

PORTFOLIO MANAGEMENT

CLASS 5

HOME WORK SUPPORT

COVERAGE

Question			Answer			Lecture Time
Q. No	Page no.	Book	Q. No	Page no.	Book	
15	50	CW Q BOOK	15	90	CW ANS BOOK	00:00:30 TO 00:14:29
16	50	CW Q BOOK	16	91	CW ANS BOOK	00:14:30 TO 00:16:55
17	50	CW Q BOOK	17	92	CW ANS BOOK	00:16:56 TO 01:12:38
6	32	HW Q BOOK	6	92	HW ANS BOOK	01:12:39 TO 01:13:43
7	33	HW Q BOOK	7	92	HW ANS BOOK	01:13:44 TO 01:14:39
2	128	HW ANS BOOK	2	128	HW ANS BOOK	01:14:40 TO 01:17:53

Topic 7 NEW EFFICIENT FRONTIER
Question 15:
CW Q BOOK PAGE NO 50

If the rate of return and Standard Deviation of Market Portfolio (Index) is 8% and 6% respectively and the risk free rate of return is 5%, you are required to:

- Construct an efficient portfolio which produces expected return of 7.5%.
- Calculate the risk of above portfolio.
- Suppose if Mr. X has Rs.1,00,000 of his personal funds, then how he would construct his portfolio giving expected return of 10% and what will be risk of this portfolio.

(Source: ICAI)

Answer:
CW ANS BOOK PAGE NO 90

- An efficient portfolio shall consist of the market portfolio and risk free securities. Accordingly, let x be the proportion of total funds invested in market portfolio then

$$E(R_p) = x E(R_m) + (1 - x) R_f$$

$$7.5\% = x \times 8\% + (1 - x) \times 5\%$$

$$7.5\% = 8x + 5 - 5x$$

$$2.5 = 3x$$

$$x = 5/6 \text{ i.e. } 83.33\%$$

Thus, $88\frac{1}{3}\%$ total funds should be invested in market portfolio and balance 16.67% in Risk Free Securities.

- Risk of above Portfolio

$$7.5 = 5.00 + \frac{8\% - 5\%}{6\%} \sigma_p$$

$$2.5 = \frac{3\%}{6\%} \sigma_p$$

$$15\% = 3\% \sigma_p$$

$$\sigma_p = 5\%$$

- Let y be the proportion of investment in market portfolio then investment in risk free securities $(1 - y)$, then

$$10\% = y \times 8\% + (1 - y) \times 5\%$$

$$10\% = 8y + 5\% - 5y$$

$$5\% = 3y$$

$$y = 1.66$$

Thus, borrow $66\frac{2}{3}\%$ of owned fund i.e. 66.67% of owned funds at risk free rate of interest of 5%.

Rs. 100000 X 66.67 % = Rs. 66,670

Now invest total fund of Rs. 1,66,670 in the market portfolio.

Risk of Portfolio

$$10\% = 5\% + \frac{8\% - 5\%}{6\%} \sigma_P$$

$$5\% = \frac{3\%}{6\%} \sigma_P$$

$$\sigma_P = 10\%$$

Topic 8 BETA CALCULATION

Question 16:

CW Q BOOK PAGE NO 50

The rates of return on the security of Company X and market portfolio for 10 periods are given below:

Period	Return of Security X (%)	Return on Market Portfolio (%)
1	20	22
2	22	20
3	25	18
4	21	16
5	18	20
6	-5	8
7	17	-6
8	19	5
9	-7	6
10	20	11

- What is the beta of Security X?
- What is the characteristic line for Security X?

(Source: ICAI)

Answer:

CW ANS BOOK PAGE NO 91

i.

Period	R_X	R_M	$R_X - \bar{R}_X$	$R_M - \bar{R}_M$	$(R_X - \bar{R}_X)(R_M - \bar{R}_M)$	$(R_M - \bar{R}_M)^2$
1	20	22	5	10	50	100
2	22	20	7	8	56	64
3	25	18	10	6	60	36
4	21	16	6	4	24	16
5	18	20	3	8	24	64
6	-5	8	-20	-4	80	16
7	17	-6	2	-18	-36	324
8	19	5	4	-7	-28	49
9	-7	6	-22	-6	132	36
10	20	11	5	-1	-5	1
	150	120			357	706
	$\sum R_X$	$\sum R_M$			$\sum (R_X - \bar{R}_X)(R_M - \bar{R}_M)$	$\sum (R_M - \bar{R}_M)^2$

$$\bar{R}_X = 15 \quad \bar{R}_M = 12$$

$$\sigma_M^2 = \frac{\sum (R_M - \bar{R}_M)^2}{n} = \frac{706}{10} = 70.60$$

$$\text{Cov}_{XM} = \frac{\sum (R_X - \bar{R}_X)(R_M - \bar{R}_M)}{n} = \frac{357}{10} = 35.70$$

$$\text{Beta}_x = \frac{\text{Cov}_{xM}}{\sigma_M^2} = \frac{35.70}{70.60} = 0.505$$

Alternative Solution

Period	X	Y	Y ²	XY
1	20	22	484	440
2	22	20	400	440
3	25	18	324	450
4	21	16	256	336
5	18	20	400	360
6	-5	8	64	-40
7	17	-6	36	-102
8	19	5	25	95
9	-7	6	36	-42
10	20	11	121	220
	150	120	2146	2157
	$\bar{X} = 15$	$\bar{Y} = 12$		

$$\begin{aligned}
 &= \frac{\sum XY - n\bar{X}\bar{Y}}{\sum X^2 - n(\bar{X})^2} \\
 &= \frac{2157 - 10 \times 15 \times 12}{2146 - 10 \times 12 \times 12} = \frac{357}{706} = 0.506
 \end{aligned}$$

ii. $\bar{R}_x = 15$ $\bar{R}_M = 12$

$$y = \alpha + \beta X$$

$$15 = \alpha + 0.505 \times 12$$

$$\text{Alpha } (\alpha) = 15 - (0.505 \times 12) = 8.94\%$$

$$\text{Characteristic line for security X} = \alpha + \beta \times R_M$$

Where, R_M = Expected return on Market Index

$\therefore$ Characteristic line for security X = $8.94 + 0.505 R_M$

Question 17: **CW Q BOOK PAGE NO 50**

Mr. Gupta is considering investment in the shares of R. Ltd. He has the following expectations of return on the stock and the market:

Probability	Return (%)	
	R. Ltd.	Market
0.35	30	25
0.30	25	20
0.15	40	30
0.20	20	10

You are required to:

- Calculate the expected return, variance and standard deviation for R. Ltd.
- Calculate the expected return variance and standard deviation for the market.
- Find out the beta co-efficient for R. Ltd. shares.

(Source: ICAI)

Answer: **CW ANS BOOK PAGE NO 92**
i. Calculation of Expected Return, Variance and Standard Deviation for R Ltd.

Prob. (P)	R	P x R	$(R - \bar{R})$	$(R - \bar{R})^2$	$(R - \bar{R})^2 P$
0.35	30	10.50	2	4	1.40
0.30	25	7.50	-3	9	2.70
0.15	40	6.00	12	144	21.60
0.20	20	4.00	-8	64	12.80
		28.00			38.50

$$\sigma = \sqrt{38.50} = 6.20$$

ii. Calculation of Expected Return, Variance and Standard Deviation for Market

Prob. (P)	M	P x M	$(M - \bar{M})$	$(M - \bar{M})^2$	$P(M - \bar{M})^2$	$(R - \bar{R})$ $(M - \bar{M})$	$(R - \bar{R})$ $(M - \bar{M}) P$
0.35	25	8.75	3.75	14.063	4.922	7.50	2.625
0.30	20	6.00	-1.25	1.563	0.469	3.75	1.125
0.15	30	4.50	8.75	76.563	11.484	105.00	15.75
0.20	10	2.00	-11.25	126.563	25.313	90.00	18.00
		21.25			42.188		37.50

$$\sigma = \sqrt{42.188} = 6.495$$

iii. Beta Co-efficient for R Ltd. Shares

$$\beta = \frac{\text{Cov}(R, M)}{\sigma_M^2} = \frac{37.50}{42.188} = 0.888$$

Topic 8 BETA CALCULATION

Question 6:

HW Q BOOK PAGE NO 32

The distribution of return of security 'F' and the market portfolio 'P' is given below:

Probability	Return %	
	F	P
0.30	30	-10
0.40	20	20
0.30	0	30

You are required to calculate the expected return of security 'F' and the market portfolio 'P', the covariance between the market portfolio and security and beta for the security.

(Source: ICAI)

Answer:

HW ANS BOOK PAGE NO 92

Security F

Prob(P)	R _f	PxR _f	Deviations of F (R _f - ER _f)	(Deviation) ² of F	(Deviations) ² P _x
0.3	30	9	13	169	50.7
0.4	20	8	3	9	3.6
0.3	0	0	-17	289	86.7
		ER _f =17			Var _f =141

$$\text{STDEV } \sigma_f = \sqrt{141} = 11.87$$

Market Portfolio, P

R _M %	P _M	Exp. Return R _M x P _M	Dev. of P (R _M -ER _M)	(Dev. of P) ²	(Dev.) ² P _M	(Deviation of F) x (Deviation of P)	Dev. of F x Dev. of P)
-10	0.3	-3	-24	576	172.8	-312	-93.6
20	0.4	8	6	36	14.4	18	7.2
30	0.3	9	16	256	76.8	-272	-81.6
		ER _M =14			Var _M =264 σ _M =16.25		=Co Var P _M =- 168

$$\text{Beta} = \frac{\text{Co Var P}_M}{\sigma_M^2} = \frac{-168}{264} = -.636$$

Question 7: **HW Q BOOK PAGE NO 33**

Given below is information of market rates of Returns and Data from two Companies A and B:

	Year 2007	Year 2008	Year 2009
Market (%)	12.0	11.0	9.0
Company A (%)	13.0	11.5	9.8
Company B (%)	11.0	10.5	9.5

You are required to determine the beta coefficients of the Shares of Company A and Company B.

(Source: ICAI)

Answer: **HW ANS BOOK PAGE NO 92**

Company A:

Year	Return % (Ra)	Market return % (Rm)	Deviation R(a)	Deviation Rm	D Ra × DRm	Rm ²
1	13.0	12.0	1.57	1.33	2.09	1.77
2	11.5	11.0	0.07	0.33	0.02	0.11
3	9.8	9.0	-1.63	-1.67	2.72	2.79
	34.3	32.0			4.83	4.67

Average Ra = 11.43

Average Rm = 10.67

$$\text{Covariance} = \frac{\sum (R_m - \bar{R}_m)(R_a - \bar{R}_a)}{N}$$

$$\text{Covariance} = \frac{4.83}{3} = 1.61$$

$$\text{Variance}(\sigma_m^2) = \frac{\sum (R_m - \bar{R}_m)^2}{N}$$

$$= \frac{4.67}{3} = 1.557$$

$$\beta = \frac{1.61}{1.557} = 1.03$$

Company B:

Year	Return % (Rb)	Market return % (Rm)	Deviation R(b)	Deviation Rm	D Rb × D Rm	Rm ²
1	11.0	12.0	0.67	1.33	0.89	1.77
2	10.5	11.0	0.17	0.33	0.06	0.11
3	9.5	9.0	-0.83	-1.67	1.39	2.79
	31.0	32.0			2.34	4.67

Average Rb = 10.33

Average Rm = 10.67

$$\text{Covariance} = \frac{\sum (R_m - \bar{R}_m)(R_b - \bar{R}_b)}{N}$$

$$\text{Covariance} = \frac{2.34}{3} = 0.78$$

$$\text{Variance}(\sigma_m^2) = \frac{\sum (R_m - \bar{R}_m)^2}{N} = \frac{4.67}{3} = 1.557$$

$$\beta = \frac{0.78}{1.557} = 0.50$$

Topic 7 NEW EFFICIENT FRONTIER
Question 2: HW ANS BOOK PAGE NO 128

If the rate of return and Standard Deviation of Market Portfolio (Index) is 12% and 9% respectively and the risk free rate of return is 6%, you are required to:

- Construct an efficient portfolio which produces expected return of 10%.
- Calculate the risk of above portfolio.
- Suppose if Mr. X has Rs.2,40,000 of his personal funds, then how he would construct his portfolio giving expected return of 15% and what will be risk of this portfolio.

(Source: ICAI)

ANSWER: HW ANS BOOK PAGE NO 128

- iv. An efficient portfolio shall consist of the market portfolio and risk free securities. Accordingly, let x be the proportion of total funds invested in market portfolio then

$$E(R_p) = x E(R_m) + (1 - x) R_f$$

$$10\% = x \times 12\% + (1 - x) \times 6\%$$

$$10\% = 12x + 6 - 6x$$

$$4 = 6x$$

$$x = 4/6 \text{ i.e. } 66.67\%$$

Thus, 66.67% of total funds should be invested in market portfolio and balance 33.33% in Risk Free Securities.

v. **Risk of above Portfolio**

$$10 = 6\% + \frac{12-06}{9} \sigma_p$$

$$4\% = 6/9 \times \sigma_p$$

$$36\% = 6\% \sigma_p$$

$$\sigma_p = 6\%$$

- vi. Let y be the proportion of investment in market portfolio then investment in risk free securities $(1 - y)$, then

$$15\% = y \times 12\% + (1 - y) 6\%$$

$$15\% = 12y + 6\% - 6y$$

$$9\% = 6y$$

$$y = 1.50$$

Thus, borrow 50% of owned fund i.e. 50% of owned funds at risk free rate of interest of 6%.

$$\text{Rs. } 240000 \times 50\% = \text{Rs. } 1,20,000$$

Now invest total fund of Rs. 3,60,000 in the market portfolio.

Risk of Portfolio

$$15\% = 6\% + \frac{12-6}{9}\sigma_P$$

$$9\% = 6/9 \times \sigma_P$$

$$\sigma_P = 13.5\%$$