PORTFOLIO MANAGEMENT
CLASS 14
CLASS WORK COVERAGE

To streamline our learning process, I've categorized the questions we'll tackle in class into four distinct groups:

1. ***Classic:*** *These questions are exactly as presented in your book, providing a familiar foundation.*
2. ***Transformed:*** *Here, we've converted book questions into multiple-choice format to enhance your analytical skills.*
3. ***Adapted:*** *These are similar to book questions but with altered numbers or names, presented as multiple-choice questions for varied practice.*
4. ***Original:*** *These are entirely new questions not found in your book, designed to challenge and expand your understanding.*

This structure will help us navigate through a range of problems, ensuring a comprehensive grasp of the material. Looking forward to our next session!

Q. No.	Type	Book	Page No.
50	***Classic***	CW Q BOOK	62
57	***Classic***	CW Q BOOK	67

PART IV: SHARPE OPTIMISATION APPROACH

Topic 18 SHARPE OPTIMISATION

Question 50: SSEI CW Book Page No. 62

Data for finding out the optimal portfolio are given below:

Security Number	Mean Return	Excess Return	Beta	Unsystematic Risk	Excess Return to Beta
	R_i	$R_i - R_f$	β	$\sigma^2_{\in i}$	$\frac{R_i - R_f}{\beta_i}$
1	19	14	1.0	20	14
2	23	18	1.5	30	12
3	11	6	0.5	10	12
4	25	20	2.0	40	10
5	13	8	1.0	20	8
6	9	4	0.5	50	8
7	14	9	1.5	30	6

The riskless rate of interest is 5 per cent and the market variance is 10. Determine the cut -off point.

(*Source: ICAI*)

ANSWER:

Security	$\frac{R_i - R_f}{\beta_i}$	$\frac{(R_i - R_f) \times \beta_i}{\sigma^2_{ei}}$	$\sum_{i=1}^{N} \frac{(R_i - R_f) \times \beta_i}{\sigma^2_{ei}}$	$\frac{\beta^2_i}{\sigma^2_{ei}}$	$\sum_{i=1}^{N} \frac{\beta^2_i}{\sigma^2_{ei}}$	C_i
1	14	0.7	0.7	0.05	0.05	4.67
2	12	0.9	1.6	0.075	0.125	7.11
3	12	0.3	1.9	0.025	0.15	7.60
4	10	1.0	2.9	0.1	0.25	8.29
5	8	0.4	3.3	0.05	0.3	8.25
6	8	0.04	3.34	0.005	0.305	8.25
7	6	0.45	3.79	0.075	0.38	7.90

'C_i ' calculations are given below:

For Security 1

$$C_1 = \frac{10 \times .7}{1 + 10(.05)} = 4.67$$

Here 0.7 is got from column 4 and 0.05 from column 6. Since the preliminary calculations are over, it is easy to calculate the C_i.

$$C_2 = \frac{10 \text{ x } 1.6}{1 + 10\ (.125)} = 7.11$$

$$C_3 = \frac{10 \text{ x } 1.9}{1 + 10\ (0.15)} = 7.6$$

$$C_4 = \frac{10 \times 2.9}{1 + 10(0.25)} = 8.29$$

$$C_5 = \frac{10 \times 3.3}{1 + 10\ (0.3)} = 8.25$$

$$C_6 = \frac{10 \times 3.34}{1 + 10\ (0.305)} = 8.25$$

$$C_7 = \frac{10 \times 3.79}{1 + 10(0.38)} = 7.90$$

The highest C_i value is taken as the cut-off point i.e. C*. The stocks ranked above C* have high excess returns to beta than the cut-off C and all the stocks ranked below C* have low excess returns to beta. Here, the cut-off point is 8.29. Hence, the first four securities i.e. 1 – 4 are selected and remaining 3 are rejected.

Now we shall compute how much to be invested in each security by calculating Z_i for these four securities as follows:

$$Z_i = \frac{B_i}{\sigma_i^2}\left(\frac{R_i - R_o}{{}_1B_i} - C*\right)$$

Thus,

$$Z_1 = \frac{1.00}{20}\left(\frac{14}{1.0} - 8.29\right) = 0.05(5.71) = 0.2855$$

$$Z_2 = \frac{1.5}{30}\left(\frac{18}{1.5} - 8.29\right) = 0.05(3.71) = 0.1855$$

$$Z_3 = \frac{0.5}{10}\left(\frac{6}{0.5} - 8.29\right) = 0.05(3.71) = 0.1855$$

$$Z_4 = \frac{2}{40}\left(\frac{20}{2} - 8.29\right) = 0.05(1.71) = 0.0855$$

The proportion of investment in each stock will be computed as follows:

$$X_i = \frac{Z_i}{\sum_{i=1}^{n} Z_j}$$

Thus $\sum_{i=1}^{n} Z_j$ = 0.2855 + 0.1855 + 0.1855 + 0.0855 = 0.742

Accordingly, proportion of investments in

Security 1 $= \frac{0.2855}{0.742} = 0.3848$ i.e. 38.48%

Security 2 $= \frac{0.1855}{0.742} = 0.25$ i.e. 25%

Security 3 $= \frac{0.1855}{0.742} = 0.25$ i.e. 25%

Security 4 $= \frac{0.0855}{0.742} = 0.1152$ i.e. 11.52%

Thus investment as per following proportion will be the optimal portfolio.

Security 1	→	38.48%
Security 2	→	25%
Security 3	→	25%
Security 4	→	11.52%

PART VI: PORTFOLIO REBALANCING

Topic 23 CORNER THEOREM

Question 57: SSEI CW Book Page No. 67

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

	WA	WB	WC
Portfolio X	0.30	0.40	0.30
Portfolio Y	0.20	0.50	0.30

It is supposed that there are no restrictions on short sales.

i. What would be the weight for each stock for a portfolio constructed by investing ₹5,000 in portfolio X and ₹ 3,000 in portfolio Y?.

ii. Suppose the investor invests ₹ 4,000 out of ₹ 8,000 in security A. How he will allocate the balance between security B and C to ensure that his portfolio is on minimum variance set?

(*Source: ICAI)*

ANSWER:

i. Investment committed to each security would be:

	A (₹)	B (₹)	C (₹)	Total (₹)
Portfolio X	1,500	2,000	1,500	5,000
Portfolio Y	600	1,500	900	3,000
Combined Portfolio	2,100	3,500	2,400	8,000
∴Stock weights	0.26	0.44	0.30	

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

WB = a + bWA

Substituting the values of WA & WB from portfolio X and Y in above equation, we get

0.40 = a + 0.30b, and
0.50 = a + 0.20b
Solving above equation we obtain the slope and intercept, a = 0.70 and b= -1 and thus, the critical line is

WB = 0.70 – WA

If half of the funds is invested in security A then,

WB = 0.70 – 0.50 = 0.20

Since WA + WB + WC = 1
WC = 1 - 0.50 – 0.20 = 0.30

∴ Allocation of funds to

security B = 0.20 x 8,000 = ₹ 1,600,
&
Security C = 0.30 x 8,000 = ₹ 2,400