SSEI
Sanjay Saraf Educational Institute Pvt. Ltd.
A positive NPV Training Center

RECENT QUESTIONS OF

ADVANCED FINANCIAL MANAGEMENT

PORTFOLIO MANAGEMENT

VISHWASGHAAT

-ULTIMATE CHALLENGE-

Question 1:

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 (β), if Mr. X invests ₹ 65,000 in A Ltd. having beta (β) of 0.45; ₹ 20,000 in B Ltd. having beta (β) of 1.15 and ₹ 15,000 in C Ltd. having beta (β) of 1.8.

SOURCE: ICAI NOV 22 EXAM

ANSWER:

Calculation of Average Return:

Year	A Ltd.	B Ltd.	C Ltd.
2018	2%	3%	5%
2019	6%	8%	7%
2020	13%	14%	15%
2021	7%	9%	11%
Sum	28%	34%	38%
Average	7%	8.50%	9.50%

i.

1. Combination 1 - 65% in A Ltd. & 35% B Ltd.
   Return = 7% × 0.65 + 8.50% × 0.35 = 4.55% + 2.975% = 7.525% or 7.53%
2. Combination 2 – 65% in B Ltd. & 35% in C Ltd.
   Return = 8.50% × 0.65 + 9.50% × 0.35 = 5.525% + 3.325% = 8.85%
3. Combination 3 – 65% in C Ltd. & 35% in A Ltd.
   Return = 0.65 × 9.50% + 0.35 × 7.00% = 6.175% + 2.45% = 8.625% or 8.63%
4. Combination 4 – 65% in A Ltd. & 35% in C Ltd.
   Return = 0.65 × 7% + 0.35 × 9.50% = 4.55% + 3.325% = 7.875% or 7.88%
5. Combination 5 – 35% in A Ltd. & 65% in B Ltd.
   Return = 0.35 × 7% + 0.65 × 8.50% = 2.45% + 5.525% = 7.975% or 7.98%
6. Combination 6 – 35% in B Ltd. & 65% in C Ltd.
   Return = 0.35 × 8.50% + 0.65 × 9.50% = 2.975% + 6.175% = 9.15%

Since maximum return is under Combination - 6 i.e. 65% investment in C Ltd. and 35% in B Ltd. hence it should be opted for.

ii. Calculation of Return and Beta of Portfolio

$$\text{Return of Portfolio} = 7\% \times \frac{65,000}{1,00,000} + 8.50\% \times \frac{20,000}{1,00,000} + 9.50\% \times \frac{15,000}{1,00,000}$$

$= 7.675\%$

$$\text{Beta of Portfolio} = 0.45 \times \frac{65,000}{1,00,000} + 1.15 \times \frac{20,000}{1,00,000} + 1.80 \times \frac{15,000}{1,00,000} =$$

0.7925 or 0.79

Question 2:

An investor has categorized all the available stock in the market into the following types and the estimated weights of the categories of stocks in the market index are given below. Further, the sensitivity of returns of these categories of stocks to two factors Inflation and Stock market are also given below:

Category	Weight in Market Index	Factor 1 (Inflation)			Factor 2 (Stock Market)		
		Beta 1	Expected Value in %	Actual Value in %	Beta 2	Expected Value in %	Actual Value in %
Small Cap	20%	1.20	6.70	6.70	0.80	10.00	10.50
Medium Cap	30%	1.75	4.50	6.00	0.90	7.00	8.00
Large Cap	15%	1.30	6.75	8.00	1.165	9.00	10.00
Flexi Cap	35%	1.70	7.00	6.50	0.85	8.85	9.75

Risk Free Rate of Interest is 7.50%.

Round off to 2 decimal.

You are required to calculate:

i. Expected return on the market index for both the factors.

ii. Expected return on the market index under Arbitrage Pricing Theory (Existing Scenario).

iii. Expected return on the market index under Arbitrage Pricing Theory if the composition of the Portfolio is changed to 25% equally in all four categories.

iv. Which alternative (Existing or Changed) will be more profitable?

SOURCE: ICAI NOV 23 EXAM

ANSWER:

i. Expected Return on Market Index for Both factors

Factor 1 = 0.20 x 6.70% + 0.30 x 4.50% + 0.15 x 6.75% + 0.35 x 7.00%
= 1.34% + 1.35% + 1.01% + 2.45%
= 6.15%

Factor 2 = 0.20 x 10% + 0.30 x 7% + 0.15 x 9% + 0.35 x 8.85%
= 2% + 2.10% + 1.35% + 3.10%
= 8.55%

ii. Calculation of expected Return on the Market index under Arbitrage Pricing Theory (Existing Scenario):

	Factor 1 (Inflation)				
Category	**Beta**	**Actual value**	**Expected value**	**Difference**	**Beta x Diff.**
	(a)	**(b) (%)**	**(c) (%)**	**(b) - (c) = (d) (%)**	**(e)**
Small Cap	1.20	6.70	6.70	0.00	0.00
Medium Cap	1.75	6.00	4.50	1.50	2.63
Large Cap	1.30	8.00	6.75	1.25	1.63
Flexi cap	1.70	6.50	7.00	(0.50)	(0.85)

	Factor 2 (Stock Market)					
Category	**Beta**	**Actual value**	**Expected value**	**Difference**	**Beta x Diff.**	**Total**
	(f)	**(g) (%)**	**(h) (%)**	**(g) – (h) = (i) (%)**	**(j)**	**(e) + (j) = (k)**
Small Cap	0.80	10.50	10.00	0.50	0.40	0.40
Medium Cap	0.90	8.00	7.00	1.00	0.90	3.53
Large Cap	1.165	10.00	9.00	1.00	1.17	2.80
Flexi cap	0.85	9.75	8.85	0.90	0.77	(0.08)

Category	**Weight in market index (1)**	**Total Beta x Diff (2)**	**Expected Return (2 x 1 = 3)**
Small Cap	20%	0.40	0.08
Medium Cap	30%	3.53	1.06
Large Cap	15%	2.80	0.42
Flexi cap	35%	(0.08)	(0.03)
Total			1.53
Add: Risk Free Rate of Interest			7.50
Expected Return (%)			9.03

iii. Expected Return on the Market Index under Arbitrage Pricing Theory under changed scenario:

Category	Weight in market index (1)	Total Beta x Diff (2)	Expected Return (2 x 1 = 3)
Small Cap	25%	0.40	0.10
Medium Cap	25%	3.53	0.88
Large Cap	25%	2.80	0.70
Flexi cap	25%	(0.08)	(0.02)
Total			1.66
Add: Risk Free Rate of Interest			7.50
Expected Return (%)			9.16

iv. As per the above calculation, the investors by investing 25% equally in all four categories, is profitable compared to the existing composition. As the proposed composition gives rate of return of 9.16% per annuum when compared to the existing return of the present portfolio which is 9.03%

Question 3:

Expected returns on two stocks against BSE SENSEX returns are given in the following table under two scenarios-bullish and bearish:

Market return	Scenario -1: Bullish Case	Scenario -2: Bearish Case
BSE Sensex	25%	-5%
Stock R	32%	-4%
Stock Z	18%	-3%

You are required to calculate:

i. The Betas of two stocks R and Z.

ii. Expected return on each stock, if the likelihood of market achieving Scenario-1 is thrice the likelihood of the market achieving Scenario-2.

iii. The Security Market Line (SML), if the risk free rate is 8% and likelihood of the market return achieving the bullish base returns of 25% is thrice that of achieving -5% returns.

iv. The Alphas of the two stocks based on Sharpe Index Model.

SOURCE: ICAI NOV 23 EXAM

ANSWER:

i. The Betas of two stocks:

Stock R - (32% + 4%)/(25% + 5%) = 1.2
Stock Z - (18% + 3%)/(25% + 5%) = 0.70

Alternatively, it can also be solved by using the Characteristic Line Relationship as follows:

$R_s = \alpha + \beta R_m$
Where
α = Alpha
β = Beta
R_m= Market Return

For Stock R

32% = α + β(25%)
- 4% = α + β(-5%)
36% = β(30%)
β = 1.2

For Stock Z

18% = α + β(25%)
-3% = α + β(-5%)
21% = β(30%)
β = 0.70

Alternatively, Beta can also be calculated as follows:

Basic Calculation for stock R

(R_R)	$\overline{R_R}$	$R_R - \overline{R_R}$	$(R_R - \overline{R_R})^2$	(R_m)	$\overline{R_M}$	$R_m - \overline{R_M}$	$(R_m - \overline{R_M})^2$	$(R_R - \overline{R_R})(R_m - \overline{R_M})$
32%	14%	18%	324	25%	10%	15%	225	270
-4%	14%	-18%	324	-5%	10%	-15%	225	270
Total			648				450	540

Basic Calculation for stock Z

(R_Z)	$\overline{R_Z}$	$R_Z - \overline{R_Z}$	$(R_Z - \overline{R_Z})^2$	(R_m)	$\overline{R_M}$	$R_m - \overline{R_M}$	$(R_m - \overline{R_M})^2$	$(R_Z - \overline{R_Z})(R_m - \overline{R_M})$
18%	7.5%	10.5%	110.25	25%	10%	15%	225	157.50
-3%	7.5%	-10.5%	110.25	-5%	10%	-15%	225	157.50
Total			220.50				450	315

Co- Variance (R, M) = 540/2=270

Co- Variance (Z, M) = 315/2=157.50

$(\sigma_M)^2$ =450/2 = 225

Beta of stocks R & Z

$$\text{Beta (R)} = \frac{\text{Cov.(R,M)}}{\sigma_M^2} = 270/225 = 1.2$$

$$\text{Beta (Z)} = \frac{\text{Cov.(R,Z)}}{\sigma_M^2} = 157.5/225 = 0.7$$

ii. Expected returns of the two stocks:

Stock R - 0.75 x 32% - 0.25 x 4% = 23%

Stock Z - 0.75 x 18% - 0.25 x 3% = 12.75%

iii. Expected return of market portfolio

= 0.75 x 25% + 0.25% x (-5%) = 17.50%

∴ Market risk prem. = 17.50% - 8.00% = 9.5%

∴ SML is, required return = 8.00% + βi 9.5%

iv. Alpha for two stocks

Required Return for Stock R

E (R) $= \alpha_R + \beta R_M$

Accordingly 23% $= \alpha_R + 1.20 \times 17.50\%$

$\alpha_R = 2\%$

Required Return for Stock Z

E (Z) $= \alpha_Z + \beta R_M$

Accordingly

12.75% $= \alpha_Z + 0.70 \times 17.50\%$

$\alpha_Z = 0.5\%$

Question 4:

M/s. Siri Ltd. has a surplus amount of ₹ 3 crores to invest and has shortlisted the following equity shares:

Company	Beta
S Ltd.	1.6
K Ltd.	1
P Ltd.	-0.3
D Ltd.	2
C Ltd.	0.6

Required:

i. If M/s. Siri Ltd. invests an equal amount in all securities, what is the beta of the portfolio?

ii. If M/s. Siri Ltd. invests 15% of its investment in S Ltd., 15% in P Ltd., 10% in C Ltd. and the balance in equal amount in the other two securities, what is the beta of the portfolio?

iii. If the expected return of market portfolio is 12% at a beta facto r 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%

SOURCE: ICAI NOV 22 EXAM

ANSWER:

i. Beta of the Portfolio

Investment	Beta (β)	Investment (₹ Lakhs)	Weighted Investment
S Ltd.	1.6	60	96
K Ltd.	1.0	60	60
P Ltd.	-0.3	60	-18
D Ltd.	2.0	60	120
C Ltd.	0.6	60	36
		300	294

$$\beta_P = \frac{294 \text{ lakh}}{300 \text{ lakh}} = 0.98$$

Alternatively, it can also be computed as follows:

$$1.6 \times \frac{1}{5} + 1.0 \times \frac{1}{5} + (-0.30) \times \frac{1}{5} + 2 \times \frac{1}{5} + 0.6 \times \frac{1}{5} = 0.98$$

ii. With varied percentages of investments portfolio beta is calculated as follows:

Investment	Beta (β)	Investment (₹ Lakhs)	Weighted Investment
S Ltd.	1.6	45	72
K Ltd.	1.0	90	90
P Ltd.	-0.3	45	-13.50
D Ltd.	2.0	90	180
C Ltd.	0.6	30	18
		300	346.50

Beta = 346.50/300 = 1.155

iii. Expected return of the portfolio with pattern of investment as in case (i) = 12% × 0.98 i.e. 11.76%

Expected Return with pattern of investment as in case (ii) = 12% × 1.155 i.e., 13.86%.

iv.

1. **Securities to be selected during Bull Phase Expected Market returns 10%**

As it is bull Market Higher Beta stocks should be selected.

Shares	% to be invested	Beta (β)	Investment	Weighted Investment
S Ltd.	20	1.6	60,00,000	96,00,000
K Ltd.	20	1	60,00,000	60,00,000
P Ltd.	0	-0.3	-	-
D Ltd.	60	2	1,80,00,000	3,60,00,000
C Ltd.	0	0.6	-	-
	100		3,00,00,000	5,16,00,000

Portfolio or Weighted Beta (β) (5,16,00,000/ 3,00,00,000)	1.72
Portfolio Beta (β)	1.72
Market Return	10%
Expected Return	17.20%

2. **Securities to be selected During Bear Phase Expected Market returns – 5%**

As it is bear market Lower Beta stocks should be selected

Shares	% to be invested	Beta (β)	Investment	Weighted Investment
S Ltd.	0	1.6	-	-
K Ltd.	20	1	60,00,000	60,00,000
P Ltd.	60	-0.3	1,80,00,000	-54,00,000
D Ltd.	0	2	-	-
C Ltd.	20	0.6	60,00,000	36,00,000
	100		3,00,00,000	42,00,000

Portfolio or Weighted Beta (β) (42,00,000/ 3,00,00,000)	0.14
Portfolio Beta (β)	0.14
Market Return	-5%
Expected Return	-0.70%

Question 5:

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?

SOURCE: ICAI MTP APRIL 23

ANSWER:

Let W_A, W_B, W_C and W_D be the weights of Stock A, B, C and Debenture respectively.

W_A = 4,00,000 ÷ 20,00,000 = 0.20

W_B = 5,00,000 ÷ 20,00,000 = 0.25

Now = $W_C + W_D = 1 – W_A – W_B$ = 0.55

It is given in the question that Portfolio should be as risky as that of the market. It means Beta of the portfolio should be 1.

Hence,

W_A (0.7) + W_B (1.1) + W_C (1.6) + W_D (0) = 1

0.2 × 0.7 + 0.25 × 1.1 + 1.6W_C + W_D × 0 = 1

0.14 + 0.275 + 1.6W_C + 0 = 1

1.6 W_C = 1 – 0.415

1.6 W_C = 0.585

W_C = 0.585/1.6 = 0.3656

Weight of Debenture (W_D) = 1- 0.2 – 0.25 – 0.3656 = 0.1844

Hence, Amount invested in Stock C

= 0.3656 × 20,00,000 = ₹ 7,31,200

Amount invested in Debenture (D)

= 0.1844 × 20,00,000

= ₹ 3,68,800

Thus, amount to be invested in Stock (C) is ₹ 7,31,200 and in Debenture is ₹ 3,68,800.

DHAAKAD

-FORMIDABLE TASK-

Question 6:

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:

i. Risk free rate of return.

ii. 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.

SOURCE: ICAI MTP APRIL 24

ANSWER:

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

Market Return

8.593% = 7% + (Rm – 7%) x 0.364 Rm = 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 7:

The risk free rate of return (R_f) is 8 percent and the expected rate of return on market portfolio (R_m) is 12 percent. The expected rate of growth for the dividend of J Ltd. is 6 percent. The last dividend paid on the equity stock was ₹ 5.00. The beta of J Ltd. equity stock is 1.5.

i. What is the equilibrium price of the equity stock of J Ltd.?

ii. Evaluate the impact of following factors jointly on the equilibrium price of equity stock of J Ltd.

- the inflation premium increases by 2 percent;
- the expected growth rate increases by 2 percent in absolute terms;
- the beta of J Ltd. equity rises to 1.8 and
- market return remains the same.

SOURCE: ICAI MTP SEP 23

ANSWER:

i. Equilibrium price of Equity using CAPM

= 8% + 1.5(12% - 8%)

= 8% + 6%= 14%

$$P=\frac{D_1}{k_e - g}=\frac{5(1.06)}{0.14-0.06}=₹\ 66.25$$

ii. New Equilibrium price of Equity using CAPM

= 8.16% + 1.8(12% - 8.16%)

= 8.16% + 6.91% = 15.07%

$$P=\frac{D_1}{k_e - g}=\frac{5(1.08)}{0.1507-0.08}=₹\ 76.38$$

Thus, the equilibrium price is increased by ₹ 10.13 per share.

Question 8:

An Investor is proposing to invest ₹ 10,000/- in two Portfolios A and B in the ratio of 3 : 2. The Portfolios have three securities each with following weights :

	Wx	Wy	Wz
Portfolio A	0.30	0.25	0.45
Portfolio B	0.20	0.45	0.35

You are required to

1. Calculate the weight of each stock.
2. Calculate the amount allocated to Y and Z if half of the funds are allocated to security X.

Note: In question paper in sub part (ii) Y and Z mistakenly got typed as B and C

SOURCE: ICAI MAY 23 EXAM

ANSWER:

i. Investment committed to each security would be:

	X (₹)	Y (₹)	Z (₹)	Total (₹)
Portfolio A	1,800	1,500	2,700	6,000
Portfolio B	800	1,800	1,400	4,000
Combined Portfolio	2,600	3,300	4,100	10,000
Stock weights	0.26	0.33	0.41	

Alternatively, it can also be computed as follows:
Weight of Security X = 0.30 x 3/5 + 0.20 x 2/5 = 0.26
Weight of Security Y = 0.25 x 3/5 + 0.45 x 2/5 = 0.33
Weight of Security Z = 0.45 x 3/5 + 0.35 x 2/5 = 0.41

ii. The equation of critical line takes the following form:

WY = a + bWX
Substituting the values of WX & WY from portfolio A and B in above equation, we get
0.25 = a + 0.30b, and
0.45 = a + 0.20b
Solving above equation we obtain the slope and intercept, a = 0.85 and b= -2 and thus, the critical line is
WY = 0.85 – 2WX
If half of the funds is invested in security X then,
WY = 0.85 – 1.00 = - 0.15
Since WX + WY + WZ = 1
WZ = 1 - 0.50 + 0.15 = 0.65
∴ Allocation of funds to Security Y = - 0.15 x 10,000 = - ₹ 1,500 and
Security Z = 0.65 x 10,000 = ₹ 6,500

Alternatively, it can also be solved as follows:

Amount to be allocated to Y & Z if half of the funds are allocated to X.
The balance fund of ₹ 5,000 shall be allocated in the ratio of 33:41.

Allocation of funds to –

Security Y = 5,000 x 33/74 = ₹ 2,230
Security Z = 5,000 x 41/74 = ₹ 2,770

RAFTAAR

-SWIFT MOVES-

Question 9:

Shiva has a fund of ₹ 5 lacs which he wants to invest in share market with rebalancing target after every 15 days to start with for a period of one month from now. The present NIFTY is 17025. The minimum NIFTY within a month can at most be 15322.50. He wants to know as to how he should rebalance his portfolio under the following situations, according to the theory of Constant Proportion Portfolio Insurance Policy, using "2" as the multiplier:

1. Immediately to start with.
2. 15 days later-being the 1st day of rebalancing if NIFTY falls to 16321.89.
3. 15 days further from the above date if the NIFTY touches 17512.14.

Note: Assume that the value of his equity component will change in tandem with that of the NIFTY.

SOURCE: ICAI MTP APRIL 23

ANSWER:

Maximum decline in one month = $\frac{(17025-15322.50)}{17025}\times 10 = 10\%$

1. Immediately to start with

Investment in equity = Multiplier x (Portfolio value – Floor value)
= 2 (5,00,000 – 4,50,000) = ₹ 1,00,000

Shiva may invest ₹ 1,00,000 in equity and balance in risk free securities.

2. After 15

days Value of equity = 1,00,000 x 16321.89 / 17025	₹ 95,870
Value of risk free investment	₹ 4,00,000
Total value of portfolio	₹ 4,95,870
Investment in equity = Multiplier x (Portfolio value – Floor value)	
= 2 (4,95,870 – 4,50,000)	₹ 91,740
Revised Portfolio:	
Equity	₹ 91,740
Risk free Securities = ₹ 4,95,870 – ₹ 91,740	₹ 4,04,130

3. After another 15 days

Value of equity = 91,740 x 17512.14 / 16321.89	₹ 98,430
Value of risk free investment	₹ 4,04,130
Total value of portfolio	₹ 5,02,560
Investment in equity = Multiplier x (Portfolio value – Floor value)	
= 2 (5,02,560 – 4,50,000)	₹ 1,05,120
Revised Portfolio:	
Equity	₹ 1,05,120
Risk Free Securities = ₹ 5,02,560 – ₹ 1,05,120	₹ 3,97,440

The investor should off-load ₹ 6,690 of risk free securities and divert to Equity.

Question 10:

Mr. A owns a portfolio with the following characteristics:

	Security X	Security Y	Risk Free security
Beta	1.60	1.80	0
Expected Return	15%	16%	7%

i. If Mr. A has ₹ 2,00,000 to invest and sells short ₹ 1,00,000 of security B and purchases ₹ 3,00,000 of security A what is the sensitivity of Mr. A's portfolio ?

ii. If Mr. A borrows ₹ 2,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹ 2,00,000 in security X and Y in the same proportion as described in part (i), what is sensitivity of the portfolio?

iii. What is the expected market risk premium?

SOURCE: ICAI MTP APRIL 23

ANSWER:

i. Mr. A's position in the two securities are +3 in security X and -1 in security Y. Hence the portfolio beta shall be calculated as follows:
Sensitivity = 1.60 x300000/200000 - 1.80 x100000/200000 = 1.50 times

ii. Mr. A's current position:

Security X ₹ 6,00,000 / ₹ 2,00,000 = 3
Security Y -₹ 2,00,000 / ₹ 2,00,000 = -1
Risk Free Asset -₹ 2,00,000 / ₹ 2,00,000 = -1
Sensitivity = 3 x 1.60 + (-1 x 1.80) + (-1 x 0) = 3 times

iii. Expected Return = Risk Free Rate of Return + Risk Premium

Let X be the market risk premium,
Accordingly
Using Security X's Return
Total Return = 15% = 7% + 1.6X
Risk Premium (X) = 8% / 1.6 = 5%
Alternatively using Security Y's Return
Total Return = 16% = 7% + 1.8X
Risk Premium (X) = 9% / 1.8 =5%

Question 11:

Ms. Sreenidhi is learning the portfolio management techniques and wants to test one of the techniques she has developed on KIFS Equity Fund and compare the gains and losses from the technique with those from a passive buy and hold strategy.

The KIFS Equity Fund consists of equities only and the ending NAVs of the fund she constructed for the last 10 months are given below:

Month Ending	NAV (₹/unit)
Jan-22	100
Feb-22	78
Mar-22	92
Apr-22	86
May-22	102
Jun-22	98
Jul-22	100
Aug-22	102
Sep-22	118
Oct-22	120

Assume:

i. Sreenidhi had invested a notional amount of ₹ 5 lakhs equally in the equity fund and a conservative portfolio (of bonds) in the beginning of January 2022 and the total portfolio was being rebalanced each time the NAV of the fund increased or decreased by 15% compared to the NAV of previous month.

ii. There is no income earned from the conservative portfolio during the period.

iii. There is no taxation and entry/exit loads.

You are required to determine:

i. Value of the portfolio for each level of NAV following the Constant Ratio Plan.

ii. Whether there are any errors in the technique developed by Sreenidhi? If so briefly explain.

SOURCE: ICAI NOV 22 EXAM

ANSWER:

i. Constant Ratio Plan:

Stock Portfolio NAV (₹)	Value of Conservative Portfolio (₹)	Value of aggressive Portfolio (₹)	Total value of Constant Ratio Plan (₹)	Revaluation Action	Total No. of units in aggressive portfolio
100	2,50,000.00	2,50,000.00	5,00,000.00	-	2500
78	2,50,000.00	1,95,000.00	4,45,000.00	-	2500
	2,22,500.00	2,22,500.00	4,45,000.00	Buy 352.56 units	2852.56
92	2,22,500.00	2,62,435.52	4,84,935.52	-	2852.56
	2,42,467.76	2,42,467.76	4,84,935.52	Sell 217.04 units	2635.52
86	2,42,467.76	2,26,654.72	4,69,122.48	-	2635.52
102	2,42,467.76	2,68,823.04	5,11,290.80	-	2635.52
	2,55,645.40	2,55,646.40	5,11,290.80	Sell 129.19 units	2506.33
98	2,55,645.40	2,45,620.34	5,01,265.74	-	2506.33
100	2,55,645.40	2,50,633.00	5,06,278.40	-	2506.33
102	2,55,645.40	2,55,645.66	5,11,291.06	-	2506.33
118	2,55,645.40	2,95,746.94	5,51,392.34	-	2506.33
	2,75,696.17	2,75,696.17	5,51,392.34	Sell 169.92 units	2336.41
120	2,75,696.17	2,80,369.20	5,56,065.37	-	2336.41

Hence, the ending value of the mechanical strategy is ₹ 5,56,065.37 and buy & hold strategy is (₹2,50,000+ 2,500 X ₹120 = ₹5,50,000)

ii. Though the value of portfolio as per technique is lesser than Buy & Hold Strategy but there is no error as if market has been bearish then the value of much lesser under Buy & Hold Strategy.

AARAMBH

-THE STARTING POINT-

Question 12:

Suppose that economy A is growing rapidly, and you are managing a global equity fund and so far you have invested only in developed- country stocks only. Now you have decided to add stocks of economy A to your portfolio. The table below shows the expected rates of return, standard deviations, and correlation coefficients (all estimates are for aggregate stock market of developed countries and stock market of Economy A).

	Developed Country Stocks	Stocks of Economy A
Expected rate of return (annualized percentage)	20	30
Risk [Annualized Standard Deviation (%)]	16	30
Correlation Coefficient (ρ) between stock of two economies	0.30	

Assuming the risk-free interest rate to be 6%, you are required to determine:

i. What percentage of your portfolio should you allocate to stocks of Economy A if you want to increase the expected rate of return on your portfolio by 1%?

ii. What will be the standard deviation of your portfolio assuming that stocks of Economy A are included in the portfolio as calculated above?

iii. Also show how well the Fund will be compensated for the risk undertaken due to inclusion of stocks of Economy A in the portfolio?

SOURCE: ICAI MTP APRIL 24

ANSWER:

i. Let the weight of stocks of Economy A be expressed as w, then

(1- w) × 20% + w × 30% = 21%

i.e. w = 0.1 or 10%.

ii. Variance of portfolio shall be:

$(0.9)^2(0.16)^2 + (0.1)^2(0.30)^2 + 2(0.9)(0.1)(0.16)(0.30)(0.30) = 0.02423$

Standard deviation is (0.02423) ½ = 0.15565 or 15.56%.

iii. The Sharpe ratio will improve by approximately 0.09, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return - Risk Free Rate of Return}}{\text{Standard Deviation}}$$

Investment in stock of developed countries only: (20-6) /16 = 0.875

Investment with inclusion of stocks of Economy A: (21-6)/15.56 = 0.964

Question 13:

An investor has two portfolios known to be on minimum variance set for a population of three securities X, Y and Z having below mentioned weights:

	WX	WY	WZ
Portfolio A	0.30	0.40	0.30
Portfolio B	0.20	0.50	0.30

Calculate the weight for each stock for a portfolio constructed by investing ₹ 10,00,000 in portfolio A and ₹ 6,00,000 in portfolio B.

SOURCE: ICAI MTP APRIL 24

ANSWER:

Investment committed to each security would be:

	X (₹)	Y (₹)	Z (₹)	Total (₹)
Portfolio A	3,00,000	4,00,000	3,00,000	10,00,000
Portfolio B	1,20,000	3,00,000	1,80,000	6,00,000
Combined Portfolio	4,20,000	7,00,000	4,80,000	16,00,000
∴ Stock weights	0.2625 Or 0.26	0.4375 Or 0.44	0.3000 Or 0.30	

Question 14:

The expected returns and Beta of three stocks are given below:

Stock	A	B	C
Expected Return (%)	20	13	17
Beta Factor	1.9	0.8	1.4

If the risk-free rate is 9% and the expected rate of return on the market portfolio is 14% , examine which of the above stocks are over, under or correctly valued in the market? What shall be the strategy?

SOURCE: ICAI MTP MARCH 24

ANSWER:

Required Rate of Return is given by

Rj = Rf + β (Rm-Rf) For Stock A,

Rj = 9% + 1.9 (14% - 9%) = 18.50%

Stock B, Rj = 9% + 0.8 (14% - 9%) = 13.00%

Stock C, Rj = 9% + 1.4 (14% - 9%) = 16.00%

Required Return %	Expected Return %	Valuation	Decision
18.50%	20.00%	Under Valued	Buy
13.00%	13.00%	Correctly Valued	Hold
16.00%	17.00%	Under Valued	Buy

Question 15:

Mr. X is interested in investing ₹ 4,00,000 for which he is considering following three alternatives:

i. Invest ₹ 4,00,000 in Security A
ii. Invest ₹ 4,00,000 in Security B
iii. Invest ₹ 2,40,000 in Security A and ₹ 1,60,000 in Security B

Average annual return earned on Security A and Security B is 15% and 14% respectively. Risk free rate of return is 10% and Market Rate of Return is 12%.

Covariance of returns of Security A , Security B and Market portfolio are as follows:

	Security A	Security B	Market
Security A	4.800	4.300	3.370
Security B	4.300	4.250	2.800
Market	3.370	2.800	3.100

On the basis of above information evaluate the following:

i. Expected Return of Security A, B and Portfolio.
ii. Variance of return of Security A, Security B and Market.
iii. Variance and Standard Deviation of Portfolio.
iv. Systematic and Unsystematic Risks of Security A, Security B and Portfolio.

SOURCE: ICAI MTP MARCH 24

ANSWER:

a. Working Notes:

1. Beta of each Security

$$\beta = \frac{Cov(\text{Security}, Market)}{Varianceof\ Market}$$

$$\beta_A = \frac{3.370}{3.100} = 1.087$$

$$\beta_B = \frac{2.800}{3.100} = 0.903$$

2. Weight of Security A in portfolio =2,40,000/4,00,000 = 0.60

Weight of Security B in portfolio = 1,60,000/ 4,00,000 = 0.40

3. Portfolio Beta 0.60 x 1.087 + 0.40 x 0.903 = 1.013

i. Expected Return

Security A Return = 10% + 1.087(12% - 10%) = 12.17%.
Security B Return = 10% + 0.903(12% - 10%) = 11.81%.
Portfolio Return = 10% + 1.013(12% - 10%) = 12.03%.

ii. Variance of Returns

$$Cor_{i,j} = \frac{Cov\ (i, j)}{\sigma_i \sigma_j}$$

Accordingly, for Security A

$$1 = \frac{Cov\ (A,A)}{\sigma_A \sigma_A}$$

$\sigma_A^2 = 4.800$

Accordingly, for Security B

$$1 = \frac{Cov\ (B,B)}{\sigma_B \sigma_B}$$

$\sigma_B^2 = 4.250$

Accordingly, for Market Return

$$1 = \frac{Cov\ (M,M)}{\sigma_M \sigma_M}$$

$\sigma_M^2 = 3.100$

Alternatively, by referring diagonally the given Table these values can identified as follows:

$Variance_A$ = 4.800

$Variance_B$ = 4.250

$Variance_M$ = 3.100

iii. Variance and Standard Deviation of Portfolio Variance

$$\sigma_{AB}^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B Cov_{A,B}$$

$$= (0.60)^2(4.800) + (0.40)^2(4.250) + 2(0.60)(0.40)(4.300)$$

Variance = 4.472

Standard Deviation

$$\sigma_{AB} = \sqrt{4.472} = 2.115$$

iv. Systematic and Unsystematic Risks of Security A, Security B and Portfolio

$$\text{Systematic Risk} = \beta^2\sigma_m^2$$

Accordingly,

Systematic Risk of Security A = $(1.087)^2$ x 3.10 = 3.663

Systematic Risk of Security B = $(0.903)^2$ x 3.10 = 2.528

Systematic Risk of Portfolio = $(1.013)^2$ x 3.10 = 3.181

Unsystematic Risk = Total Risk – Systematic Risk

Accordingly,

Unsystematic Risk of Security A = 4.80 – 3.663 = 1.137

Unsystematic Risk of Security B = 4.250 – 2.528 = 1.722

Unsystematic Risk of Portfolio = 4.472 – 3.181 = 1.291

Question 16:

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

Market Return	Aggressive	Defensive
10.50%	6%	13.50%
37.50%	60%	27%

You are required to calculate:

1. The Betas of the two stocks.
2. Expected return of each stock, if the market return is equally likely to be 10.50% or 37.50%.
3. The Security Market Line (SML), if the risk free rate is 11.25% and market return is equally likely to be 10.50% or 37.50%.
4. The Alphas of the two stocks.

SOURCE: ICAI MTP SEP 23

ANSWER:

1. **The Betas of two stocks:**

   Aggressive stock - (60% - 6%)/(37.50% -10.50%) = 2
   Defensive stock - (27% - 13.50%)/(37.50% - 10.50%) = 0.50

   Alternatively, it can also be solved by using the Characteristic Line Relationship as follows:

   $Rs = \alpha + \beta R_m$

   Where,
   α = Alpha
   β = Beta
   R_m= Market Return

   For Aggressive Stock

   $6\% = \alpha + \beta(10.50\%)$
   $60\% = \alpha + \beta(37.50\%)$
   $54\% = \beta(27\%)$
   $\beta = 2$

   For Defensive Stock

   $13.50\% = \alpha + \beta(10.50\%)$
   $27\% = \alpha + \beta(37.50\%)$
   $13.50\% = \beta(27\%)$
   $\beta = 0.50$

2. **Expected returns of the two stocks:**

   Aggressive stock - 0.5 x 6% + 0.5 x 60% = 33%
   Defensive stock - 0.5 x 13.50% + 0.5 x 27% = 20.25%

3. **Expected return of market portfolio = 0.5 x 10.50% + 0.5% x 37.50% = 24%**

   ∴ Market risk premium = 24% - 11.25% = 12.75%
   ∴ SML is, required return = 11.25% + βi 12.75%

4. $R_s = \alpha + \beta R_m$
   For Aggressive Stock
   $33\% = \alpha_A + 2(24\%)$
   $\alpha_A = -15\%$
   For Defensive Stock
   $20.25\% = \alpha_D + 0.50(24\%)$
   $\alpha_D = 8.25\%$

Question 17:

An investor has decided to invest Rs. 1,00,000 in the shares of X Ltd. and Y Ltd. The desired returns from the shares of the two companies along with their probabilities are as follows:

Probability	X Ltd (%)	Y Ltd (%)
0.20	-5	15
0.50	10	25
0.30	15	-10

You are required to:

i. Calculate the risk and return of investment in individual shares.

ii. Compare the risk and return of these two shares with a portfolio of these shares in equal proportions.

iii. Find out the proportion of each of the above shares to formulate a minimum risk portfolio.

SOURCE: ICAI MAY 24 EXAM

ANSWER:

i.

Probability	X Ltd. (%)	Y Ltd. (%)	1X2 (%)	1X3 (%)
(1)	(2)	(3)	(4)	(5)
0.20	-5	15	- 1.00	3.00
0.50	10	25	5.00	12.50
0.30	15	-10	4.50	- 3.00
Average return			8.50	12.50

Hence the expected return from X Ltd. = 8.50% and Y Ltd. is 12.50%

Probability	$(X-\bar{X})$	$(X-\bar{X})^2$	1X3	$(Y-\bar{Y})$	$(Y-\bar{Y})^2$	(1)X(6)
(1)	(2)	(3)	(4)	(5)	(6)	
0.20	-13.50	182.25	36.45	2.50	6.25	1.25
0.50	1.50	2.25	1.125	12.50	156.25	78.125
0.30	6.50	42.25	12.675	-22.50	506.25	151.875
			50.25			231.25

$\sigma^2_X = 50.25(\%)^2$; $\sigma_X = 7.09\%$

$\sigma^2_Y = 231.25(\%)^2$; $\sigma_Y = 15.21\%$

ii. In order to find risk of portfolio of two shares, the covariance between the two is necessary here.

Probability	$(X-\bar{X})$	$(Y-\bar{Y})$	2X3	1X4
(1)	(2)	(3)	(4)	(5)
0.20	-13.50	2.50	-33.75	-6.75
0.50	1.50	12.50	18.75	9.375
0.30	6.50	-22.50	-146.25	-43.875
				-41.25

$\sigma^2_P = (0.5^2 \times 50.25) + (0.5^2 \times 231.25) + 2 \times (-41.25) \times 0.5 \times 0.5$

$\sigma^2_P = 12.563 + 57.813 - 20.625$

$\sigma^2_P = 49.751$ or $49.75(\%)$

$\sigma_P = \sqrt{49.75} = 7.053\%$ or 7.05%

$E(R_p) = (0.5 \times 8.50) + (0.5 \times 12.50) = 10.50\%$

	Return	Risk	Return to Risk Ratio of CV	Ranking
X Ltd.	8.50%	7.09	1.20	2
Y Ltd.	12.50%	15.21	0.82	3
Portfolio	10.50%	7.05	1.48	1

Risk of the portfolio is reduced by combining two shares.

iii. For constructing the minimum risk portfolio the condition to be satisfied is

$$Y = \frac{\sigma_X^2 - r_{XY}\sigma_X\sigma_Y}{\sigma_X^2 + \sigma_Y^2 - 2r_{XY}\sigma_X\sigma_Y} \text{ or } = \frac{\sigma_X^2 - Cov_{XY}}{\sigma_X^2 + \sigma_Y^2 - 2Cov_{XY}}$$

σ_X = Std. Deviation of X Ltd.

σ_Y = Std. Deviation of Y Ltd.

r_{XY}= Coefficient of Correlation between X Ltd. and Y Ltd.

Cov. $_{XY}$ = Covariance between X Ltd. and Y Ltd.

Therefore,

$$\% \text{ Y Ltd.} = \frac{50.25 - (-41.25)}{50.25 + 231.25 - [2\times(-41.25)]} = \frac{91.50}{364} = 0.2514 \text{ or } 25.14\% \text{ or } 25\%$$

Y Ltd. = 25.14% or 25%

X Ltd. = 74.86% or 75%

Alternatively, it can also be computed as follows:

For constructing the minimum risk portfolio the condition to be satisfied is

$$X = \frac{\sigma_Y^2 - r_{XY}\sigma_X\sigma_Y}{\sigma_X^2 + \sigma_Y^2 - 2r_{XY}\sigma_X\sigma_Y} \text{ or } = \frac{\sigma_Y^2 - Cov_{XY}}{\sigma_X^2 + \sigma_Y^2 - 2Cov_{XY}}$$

σ_X = Std. Deviation of X Ltd.

σ_Y = Std. Deviation of Y Ltd.

r_{XY}= Coefficient of Correlation between X Ltd. and Y Ltd.

Cov. $_{XY}$ = Covariance between X Ltd. and Y Ltd.

Therefore,

$$\% \text{ X Ltd.} = \frac{231.25 - (-41.25)}{50.25 + 231.25 - [2\times(-41.25)]} = \frac{272.50}{364} = 0.7486$$

or 74.86% or 75%

Y Ltd. = 25.14% or 25%

X Ltd. = 74.86% or 75%

Question 18:

Ankit has a fund of ₹ 10 lacs which he wants to invest in share market with rebalancing target after every 15 days to start with for a period of one month from now. The present NIFTY is 19679. The minimum NIFTY within a month can at most be 18104.68. He wants to know as to how he should rebalance his portfolio under the following situations, according to the theory of Constant Proportion Portfolio Insurance Policy, using "2" as the multiplier:

1. Immediately to start with.
2. 15 days later-being the 1st day of rebalancing if NIFTY falls to 19088.63.
3. 15 days further from the above date if the NIFTY touches 20997.493.

Note: Assume that the value of his equity component will change in tandem with that of the NIFTY.

SOURCE: ICAI RTP NOV 23

ANSWER:

Maximum decline in one month = $\frac{19679 - 18104.68}{19679} \times 100 = 8\%$

(1) Immediately to start with

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (10,00,000 – 9,20,000) = ₹ 1,60,000

Ankit may invest ₹ 1,60,000 in equity and balance in risk free securities.

(2) After 15 days

Value of equity = 1,60,000 x 19088.63 / 19679	=	₹ 1,55,200
Value of risk free investment	=	₹ 8,40,000
Total value of portfolio	=	₹ 9,95,200

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (9,95,200 – 9,20,000)	=	₹ 1,50,400
Revised Portfolio:		
Equity	=	₹ 1,50,400
Risk free Securities = ₹ 9,95,200 – ₹ 1,50,400	=	₹ 8,44,800

(3) After another 15 days

Value of equity = 1,50,400 x 20997.493 / 19088.63	=	₹ 1,65,440
Value of risk free investment	=	₹ 8,44,800
Total value of portfolio	=	₹ 10,10,240

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (10,10,240 – 9,20,000)	=	₹ 1,80,480
Revised Portfolio:		
Equity	=	₹ 1,80,480

Risk Free Securities = ₹ 10,10,240 – ₹ 1,80,480 = ₹ 8,29,760

Ankit should off-load ₹ 15,040 of risk free securities and divert to Equity.

CASE STUDY

CASE STUDY:

[Same Question present in SSEI CW Book Q18 Page no. 51 but in RTP NOV 24 it is in Case Study Format]

Two friend Mr. A and Mr. N were discussing about the risks of market. While Mr. A is sort of risk averse, Mr. N is an aggressive investor and believes in taking risk.

Mr. N said we cannot diversify the market risk at all, and he quoted the Modern Portfolio Approach. Both friends analyze the market data for the few months and came out with expected returns on two stocks for a particular market.

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

Based on above scenario, answer the following questions:

i. The Beta of Defensive stock is……

(a) 2
(b) 0.5
(c) 4
(d) 1

ii. If the market return is equally likely to be 7% or 25% then expected return of Aggressive stock shall be……..

(a) 18%
(b) 13.50%
(c) 22%
(d) 11%

iii. The Alpha of the Defensive stocks is……..

(a) -10%
(b) 22%
(c) 5.50%
(d) 12%

iv. The Modern Portfolio Theory was propounded by ……

(a) William Sharpe
(b) Black Scholes
(c) Stephen Ross
(d) Harry Markowitz

v. As per Capital Market Line (CML) Theory the Portfolios lying on the CML over the market portfolio are called …….

(a) Lending Portfolios
(b) Borrowing Portfolios
(c) Diversified Portfolios
(d) Risk- Free Portfolios

ANSWER:

I (b)
II (c)
III (c)
IV (d)
V (c)