

PORTFOLIO MANAGEMENT

CLASS 12

HOME WORK SUPPORT COVERAGE

Question			Answer			Lecture Time
Q. No	Page no.	Book	Q. No	Page no.	Book	
EQ 1	130	HW ANS BOOK	EQ 1	130	HW ANS BOOK	NO VIDEO
31	43	HW Q BOOK	31	112	HW ANS BOOK	NO VIDEO
32	43	HW Q BOOK	32	112	HW ANS BOOK	NO VIDEO
34	44	HW Q BOOK	34	114	HW ANS BOOK	NO VIDEO
35	44	HW Q BOOK	35	115	HW ANS BOOK	NO VIDEO
37	45	HW Q BOOK	37	116	HW ANS BOOK	NO VIDEO

PART II: CAPITAL MARKET THEORY (CMT)

EXTRA QUESTION

Topic 15 TR, SR AND UR OF A PORTFOLIO

Question: HW ANS BOOK PAGE 130

Following are the details of a portfolio consisting of three shares:

Share	Portfolio weight	Beta	Expected return in %	Total Variance
DGS	0.35	0.30	12%	0.010
DV	0.25	1.20	18%	0.030
BP	0.40	0.50	10%	0.015

Standard Deviation of Market Portfolio Returns = 14%

Covariance (DGS, DV) = 0.020,

Covariance (DV, BP) = 0.050,

Covariance (BP, DGS) = 0.030

You are required to calculate:

- i. The Portfolio Beta
- ii. Residual Variance of each of the three Shares,
- iii. Portfolio Variance using Sharpe Index Model,
- iv. Portfolio Variance (on the basis of Modern Portfolio Theory given by Markowitz).

ANSWER:

i. Portfolio Beta

$$0.35 \times 0.30 + 0.25 \times 1.20 + 0.40 \times 0.50 = 0.605$$

ii. Residual Variance

To determine Residual Variance first of all we shall compute the Systematic Risk as follows:

$$\beta_A^2 \times \sigma_M^2 = (0.30)^2(0.14)^2 = 0.001764$$

$$\beta_B^2 \times \sigma_M^2 = (1.20)^2(0.14)^2 = 0.028224$$

$$\beta_C^2 \times \sigma_M^2 = (0.50)^2(0.14)^2 = 0.0049$$

Residual Variance

$$\text{DGS} \quad 0.010 - 0.001764 = 0.008236$$

$$\text{DV} \quad 0.030 - 0.028224 = 0.001776$$

$$\text{BP} \quad 0.015 - 0.0049 = 0.0101$$

iii. Portfolio variance using Sharpe Index Model

$$\text{Systematic Variance of Portfolio} = (0.14)^2 \times (0.605)^2 = 0.007174 \text{ or } 0.0072$$

$$\text{Unsystematic Variance of Portfolio} = 0.008236 \times (0.35)^2 + 0.001776 \times (0.25)^2 + 0.0101 \times (0.40)^2 = 0.002736 \text{ or } 0.0027$$

$$\text{Total Variance} = 0.007174 + 0.002736 = 0.00991 \text{ or } 0.0099$$

iv. Portfolio variance on the basis of Markowitz Theory

$$\begin{aligned} &= (w_A \times w_A \times \sigma_A^2) + (w_A \times w_B \times \text{Cov}_{AB}) + (w_A \times w_C \times \text{Cov}_{AC}) + (w_B \times w_A \times \text{Cov}_{AB}) \\ &+ (w_B \times w_B \times \sigma_B^2) + (w_B \times w_C \times \text{Cov}_{BC}) + (w_C \times w_A \times \text{Cov}_{CA}) + (w_C \times w_B \times \text{Cov}_{CB}) \\ &+ (w_C \times w_C \times \sigma_C^2) \\ &= (0.35 \times 0.35 \times 0.010) + (0.35 \times 0.25 \times 0.020) + (0.25 \times 0.40 \times 0.050) + (0.40 \times 0.35 \\ &\times 0.030) + (0.25 \times 0.35 \times 0.020) + (0.40 \times 0.25 \times 0.050) + (0.35 \times 0.40 \times 0.030) + \\ &(0.25 \times 0.25 \times 0.030) + (0.40 \times 0.40 \times 0.015) \\ &= 0.001225 + 0.00175 + 0.005 + 0.0042 + 0.00175 + 0.005 + 0.0042 + 0.001875 + \\ &0.0024 \\ &= 0.0274 \end{aligned}$$

PART VII: AMBIGUOUS

Question 31: SSEI HW Book Page No. 43

A company has a choice of investments between several different equity oriented mutual funds. The company has an amount of ₹ 100 lakhs to invest. The details of the mutual funds are as follows:

Mutual Funds	A	B	C	D	E
Beta	1.5	1.0	0.8	2.0	0.7

PLAN I

If the company invests 20% of its investments in each of the first two mutual funds (A and B) and balance in equal amounts in the mutual funds C, D and E, what is the beta of the portfolio?

PLAN II

If the company invests 15% of its investment in C, 15% in A, 10% in E and the balance in equal amounts in the other two mutual funds, what is the beta of the portfolio?

If the expected return of market portfolio is 12% at a beta factor of 1.0, what will be the expected return on the portfolio in both the plans given above?

(Source: ICAI)

ANSWER:

Plan I: Investment in A and B at 20 % each and balance in equal proportion in C, D, and E.

Mutual Fund	Proportion of Investment	Beta	Proportion × Fund beta
A	0.2	1.50	0.30
B	0.2	1.00	0.20
C	0.2	0.80	0.16
D	0.2	2.00	0.40
E	0.2	0.70	0.14
Portfolio beta			1.20

Plan II: Investment in A at 15%, C at 15% and E at 10% and balance in equal proportion in B and D:

Mutual Fund	Proportion of Investment	Beta	Proportion × Fund beta
A	0.15	1.50	0.225
B	0.30	1.00	0.300
C	0.15	0.80	0.120
D	0.30	2.00	0.600
E	0.10	0.70	0.070
Portfolio Beta			1.315

Expected return = Market return × Portfolio Beta

Plan	Return
I	$12\% \times 1.20 = 14.40\%$
II	$12\% \times 1.315 = 15.78\%$

Question 32: SSEI HW Book Page No. 43

Mr. X holds the following portfolio:

Securities	Cost (₹)	Dividends (₹)	Market Price (₹)	Beta
Equity shares:				
A Ltd	16,000	1,600	16,400	0.9
B Ltd.	20,000	1,600	21,000	0.8
C Ltd.	32,000	1,600	44,000	0.6
PSU Bonds	68,000	6,800	64,600	0.4

The risk-free rate of return is 12%.

Calculate the following:

- i. The expected rate of return on his portfolio using Capital Asset Pricing Model (CAPM).
- ii. The average return on his portfolio. (Calculate up to two decimal points)

(Source: ICAI)

ANSWER:

Calculation of expected return on market portfolio (R_m)

Investment	Cost (₹)	Dividends (₹)	Capital Gains (₹)
Shares A	16,000	1600	400
Shares B	20,000	1600	1000
Shares C	32,000	1600	12,000
PSU Bonds	<u>68,000</u>	<u>6800</u>	<u>-3,400</u>
	<u>1,36,000</u>	<u>11,600</u>	<u>10,000</u>

$$R_m = \frac{11,600 + 10,000}{1,36,000} \times 100 = 15.88\%$$

Calculation of expected rate of return on individual security:

Security

Shares A	$12 + 0.9 (15.88 - 12.0)$	= 15.49%
Shares B	$12 + 0.8 (15.88 - 12.0)$	= 15.10%
Shares C	$12 + 0.6 (15.88 - 12.0)$	= 14.33%
PSU Bonds	$12 + 0.4 (15.88 - 12.0)$	= 13.55%

Calculation of the Average Return of the Portfolio:

$$= \frac{15.49 + 15.10 + 14.33 + 13.55}{4} = 14.62\%$$

Question 34: SSEI HW Book Page No. 44

A holds the following portfolio:

Share/Bond	Beta	Initial Price ₹	Dividends ₹	Market Price at 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:

- The expected rate of return of each security using Capital Asset Pricing Method (CAPM)
- The average return of his portfolio.

Risk-free return is 14%.

(Source: ICAI)

ANSWER:

i. Expected rate of return

	Total Investments	Dividends	Capital Gains
Epsilon Ltd.	25	2	25
Sigma Ltd.	35	2	25
Omega Ltd.	45	2	90
GOI Bonds	1,000	140	5
	1,105	146	145

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

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

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

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

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 35: SSEI HW Book Page No. 44

Your client is holding the following securities:

Particulars of Securities	Cost ₹	Dividends ₹	Market Price ₹	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.

(Source: ICAI)

ANSWER:

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	34,000	3,400	-1,700
	68,000	5,800	5,000

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

Calculation of expected rate of return on individual security:

Security		
Shares X	$15 + 0.8 (15.88 - 15.0)$	15.70%
Shares Y	$15 + 0.7 (15.88 - 15.0)$	15.62%
Shares Z	$15 + 0.5 (15.88 - 15.0)$	15.44%
PSU Bonds	$15 + 0.2 (15.88 - 15.0)$	15.18%

Calculation of the Average Return of the Portfolio:

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

Question 37: SSEI HW Book Page No. 45

As an investment manager, you are given the following information:

Particulars	Initial price (₹)	Dividend (₹)	Market price of the dividends (₹)	Beta (Risk factor)
A. Equity Shares :				
Manufacturing Ltd.	30	2	55	0.8
Pharma Ltd.	40	2	65	0.7
Auto Ltd.	50	2	140	0.5
B. Government of India Bonds	1005	140	1010	0.99

By assuming risk free return as 16%, Calculate:

- i. Expected rate of return on the portfolio (aggregate) of investor;
- ii. Expected rate of return of portfolio in each above stated share/ bond using Capital Asset Pricing Model (CAPM); and
- iii. Average Rate of Return.

(Source: ICAI)

ANSWER:

i. Expected rate of return

	Total Investments	Dividends	Capital Gains
Manufacturing Ltd.	30	2	25
Pharma Ltd.	40	2	25
Auto Ltd.	50	2	90
GOI Bonds	1005	140	5
	1125	146	145

$$\text{Expected Return on market portfolio} = \frac{146 + 145}{1125} = 25.87\%$$

ii. CAPM = E(Rp) = R_F + β [E(R_M) – R_F]

Manufacturing Ltd. Ltd	16 + 0.8 [25.87-16]	16 + 7.90	23.90%
Pharma Ltd.	16 + 0.7 [25.87-16]	16 + 6.91	22.91%
Auto Ltd.	16 + 0.5 [25.87-16]	16 + 4.93	20.93%
GOI Bonds	16 + 0.99 [25.87-16]	16 + 9.77	25.77%

iii. Average Return of Portfolio

$$\frac{23.90 + 22.91 + 20.93 + 25.77}{4} = \frac{93.51}{4} = 23.38\%$$

Alternatively,

$$\frac{0.8 + 0.7 + 0.5 + 0.99}{4} = \frac{2.99}{4} = 0.7475$$

$$16 + 0.7475(25.87 - 16)$$

$$16 + 7.38 = 23.38\%$$