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 × 19,600/1,53,980 + 0.8 × 30,400/1,53,980 + 0.60 × 32,000/1,53,980 + 0.01 × 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 × 100% = 8.593%

Market Return

8.593% = 7% + (R_m – 7%) × 0.364

R_m = 11.376%

Expected Rate of Return for each security is

Rate of Return = Rf + β (Rm – Rf)

G Ltd. = 7.000% + 0.6 (11.376% – 7.000%) = 9.626%

S Ltd. = 7.000% + 0.8 (11.376% – 7.000%) = 10.501%

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"

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

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

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

$$= 7,31,200$$

Investment in stock C = 7,31,200

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

$19.8 = R_f + 1.2$ MRP .....(i)

17.1 = R_f + 0.9 MRP .....(ii)

2.70 = 0.3 MRP

MRP = 9

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

19.8 = R_f + (1.2 × 9)

R_f = 9

SML

→ E_R = 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, σ_A, σ_M & β_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 – $\bar{A}$) × (M – $\bar{M}$) × 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%	σ_A^2 =	115.25(%)^2		10.2	σ_M^2 =	78.96(%)^2	106.2 (%)^2

σ_A = 12.46% σ_M = 8.88%

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

Calculation of ER_A, ER_B, σ_B & β_A

P	A	P (B)	$(B - \bar{B})$	$(B - \bar{B})^2 P$	$(M - \bar{M})$	$(B - \bar{B}) \times (M - \bar{M}) \times P$
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%	σ_B^2 =	144.69(%)²		106.68(%)²

σ_B^2 = 12.029%

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

Calculation of Ke as per CAPM

(i) Required return for A

Ke = $R_f + (R_m - R_f)\ \beta_A$

= 11 + (10.2 – 11) 1.345

= 9.924%

(ii) Required return for B

Ke = 11 + (10.2 – 11) 1.351

= 9.92%

Calculation of Alpha α = ER – Ke

A = α_A = 11.5 – 9.924 = 1.576%

B = α_B = 10.1 – 9.92 = 0.18%

Since α 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:

(i) Calculate the risk of XYZ's short-term investment portfolio relative to that of the market;

(ii) Whether XYZ should change the composition of its portfolio.

(SM TYK – 22)

Solution:

(i) Calculation of Beta of Portfolio

Invest-ment	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	2.29	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_P	1.46

ER_p = (19.50 × 0.2339) + (24 × 0.2123) + (17.50 × 0.1972) + (26 × 0.3566)

= 22.38%

Calculation of B_p assuming required rate of return is 22.38%

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

$Ke = R_f + (Rm - Rf)\ B_p$

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

$11.38 = 8\ B_p$

$B_p = \frac{11.38}{8} = 1.42$

Portfolio Beta (1.46) is more than market implicit Beta (1.42) hence portfolio is Risky in Comparison to market.

(ii) Calculation of required Rate of Return

		Ke	ER		
I	= 11 + (19 – 11) 1.16	= 20.28%	19.50%	Ke>ER	Sell
II	= 11 + (19 – 11) 2.28	= 29.24%	24%	Ke>ER	Sell
III	= 11 + (19 – 11) 0.9	= 18.20%	17.50%	Ke>ER	Sell
IV	= 11 + (19 – 11) 1.50	= 23%	26%	Ke<ER	Buy

Question – 32

The following information are available with respect of Krishna Ltd.

Year	Krishna Ltd. Average share price	Dividend per Share	Average Market Index	Dividend Yield	Return on Govt. Bonds
	₹	₹			
2012	245	20	2013	4%	7%
2013	253	22	2130	5%	6%
2014	310	25	2350	6%	6%
2015	330	30	2580	7%	6%

Compute beta value of the Krishna Ltd. at the end of 2015 and state your observation.

(SM TYK – 08)

Solution:

(1) Annual Return of Krishna Ltd. (x)

$$x = \frac{(P_1 - P_0) + D_1}{P_0} \times 100$$

$$2013 = \frac{(253 - 245) + 22}{245} \times 100 = 12.24\%$$

$$2014 = \frac{(310 - 253) + 25}{253} \times 100 = 32.41\%$$

$$2015 = \frac{(330 - 310) + 30}{310} \times 100 = 16.13\%$$

(2) Calculation of Rm (y)

$$2013 = \left(\frac{2{,}130 - 2{,}013}{2{,}013} \times 100\right) + 5 = 10.81\%$$

$$2014 = \left(\frac{2{,}350 - 2\,130}{2{,}130} \times 100\right) + 6 = 16.33\%$$

$$2015 = \left(\frac{2{,}580 - 2{,}350}{2{,}350} \times 100\right) + 7 = 16.79\%$$

$$Rf = \frac{6 + 6 + 6}{3} = 6\%$$

Calculation of Cov_{xy}

Year	x	$(x - \bar{x})$	y	$(y - \bar{y})$	$(y - \bar{y})^2$	$(x - \bar{x})(y - \bar{y})$
1	12.24	-8.02	10.81	-3.83	14.67	30.717
2	32.41	12.15	16.33	1.69	2.86	20.533
3	16.13	-4.13	16.79	2.15	4.62	-8.879
$\sum x =$	60.78	$\sum y =$	43.93	$\sum (y - \bar{y})^2 =$	22.15	$42.371(\%)^2$

$$\bar{x} = \frac{60.78}{3} = 20.26\%$$

$$\bar{y} = \frac{43.92}{3} = 14.64\%$$

$\sigma_m^2 = \frac{22.15}{3} = 7.383(\%)^2$

$Cov_{xy} = \frac{42.371}{3} = 14.123(\%)^2$

$\beta = \frac{Cov_{xy}}{\sigma_m^2} = \frac{14.123}{7.383} = 1.91$

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

$= 6 + 1.91(14.64 - 6) = 22.50\%$

Observation

2013 = Ke = 6 + (10.81 – 6) 1.91 = 15.19% > ER = 12.24 Sell

2014 = Ke = 6 + (16.33 – 6) 1.91 = 25.71% < ER = 32.41 Buy

2015 = Ke = 6 + (16.79 – 6) 1.91 = 26.61% > ER = 16.13 Sell

Question – 33

Expected returns on two stocks for particular market returns are given in the following table:

Market Return	Aggressive	Defensive
7%	4%	9%
25%	40%	18%

You are required to calculate:

(a) The Betas of the two stocks.

(b) Expected return of each stock, if the market return is equally likely to be 7% or 25%.

(c) The Security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.

(d) The Alphas of the two stocks.

(SM TYK – 13)

Solution:

(a) Beta

$$\text{Beta} = \frac{\text{Change in Stock Return}}{\text{Change in Market Return}}$$

$$A = \frac{40-4}{25-7} = 2$$

$$D = \frac{18-9}{25-7} = 0.5$$

(b) Expected Return

$A = (4 \times 0.5) + (40 \times 0.5) = 22\%$

$= (9 \times 0.5) + (18 \times 0.5) = 13.5\%$

(c) Security Market Line

$R_m = (7 \times 0.5) + (25 \times 0.5)$

$= 16\%$

$SML = R_f + MRP\ \beta$

$= 7.5 + (16 - 7.5)\ \beta$

$= 7.5 + 8.5\ \beta$

(d) Alpha

$Y = \alpha + bx$

Security A

$22 = \alpha + 2 \times 16$

$\alpha = -10$

Security B

$13.5 = \alpha + 0.5 \times 16$

$\alpha = 5.5$

Question – 34

A Ltd. has an expected return of 22% and Standard deviation of 40%. B Ltd. has an expected return of 24% and Standard deviation of 38%. A Ltd. has a

beta of 0.86 and B Ltd. a beta of 1.24. The correlation coefficient between the return of A Ltd. and B Ltd. is 0.72. The Standard deviation of the market return is 20%. Suggest:

(i) Is investing in B Ltd. better than investing in A Ltd.?

(ii) If you invest 30% in B Ltd. and 70% in A Ltd., what is your expected rate of return and portfolio Standard deviation?

(iii) What is the market portfolios expected rate of return and how much is the risk-free rate?

(iv) What is the beta of Portfolio if A Ltd.'s weight is 70% and B Ltd.'s weight is 30%?

(SM TYK – 21)

Solution:

	A	**B**
ER	22%	24%
SD	40%	38%
Beta	0.86	1.24

r_{AB} = 0.72

σ_m = 20%

(I) Yes Investment in B Ltd is better than A Ltd due to higher return & lower standard deviation.

(II) ER_p & $S.D_p$ $W_A = 0.70$ $W_B = 0.30$

$ER_p = (22 \times 0.7) + (24 \times 0.3) = 22.60\%$

$$\sigma_p = \sqrt{\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2 + 2 \times \sigma_A \times W_A \times \sigma_B \times r_{AB}}$$

$$= \sqrt{40^2 \times 0.7^2 + 38^2 \times 0.3^2 + 2 \times 40 \times 0.7 \times 38 \times 0.3 \times 0.72}$$

$$= 37.06\%$$