

- (iii) If the expected return of market portfolio is 12% at a beta factor of 1.0, what will be the portfolios expected return in both the situations given above?
- (iv) If the Company changes its policy to invest in any 3 securities with a minimum of 20% in each of these 3 securities to diversify risk, you are requested to advise the company to have a right mix of securities to maximize the return in the following two scenarios and also calculate the expected return:

(1) Bull Phase: Expected Market returns 10%

(2) Bear Phase: Expected Market returns — 5%

**(Exam Nov – 2022) (8 Marks)**

**Solution:**

$$\begin{aligned} \text{(i)} \quad B_p &= \frac{1.6 + 1 - 0.30 + 2 + 0.6}{5} \\ &= 0.98 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad B_p &= (1.60 \times 0.15) + (1 \times 0.30) + (-0.3 \times 0.15) + (2 \times 0.30) + \\ &\quad (0.6 \times 0.10) \\ &= 1.155 \end{aligned}$$

**(iii)** [Since  $R_f$  is not given hence we calculate  $ER_p$  as below]

$$ER_p = R_m \times B_p$$

$$\text{Situation I} = 12 \times 0.98 = 11.76\%$$

$$\text{Situation II} = 12 \times 1.155 = 13.86\%$$

**(iv) Bull Phase**

In this situation portfolio Beta should be higher hence we invest 20% in S Ltd. 20% in K Ltd. & 60% in D Ltd.

$$\begin{aligned} B_p &= (1.60 \times 0.20) + (1 \times 0.20) + (2 \times 0.60) \\ &= 1.72 \end{aligned}$$

$$ER_p = 10 \times 1.72$$

$$= 17.20\%$$

**Bearish Phase**

In this situation portfolio beta should be lower hence we invest 20% in C Ltd., 20% in K Ltd. & 60% in P Ltd.

$$\begin{aligned} B_p &= (0.6 \times 0.2) + (1 \times 0.2) + (-0.3 \times 0.6) \\ &= 0.14 \end{aligned}$$

$$\begin{aligned} ER_p &= -5 \times 0.14 \\ &= -0.7\% \end{aligned}$$

**Question – 21**

Mr. A is having 1 lakh shares of K Ltd. The beta of the company is 1.40.

Mr. B a financial advisor has suggested having the following portfolio:

| Security | Beta | % Holding |
|----------|------|-----------|
| L        | 1.20 | 10        |
| M        | 0.75 | 10        |
| N        | 0.40 | 30        |
| O        | 1.40 | 50        |
|          |      | 100       |

Market Return is 12%

Risk free rate is 8%

You are required to calculate the following for the present investment and suggested portfolio:

- (i) What is the expected return based on CAPM and also
  - (1) If the market goes up by 2.5%.
  - (2) If the market goes down by 2.5%.
  - (3) If the market is giving a negative return of 2.5%.
- (ii) If the probability of market giving negative return is more, please advise Mr. A whether to continue the holdings of M/s. K Ltd. or to buy the portfolio as per the suggestion of Mr. B. If so, why?

**(RTP May – 2022)****Solution:****(i) Expected Return as per CAPM**

$$\text{Beta of K Ltd.} = 1.40$$

$$\begin{aligned} B_p &= (1.20 \times 0.10) + (0.75 \times 0.10) + (0.40 \times 0.30) + (1.40 \times 0.50) \\ &= 1.015 \end{aligned}$$

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

$$\text{K Ltd.} = 8 + 1.40 (12 - 8) = 13.6\%$$

$$\text{Portfolio} = 8 + 1.015 (12 - 8) = 12.06\%$$

**(1) If market return goes up by 2.5%**

$$\text{It means } R_m = [12 + 2.5] = 14.5\%$$

$$E_R \text{ K Ltd.} = 8 + (14.5 - 8) 1.40 = 17.1\%$$

$$\text{Portfolio} = 8 + (14.5 - 8) 1.015 = 14.6\%$$

**(2) If market goes down by 2.5%**

$$R_m = [12 - 2.5] = 9.5\%$$

$$E_R \text{ K Ltd.} = 8 + (9.5 - 8) 1.40 = 10.1\%$$

$$\text{Portfolio} = 8 + (9.5 - 8) 1.015 = 9.52\%$$

**(3)  $R_m = -2.5$** 

$$\text{K Ltd.} = 8 + (-2.5 - 8) 1.40 = -6.7\%$$

$$\text{Portfolio} = 8 + (-2.5 - 8) 1.015 = -2.66\%$$

**(ii)** Since  $B_p = 1.015$  is less than Beta of K Ltd. (1.40) hence it is better to invest in portfolio.

**Question – 22**

Following is the information related to return on shares of three different companies:

| Years | A Ltd. | B Ltd. | C Ltd. |
|-------|--------|--------|--------|
| 2018  | 2%     | 3%     | 5%     |
| 2019  | 6%     | 8%     | 7%     |
| 2020  | 13%    | 14%    | 15%    |
| 2021  | 7%     | 9%     | 11%    |

**Required:**

- (i) Construct maximum number of portfolio and its return, if each portfolio consists of any two Company's shares in proportion of 65% and 35% and suggest which portfolio provides highest return.
- (ii) Calculate portfolio return and beta ( $\beta$ ), if Mr. X invests ₹ 65,000 in A Ltd. having beta ( $\beta$ ) of 0.45; ₹ 20,000 in B Ltd. having beta ( $\beta$ ) of 1.15 and ₹ 15,000 in C Ltd. having beta ( $\beta$ ) of 1.8.

**(Exam Nov – 2022) (8 Marks)**

**Solution:**

| Year | A Ltd.    | B Ltd.      | C Ltd.      |
|------|-----------|-------------|-------------|
| 2018 | 2         | 3           | 5           |
| 2019 | 6         | 8           | 7           |
| 2020 | 13        | 14          | 15          |
| 2021 | 7         | 9           | 11          |
|      | <b>7%</b> | <b>8.5%</b> | <b>9.5%</b> |

**(I) No. of Portfolio & Return**

- (1) A & B (65:35)

$$ER_P = (0.65 \times 7) + (0.35 \times 8.5) = 7.525\%$$

- (2) B & A (65:35)

$$ER_P = (0.65 \times 8.5) + (0.35 \times 7) = 7.98\%$$

- (3) A & C (65:35)

$$ER_P = (0.65 \times 7) + (0.35 \times 9.5) = 7.88\%$$

- (4) C & A (65:35)

$$= (0.65 \times 9.5) + (0.35 \times 7) = 8.63\%$$

$$(5) \quad B \ \& \ C \ (65:35) \\ = (0.65 \times 8.5) + (0.35 \times 9.5) = 8.85\%$$

$$(6) \quad C \ \& \ B \ (65:35) \\ = (0.65 \times 9.5) + (0.35 \times 8.5) = 9.15\%$$

Since maximum return is under combination (6) i.e. 65% investment in C Ltd. & 35% investment in B Ltd. hence it should be opted.

**(II) Portfolio Return & Beta.**

$$ER_P = \frac{(65,000 \times 7) + (20,000 \times 8.5) + (15,000 \times 9.5)}{1,00,000} \\ = 7.68\%$$

$$\beta_p = (0.65 \times 0.45) + (0.2 \times 1.15) + (0.15 \times 1.8) \\ = 0.793$$

**Question – 23**

Your client is holding the following securities:

| Particulars of Securities | Cost<br>₹ | Dividends<br>₹ | Market Price<br>₹ | BETA |
|---------------------------|-----------|----------------|-------------------|------|
| Equity shares:            |           |                |                   |      |
| Co. X                     | 8,000     | 800            | 8,200             | 0.8  |
| Co. Y                     | 10,000    | 800            | 10,500            | 0.7  |
| Co. Z                     | 16,000    | 800            | 22,000            | 0.5  |
| PSU Bonds                 | 34,000    | 3,400          | 32,300            | 0.2  |

Assuming a Risk-free rate of 15%, calculate:

- Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).
- Simple Average return of the portfolio.

**(SM TYK – 28)**

**Solution:**

$$ER_P = \frac{(73,000 - 68,000) + 5,800}{68,000} \times 100$$

$$= 15.88\%$$

$$B_P = \frac{(8,000 \times 0.8) + (10,000 \times 0.7) + (16,000 \times 0.5) + (34,000 \times 0.2)}{68,000}$$

$$= 0.415$$

$$ER_P = R_f + (R_m - R_f) B_P$$

$$15.88 = 15 + (R_m - 15) 0.415$$

$$15.88 = 15 + 0.415 R_m - 6.225$$

$$= \frac{7.12}{0.415} = 17.12\%$$

**(I) Expected return of each security**

$$ER = (R_f + R_m) B$$

$$X = 15 + (17.12 - 15) 0.8 = 16.70\%$$

$$Y = 15 + (17.12 - 15) 0.7 = 16.48\%$$

$$Z = 15 + (17.12 - 15) 0.5 = 16.06\%$$

$$\text{Bond} = 15 + (17.12 - 15) 0.2 = 15.42\%$$

$$\text{(II) Simple average return} = \frac{16.7 + 16.48 + 16.06 + 15.42}{4}$$

$$= 16.17\%$$

**Alternative (ICAI)**

Calculation of expected return on market portfolio ( $R_m$ )

| Investment | Cost (₹)      | Dividends (₹) | Capital Gains (₹) |
|------------|---------------|---------------|-------------------|
| shares X   | 8,000         | 800           | 200               |
| shares Y   | 10,000        | 800           | 500               |
| shares Z   | 16,000        | 800           | 6,000             |
| PSU Bonds  | <u>34,000</u> | <u>3,400</u>  | <u>-1700</u>      |
|            | <u>68,000</u> | <u>5,800</u>  | <u>5,000</u>      |

$$R_m = \frac{5,800 + 5,000}{68,000} \times 100 = 15.88\%$$

Calculation of expected rate of return on individual security:

Security

$$\text{Shares X} \quad 15 + 0.8 (15.88 - 15.0) = 15.70\%$$

$$\text{Shares Y} \quad 15 + 0.7 (15.88 - 15.0) = 15.62\%$$

$$\text{Shares Z} \quad 15 + 0.5 (15.88 - 15.0) = 15.44\%$$

$$\text{PSU Bonds} \quad 15 + 0.2 (15.88 - 15.0) = 15.18\%$$

Calculation of the Average Return of the Portfolio:

$$= \frac{15.70 + 15.62 + 15.44 + 15.18}{4} = 15.49\%.$$

### **Question – 24**

Your client is holding the following securities:

| Particulars of Securities | Cost<br>₹ | Dividends/Interest<br>₹ | Market Price<br>₹ | Beta |
|---------------------------|-----------|-------------------------|-------------------|------|
| Equity Shares:            |           |                         |                   |      |
| Gold Ltd.                 | 10,000    | 1,725                   | 9,800             | 0.6  |
| Silver Ltd.               | 15,000    | 1,000                   | 16,200            | 0.8  |
| Bronze Ltd.               | 14,000    | 700                     | 20,000            | 0.6  |
| GOI Bonds                 | 36,000    | 3,600                   | 34,500            | 0.01 |

Average return of the portfolio is 15.7%, calculate:

- Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).
- Risk free rate of return

**(SM TYK – 26)**

### **Solution:**

#### **(I) Risk Free Rate**

$$R_f = \frac{(34,500 - 36,000) + 3,600}{36,000} \times 100 = 5.833 \%$$

**(II) Beta**

$$= \frac{(0.6 \times 10,000) + (0.8 \times 15,000) + (0.6 \times 14,000) + (0.01 \times 36,000)}{75,000}$$
$$= 0.357$$

**(III) Market Rate of Return**

$$ER_P = R_f + (R_m - R_f) B_P$$

$$15.7 = 5.833 + (R_m - 5.833) 0.357$$

$$R_m = 33.472\%$$

**Expected return of each security**

$$G = 5.833 + (33.472 - 5.833) 0.6 = 22.416\%$$

$$S = 5.833 + (33.472 - 5.833) 0.8 = 27.944\%$$

$$B = 5.833 + (33.472 - 5.833) 0.6 = 22.416\%$$

$$GOI = 5.833 + (33.472 - 5.833) 0.01 = 6.109\%$$

**Alternative (ICAI)**

Expected rate of return on market portfolio

$$\frac{\text{Dividend Earned} + \text{Capital nappreciation}}{\text{Initial investment}} \times 100$$

$$= \frac{\text{₹ } 7,025 + \text{₹ } 5,500}{\text{₹ } 7,025} \times 100 = 16.7\%$$

**Risk Free Return**

$$\text{Average of Betas} = \frac{0.6 + 0.8 + 0.6 + 0.01}{4} = \text{Average of Betas}^* = 0.50$$

Average return = Risk free return + Average Betas (Expected return of market – Risk free return)

$$15.7 = \text{Risk free return} + 0.50 (16.7 - \text{Risk free return})$$

$$\text{Risk free return} = 14.7\%$$



\* Alternatively, it can also be calculated through Weighted Average Beta.

Expected Rate of Return for each security is

$$\text{Rate of Return} = R_f + B (R_m - R_f)$$

$$\text{Gold Ltd.} = 14.7 + 0.6 (16.7 - 14.7) = 15.90\%$$

$$\text{Silver Ltd.} = 14.7 + 0.8 (16.7 - 14.7) = 16.30\%$$

$$\text{Bronze Ltd.} = 14.7 + 0.6 (16.7 - 14.7) = 15.90\%$$

$$\text{GOI Bonds} = 14.7 + 0.01 (16.7 - 14.7) = 14.72\%$$

\*Alternatively, it can also be computed by using Weighted Average Method.

**Solution updated in May-2025 SM:**

\*Alternatively, it can also be computed as follows:

| Particulars of Securities (1) | Cost ₹ (2) | Market Price ₹ (3) | Dividend ₹ (4) | Capital Gain ₹ (5) | Beta (6) | (3) × (6) |
|-------------------------------|------------|--------------------|----------------|--------------------|----------|-----------|
| Gold Ltd.                     | 10,000     | 9,800              | 1,725          | -200               | 0.6      | 5,880     |
| Silver Ltd.                   | 15,000     | 16,200             | 1,000          | 1,200              | 0.8      | 12,960    |
| Bronz Ltd.                    | 14,000     | 20,000             | 700            | 6,000              | 0.6      | 12,000    |
| GOI Bonds                     | 36,000     | 34,500             | 3,600          | -1,500             | 0.01     | 345       |
| Total                         | 75,000     | 80,500             | 7,025          | 5,500              |          | 31,185    |

$$\beta \text{ of the portfolio} = \frac{31,185}{80,500} = 0.387$$

Using GOI Bond we can compute Risk Free Rate of Return as follows:

$$R_f = \frac{(34,500 - 36,000) + 3,600}{36,000} = 0.0583 \text{ i.e. } 5.83\%$$

Now we can calculated Market Return ( $R_m$ ) using average return of the portfolio as follows:

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

$$15.7\% = 5.83\% + 0.387(R_m - 5.83\%)$$

**Question – 25**

A holds the following portfolio:

| Share/Bond   | Beta | Initial Price<br>₹ | Dividends<br>₹ | Market Price at<br>end of Year ₹ |
|--------------|------|--------------------|----------------|----------------------------------|
| Epsilon Ltd. | 0.8  | 25                 | 2              | 50                               |
| Sigma Ltd.   | 0.7  | 35                 | 2              | 60                               |
| Omega Ltd.   | 0.5  | 45                 | 2              | 135                              |
| GOI Bonds    | 0.01 | 1,000              | 140            | 1,005                            |

Calculate:

(i) The expected rate of return of each security using Capital Asset Pricing Method (CAPM)

(ii) The average return of his portfolio.

Risk-free return is 14%.

(SM TYK – 27)

**Solution:**

**(i) Expected Rate of Return**

|              | Total<br>Investments | Dividends  | Capital<br>Gains |
|--------------|----------------------|------------|------------------|
| Epsilon Ltd. | 25                   | 2          | 25               |
| Sigma Ltd.   | 35                   | 2          | 25               |
| Omega Ltd.   | 45                   | 2          | 90               |
| GOI Bonds    | <u>1,000</u>         | <u>140</u> | <u>5</u>         |
|              | <u>1,105</u>         | <u>146</u> | <u>145</u>       |

$$\text{Expected Return on market portfolio} = \frac{146 + 145}{1105} = 26.33\%$$

$$\text{CAPM} \quad E(R_p) = R_F + \beta [E(R_M) - R_F]$$

|              |                           |             |             |
|--------------|---------------------------|-------------|-------------|
| Epsilon Ltd. | $14 + 0.8[26.33 - 14] =$  | $14 + 9.86$ | $= 23.86\%$ |
| Sigma Ltd.   | $14 + 0.7[26.33 - 14] =$  | $14 + 8.63$ | $= 22.63\%$ |
| Omega Ltd.   | $14 + 0.5[26.33 - 14] =$  | $14 + 6.17$ | $= 20.17\%$ |
| GOI Bonds    | $14 + 0.01[26.33 - 14] =$ | $14 + 0.12$ | $= 14.12\%$ |

**(ii) Average Return of Portfolio**

$$\frac{23.86 + 22.63 + 20.17 + 14.12}{4} = \frac{80.78}{4} = 20.20\%$$

$$\text{Alternatively, } = \frac{0.8 + 0.7 + 0.5 + 0.01}{4} = \frac{2.01}{4} = 0.5025$$

$$14 + 0.5025 (26.33 - 14) = 14 + 6.20 = 20.20\%$$

**Question – 26**

Suppose one of your HNI clients is holding the following portfolio as per his risk appetite:

| Particulars    | Securities |
|----------------|------------|
| Equity Shares: |            |
| G Ltd.         | 1,000      |
| S Ltd.         | 1,000      |
| B Ltd.         | 500        |
| PSU Bonds      | 20,000     |

The other data related to each of these securities is as follows:

| Cost   | Dividends/Interest | Market Price | Beta |
|--------|--------------------|--------------|------|
| ₹      | ₹                  | ₹            |      |
| 10,000 | 1,725              | 9,800        | 0.6  |
| 15,000 | 1,000              | 16,200       | 0.8  |
| 28,000 | 1,400              | 28,300       | 0.6  |
| 1,800  | 180                | 1,725        | 0.10 |

Your client is interested in investing some more funds in Bonds issued by GOI.

- (1) Estimate the minimum rate of return that your client would expect from these Bonds keeping in view his risk appetite and assuming Market Return as 12.70%.
- (2) Analyze whether this portfolio has out-performed the market or not assuming Risk Free Rate of Return as 7%.

**(MTP Nov – 2021)**

**Solution:**

**(i) Weighted Average Beta**

| Stocks    | Cost               | Dividend         | Market Value       |
|-----------|--------------------|------------------|--------------------|
| G Ltd     | 1,00,00,000        | 17,25,000        | 98,00,000          |
| S Ltd     | 1,50,00,000        | 10,00,000        | 1,62,00,000        |
| B Ltd     | 1,40,00,000        | 7,00,000         | 1,41,50,000        |
| PSU Bonds | 3,60,00,000        | 36,00,000        | 3,45,00,000        |
|           | <b>7,50,00,000</b> | <b>70,25,000</b> | <b>7,46,50,000</b> |

$$ER_p = \frac{(7,46,50,000 - 7,50,00,000) + 70,25,000}{7,50,00,000} \times 100 = 8.9\%$$

$$B_p = \frac{(100 \times 0.6) + (150 \times 0.8) + (140 \times 0.6) + (360 \times 0.10)}{750}$$

$$= 0.4$$

$R_f$  Rate

$$ER_p = R_f + (R_m - R_f) B_p$$

$$8.90 = R_f + (12.7 - R_f) 0.4$$

$$8.90 = R_f + 5.08 - 0.4 R_f$$

$$R_f = \frac{8.90 - 5.08}{0.6} = 6.36\% \text{ (Implicit } R_f)$$

**(ii) Required Rate of Return (Risk)**

Portfolio Estimation = 8.9 %

$$\begin{aligned} \text{CAPM} &= R_f + (R_m - R_f) B_p \\ &= 7 + (12.7\% - 7) 0.4 \\ &= 9.28\% \end{aligned}$$

**जितना Risk है उस हिसाब से 9.28% Return मिलना चाहिए ।**

Portfolio performance is not good because required rate of return (9.28%) is more than expected rate of return (8.9%).

**Question – 27**

Your client is holding the following securities:

| Particulars of Securities | Cost   | Dividends/ Interest | Market price at the end of holding period | Beta |
|---------------------------|--------|---------------------|-------------------------------------------|------|
|                           | ₹      | ₹                   | ₹                                         |      |
| Equity Shares:            |        |                     |                                           |      |
| G Ltd.                    | 20,000 | 1,450               | 19,600                                    | 0.6  |
| S Ltd.                    | 30,000 | 1,000               | 30,400                                    | 0.8  |
| B Ltd.                    | 28,000 | 1,400               | 32,000                                    | 0.6  |
| GOI Bonds                 | 72,000 | 5,060               | 71,980                                    | 0.01 |

**Evaluate:**

- Risk free rate of return.
- Expected rate of return of each security (except GOI Bond), using the Capital Asset Pricing Model (CAPM).

Note: (1) Use weighted average Beta in calculations.

(2) Round off calculations upto 3 decimal points.

**(SM TYK, MTP April – 2024)**

**Solution:**

**(i)  $R_f$  Rate**

$$R_f = \frac{(P_1 - P_0) + \text{Income}}{P_0} \times 100$$

$$R_f = \frac{(71,980 - 72,000) + 5,060}{72,000} \times 100$$

$$= 7\%$$

**(ii) Expected Return of Each Security**

| Particulars | Cost   | Dividend | MP     |
|-------------|--------|----------|--------|
| G Ltd.      | 20,000 | 1,450    | 19,600 |
| S Ltd.      | 30,000 | 1,000    | 30,400 |
| B Ltd.      | 28,000 | 1,400    | 32,000 |

|          |          |       |          |
|----------|----------|-------|----------|
| GOI Bond | 72,000   | 5,060 | 71,980   |
|          | 1,50,000 | 8,910 | 1,53,980 |

$$ER_p = \frac{(1,53,980 - 1,50,000) + 8,910}{1,50,000} \times 100$$

$$= 8.593\%$$

$$\text{Beta} = \frac{(20,000 \times 0.6) + (30,000 \times 0.8) + (28,000 \times 0.6) + (72,000 \times 0.6)}{1,50,000}$$

$$= 0.357$$

Market Return ( $R_m$ )

$$ERP = R_f + (R_m - R_f) B_p$$

$$8.593 = 7 + (R_m - 7) 0.357$$

$$8.593 = 7 + 0.357 R_m - 2.499$$

$$R_m = 11.462\%$$

$$G \text{ Ltd.} = 7 + (11.462 - 7) 0.6 = 9.677$$

$$S \text{ Ltd.} = 7 + (11.462 - 7) 0.8 = 10.57\%$$

$$B \text{ Ltd.} = 7 + (11.462 - 7) 0.6 = 9.677\%$$

**ICAI Solution:**

| Particulars of Securities | Cost ₹   | Market Price | Capital gain | Dividend/Interest |
|---------------------------|----------|--------------|--------------|-------------------|
| G Ltd.                    | 20,000   | 19,600       | -400         | 1,450             |
| S Ltd.                    | 30,000   | 30,400       | 400          | 1,000             |
| B Ltd.                    | 28,000   | 32,000       | 4,000        | 1,400             |
| GOI Bonds                 | 72,000   | 71,980       | -20          | 5,060             |
| Total                     | 1,50,000 | 1,53,980     | 3,980        | 8,910             |

(i) Risk free return [Return on Govt. Security (GOI Bond)]

$$\frac{5,060 + (72,000 - 71,980)}{72,000} = 7\%$$

(ii) Weighted Average of Beta

$$0.6 \times 19,600/1,53,980 + 0.8 \times 30,400/1,53,980 + 0.60 \times 32,000/1,53,980 + 0.01 \times 71,980/1,53,980$$

$$= 0.076 + 0.158 + 0.125 + 0.005 = 0.364$$

**Average Return on Portfolio**

$$(8,910 + 3,980) / 1,50,000 \times 100\% = 8.593\%$$

**Market Return**

$$8.593\% = 7\% + (R_m - 7\%) \times 0.364$$

$$R_m = 11.376\%$$

Expected Rate of Return for each security is

$$\text{Rate of Return} = R_f + \beta (R_m - R_f)$$

$$\text{G Ltd.} = 7.000\% + 0.6 (11.376\% - 7.000\%) = 9.626\%$$

$$\text{S Ltd.} = 7.000\% + 0.8 (11.376\% - 7.000\%) = 10.501\%$$

$$\text{B Ltd.} = 7.000\% + 0.6 (11.376\% - 7.000\%) = 9.626\%$$

**Question – 28**

On the basis of given information, Mr. XLY want to create a portfolio equally as risky as the market and is having ₹ 20,00,000 to invest.

| Assets        | Investment | Beta |
|---------------|------------|------|
| Stock A       | ₹ 4,00,000 | 0.70 |
| Stock B       | ₹ 5,00,000 | 1.10 |
| Stock C       | ?          | 1.60 |
| Debenture (D) | ?          | 0    |

How do you recommend and interpret the risk scenario and investment in all the securities?

**(MTP April – 2023)**

**Solution:**

Since portfolio equally as risky as the market hence portfolio beta shall be "1"

$$1 = \frac{(4,00,000 \times 0.7) + (5,00,000 \times 1.10) + (x \times 1.60) + (y \times 0)}{20,00,000}$$

$$20,00,000 = 8,30,000 + 1.60x$$

$$x = \frac{20,00,000 - 8,30,000}{1.60}$$

$$= 7,31,200$$

$$\text{Investment in stock C} = 7,31,200$$

$$\text{Investment in Debenture D} = 3,68,800$$

**ALPHA CALCULATION**

**Question – 29**

Assuming that shares of ABC Ltd. and XYZ Ltd. are correctly priced according to Capital Asset Pricing Model. The expected return from and Beta of these shares are as follows:

| Share | Beta | Expected return |
|-------|------|-----------------|
| ABC   | 1.2  | 19.8%           |
| XYZ   | 0.9  | 17.1%           |

You are required to derive Security Market Line.

**(SM TYK – 20)**

**Solution:**

**Calculation of  $R_f$  & MRP**

$$19.8 = R_f + 1.2 \text{ MRP} \quad \dots\dots\dots(i)$$

$$17.1 = R_f + 0.9 \text{ MRP} \quad \dots\dots\dots(ii)$$

$$2.70 = 0.3 \text{ MRP}$$

$$\text{MRP} = 9$$

Put MRP in Equation.....(i)

$$19.8 = R_f + (1.2 \times 9)$$



$$R_f = 9$$

SML

$$\rightarrow ER = 9 + 9B$$

**Question – 30**

An investor holds two stocks A and B. An analyst prepared ex-ante probability distribution for the possible economic scenarios and the conditional returns for two stocks and the market index as shown below:

| Economic Scenario | Probability | Conditional Returns % |    |        |
|-------------------|-------------|-----------------------|----|--------|
|                   |             | A                     | B  | Market |
| Growth            | 0.40        | 25                    | 20 | 18     |
| Stagnation        | 0.30        | 10                    | 15 | 13     |
| Recession         | 0.30        | -5                    | -8 | -3     |

The risk free rate during the next year is expected to be around 11%. Determine whether the investor should liquidate his holdings in stocks A and B or on the contrary make fresh investments in them. CAPM assumptions are holding true.

(SM TYK – 33)

**Solution:**

**Calculation of  $ER_A$ ,  $ER_M$ ,  $\sigma_A$ ,  $\sigma_M$  &  $\beta_A$**

| P    | A           | P (A) | $(A - \bar{A})$ | $(A - \bar{A})^2 P$    | M  | P (M) | $(M - \bar{M})$ | $(M - \bar{M})^2 P$   | $(A - \bar{A}) \times (M - \bar{M}) \times P$ |
|------|-------------|-------|-----------------|------------------------|----|-------|-----------------|-----------------------|-----------------------------------------------|
| 0.40 | 25          | 10    | 13.5            | 72.9                   | 18 | 7.2   | 7.8             | 24.336                | 42.32                                         |
| 0.30 | 10          | 3     | -1.5            | 0.675                  | 13 | 3.9   | 2.8             | 2.352                 | -1.26                                         |
| 0.30 | -5          | -1.5  | -16.5           | 81.675                 | -3 | -0.9  | -13.2           | 52.272                | 65.34                                         |
|      | $\bar{A} =$ | 11.5% | $\sigma_A^2 =$  | 115.25(%) <sup>2</sup> |    | 10.2  | $\sigma_M^2 =$  | 78.96(%) <sup>2</sup> | 106.2(%) <sup>2</sup>                         |

$$\sigma_A = 12.46\%$$

$$\sigma_M = 8.88\%$$

$$\beta_A = \frac{COV_{AM}}{\sigma_M^2} = \frac{106.2}{78.96} = 1.345$$

**Calculation of  $ER_A$ ,  $ER_B$ ,  $\sigma_B$  &  $\beta_A$**

| P   | A           | P (B) | (B - $\bar{B}$ ) | (B - $\bar{B}$ ) <sup>2</sup> P | (M - $\bar{M}$ ) | (B - $\bar{B}$ ) × (M - $\bar{M}$ ) × P |
|-----|-------------|-------|------------------|---------------------------------|------------------|-----------------------------------------|
| 0.4 | 20          | 8     | 9.9              | 39.204                          | 7.8              | 30.888                                  |
| 0.3 | 15          | 4.5   | 4.9              | 7.203                           | 2.8              | 4.116                                   |
| 0.3 | -8          | -2.4  | -18.1            | 98.283                          | -13.2            | 71.676                                  |
|     | $\bar{B} =$ | 10.1% | $\sigma_B^2 =$   | 144.69(%) <sup>2</sup>          |                  | 106.68(%) <sup>2</sup>                  |

$$\sigma_B^2 = 12.029\%$$

$$\beta_B = \frac{COV_{BM}}{\sigma_M^2} = \frac{106.68}{78.96} = 1.351$$

**Calculation of  $K_e$  as per CAPM**

**(i) Required return for A**

$$\begin{aligned} K_e &= R_f + (R_m - R_f) \beta_A \\ &= 11 + (10.2 - 11) 1.345 \\ &= 9.924\% \end{aligned}$$

**(ii) Required return for B**

$$\begin{aligned} K_e &= 11 + (10.2 - 11) 1.351 \\ &= 9.92\% \end{aligned}$$

Calculation of Alpha  $\alpha = ER - K_e$

$$A = \alpha_A = 11.5 - 9.924 = 1.576\%$$

$$B = \alpha_B = 10.1 - 9.92 = 0.18\%$$

Since  $\alpha$  of both stock A & stock B is positive, they are underpriced. It is advised to make fresh investment in them.

**Question – 31**

XYZ Ltd. has substantial cash flow and until the surplus funds are utilized to meet the future capital expenditure, likely to happen after several months, are invested in a portfolio of short-term equity investments, details for which are given below:

| Investment | No. of shares | Beta | Market price per share ₹ | Expected dividend yield |
|------------|---------------|------|--------------------------|-------------------------|
| I          | 60,000        | 1.16 | 4.29                     | 19.50%                  |
| II         | 80,000        | 2.28 | 2.92                     | 24.00%                  |
| III        | 1,00,000      | 0.90 | 2.17                     | 17.50%                  |
| IV         | 1,25,000      | 1.50 | 3.14                     | 26.00%                  |

The current market return is 19% and the risk free rate is 11%.

Required to:

- Calculate the risk of XYZ's short-term investment portfolio relative to that of the market;
- Whether XYZ should change the composition of its portfolio.

(SM TYK – 22)

**Solution:**

**(i) Calculation of Beta of Portfolio**

| Investment | No. of Shares | Market Price per Share ₹ | Total     | Weight | Beta           | Weight × Beta |
|------------|---------------|--------------------------|-----------|--------|----------------|---------------|
| I          | 60,000        | 4.29                     | 2,57,400  | 0.2339 | 1.16           | 0.27          |
| II         | 80,000        | 2.92                     | 2,33,600  | 0.2123 | 2.28           | 0.48          |
| III        | 1,00,000      | 2.17                     | 2,17,000  | 0.1972 | 0.90           | 0.18          |
| IV         | 1,25,000      | 3.14                     | 3,92,500  | 0.3566 | 1.50           | 0.50          |
|            |               |                          | 11,00,500 | 1.0000 | B <sub>p</sub> | 1.46          |

$$\begin{aligned}
 ER_p &= (19.50 \times 0.2339) + (24 \times 0.2123) + (17.50 \times 0.1972) + (26 \times 0.3566) \\
 &= 22.38\%
 \end{aligned}$$

**Calculation of B<sub>p</sub> assuming required rate of return is 22.38%**

**(जो 22.38% Return मिलना है उसके हिसाब से Beta कितना चाहिए)**

$$K_e = R_f + (R_m - R_f) B_p$$

$$22.38 = 11 + (19 - 11) B_p$$