Bond}}{1 + \text{Yield To Maturity}} \right) \]

Note: % Change in Bond Price = - Modified Duration \times Change In Yield To Maturity
Note: The Modified Duration will always be lower than the Macaulay Duration.

FAIR VALUE OF CONVERTIBLE BONDS AS ON TODAY/STOCK VALUE OF BOND

Fair Conversion Value or Stock Value Of Bond
= Number Of Equity Shares Received on Conversion x Market Price Per Share prevailing at the time of conversion
Decision: If Fair Conversion Value Of Convertible Bond is greater than Basic Bond Value Of Debenture, investor will convert otherwise not.

CONVERSION RATIO

Conversion Ratio directly specifies the number of equity shares we get in place of one convertible bond.

PERCENTAGE OF DOWNSIDE RISK

Downside Risk = Market Value Of Convertible Bond - Market Value Of Non Convertible Bond or Straight Coupon Bond
It should be further divided by Market Value Of Convertible Bond to calculate answer in %.

CONVERSION PREMIUM

Conversion Premium or Premium Over Conversion Value
= Market Price Of Convertible Bond-Fair Conversion Value Of Convertible Bond As On Today
It should be further divided by Fair Value Of Convertible Bond to calculate answer in %.
CONVERSION PARITY PRICE

Convension Parity Price = \(\frac{\text{Market Price Of Convertible Bond}}{\text{No.of Shares on Conversion}}\)

It is the price at which premium will be 0.

CONVERSION PARITY PRICE PREMIUM PER EQUITY SHARE

IN Rs: [Also Known As Conversion Premium Per Share] = Conversion Parity Price of Equity - Actual Market Price of Equity

IN %: [Also Known As Ratio Of Conversion Premium] = \(\frac{\text{Conversion Parity Price of Equity} - \text{Actual Market Price of Equity}}{\text{Actual Market Price of Equity}}\)

FAVOURABLE INCOME DIFFERENTIAL PER SHARE

Conversion premium per Equity share = Coupon Interest From Debenture – Conversion Ratio
× Dividend Per Share

Conversion Ratio i.e No. Of Equity Shares

PREMIUM PAY BACK PERIOD

Conversion premium per Equity share = Favourable Income Differentia l Per Share

COST OF REDEEMABLE PREFERENCE SHARES

\[ K_p = \frac{\text{Annual Dividend} + \left( \frac{\text{Maturity Value} - \text{PSC}_0}{\text{Maturity Value} + \text{PSC}_0} \right)^n}{2} \]

Note On PSCo: PSC_0 = Current Market Price [In case of existing preference share]; and
P_0 = Net Proceeds Where Net Proceeds = Face Value + Premium - Discount - Flotation Cost [ In case of new preference share ]

COST OF IRREDEEMABLE PREFERENCE SHARES

\[ K_p = \frac{\text{Annual Dividend}}{\text{PSC}_0} \]

Sometimes when relevant information is not given for calculation of Kp then we simply use
Kp = Rate Of Preference Dividend

VALUE OF IRREDEEMABLE PREFERENCE SHARES

\[ \text{Value Of Irredeemable Preference Shares(PSCo)} = \frac{\text{Annual Dividend}}{K_p} \]

VALUE OF REDEEMABLE PREFERENCE SHARES

\[ \text{Value of Preference Share (PS)_0) = \frac{\text{Dividend}}{(1 + K_p)^1} + \frac{\text{Dividend}}{(1 + K_p)^2} + \ldots + \frac{\text{Dividend}}{(1 + K_p)^n} + \frac{\text{Maturity Value}}{(1 + K_p)^n} \]

VALUE OF BOND UNDER REINVESTMENT CONCEPT

\[ B_0 = \text{Coupon Amount x n + Face Value} \]

\[ (1 + YTM)^n \]

DIRTY PRICE AND CLEAN PRICE

Dirty Price = Clean Price + Accrued Interest

1 % = 100 basis points
CALCULATION OF BO WHEN ENTIRE PRINCIPAL & INTEREST AMOUNT IS RECEIVED AT MATURITY YEARS

In such case our equation is:

\[ B_0 = \frac{\text{Face Value}\left(1 + \text{Coupon Rate}\right)^n}{(1 + \text{YTM})^n} \]

CALCULATION OF YTM OF HALF YEARLY INTEREST PAYMENT BOND

\[ \text{Kd Of 6 month} = \frac{\text{Interest per 6 months} + \left(\frac{\text{Maturity Value} - \text{Bo}}{n \times 2}\right)}{\text{Maturity Value} + \text{Bo}} \]

Now Kd p.a = Kd for 6 month * 2

NET ASSET VALUE (NAV)

Symbolically:

\[ \text{NAV} = \frac{\text{Net Asset Number Of Units}}{\text{Total Asset - Total External Liability Number Of Units}} \]

Where net assets of the scheme will normally be: Total Asset - Total External Liability =

[ Market Value of Investments + Receivables + Accured Income + Other Assets ] - [ Accured Expenses + Payables + Other Liabilities ]

EXPENSE RATIO

\[ \text{Expense Ratio} = \frac{\text{Expenses Incurred Per Unit}}{\text{Average NAV}} \]

Where Average NAV = \(\frac{\text{Opening NAV} + \text{Closing NAV}}{2}\)

HOLDING PERIOD RETURN (HPR)

\[ \text{Holding Period Return} = \frac{\text{NAV end} - \text{NAV beginning} + \text{Dividend Received} + \text{Capital Gain Received}}{\text{NAV at the beginning}} \]

RELATIONSHIP BETWEEN RETURN OF MUTUAL FUND, RECURRING EXPENSES, INITIAL EXPENSES AND RETURN DESIRED BY INVESTORS

Return Required By Investors = \((\text{Return Of Mutual Fund} - \text{Recurring Expenses}) \times (1 - \text{Initial Expenses})\)

DIVIDEND YIELD METHOD OR DIVIDEND CAPITALIZATION VALUATION METHOD

\[ \text{Dividend Yield} = \frac{\text{Dividend Per Share (DPS)}}{\text{Market Price Per Share (MPS)}} \]

\[ \Rightarrow \text{Market Price Per Share} = \frac{\text{Dividend Per Share (DPS)}}{\text{Dividend Yield}} \]

EARNING YIELD METHOD OR INCOME OR EARNING CAPITALIZATION VALUATION METHOD

\[ \text{Earning Yield} = \frac{\text{Earning Per Share (EPS)}}{\text{Market Price Per Share (MPS)}} \]

\[ \Rightarrow \text{Market Price Per Share} = \frac{\text{Earning Per Share (EPS)}}{\text{Earning Yield}} \]

PRESENTATION OF INCOME STATEMENT TO CALCULATE MPS

Sales
Less: Variable cost
Contribution
Less: Fixed cost
VALUE OF FIRM USING FUTURE MAINTAINABLE PROFITS (FMP)

Value Of Business = \frac{\text{Future Maintainable Profit}}{\text{Relevant Capitalization Rate}}

**Calculation Of Future Maintainable Profits:**

Average Past Year Profits

Add:
All Actual Expenses and Losses not likely to occur in future
All Profits likely to arise in Future
Less: All Expenses and Losses expected to arise in future
Less : All Profits not likely to occur in future
Future Maintainable Profits (FMP)

PRICE EARNING [P/E] RATIO VALUATION METHOD

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

**Note:** Total Market Value can be calculated by multiplying MPS with Number of Equity Share.
**Note:** If we take total earning in the above formula we will directly get Market Value.

NET ASSET VALUATION METHOD

Net Assets Value = \{ \text{Total Assets} - \text{Total External Liability} \}

Net Asset Value Per Equity Shareholder = \frac{\text{Net Asset}}{\text{Total Number Of Equity Share}}

**Note:** Total Asset and Total External Liability may be taken on the basis of Market Value, Liquidation Value or Book Value as the case may be.
**Note:** If question is silent always use Market Value Approach.

DISCOUNTED CASH FLOW (DCF) APPROACH/FREE CASH FLOW APPROACH

It is a method of evaluating an investment by estimating future cash flows and taking into consideration the time value of money.

**Note:** How To Calculate Free Cash Flow:

EBDITA
(-) Depreciation
(-) Amortization
(-) Interest
EBT
(-) Tax
EAT
+ Depreciation
+ Amortization
- Increase In Working Capital
- Decrease In Working Capital
- Capital Expenditure
Free Cash Flow
**CHOICE OF CORRECT DISCOUNT RATE WHILE CALCULATING VARIOUS VALUES**

- Use Of Discount Rate
  - Value Of Firm \( Ko \)
  - Value Of Equity \( Ke \)
  - Value Of Debt \( Kd \)

**CALCULATION OF CAPITAL EMPLOYED**

- Capital employed can be calculated in two ways
- One way is to calculate from liabilities side and
- Other way is to calculate through asset side.

**Liabilities side**
- Capital employed = Equity Share Capital + Preference Share Capital + Reserves – Fictitious Assets + Debentures + Long Term Loans

**Assets Side**
- Capital Employed = Fixed assets (excluding Fictitious Assets) + Current assets – Current liabilities

**SHARE EXCHANGE RATIO BASED ON EPS**

\[
\text{Share Exchange Ratio} = \frac{\text{EPS of Target Firm (B Ltd)}}{\text{EPS of Acquiring Firm (A Ltd)}}
\]

**SHARE EXCHANGE RATIO BASED ON MPS**

\[
\text{Share Exchange Ratio} = \frac{\text{MPS of Target Firm (B Ltd)}}{\text{MPS of Acquiring Firm (A Ltd)}}
\]

**SHARE EXCHANGE RATIO BASED ON BOOK VALUE PER SHARE (BVPS)**

\[
\text{Share Exchange Ratio} = \frac{\text{Book Value Per Share of Target Firm (B Ltd)}}{\text{Book Value Per Share of Acquiring Firm (A Ltd)}}
\]

**SHARE EXCHANGE RATIO BASED ON NET ASSET VALUE PER SHARE (NAV)**

\[
\text{Share Exchange Ratio} = \frac{\text{Net Asset Value of Target Firm (B Ltd)}}{\text{Net Asset Value of Acquiring Firm (A Ltd)}}
\]

**TOTAL NO. OF EQUITY SHARES AFTER MERGER**

\[
N_A + N_B \times \text{ER}
\]

**EPS (A+B) WHEN SHARES ARE ISSUED**

\[
\text{EPS of the Combined Firm after Merger} = \frac{\text{Total Earning After Merger}}{\text{N_A} + \text{N_B} \times \text{ER}} = \frac{\text{E_A + E_B + Synergy Gain}}{\text{N_A} + \text{N_B} \times \text{ER}}
\]

**MPS (A+B) WHEN SHARES ARE ISSUED**

1st Preference: [to be used when PE A+B is given or any hint regarding this is given]

\[
\text{MPS of Combined Firm after Merger} = \text{EPS}_{A+B} \times \text{P/E Ratio}_{A+B}
\]

2nd Preference:

\[
\text{MPS of Combined Firm after Merger} = \frac{\text{Total Market Value After Merger}}{\text{N_A} + \text{N_B} \times \text{ER}} = \frac{\text{MV_A + MV_B + Synergy Gain (If Any)}}{\text{N_A} + \text{N_B} \times \text{ER}}
\]

**MARKET VALUE OF MERGED FIRM**

1st Preference: \( \text{MV (A+B)} = \text{EPS}_{A+B} \times \text{P/E Ratio}_{A+B} \times \left[ \text{N_A} + \text{N_B} \times \text{ER} \right] \)

2nd Preference: \( \text{MV (A+B)} = \text{MV_A} + \text{MV_B} + \text{Synergy} \)
EQUIVALENT EPS OF B LTD IN A NEW COMPANY

\[
\text{EPS} \ (A+B) \times ER
\]

EQUIVALENT MPS OF B LTD IN A NEW COMPANY

\[
\text{MPS} \ (A+B) \times ER
\]

NEW NO. OF EQUITY SHARES ISSUED TO B LTD.

\[
N_B \times ER
\]

CALCULATION OF % HOLDING IN MERGED COMPANY

For A Ltd:

\[
\frac{\text{Total No. Of A Ltd Shares}}{\text{Total No. Of A Ltd Shares + Total No. Of New Shares Issued To B Ltd}}
\]

For B Ltd:

\[
\frac{\text{Total No. Of New Shares Issued To B Ltd}}{\text{Total No. Of A Ltd Shares + Total No. Of New Shares Issued To B Ltd}}
\]

EPS A+B WHEN SYNERGY IS EXPRESSED IN AMOUNT

\[
\text{EPS}_{A+B} = \frac{(\text{Earning}_A + \text{Earning}_B + \text{Synergy Gain})}{N_A + N_B \times ER}
\]

EPS A+B WHEN SYNERGY IS EXPRESSED IN %

\[
\text{EPS}_{A+B} = \frac{(\text{Earning}_A + \text{Earning}_B \times (1 + \text{Synergy Gain})}{N_A + N_B \times ER}
\]

MAXIMUM EXCHANGE RATIO TAKING EPS BASE-FOR A LTD

Maximum Exchange Ratio (i.e. the Exchange Ratio at which EPS of Firm’s A shareholder before and after merger will be same)

\[
\text{EPS Before Merger} = \text{EPS after Merger}
\]

\[
\Rightarrow \text{EPS}_A = \frac{E_A + E_B + \text{Synergy}}{N_A + N_B \times ER}
\]

Now by solving the above equation keeping Exchange Ratio constant we can find desired Exchange Ratio.

MINIMUM EXCHANGE RATIO TAKING EPS BASE-FOR B LTD

Minimum Exchange Ratio (i.e. the Exchange ratio at which EPS of Firm’s B shareholder before and after merger will be same)

\[
\text{EPS Before Merger} = \text{Equivalent EPS after Merger}
\]

\[
\Rightarrow \text{EPS}_B = \text{EPS}_{A+B} \times ER
\]

\[
\text{EPS}_B = \frac{E_A + E_B + \text{Synergy}}{N_A + N_B \times ER} \times ER
\]

Now by solving the above equation keeping Exchange Ratio constant we can find desired Exchange Ratio.

IF DECISION IS BASED ON MPS [AND IF P/E RATIO AFTER MERGER FOR A LTD IS GIVEN OR ANY HINT IN THE QUESTION IS GIVEN REGARDING THIS]: FOR A LTD

Maximum Exchange Ratio (i.e. the Exchange Ratio at which MPS of Firm’s A shareholder before and after merger will be same)

\[
\text{MPS Before Merger} = \text{MPS After Merger}
\]

\[
\Rightarrow \text{MPS}_A = \text{MPS}_{A+B}
\]

\[
\Rightarrow \text{MPS}_A = \frac{\text{P/E Ratio}_{A+B} \times \text{EPS}_{A+B}}{E_A + E_B + \text{Synergy}}
\]

Now by solving the above equation keeping Exchange Ratio constant we can find desired Exchange Ratio.
**Minimum Exchange Ratio** (i.e. the Exchange ratio at which MPS of Firm’s B shareholder before and after merger will be same)

MPS Before Merger = Equivalent MPS after Merger

⇒ MPS_B = ER × MPS_A + B

⇒ MPS_B = ER × Earnings Per Share_A + B × P/E Ratio_A + B

⇒ MPS_B = ER × P/E Ratio_A + B × \left[ \frac{\text{Earnings Per Share}_A + \text{Earnings Per Share}_B + \text{Synergy Gain}}{\text{No. of Equity Shares}_A + \text{No. of Equity Shares}_B \times \text{Exchange Ratio}} \right]

Now by solving the above equation keeping Exchange Ratio constant we can find desired Exchange Ratio.

**Maximum Exchange Ratio** (i.e. the Exchange ratio at which MPS of Firm’s A shareholder before and after merger will be same)

MPS Before Merger = MPS After Merger

⇒ MPS_A = MPS_A + B

⇒ MPS_A = \left[ \frac{\text{MPS}_A \times \text{No. of Equity Shares}_A + \text{MPS}_B \times \text{No. of Equity Shares}_B + \text{Synergy Gain}}{\text{No. of Equity Shares}_A + \text{No. of Equity Shares}_B \times \text{Exchange Ratio}} \right]

Now by solving the above equation keeping Exchange Ratio constant we can find desired Exchange Ratio.

**Components of Market Price Per Share**

Market Price Per Share (MPS) = Earnings Per Share (EPS) × Price Earning Ratio (PE Ratio)

\[ \text{MPS} = \frac{\text{Earnings For Equity Shareholder}}{\text{No. of Equity Share}} \times \frac{\text{Market Price Per Share}}{\text{Earnings Per Share}} \]

\[ \text{MPS} = \left( \text{Return on Equity (ROE)} \times \frac{\text{Book Value / Intrinsic Value Per Share}}{\text{Market Price Per Share}} \right) \times \frac{\text{Earnings For Equity Shareholder}}{\text{No. of Equity Share}} \times \frac{\text{Equity Shareholder’s Fund}}{\text{No. of Equity Shares}} \times \frac{\text{Market Price Per Share}}{\text{Earnings Per Share}} \]

Where Equity Shareholder’s Fund = Equity Share Capital + Reserves - P/L account (Dr.)

**EPS_A+B When Cash is Paid Out of Borrowed Money**

\[ \text{EPS}_{A+B} = \frac{(\text{Earnings}_A + \text{Earnings}_B - \text{Borrowed Amount} \times \text{Interest Rate} \times (1 - \text{Tax Rate}))}{\text{No. of Equity Shares}_A} \]

**EPS_A+B When Cash is Paid Out of Business Money**

\[ \text{EPS}_{A+B} = \frac{(\text{Earnings}_A + \text{Earnings}_B - \text{Cash Paid} \times \text{Opportunity Cost Of Interest} \times (1-\text{tax}))}{\text{No. of Equity Shares}_A} \]

**Market Value After Merger When Growth Rate of B Ltd Under New Management Increases**

\[ \text{Market Value After Merger} = \text{MPS}_A \times \text{No. of Equity Share}_A + \text{New MPS}_B \text{ Taking new growth rate} \times \text{No. of Equity Share}_B + \text{Synergy} \]

\[ \text{to be taken as zero} \]
NPV OF A LTD UNDER MERGER
PV Of Cash Flows Received By A Ltd From B Ltd
Less: Cost of Acquisition Paid By A Ltd To B Ltd
NPV Of A Ltd if B Ltd is acquired
Decision: If NPV is positive, A Ltd should takeover B Ltd.

COST OF MERGER-WHEN CASH IS PAID-FOR A LTD
Cost = Cash Paid - Market Value Of B received

COST OF MERGER-WHEN SHARES ARE ISSUED-FOR A LTD
Cost = Value of shares given – Value Of B Received = \( \alpha \times \) Combined Value Of A & B – Value Of B received
Where \( \alpha \) represents the % holding of B Ltd. in merged firm

SYNERGY GAIN-BASED ON EARNINGS
Merger Gain or Synergy Based On Earnings = Total Combined Earning Of Merged Firm - [Earning Of A + Earning Of B]

SYNERGY GAIN-BASED ON MARKET VALUES
Merger Gain or Synergy Based On Market Value = Total Combined Market Value Of Merged Firm - [Market Value Of A + Market Value Of B]

EFFECT OF CASH TAKEOVER IN EARNINGS AND MARKET VALUE
Total Earning After Merger = Earning A + Earning B - Opportunity/Borrowing Cost Of Cash Paid Adjusted For Tax
Total Market Value After Merger = Market Value A + Market Value B - Cash Paid

GROSS NPA (%)
GNPA Ratio = \( \frac{\text{Gross NPA}}{\text{Gross Advance or Deposit Given By Bank}} \times 100 \)

CAR (CAPITAL ADEQUACY RATIO) OR CRWAR (CAPITAL TO RISK WEIGHTED ASSET RATIO)
CAR or CRWAR or Total Capital To Risk Weight Asset Ratio = \( \frac{\text{Total Capital}}{\text{Risky Weighted Assets}} \)

CALCULATION OF SWAP RATIO IN CASE OF NEGATIVE FACTOR LIKE GROSS NPA
Swap Ratio = \( \frac{\text{Gross NPA Of A Ltd.}}{\text{Gross NPA Of B Ltd.}} \)

CALCULATION OF RETURN OF A SECURITY OR ASSET
Holding Period Return = \( \frac{\text{(Price At The End – Price At The Beginning)} + \text{Any Income Distribution}}{\text{Price At The Beginning}} \)

STANDARD DEVIATION (\( \sigma \)) BASED ON PAST DATA
\( \sigma = \sqrt{\frac{\sum (\text{Given Return} - \text{Average Return})^2}{n}} \)

STANDARD DEVIATION (\( \sigma \)) BASED ON PROBABILITY
\( \sigma = \sqrt{\sum \text{probability} \times (\text{Given Return} - \text{Expected Return})^2} \)

VARIANCE
Variance = \( \sigma^2 \)

Decision: Higher the variance, higher the risk.

COEFFICIENT OF VARIATION (CV) - PAST DATA
Coefficient Of Variation measures Risk Per Unit Of Return.
Standard Deviation

\[ CV = \frac{\text{Standard Deviation}}{\text{Expected Return}} \]

**Decision:** Higher the CV, higher the risk.

**COEFFICIENT OF VARIATION (CV) BASED ON PROBABILITY**

\[ CV = \frac{\text{Standard Deviation}}{\text{Expected Return}} \]

**Decision:** Higher the CV, higher the risk.

**RETURN OF PORTFOLIO-BASED ON PAST DATA**

- The Return of the portfolio is the weighted average return of individual security.
- Return Of Portfolio = A's Average Return \( \times \) Weight\textsubscript{A} + B's Average Return \( \times \) Weight\textsubscript{B}

**RETURN OF PORTFOLIO ON THE BASIS OF PROBABILITY**

Return Of Portfolio = A's Expected Return \( \times \) Weight\textsubscript{A} + B's Expected Return \( \times \) Weight\textsubscript{B}

**Note:** Sum of Weights used in Portfolio for different security will always be equal to 1.

**STANDARD DEVIATION OF THE PORTFOLIO CONSISTING OF TWO SECURITY**

\[
\text{Standard Deviation}\left[\sigma_{1+2}\right] = \sqrt{\sigma_1^2 w_1^2 + \sigma_2^2 w_2^2 + 2 \sigma_1 \sigma_2 w_1 w_2 r_{1,2}}
\]

Where, \( \sigma_{1+2} \) = Standard Deviation of Portfolio consisting of Security 1 & 2
\( \sigma_1 \) = Standard Deviation Of Security 1; \( \sigma_2 \) = Standard Deviation Of Security 2;
\( W_1 \) = Weight Of Security 1; \( W_2 \) = Weight Of Security 2; \( r_{1,2} \) = Coefficient Of Correlation Between Security 1 and Security 2

**COEFFICIENT OF CORRELATION (r)**

Coefficient of Correlation between A & B : \( \rho_{A,B} = \frac{\text{Covariance} \left( A, B \right)}{\sigma_A \times \sigma_B} \)

**COVARIANCE-BASED ON PAST DATA**

\[
\text{Covariance} \left( A, B \right) = \frac{\sum \left( \text{Given Return}_A - \text{Average Return}_A \right) \times \left( \text{Given Return}_B - \text{Average Return}_B \right)}{n} = \frac{\sum \left( d_A \times d_B \right)}{n}
\]

**COVARIANCE BASED ON PROBABILITY**

\[
\text{Covariance} \left( A, B \right) = \sum \text{probability} \times \left( \text{Given Return}_A - \text{Expected Return}_A \right) \left( \text{Given Return}_B - \text{Expected Return}_B \right)
\]

**WHEN RISK REDUCTION IS ACHIEVED BY BUILDING A PORTFOLIO/CONCEPT OF RISK REDUCTION**

- Risk Reduction is achieved when Portfolio Standard Deviation is less than Weighted Average Standard Deviation Of Individual Security.

**MEANING OF r=+1**

- It is a Perfect Positive Correlated Portfolio
- Portfolio Risk will be Maximum
- Standard Deviation Of Portfolio will become \( (\sigma_{A+B}) = \sigma_A \times W_A + \sigma_B \times W_B \)

**MEANING OF r=-1**

- It is a Perfect Negative Correlated Portfolio
- Portfolio Risk will be minimum
- Standard Deviation Of Portfolio will become \( (\sigma_{A+B}) = \sigma_A \times W_A - \sigma_B \times W_B \)

**MEANING OF r=0**

- It is a No Correlated Portfolio
- Portfolio Risk will be between minimum and maximum range
- Standard Deviation Of Portfolio will become \( (\sigma_{A+B}) = \sqrt{\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2} \)

**RANGE OF ‘r’ OR COEFFICIENT OF CORRELATION**

Range of r is between -1 to +1
Higher the \( r \), higher the risk. As \( r \) increases, risk also increases. When \( r = -1 \) : Minimum Risk. When \( r = +1 \) : Maximum Risk.

**Overall Decision:** Lower the Standard Deviation, Coefficient Of Variation, Variance or Range Lower will be the Risk Of Security.

**STANDARD DEVIATION OF PORTFOLIO CONSISTING OF THREE SECURITIES**

\[
\sigma_{ABC} = \sqrt{\sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + \sigma_C^2 w_C^2 + 2w_A \sigma_A w_B \sigma_B r_{AB} + 2w_B \sigma_B w_C \sigma_C r_{BC}}
\]

When \( r = +1 \) we can use short cut formula: \( \sigma_{ABC} = \sigma_A w_A + \sigma_B w_B + \sigma_C w_C \)

**CAPITAL ASSET PRICING MODEL (CAPM) BASED RETURN**


\[
Rf + \frac{\text{Beta}_{\text{Security}}}{\text{Beta}_{\text{Market}}} [(Rm - Rf)] = Rf + \text{Beta}_{\text{Security}} (Rm - Rf)
\]

**CAPITAL ASSET PRICING MODEL (CAPM) BASED DECISION OR UNDervalued/OVERvalued CONCEPT**

<table>
<thead>
<tr>
<th>Case</th>
<th>Valuation</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>If CAPM Return &gt; Given Return</td>
<td>Overvalued or Overpriced</td>
<td>Sell</td>
</tr>
<tr>
<td>If CAPM Return &lt; Given Return</td>
<td>Undervalued or Underpriced</td>
<td>Buy</td>
</tr>
<tr>
<td>If CAPM Return = Given Return</td>
<td>Correctlyvalued or Correctly priced</td>
<td>Hold</td>
</tr>
</tbody>
</table>

**BETA OF A SECURITY BASED ON % RETURN CHANGES**

Beta is the degree of the responsiveness of the security's return with the market return.

\[
\text{Beta} = \frac{\text{Change in Security Return}}{\text{Change in Market Return}}
\]

This equation is normally applicable when two return data is given.

**CALCULATION OF BETA USING COVARIANCE FORMULA**

Beta is a ratio of "Covariance Of Security with the Market" and "Variance Of Market"

\[
\text{Beta of an Asset or Security} = \frac{\text{Covariance between Security and Market}}{\text{Variance of the market}} = \frac{\text{Covariance (s,m)}}{\sigma_m^2}
\]

**BETA OF A SECURITY USING CORRELATION**

\[
\text{Beta Of Security} = \frac{\tau_{s,m} \times \sigma_s}{\sigma_m}
\]

**ARBITRAGE PRICING THEORY [STEPHEN ROSS'S APT MODEL] /MULTI FACTOR MODEL**

Symbolically: Overall Return in case of APT will be = Risk Free Return + (Beta x Risk Premium) Of Each Factor

\[
= \text{Risk Free Return} + \{\text{Beta}_{\text{Inflation}} \times \text{Inflation Differential or Premium}\} + \{\text{Beta}_{\text{GNP}} \times \text{GNP Differential or Premium}\} ... + \text{and so on}
\]

Where , Differential or Premium = [ Actual Value - Expected/Estimated Value ]

**PORTFOLIO EVALUATION TECHNIQUE-SHARPE RATIO**

It indicate the amount of return earned per unit of risk. It is also known as Reward to Risk Ratio or Reward to Variability Ratio.

Symbolically: Sharpe Ratio = \( \frac{\text{Return Of Security} - \text{Return Of Risk Free Investment}}{\text{Standard Deviation Of Security}} \)

Decision: Higher the ratio, Better the performance

**TREYNOR RATIO**

This ratio measures the return earned per unit of systematic risk. It is also known as the Reward to Volatility Ratio.
Symbolically: Treynor Ratio = \( \frac{\text{Return Of Security} - \text{Return Of Risk Free Investment}}{\text{Beta Of Security}} \)

Decision: Higher the ratio, Better the performance

Jensen’s Alpha / Jensen’s Index

Symbolically: Jensen’s Alpha = Actual or Given or Expected or Average Return - CAPM Return
where, CAPM Return = \( R_f + \beta \times (R_m - R_f) \)

Decision: If Alpha is positive, it shows that the portfolio has performed better and it has outperformed the market. If Alpha is negative, it means that the portfolio has underperformed as compared to the market. If Alpha is zero, it indicates that the portfolio has just performed what it is expected to.

Standard Deviation of Portfolio Consisting of Four Securities

\[ \sigma_{ABCD} = \sqrt{w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + w_C^2 \sigma_C^2 + w_D^2 \sigma_D^2 + \sum 2w_i \sigma_i \sum \frac{A \sigma_i}{A}} + 2w_B \sigma_B \sum \frac{A \sigma_i}{A} + 2w_C \sigma_C \sum \frac{B \sigma_i}{B} + 2w_D \sigma_D \sum \frac{C \sigma_i}{C} + \sum \frac{D \sigma_i}{D} \]

When \( r = +1 \) we can use short cut formula
\[ \sigma_{ABC} = \sigma_A w_A + \sigma_B w_B + \sigma_C w_C + \sigma_D w_D \]

Standard Deviation of Portfolio Consisting Risk Free & Risky Security

\( \sigma_{A+B} = \sigma_A \times W_A \) Where A is risky security & B is risk free security

Standard Deviation of Portfolio Consisting Risk Free & Risky Security

\( \sigma_{A+B} = \sigma_A \times W_A \) Where A is risky security & B is risk free security

Beta of a Portfolio

Beta of a portfolio is the weighted average beta of individual securities .

Symbolically: Beta Of Portfolio = Beta Of Security A \times Weight Of A + Beta Of Security B \times Weight Of B = \( \beta_A \times W_A + \beta_B \times W_B \)

Security Market Line (SML)

A Graphical representation of CAPM is known as Security Market Line.

Expected Return under SML is calculated by using following equation:
\[ R_f + \frac{\text{Beta Security}}{\text{Beta Market}} \left[ (R_m - R_f) \right] = R_f + \beta \times \text{Security} \times \left[ (R_m - R_f) \right] \]

Note: Beta of market assumed to be 1.

Decision:
- If a security lie on SML: Efficient Security Correctly Priced Hold Security giving Optimum Return as expected
- If a security lie below SML: Inefficient Security Under Priced Sold Security giving Low Return than expected
- If a security lie above SML: Inefficient Security Over Priced Buy Security giving High Return than expected

Capital Market Line (CML)

Capital Market Line shows the relationship between Return & Standard Deviation of security.

Capital Market Line takes into account Total Risk.

Return under CML is calculated by using following equation:
\[ R_f + \left( \frac{\sigma_S}{\sigma_m} \right) \times \left[ (R_m - R_f) \right] \]

Decision: Same as SML

Characteristics Line (CL)

The Characteristic Line shows the relationship between the Return Of an Investment in Security and Return Of Market Portfolio.
**Equation Of Characteristics Line:** \( Y = a + \beta \times X \), Where

\( Y \) = Average or Expected Return for the Security; \( X \) = Average or Expected Return of the Market Portfolio; \( \beta \) = Beta of Security

\( a \) = Intercept or alpha which can be calculated as \( Y - \beta \times X \)

**SLOPE OF CHARACTERISTICS LINE (CL)**

Beta of a security is a slope of Characteristics Line.

**SLOPE OF SML**

- Slope Of SML may be obtained as follows:
  \[ \frac{R_m - R_f}{\beta_m} = \frac{R_m - R_f}{\beta_m} \]

**SLOPE OF CML**

- Slope Of CML may be obtained as follows:
  \[ \frac{R_m - R_f}{\sigma_m} \]

**COVARIANCE FORMULA USING CORRELATION**

\[ \text{Covariance} (A, B) = r_{A,B} \times \sigma_A \times \sigma_B \]

**CALCULATION OF OPTIMUM WEIGHTS TO MINIMIZE PORTFOLIO RISK WHEN WEIGHTS ARE MISSING**

- Under this concept we will try to find out that “What percentage in each of the security consisting in the portfolio would result into lowest possible risk”. Hence if we are asked to calculate optimum weights which will reduce our portfolio risk then we will use following formula:

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

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

**SHORT CUT FORMULA FOR OPTIMUM WEIGHTS WHEN \( r = -1 \)**

- When \( r = -1 \) then we can also use the following formula for finding Optimum Weights

\[ W_X = \frac{\sigma_Y}{\sigma_X + \sigma_Y}; W_Y = \frac{\sigma_X}{\sigma_X + \sigma_Y} \text{ or } 1 - W_X \] (Since \( W_X + W_Y = 1 \))

**Note:** If we find the Standard Deviation (risk) from this optimum weights when \( r = -1 \) then portfolio risk will be zero.

**COVARIANCE OF A SECURITY WITH THE SAME SECURITY**

\[ \text{Covariance}(A, A) = \text{Variance Of } A \]

**Note:** Covariance with oneself is variance.

**CORRELATION OF A SECURITY WITH SAME SECURITY (r_{A,B})**

\[ r_{A,B} = 1 \]

**COVARIANCE MATRIX**

\[
\begin{array}{ccc}
A & B & C \\
\text{cov}(A, A) & \text{cov}(A, B) & \text{cov}(A, C) \\
\text{cov}(A, B) & \text{cov}(B, B) & \text{cov}(B, C) \\
\text{cov}(A, C) & \text{cov}(C, B) & \text{cov}(C, C)
\end{array}
\]

**NEW FORMULA OF COVARIANCE USING BETA**

Covariance between any 2 stocks = \( \beta_1 \times \beta_2 \times \sigma_m^2 \)

**RISK RETURN RATIO (TRADE OFF) OF MARKET**
Risk Return Trade Off Of Market = \( \frac{R_m - R_f}{\sigma_m} \)

**HOW TO CALCULATE SYSTEMATIC RISK AND UNSYSTEMATIC RISK / SHARPE INDEX MODEL**

**FOR A SECURITY:** Total Risk = \( \sigma_s^2 \);

Systematic Risk Of a Security = \( \sigma_m^2 \beta_s^2 \); Unsystmatic Risk Of a Security = Total Risk - Systematic Risk = \( \sigma_s^2 - \sigma_m^2 \beta_s^2 \)

**FOR A PORTFOLIO:** Total Risk = \( \sigma_p^2 \);

Systematic Risk Of a Portfolio = \( \sigma_m^2 \beta_p^2 \);

Unsystematic Risk Of a Portfolio = Total Risk - Systematic Risk = \( \sigma_p^2 - \sigma_m^2 \beta_p^2 \) or \( \sum_{i=1}^{n} \sigma_{USR}^2 w_i^2 \)

**CALCULATION OF SYSTEMATIC & UNSYSTEMATIC RISK USING COEFFICIENT OF DETERMINATION**

Coefficient Of Determination = \( (\text{coefficient of correlation})^2 = (r^2) \)

Use of Coefficient of Determination in calculating Systematic Risk & Unsystematic Risk

- **Explained by the index (Systematic Risk)** = Variance of Security Return \( \times \) Co-efficient of Determination of Security

- **Not explained by the index (Unsystematic Risk)** = Variance of Security Return \( \times (1 - \text{Co-efficient of Determination of Security}) \)

**CONVERTING DIRECT QUOTE INTO INDIRECT QUOTE AND VICE-VERSA-WHEN BID & ASK RATE ARE SAME**

- Direct Quotes can be converted into Indirect Quotes by taking reciprocals of each other, which can be mathematically expressed as follows: Direct Quote = \( \frac{1}{\text{Indirect Quote}} \) or Indirect Quote = \( \frac{1}{\text{Direct Quote}} \)

- **For Example:** 1 DM = Rs. 20 is a direct quote for India. 1 Re. = \( \frac{1}{20} \) DM is indirect quote for India

**CONVERTING DIRECT QUOTE INTO INDIRECT QUOTE AND VICE-VERSA-WHEN BID AND ASK RATE ARE DIFFERENT**

- Direct Quotes can be converted into Indirect Quotes by taking reciprocals of each other and then switching the position.

- **For Example:** Direct Quote with reference to India: 1 $ = Rs. 46.10 / 46.20.

Indirect Quote with reference to India: Re 1 = $ \frac{1}{46.20} - $ \frac{1}{46.10} or Re 1 = $ .02165 - $ .02170

**CALCULATION OF CONTRIBUTION TO SALES RATIO UNDER FOREX**

- Contribution to Sales Ratio = \( \frac{\text{Contribuntion}}{\text{Sale}} \times 100 \)

- **Decision:** Higher the C/S Ratio better the situation

Contribution is the selling price minus the variable cost.

**CONTRIBUTION**

**EXCHANGE MARGIN**

Exchange Margin is the extra amount or percentage charged by the bank over and above the rate quoted by bank. It represents commission, transaction related expenses etc.

- **In case of Buying Rate quoted by bank:** Deduct Exchange Margin: i.e. Actual Buying Rate = Bid Rate (1 - Exchange Margin)

- **In case of Selling Rate quoted by bank:** Add Exchange Margin: i.e. Actual Selling Rate = Ask Rate (1 + Exchange Margin)
PREMIUM AND DISCOUNT

How to Calculate Premium or Discount: Rate of Premium or Discount of Left Hand Currency is given by:

\[
\text{Forward Rate} - \text{Spot Rate} \times \frac{12}{\text{Spot Rate}} \times \text{Forward Period} \times 100
\]

PURCHASE PRICE PARITY THEORY (PPPT)-CALCULATION OF SPOT RATE

\[
\text{Spot Rate (Rs. / $)} = \frac{\text{A [Current Price in India]}}{\text{B [Current Price in USA]}}
\]

PURCHASE PRICE PARITY THEORY (PPPT)-CALCULATION OF FORWARD RATE- USING INFLATION

Symbolically: As per PPP Theory we have:

\[
\text{Forward Rate (Rs/$)} = \left(\frac{1 + \text{Rupee Inflation}}{1 + \text{Dollar Inflation}}\right) \times \text{Spot Rate (Rs/$)}
\]

DETERMINATION OF PREMIUM & DISCOUNT USING PPPT

Higher Rate of Inflation in one country (as compared to the other country) results in discount of currency of that country and vice-versa.

INTEREST RATE PARITY THEORY (IRPT)

Symbolically:

\[
\frac{\text{Forward Rate (Rs/$)}}{\text{Spot Rate (Rs/$)}} = \frac{1 + \text{Rupee Interest Rate}}{1 + \text{Dollar Interest Rate}}
\]

DETERMINATION OF PREMIUM & DISCOUNT USING IRPT

Higher Rate of Interest in one country (as compared to the other country) results in discount of currency of that country and vice-versa.

SPREAD

The difference between Ask and Bid Rates is called the Spread, representing the profit margin of the dealer.

\[
\text{Spread} = \text{Ask Rate} - \text{Bid Rate}
\]

CALCULATION OF NET EXPOSURE USING FORWARD RATE AND SPOT RATE

Net exposure we mean advantage of using Forward Contract over Spot Contract.

\[
\text{Net exposure} = \text{Net Cash Flow} \times (\text{Forward Rate} - \text{Spot Rate}) = \text{Net Cash Flow} \times \text{Swap Points}
\]

Decision: A positive Net Exposure indicates benefit of Forward Rate over Spot Rate.

INTERNATIONAL FISHER EFFECT (IFE)

It analyses the relationship between the Interest Rates and the Inflation.

As per IFE we have:

\[
(1 + \text{Money Interest Rate}) = (1 + \text{Real Interest Rate}) (1 + \text{Inflation Rate})
\]

INTEREST RATE DIFFERENTIAL- NO ARBITRAGE

When Difference in Interest Rates Between The Two Countries is equal to Premium Or Discount - No Arbitrage Is Possible

\[
\frac{\text{FR[Rs/$] - SR[Rs/$]}}{\text{SR[Rs/$]}} \times \frac{12}{\text{Forward Period}} \times 100 = \text{Interest Rate Of Rupee} - \text{Interest Rate Of Dollar}
\]

GAIN OR LOSS UNDER FUTURE CONTRACT-LONG POSITION

<table>
<thead>
<tr>
<th>Position</th>
<th>Increase</th>
<th>Profit</th>
<th>Decrease</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GAIN OR LOSS UNDER FUTURE CONTRACT-SHORT POSITION

<table>
<thead>
<tr>
<th>Position</th>
<th>Increase</th>
<th>Profit</th>
<th>Decrease</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How Settlement is done under Long Position

Short Position is settled by taking Long position at the time of settlement

How Settlement is done under Short Position

Long Position : If a person buys or holds an asset, he is said to be in a Long Position.
Short Position : If a person sells an asset, he is said to be in a Short Position.

Initial Margin

- Initial Margin deposited is not an expense; it is just like a security deposit.
- Sometimes when initial margin is not given in question, it can be calculated by using the following equation:
  \[ \text{Initial Margin} = \text{Daily Absolute Changes} + 3 \times \text{Standard Deviation} \]

Mark to Market Margin

It is like a profit and loss account.

When Interest Rate is Compounded Continuously or Infinity

\[ \text{Future Value} = \text{Present Value} \times e^{rt} \]
\[ \text{Present Value} = \frac{\text{Future Value}}{e^{rt}} = \text{Future Value} \times e^{-rt} \]

Present Value When Interest Rate is Discounted Continuously

\[ \text{Present Value} = \frac{\text{Future Value}}{e^{rt}} = \text{Future Value} \times e^{-rt} \]

Fair Future Price of Securities

Basic Principle While Calculating Fair Future Price:
1. Cost:
   - If Given In Rs.: Add in CMP
   - If Given In %: Add in rate

2. Dividend:
   - If Given In Rs.: Deduct in CMP
   - If Given In %: Deduct in rate

How to Calculate Arbitrage Profit? When-Actual Future Value > Fair Future Value

<table>
<thead>
<tr>
<th>Case</th>
<th>Valuation</th>
<th>Borrow/Invest</th>
<th>Cash Market</th>
<th>Future Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Future Value &gt; Fair Future Value</td>
<td>Overvalued</td>
<td>Borrow</td>
<td>Buy</td>
<td>Sell</td>
</tr>
</tbody>
</table>

Principle of Convergence

The process by which the futures price and the cash price of an underlying asset approach one another as the delivery date nears. The futures and cash prices should be equal on the delivery date.

How to Calculate Arbitrage Profit? When-Actual Future Value < Fair Future Value

<table>
<thead>
<tr>
<th>Case</th>
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<td>Actual Future Value &lt; Fair Future Value</td>
<td>Undervalued</td>
<td>Invest</td>
<td>Sell*</td>
<td>Buy</td>
</tr>
</tbody>
</table>

Position to be Taken For Hedging

If you are Short on any Security, you should go Long in Index [Sensex or Nifty]
If you are Long on any Security, you should go Short in Index [Sensex or Nifty]

Value of Index to be Hedged for Complete Hedging

The extent or value of hedging (hedge ratio) is determined by the beta of a security and the value of the current portfolio.

\[ \text{Extent Of Hedging or Total Value to be hedged} = \text{Existing Beta Of The Stock} \times \text{Value Of Transaction or Value Of Exposure or Current Value Of Portfolio which requires hedging} \]
VALUE OF HEDGING FOR INCREASING & REDUCING BETA TO A DESIRED LEVEL (ASSUMING LONG POSITION)

When Existing beta > Desired beta
Objective: Reducing Risk
Position To Be Taken: Take Short Position
Amount Of hedging Required = Value of Existing Portfolio \times (Existing Beta - Desired Beta)

When Existing beta < Desired beta
Objective: Increasing Risk
Position To Be Taken: Take Long Position
Amount Of hedging Required = Value of Existing Portfolio \times (Desired Beta - Existing Beta)

BETA OF CASH & CASH EQUIVALENT

Beta of Cash & Cash equivalent is always assumed to be zero.

DETERMINATION OF NUMBER OF FUTURE CONTRACTS TO BE TAKEN

The number of futures contract to be taken for increasing and reducing beta to a desired level is given by the following formula:

\[
\text{Value Of Total Index Future Position} = \text{Value Of One Index Future Contract}
\]

HEDGE RATIO UNDER FUTURE CONTRACT

Hedge Ratio i.e Existing Beta for complete hedge purpose = \( r_s, f \times \frac{\sigma_s}{\sigma_f} \)

\( \sigma_s \) = Standard Deviation of the Spot Price; \( \sigma_f \) = Standard Deviation of the Future Price; \( r_s, f \) = Correlation Coefficient between the two

OPTION- AN UNDERSTANDING

- In Forward Contract: Both parties are obliged to perform
- In Future Contract: Both the parties are obliged to perform
- In Option Contract: Only one party is obliged to perform

TYPES OF OPTION-CALL & PUT

(i) Call Option Contract
(ii) Put Options Contract

PARTIES OF OPTION CONTRACT

(i) Call Option
   (i) Call Writer / Call Seller
   (ii) Call Holder / Call Buyer

(ii) Put Option
   (i) Put Writer / Put Seller
   (ii) Put Holder / Put Buyer

DIFFERENCE BETWEEN CALL BUYER AND CALL SELLER

<table>
<thead>
<tr>
<th>CALL BUYER</th>
<th>CALL SELLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay Premium</td>
<td>Receive Premium</td>
</tr>
<tr>
<td>Purchase Right</td>
<td>Sell Right</td>
</tr>
<tr>
<td>Buy Share</td>
<td>Sell Share</td>
</tr>
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</table>

DIFFERENCE BETWEEN PUT BUYER AND PUT SELLER

<table>
<thead>
<tr>
<th>PUT BUYER</th>
<th>PUT SELLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay Premium</td>
<td>Receive Premium</td>
</tr>
<tr>
<td>Purchase Right</td>
<td>Sell Right</td>
</tr>
<tr>
<td>Sell Share</td>
<td>Buy Share</td>
</tr>
</tbody>
</table>

PAY OFF/PROFIT & LOSS OF A CALL BUYER

Pay off means Profit and Loss.

Call Option:

Profit: When Cash Market Price As On Expiry > Strike Price
In such case Call Buyer will exercise the Option.
Net Profit = Cash Market Price As On Expiry - Strike Price - Option Premium

Loss: When Cash Market Price As On Expiry < Strike Price
In such case Call Buyer will not exercise the option.
His loss is limited to the amount of Call Premium. i.e Loss = Amount Of Premium Paid
Pay off means Profit and Loss.

**Put Option:**
- **Profit:** When Cash Market Price As On Expiry < Strike Price
  In such case Put Buyer will exercise the option.
  Net Profit = Strike Price - Cash Market Price as on expiry - Option Premium
- **Loss:** When Cash Market Price As On Expiry > Strike Price
  In such case Put Buyer will not exercise the Option.
  His Loss will be limited to the amount of premium.

**BREAK EVEN PRICE OF CALL OPTION**

- Breakeven price is the market price at which the option parties neither makes a profit nor incur any losses.
- Break-Even Market Price for Buyer and Seller of Call Option:
  Exercise Price + Option Premium

**BREAK EVEN PRICE OF PUT OPTION**

- Breakeven price is the market price at which the option parties neither makes a profit nor incur any losses.
- Break-Even Market Price for Buyer and Seller of Put Option:
  Exercise Price − Option Premium

**POINT OF MAXIMUM PROFIT & LOSS - FOR CALL BUYER & SELLER**

- Call Buyer **maximum loss** is the amount of premium paid
- Call Seller **maximum profit** will be equal to the amount of premium received
- Call Buyer **maximum profit** will be unlimited
- Call Seller **maximum loss** will be unlimited

**POINT OF MAXIMUM PROFIT & LOSS - FOR PUT BUYER & SELLER**

- Put Buyer **maximum loss** is the amount of premium paid
- Put Seller **maximum profit** will be equal to the amount of premium received
- Put Buyer **maximum profit** will be equal to Strike Price - Premium Paid
- Put Seller **maximum loss** will be Strike Price - Premium Received

**TYPES OF RIGHT**

Right To Buy Shares - Call Buyer; Right To Sell Shares - Put Buyer

**IN/OUT/AT THE MONEY OPTION - FOR CALL BUYER**

<table>
<thead>
<tr>
<th>Market Scenario</th>
<th>In/Out/At</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Market Price as on expiry &gt; Strike Price</td>
<td>In the Money</td>
</tr>
<tr>
<td>Cash Market Price as on expiry &lt; Strike Price</td>
<td>Out Of The Money</td>
</tr>
<tr>
<td>Cash Market Price as on expiry = Strike Price</td>
<td>At The Money</td>
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**IN/OUT/AT THE MONEY OPTION - FOR PUT BUYER**

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<tr>
<td>Cash Market Price as on expiry = Strike Price</td>
<td>At The Money</td>
</tr>
</tbody>
</table>

**FAIR VALUE/PREMIUM/PRICE OF CALL OPTION AS ON EXPIRY**

- Value(Premium) of Call Option at expiration
  = Maximum of (Cash Market Price As On Expiry - Strike Price, 0)

**FAIR VALUE/PREMIUM/PRICE OF PUT OPTION AS ON EXPIRY**

- Value(Premium) of Put Option at expiration
  = Maximum of (Strike Price - Cash Market Price As On Expiry, 0)

**FAIR VALUE OF CALL OPTION BEFORE EXPIRY DATE MINIMUM THEORETICAL PRICE OF CALL OPTION**

- Theoretical Minimum Value of Call Option:
  = Spot Price − Present Value of Strike Price
  = Spot Price − Strike Price × e^−rt
FAIR VALUE OF PUT OPTION BEFORE EXPIRY DATE: MINIMUM THEORETICAL PRICE OF PUT OPTION

Theoretical Minimum Value of Put Option:
= Present Value of Strike Price - Current Market Price = Strike Price × e\(^{-rt}\) - Current Market Price

INTRINSIC VALUE AND TIME VALUE OF OPTION - CALL

Option Premium is the component of two parts:

- Intrinsic Value = Maximum of (0, Current Market Price - Exercise Price);
- Time Value of Option = Option Premium - Intrinsic Value

INTRINSIC VALUE AND TIME VALUE OF OPTION - PUT

- Intrinsic Value of Put Option = Maximum of (0, Exercise Price - Current Market Price);
- Time Value of Option = Option Premium - Intrinsic Value

STRADDLES

- Straddle can be of two types:
  1. **Long Straddle**: Buying a Call and a Put with the same strike price and the same expiry date. In Long straddle, the investor will have to pay premium on the call as well as on the put option contract.
  2. **Short Straddle**: Selling a Call and a Put with the same strike price and the same expiry date. In Short straddle, the investor will receive premium on the call as well as on the put option contract.

RISK NEUTRAL METHOD - FOR CALL

Value/Premium/Price Of Call As On Today = \( \frac{C_1 \times p + C_2 \times (1 - p)}{(1 + r)} \)

HOW TO CALCULATE PROBABILITY

**Alt 1**: \( p = \frac{\text{Spot Price} (1 + \text{Interest Rate}) - \text{Lower Price}}{\text{Higher Price} - \text{Lower Price}} \)

**Alt 2**: \( r = \text{rate of interest adjusted as per option period} \)

CALCULATION OF OPTION PREMIUM FOR CALL UNDER BINOMIAL MODEL - HEDGE RATIO TECHNIQUE

Option Premium = \( \Delta \times \text{Current Market Price} - \text{Amount Of Borrowing} \),

\[ \Delta = \frac{\text{Value Of Call On Expiry At High Price} - \text{Value Of Call On Expiry At Low Price}}{\text{High Price} - \text{Low Price}} \]

Amount Of Borrowings: \( B = \frac{1}{1 + r} (\Delta S_2 - C_2) \)

CALCULATION OF AMOUNT OF BORROWING UNDER HEDGE RATIO TECHNIQUE

Amount Of Borrowings: \( B = \frac{1}{1 + r} (\Delta S_2 - C_2) \) or \( \frac{1}{1 + r} (\Delta S_1 - C_1) \)

Where \( r = \text{rate of interest adjusted for periods} \)

HEDGE RATIO OR DELTA FOR CALL

\[ \Delta = \frac{\text{Change in Option Premium}}{\text{Change in Price of Underlying Asset}} = \frac{C_1 - C_2}{S_1 - S_2} \]

**Note**: Delta of a Call Option is always positive and Delta of a Put Option is always negative

DELTA OF PUT OPTION

\[ \Delta = \frac{\text{Value Of Put On Expiry At High Price} - \text{Value Of Put On Expiry At Low Price}}{\text{High Price} - \text{Low Price}} = \frac{C_1 - C_2}{S_1 - S_2} \]

**Note**: It will always be negative.
OPTIONS GREEKS

**Gamma (Sensitivity to Change in Delta)**: It is a measure of the rate of change of the delta with respect to the price of the underlying asset.

It is calculated as: \( \text{Gamma} = \frac{\text{Change in Delta}}{\text{Change in Price of Underlying Asset}} \)

**Vega (Sensitivity to Change in Volatility of Asset Price)**: It is a measure of the rate of change in option price with respect to the percentage change in volatility.

It is calculated as: \( \text{Vega} = \frac{\text{Change in Option Premium}}{\text{Change in Volatility of Price}} \)

**Theta (Sensitivity to Change in Time to Expiry)**: It is the rate of change in value of the option with respect to time to maturity.

It is calculated as: \( \text{Theta} = \frac{\text{Change in Option Premium}}{\text{Change in Time to Expiry}} \)

**Rho (Sensitivity to Change in Interest Rate)**: It is the rate of change in option price with respect to change in interest rate.

It is calculated as: \( \text{Rho} = \frac{\text{Change in Option Premium}}{\text{Change in Rate of Interest}} \)

**Put Call Parity Theory (PCPT)**

Symbolically: As per PCPT we have:

\[ \text{OP of Call As On Today} + \text{Present Value of Strike Price} = \text{OP of Put As On Today} + \text{Current Market Price} \]

**Black & Scholes Model - For Call**

\[ \text{Value or Premium Of Call Option} = \text{Spot Price} \times N(d_1) - \text{Exercise Price} \times e^{-rt} \times N(d_2) \]

**How to Calculate D1 & D2**

\[ d_2 = \frac{\ln \left( \frac{\text{Current Market Price}}{\text{Exercise Price}} \right) + [r + 0.5\sigma^2] \times t}{\sigma \sqrt{t}} \]

\[ d_1 = d_2 - \sigma \sqrt{t} \]

\( \sigma = \text{Standard Deviation} \quad t = \text{remaining life to expiration of the option in terms of year} \quad \text{for example for a call option of 6 months } t = 0.5 \), for a call option of 73 days \( t = \frac{73}{365} \)

\( r = \text{continuous compounded risk free annual rate of return} \quad \text{ln} = \text{Natural Log} \)

**Black & Scholes Model - When Dividend Amount is Given**

As per BSM Model: Value of Call Option = Adjusted Current Price \( \times N(d_1) \) – Exercise Price \( \times e^{-rt} \times N(d_2) \)

\[ \text{ln} \left( \frac{\text{Adjusted Current Market Price}}{\text{Exercise Price}} \right) + [r + 0.5\sigma^2] \times t \]

\( d_1 = \frac{\ln \left( \frac{\text{Adjusted Current Market Price}}{\text{Exercise Price}} \right) + [r + 0.5\sigma^2] \times t}{\sigma \sqrt{t}} \)

\( d_2 = d_1 - \sigma \sqrt{t} \)

Where Adjusted Current Market Price = Current Market Price - Present Value Of Dividend Income

**Party to Lease Agreement**

There are two parties under any lease agreement:

(i) **Lessor**: Owner of the asset is known as Lessor.

(ii) **Lessee**: The party who uses the asset is known as Lessee.

**Treatment of Depreciation**

Depreciation can be calculated in the following manner:

(i) **Straight Line Method** (SLM)

(ii) **Written Down Value** (WDV)

Depreciation is charged by the owner of the asset.
Under Lease Agreement it is the lessor who claims the depreciation and Under Loan Agreement it is charged by the Borrower.

Depreciation is not an item of Cash Outflow, hence it should not be considered for our analysis.

However, Tax Saving on depreciation is an item of inflow and hence must be recognized.

Tax Saving On Depreciation = Amount Of Depreciation x Tax Rate

### TREATMENT OF SALVAGE VALUE - WDV IN CASE OF PROFIT

Adjusted Salvage Value = Salvage Value - Profit On Sale x Tax Rate

### TREATMENT OF SALVAGE VALUE - WDV IN CASE OF LOSS

Adjusted Salvage Value = Salvage Value + Loss On Sale x Tax Rate

### TREATMENT OF SALVAGE VALUE - SLM

Salvage Value is not adjusted for tax under SLM unless otherwise stated.

### TREATMENT OF TAXATION

All cash inflows and outflows which are a part of Profit and Loss account should be taken after tax.

### TREATMENT OF TAXATION FOR ITEMS ARISING AT THE BEGINNING OF EACH YEAR:

Tax Savings On Items Arising At the Beginning of each year can be taken

**Alt 1:** Either at the end of each year [Normally preferred in case of Leasing Chapter]

**Alt 2:** At the beginning of each year

### PARTIES UNDER LOAN AGREEMENT

There are two parties under loan agreement

1. **Borrower:**
   - Borrower will take loan
   - Borrower will be the user as well as the owner of the assets
   - Borrower will be entitled to Charge depreciation and will receive Salvage value

2. **Bank**
   - Bank will give loan
   - Bank will be neither be a user nor the owner of the assets
   - Bank will be not Charge depreciation and will not receive Salvage value

### LESSEE VS BORROWER

Calculate Present Value Of Outflow under both the option separately by using the discount rate and choose such option which involves least outflow.

#### LESSEE

<table>
<thead>
<tr>
<th>No Depreciation Charge</th>
<th>Charge Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>User &amp; Owner</td>
</tr>
<tr>
<td>Not Entitled To Salvage Value</td>
<td>Entitled To Salvage Value</td>
</tr>
<tr>
<td>Pay Lease Rent</td>
<td>No Lease Rent Is Paid</td>
</tr>
<tr>
<td>No Principal Repayment</td>
<td>Principal Repayment</td>
</tr>
<tr>
<td>No Payment Of Interest</td>
<td>Interest Payment</td>
</tr>
</tbody>
</table>

#### BORROWER

Evaluation For Lessee

Lessee should choose such option which will minimize its Outflow and maximize its Inflow. He should generally undertake the following steps for taking decision:

**Step 1:** He should first evaluate its inflow and outflow under both the option given in question

Major Outflow Under Leasing Option:

(i) Lease Rent Paid Net Of Tax

Major Inflow Under Leasing Option:

No major inflow for lessee

There may be other inflow and outflow which, if given in question, must be also taken into account.

**Step 2:** Discount Rate: \( Kd = \text{Interest Rate} \times (1-\text{Tax}) \)

**Step 3:** Calculate Present Value Of Cash Outflow(PVCO) by using the discount rate
EVALUATION FOR BORROWER

Borrower should choose such option which will minimize its Outflow and maximize its Inflow. He should generally undertake the following steps for taking decision:

Step 1: He should first evaluate its inflow and outflow under both the option given in question

Major Outflow Under Borrowing Option:
(i) Interest Paid Net Of Tax
(ii) Principal Repayment

Major Inflow Under Borrowing Option:
(i) Tax Saving On Depreciation
(ii) Salvage Value Adjusted for Tax on Capital Gain/Loss

Step 2: Discount Rate: Kd = Interest Rate (1 - tax)

Step 3: Calculate Present Value Of Cash Outflow (PVCO) by using the discount rate.

BREAKEVEN LEASE RENTALS FROM THE VIEWPOINT OF LESSEE:

The break even lease rental is the rental at which the lessee is indifferent to a choice between lease financing and borrowing option.

At Breakeven Lease Rental:

PV Of Cash Outflow Under Loan Option = PV Of Cash Outflow Under Lease Option

HOW TO EVALUATE FROM THE POINT OF VIEW OF LESSOR- AN INVESTMENT DECISION

While deciding whether to give asset on Lease or not, Lessor should undertake following steps

Step 1: He should first evaluate the inflows and outflows

Major Outflow: Cost Of Asset

Major Inflow: Lease Rental Received Net Of Tax, Tax Saving on Depreciation, Salvage Value adjusted for tax.

Step 2: Discount Rate: Ko = Cost Of Capital

Step 3: Calculate NPV

Decision: If NPV is positive, then Lessor should give the asset on Lease otherwise he should not give.

EQUAL ANNUAL LOAN INCLUSIVE OF INTEREST:-
WHEN INSTALMENT IS PAID AT THE END OF EACH YEAR

For calculating Equal Annual Loan Inclusive Of Interest we will use following formula:

\[
\text{Cost Of Asset (or Loan Taken If It Differs)} \div \text{PVAF} (r \%, n \text{ years})
\]

Where \( r \) = interest rate charged by bank before tax i.e Kd before tax.

EQUAL ANNUAL LOAN INCLUSIVE OF INTEREST:-
WHEN INSTALMENT IS PAID AT THE BEGINNING OF EACH YEAR

For calculating Equal Annual Loan Inclusive Of Interest we will use following formula:

\[
\text{Cost Of Asset (or Loan Taken If It Differs)} \div (1 + \text{PVAF} (r \%, n - 1 \text{ years}))
\]

Where \( r \) = interest rate charged by bank before tax i.e Kd before tax.

PRESENT VALUE OF INTEREST NET OF TAX & PRINCIPAL REPAYMENT MUST BE EQUAL TO THE AMOUNT OF LOAN PROVIDED DISCOUNT RATE IS Kd

When discount rate is Kd then-

\[
\text{PV Of Interest Net Of Tax + Present Value Of Principal Repayment} = \text{Amount Of Loan}
\]

NET ADVANTAGE OF LEASING (NAL)

\( \text{NAL} = \text{Outflow Under Loan Option} - \text{Outflow Under Lease Option} \)

Decision: If NAL is positive, Lease Option is preferred, otherwise select Loan Option.

EQUAL MONTHLY INSTALMENT - WHEN INSTALMENT IS PAID AT THE END OF EACH MONTH

\[
\text{EMI} = \frac{\text{Cost Of Asset (or Loan Taken If It Differs)}}{\text{PVAF} (r \%, n \times 12 \text{ periods})}
\]

Where \( r \) = interest rate charged by bank before tax i.e Kd before tax.

EQUAL MONTHLY INSTALMENT - WHEN INSTALMENT IS PAID AT THE BEGINNING OF EACH MONTH

\[
\text{EMI} = \frac{\text{Cost Of Asset (or Loan Taken If It Differs)}}{1 + \text{PVAF} [r \%, (n \times 12 \text{ periods} - 1)]}
\]

Where \( r \) = interest rate charged by bank before tax i.e Kd before tax.
**NET PRESENT VALUE (NPV)**

- **Formula:** Net Present Value (NPV) = Present Value Of Cash Inflows - Present Value Of Cash Outflows
- **Accept/Reject Criterion:** NPV > 0 Accept the proposal; NPV = 0 Indifference point; NPV < 0 Reject the proposal
- **Note:** If question has not said specifically that which evaluation technique should be used, we will always prefer NPV Method.

**RISK ADJUSTED DISCOUNT RATE (RADR)**

- Under this technique we discount the Cash Flows by a rate higher than Risk Free Rate. Such rate is known as Risk Adjusted Discount Rate. Such rate is computed in the following manner
  - **Alternative 1:** \[(1 + \text{Risk Adjusted Discount Rate}) = (1 + \text{Risk Free Discount Rate}) (1 + \text{Risk Premium})\]
  - **Alternative 2:** It can also be calculated by using CAPM: Discount Rate = \(R_f + \beta \times (R_m - R_f)\)

**Note:** The Net Present Value computed by using Risk Adjusted Discount Rate is known as Risk Adjusted Net Present Value.

**CERTAINTY EQUIVALENT APPROACH (CEC)**

- Certainty Equivalent Approach involves discounting of Certain Cash Flows instead of the Total Cash Flows.

**Steps In Certainty Equivalent Approach**

- **Step 1:** Estimate the total future cash flows from the proposal. These cash flows have some degree of risk involved.
- **Step 2:** Calculate the Certainty Equivalent Coefficient (CEC) factors for different years.
  - The value of CEC can vary between 1 indicating no risk and 0 indicating the extreme risk. This means higher the risk, lower is the value of CEC. (This value is generally given in question)
- **Step 3:** Multiply Total Cash Flows (Step 1) \(\times\) CEC (Step 2) = Certainty Equivalent Cash Flows
- **Step 4:** Certainty Equivalent Cash Flows are discounted at Risk Free Rate to find out the NPV of the proposal.

**EXPECTED NET PRESENT VALUE OR EXPECTED CASH FLOWS OR EXPECTED VALUE**

Expected NPV or Expected CF or Expected Value = \(\sum\) Each possible outcome of an event \(\times\) Probability of that outcome occurring

**Example:**

<table>
<thead>
<tr>
<th>Estimated Value</th>
<th>Probability</th>
<th>Estimated Value (\times) Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>.1</td>
<td>100</td>
</tr>
<tr>
<td>2000</td>
<td>.3</td>
<td>600</td>
</tr>
<tr>
<td>4000</td>
<td>.3</td>
<td>1200</td>
</tr>
<tr>
<td>3000</td>
<td>.2</td>
<td>600</td>
</tr>
<tr>
<td>5000</td>
<td>.1</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>(\sum) Expected Value/NPV/Cash Flow = 3000</td>
</tr>
</tbody>
</table>

**Note:** Probability Of All Outcomes will always be equal to 1

**PROFITABILITY INDEX (PI) / BENEFIT COST RATIO / PRESENT VALUE INDEX / DESIRABILITY FACTOR**

- **Formula:** Profitability Index (PI) = Present Value Of Inflows / Present Value Of Outflows
- **Accept/Reject Criterion:** Where PI > 1 Accept the proposal; PI = 1 Indifference point; PI < 1 Reject the proposal

**EFFECT ON CASH FLOW DUE TO INFLATION**

- The future cash flows can be either expressed as
  - (i) inclusive of inflation which are referred as Money Cash Flows
  - (ii) exclusive of inflation which are referred as Real Cash flows
- **Conversion of Real Cash Flows into Money Cash Flows and Vice-versa:**
  \[\text{Money Cash flows} = \text{Real Cash Flows} \times (1 + \text{Inflation Rate})\]

Money Cash flows = Real Cash Flows (1+ Inflation Rate) or Real Cash Flows = Money Cash Flows / (1+ Inflation Rate)

**NOTE:**

- **Discount Rate can be expressed either as**
  - (i) inclusive of future inflation which is referred to as Money Discount Rate
  - (ii) exclusive of future inflation which is referred to as Real Discount Rate
Conversion of Money Discount Rate into Real Discount Rate and vice versa:

\[(1 + \text{Money Discount Rate}) = (1 + \text{Real Discount Rate})(1 + \text{Inflation Rate})\]

**CALCULATION OF NPV WHEN INFLATION RATE IS GIVEN**

- Present Value may be found either by
  (i) Discounting the Real Cash Flows at the Real Discount Rate or
  (ii) Discounting the Money Cash Flows at the Money Discount Rate
- In both cases resultant NPV would be same

*Note*: If question said that the value are given at "Current Prices " it means that these prices are given without taking the effect of inflation.

**COMPARISON IN CASE OF UNEQUAL LIFE/EQUATED ANNUAL VALUE**

- If two projects have unequal life , then the two projects are not comparable . To make them comparable we will use Equivalent Annual Value Concept for each project by applying the following formula:

\[\text{NPV or Present Value Of Cash Outflow or Present Value Of Cash Inflow} = \frac{\text{PVAF}(K\%, n \text{ years})}{\text{Value}}\]

Where \(K\%\) = Discount Rate and \(n\) = Total Life of the project

**PAY BACK PERIOD/PAY OFF PERIOD/CAPITAL RECOVERY PERIOD: IN CASE OF EVEN CASH FLOWS**

- **Payback Period** is the period within which the total cash inflows from the project equals the cost of the project.

**Formula**: Payback Period \[= \frac{\text{Initial Investment}}{\text{Annual Cash Inflows}}\]

**Decision**: The project with the lower payback period will be preferred.

**PAY BACK PERIOD/PAY OFF PERIOD/CAPITAL RECOVERY PERIOD: IN CASE OF UNEVEN CASH FLOWS**

**Formula**: Payback Period \[= \text{Completed Years} + \frac{\text{Remaining Amount}}{\text{Available Amount}}\]

**Decision**: The project with the lower payback period will be preferred.

**SENSITIVITY ANALYSIS/SCENARIO ANALYSIS - KEEPING NPV = 0**

- **Meaning**: Sensitivity Analysis enables managers to assess how responsive the Net Present Value is to changes in the variables or factors which are used to calculate it.
- **Importance**: It directs the management to pay maximum attention towards the factor where minimum percentage of adverse changes causes maximum adverse effect.
- **Decision**: If NPV were to become 0 with 2\% change in Initial Investment relative to 10\% change in Cash Inflows, Project is said to be more sensitive to Initial Investment than to Cash Inflows.

**Symbolically**: Sensitivity \(\%\) = \[\frac{\text{Change}}{\text{Base}}\times100\]

Some factors to be used under Sensitivity Analysis are Size of the project, Cash flows, Life of the project, Discount rate.

Under this analysis adverse effect of each input variable (parameters) is considered separately and all other variables are held constant.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Adverse Effect</th>
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<tbody>
<tr>
<td>Inflow</td>
<td>Decrease</td>
</tr>
<tr>
<td>Discount Rate</td>
<td>Increase</td>
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<tr>
<td>Outflow</td>
<td>Increase</td>
</tr>
<tr>
<td>Life</td>
<td>Decrease</td>
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</tbody>
</table>

**SENSITIVITY ANALYSIS USING % ADVERSE VARIATION IN FACTORS**

- Under this method Sensitivity is calculated by taking adverse changes by a specific \% which will be indicated in question
- The adverse factor for which \% Fall In NPV is maximum is considered to be most sensitive.

\[\% \text{ Fall In NPV} = \frac{\text{Revised NPV} - \text{Original NPV}}{\text{Original NPV}}\times100\]

**PROBABILITY OF OCCURRENCE IF THE CASH FLOWS ARE (A) PERFECTLY DEPENDENT OVER TIME (B) INDEPENDENT OVER TIME**
The probability of occurrence of the worst or best case if the cash flows are
(a) Perfectly Dependent Overtime is Required Probability  
(b) Independent Overtime is (Required Probability) n
Where n = Life Of The Project

**Beta of a Firm/Firm Beta/Overall Beta of Firm/Asset Beta/Project Beta-if Tax is Nil**

\[
\text{Overall Beta or Firm Beta or Asset Beta or Project Beta} = \text{Equity Beta} \times \left(\frac{\text{Equity}}{\text{Debt} + \text{Equity}}\right) + \text{Debt Beta} \times \left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}}\right)
\]

**Beta of a Firm/Firm Beta/Overall Beta of Firm/Asset Beta/Project Beta-if Tax is Considered**

\[
\text{Overall Beta or Firm Beta or Asset Beta or Project Beta} = \text{Equity Beta} \times \left(\frac{\text{Equity}}{\text{Debt}(1-\text{tax}) + \text{Equity}}\right) + \text{Debt Beta} \times \left(\frac{\text{Debt}(1-\text{tax})}{\text{Debt}(1-\text{tax}) + \text{Equity}}\right)
\]

**Levered and Unlevered Firm**

- If a company finances its investments and projects completely with Equity then the company is known as **Unlevered Firm**
- If a company finances its investments and projects both with Equity and Debt then the company is known as **Levered Firm**

**Overall Cost of Capital (KO)-If Tax is Nil**

**Alt 1:**  
\[\text{K}_o = \text{Risk Free Rate} + \beta \times \text{Overall [Market Return – Risk Free Return]}\]

**Alt 2:**  
\[\text{K}_o = \text{Cost Of Equity} \times \text{Weight Of Equity} + \text{Cost Of Debt} \times \text{Weight Of Debt} = \text{K}_e \times W_e + \text{K}_d \times W_d\]

Where,
\[\text{K}_e = \text{Risk Free Rate} + \text{Equity Beta} (\text{Market Return} – \text{Risk Free Rate}) = R_f + B_{\text{Equity}} (R_m - R_f)\]
\[\text{K}_d = R_f + B_{\text{Debt}} (R_m - R_f)\]

**Overall Cost of Capital (KO)-If Tax is Considered**

\[\text{K}_o = \text{Cost Of Equity} \times \text{Weight Of Equity} + \text{Cost Of Debt} \times \text{Weight Of Debt} = \text{K}_e \times W_e + \text{K}_d \times W_d\]

Where, \[\text{K}_e = \text{Risk Free Rate} + \text{Equity Beta} (\text{Market Return} – \text{Risk Free Rate}) = R_f + B_{\text{Equity}} (R_m - R_f)\]
\[\text{K}_d = \text{Interest (1-Tax)}\]

**Cost of Capital for Unlevered Firm**

- Cost Of Capital = Cost Of Equity

**Overall Beta for Unlevered Firm**

- Overall Beta For Unlevered Firm = Equity Beta

**Debt Equity Ratio**

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

**Debt Ratio**

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

**Effect in Overall Beta due to Change in Capital Structure**

- A school of thought led by Modigliani and Miller’s theory believe that Overall Beta of the firm is not affected by the Change in Capital Structure.
- Overall Beta of a firm will be same as other company belonging to the same industry(sector) and it will not be effected by the Change in Capital Structure.

**Effect in Equity & Debt Beta due to Change in Capital Structure**

- Equity Beta and Debt Beta Changes with the change in Capital Structure
For example: Overall Beta of Idea Company will be same as Overall Beta of Airtel Company as both the company belong to the same industry. But there Equity Beta and Debt Beta may be different at different Capital Structure.

**TREATMENT OF WORKING CAPITAL**

In the absence of information the students are advised to assume:

- Introduction Of Working Capital at the beginning. This should be treated as Outflow.
- Release Of Working Capital at the end. This should be treated as Inflow.

**Note**: Changes in items such as Working Capital do not affect taxes.

**Note**: Any Increase in Working Capital should be treated as Outflow.

**Note**: Any Decrease in Working Capital should be treated as Inflow.

**HILLER’S MODEL**

When Cash Flows are Dependent or correlated: Standard Deviation of the project as a whole:

\[ (SD_1 \times PVF_1) + (SD_2 \times PVF_2) + \ldots + (SD_n \times PVF_n) \]

When Cash Flows are Independent or uncorrelated: Standard Deviation of the Project as a whole:

\[ \sqrt{(SD_1 \times PVF_1)^2 + (SD_2 \times PVF_2)^2 + \ldots + (SD_n \times PVF_n)^2} \]

**BREAKEVEN UNITS**

- BEP refers to that volume of sales where the profit or loss is zero.
- Break Even Units = \( \frac{\text{Fixed Cost} \times 100}{\text{Contribution Per Unit}} \)

**MODIFIED NPV**

- The Net Present Value calculated so far was based on an assumption that the cash inflow that is generated over the years is invested at the same rate at which our cash flows are discounted. But this may not be true in all cases. It may so happen that the cash inflows of the project may be invested at different rates. In such case we should compute Modified NPV as follows:
- Find the Future Value of cash inflows at the given rate of investment for the remaining years. So if the project is for 5 years, the cash inflow generated in the first year end shall be compounded for 4 years. Similarly the cash inflow generated in the second year end shall be compounded for 3 years and so on.
- Take the total of future values which may be termed as Future Value or Terminal Value.
- Find the Present Value Of Cash Inflows in the following manner:
  \[ \text{Modified Net Present Value} = \text{Present Value Of Cash Inflows} - \text{Initial Cash Outflow} \]

**MODIFIED IRR**

- Modified IRR is the rate at which Modified NPV is zero.

**THEORETICAL POST-RIGHTS (EX-RIGHT) PRICE PER SHARE**

Theoretical Post-Rights (ex-right) or After Right Price Per Share =

\[ \text{MPS Cum Right} \times \text{Existing No. Of Share} + \text{Right Share Price} \times \text{No. of Right Shares} \]

\[ \text{Existing No. Of Share} + \text{New Number Of Right Share Issued} \]

**THEORETICAL VALUE OF THE RIGHTS ALONE**

- **Alt 1**: Value Of Right Per Share = MPS Before Right - MPS After Right
- **Alt 2**: Value Of Right Per Share = MPS Ex Right - Offer Price

\[ \text{No. Of Shares In Respect Of Which One Right Shares Are Issued} \]

**MPS AFTER RIGHT ISSUE IN CASE OF SYNERGY (NPV)**

MPS of the Project After Right Issue =

\[ \text{Existing MPS} \times \text{Existing Share} + \text{Right Share Price} \times \text{Right Shares} + \text{Synergy or NPV} \]

\[ \text{Existing No. Of Share} + \text{New Number Of Right Share Issued} \]
FRA: HOW TO CALCULATE PROFIT/LOSS

\[ \text{FRA (Net Settlement)} = \frac{\text{Rate At Expiration} - \text{Forward Contract Rate} \times \frac{\text{Days in underlying rate}}{360 \text{ or } 365}}{1 + \text{Rate at expiration} \times \frac{\text{Days in underlying rate}}{360 \text{ or } 365}} \]

HOW TO CALCULATE EVA

Symbolically: EVA = Net Operating Profit After Taxes - Cost Of Capital Employed
Where Net Operating Profit After Taxes [NOPAT] = EBIT(1 - Tax)
Cost Of Capital Employed = Cost Of Capital \times Capital Employed

Cost Of Capital (Ko) or Weighted Average Cost of Capital (WACC) = \( K_e \times W_e + K_r \times W_r + K_d \times W_d + K_p \times W_p \)

Note: In Calculating Operating Profit, interest is not deducted as interest is a non-operating items.
Note: Total Funds / Capital Employed includes: Equity Share Capital + Reserves + Debentures + Preference Share Capital + Long Term Loan - Profit and Loss Account (Dr.) - Fictitious Asset

Note: Financial Leverage = \( \frac{\text{Earning or Profit Before Interest and Tax}[EBIT]}{\text{Earning or Profit Before Tax}[EBIT]} \)

Note: EBT = EBIT - Interest

MARKET VALUE ADDED (MVA)

Symbolically:

From Equity Point Of View
MVA = Current Value of the securities of the Company in the Market - Total Amount of Shareholder’s Funds [Balance Sheet Fig.]
Note: Shareholder’s Funds [Balance Sheet Fig.] includes Equity Share Capital + Retained Earning - Accumulated Loss - P/L Account (Debit Balance)

From Overall Company’s Point Of View
MVA = Value of the Company Based On Free Cash Flows - Total Capital Employed or Amount Invested

INTEREST COVERAGE RATIO (ICR)

A ratio used to determine how easily a company can pay interest on outstanding debt.

\[ \text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expense}} \]

The lower the ratio, the more the company is burdened by debt expense. An interest coverage ratio below 1 indicates the company is not generating sufficient revenues to satisfy interest expenses.

Decision: Higher the better

CAPITAL GEARING RATIO (CGR)

Formula: Capital Gearing Ratio = \( \frac{\text{Fixed Income Bearing Funds}}{\text{Equity Shareholders’ Fund}} = \frac{(\text{Preference Share Capital} + \text{Debentures} + \text{Long Term Loan})}{(\text{Equity Share Capital} + \text{Reserves} \& \text{Surplus} - \text{Losses})} \)

Decision: Lower the better

FIXED INTEREST AND DIVIDEND COVERAGE

Interest and Fixed Dividend Coverage = \( \frac{\text{PAT} + \text{Debenture Interest}}{\text{Debenture Interest} + \text{Preference Dividend}} \)

Decision: Higher the better

EXPONENTIAL MOVING AVERAGE (EMA)

Formula: EMA = EMA yesterday + \( a \times [\text{Price Today} - \text{EMA Yesterday}] \) Where \( a = \text{Smoothing Constant} / \text{Multiplier} \). It will be normally given in question. If not given than it can be calculated by using \( a = \frac{2}{N+1} \) where N is the number of items in the average.

SHARPE’S OPTIMAL PORTFOLIO/APPLICATION OF CUT OFF POINT

1. Find out the “excess return to beta” ratio for each stock under consideration.
2. Rank them from the highest to the lowest.
3. Proceed to calculate Cut Off Point Of Security (Ci) for all the stocks according to the ranked order using the following formula:
\[ C_i = \frac{\sigma_m^2 \sum_{i=1}^{N} (R_i - R_f) \times \beta_i}{\sigma_{ei}^2 + \sigma_m^2 \sum_{i=1}^{N} \frac{\beta_i^2}{\sigma_{ei}^2}} \]

Where \( \sigma_{ei}^2 \) = variance of a stock’s movement that is not associated with the movement of market index i.e. stock’s unsystematic risk.

The highest \( C_i \) value is taken as the cut-off point i.e. \( C^* \). It is the cut off rate. Security with \( C^* \) value and the securities before this security are to be included in the portfolio and others are rejected.

4. The next step is to calculate weights. For this purpose we have to calculate \( Z_i \).

\[ Z_i = \frac{\beta_i}{\sigma_{ei}^2} \left[ \frac{R_i - R_f - C^*}{\beta_i} \right] \]

By using \( Z_i \), weights are calculated.

**VALUE OF EQUITY AS PER RISK PREMIUM APPROACH**

Value of Equity Share = \( \frac{\text{Actual Yield Of The Company}}{\text{Expected Yield Of Industry Adjusted According To Risk}} \times \text{PaidUp Value Per Share} \)

Actual Yield On Equity Shares(%): \( \frac{\text{Yield On Shares}}{\text{Equity Share Capital}} \times 100 \)

**BOND IMMUNIZATION**

- A portfolio is immunized when its duration equals the investor’s time horizon. In other words, if the average duration of portfolio must be equals the investor’s planned investment period.
- A portfolio is immunized when it is “unaffected” by interest rate changes.

**TEST OF HYPOTHESIS/RUN TEST/DEGREE OF FREEDOM**

**Step-1:** First Calculate Mean Value of \( r \) & Standard Deviation in the following manner.

\[ \text{Mean Value Of } r = \frac{2n_1n_2}{n_1 + n_2} + 1 \]

\[ \text{Standard Deviation} = \sqrt{\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}} \]

Here \( n_1 \) refers to total number of positive changes; \( n_2 \) refers to total number of negative changes.

**Step-2:** Calculate Standard Lower & Upper Limit in the following manner:

The Standard Lower limit = Mean Value Of \( r \) - Table Value x SD

The Standard Upper limit = Mean Value Of \( r \) + Table Value x SD

**Step-3:** Decision: If our value of \( r \) lies within the standard lower limit and standard upper limit, the randomness is there i.e. the market is weakly efficient, otherwise it is not weakly efficient.

Here \( r \) refers to number of times sign changes

**Note:** Table Value or Degree Of freedom should be selected in following manner: \( n_1+n_2-1 \)
Thanks to Aaditya Jain Sir, I scored 94 marks in SFM with All India Rank 1.

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<tr>
<td>Name</td>
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### Group I

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<tr>
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<th>Marks</th>
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<tr>
<td>Financial Reporting</td>
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<td>Strategic Financial Management</td>
<td>094</td>
</tr>
<tr>
<td>Advanced Auditing and Professional Ethics</td>
<td>070</td>
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### Result

**Pass**

Thanks to Aaditya Jain Sir. I scored 100 out of 100 marks in SFM with All India Rank 3. You are No.1 SFM Faculty of India. Plz check my result at NRO-0329834; Roll No.-426168; It's a tribute to your teaching.

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### Result

**Pass**

100 OUT OF 100 MARKS IN SFM