Chapter Tests of SFM of
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Solution of Test of Portfolio Management – 1

Q 1

(a) As per CAPM -
$E_{(r)} = 10 + 8\beta$

Calculation of Alpha:

Portfolio	Actual Expected Return	CAPM Required Return	Alpha
P_1	18	17.2	0.8
P_2	18	19.96	-0.96
P_3	24	22	2
P_4	16	17.6	-1.6

P_3 has performed the best in view of higher alpha.

(b) Average return from Security A: 13%; B: 15%; C: 13%

(i) Portfolio return = 13 (.4) + 15 (.6) = 14.20 %

(ii) **Security Risk and Correlation Coefficient:**

		A				B		
a	b	c = [a – b]	d = c^2	e	f	g = [e – f]	h = f^2	i = c X g
10	13	-3	9	12	15	-3	9	9
16	13	3	9	18	15	3	9	9
			18				18	18

S.D. of security A = square root of 18 / 2 = 3 %
S.D. of security B = square root of 18 / 2 = 3 %
Cov (A, B) = 18 / 2 = 9
r_{AB} = 9 / (3) (3) = 1

Since, r_{AB} = 1;
Portfolio risk = 3 (.4) + 3 (.6) = 3 %

(iii) **Covariance:**

		C			
j	k	l = [j – k]	m = l^2	n = c X l	o = g X l
16	13	3	9	-9	-9
10	13	-3	9	-9	-9
			18	-18	-18

S.D. of security C = square root of 18 / 2 = 3 %
Cov (A, C) = -18 / 2 = -9
Cov (B, C) = -18 / 2 = -9

r_{AC} = -9 / (3) (3) = -1
r_{BC} = -9 / (3) (3) = -1

(iv) There is perfect negative correlation between securities A and C and also between B and C. Thus, one can design a zero-risk portfolio by combining these securities.

In other words, one can derive higher benefits of diversification by combining security C with either security A or B.

Q 2

(a) R_f = 6 / 120 = 5%

Equilibrium return of a security is 20%.

As per CAPM -
$E_r = R_f + \beta_s (R_m - R_f)$
$20 = 5 + \beta_s (20 - 5)$
$\beta_s = 1$

Now –

$$\beta_s = \frac{COV (S, M)}{\sigma_m^2}$$

$$1 = \frac{225}{\sigma_m^2}$$

$$\sigma_m^2 = 225$$
$$\sigma_m = 15\%$$

Further –

$$\beta_s = \frac{r_{sm}\ \sigma_s}{\sigma_m}$$

$$1 = \frac{(0.85)\ \sigma_s}{15}$$

$$\sigma_s = 15 / 0.85$$
$$= 17.65\%$$

(b) β_p = 0.6 (125/500) + 1.5 (150/500) + 0.9 (80/500) + 1.3 (145/500)

= 1.121

As per CAPM -
$E_r = R_f + \beta_p (R_m - R_f)$
$E_r = 8 + 1.121 (14 - 8)$
$E_r = 14.726\%$

Security O is replaced by RBI Bonds:

β_p = 0.6 (125/500) + 1.5 (150/500) + 0 (80/500) + 1.3 (145/500)

= 0.977

$E_r = 8 + 0.977 (14 - 8)$
$E_r = 13.862\%$

Q 3 Weights for minimum risk portfolio:

$$W_x = \frac{\sigma_Y^2 - Cov_{XY}}{\sigma_X^2 + \sigma_Y^2 - 2\, Cov_{XY}}$$

$$W_Y = 1 - W_x$$

$$r_{XY} = \frac{Cov_{XY}}{\sigma_X\ \sigma_Y}$$

$$Cov_{XY} = \sigma_X\ \sigma_Y\ r_{XY}$$

a)

$Cov_{XY} = (3)(9)(-1) = -27$

$$W_x = \frac{(9)^2 - (-27)}{(3)^2 + (9)^2 - 2(-27)}$$

$$= \frac{81 + 27}{9 + 81 + 54}$$

$$= 0.75$$

$W_Y = 1 - 0.75 = 0.25$

Rs.15,00,000 to be invested in X
Rs.5,00,000 to be invested in Y

b)

$Cov_{XY} = (3)(9)(-0.3) = -8.1$

$$W_x = \frac{81 + 8.1}{9 + 81 + 16.2}$$

$$= 0.839$$

$W_Y = 1 - 0.839 = 0.161$

Rs.16,78,000 to be invested in X
Rs.5,22,000 to be invested in Y

c)

Cov_{XY} = (3) (9) (0) = 0

$$W_x = \frac{81 - 0}{9 + 81 - 0}$$

= 0.9

W_Y = 1 - 0.9 = 0.1

Rs.18,00,000 to be invested in X
Rs.2,00,000 to be invested in Y

d)

Cov_{XY} = (3) (9) (0.6) = 16.2

$$W_x = \frac{81 - 16.2}{9 + 81 - 32.4}$$

= 1.125

W_Y = 1 - 1.125= -0.125

Rs.22,50,000 to be invested in X
Rs.2,50,000 of Y to be short-sold

Solution prepared by CA. Ashish Lalaji