PORTFOLIO MANAGEMENT

CLASS 6

HOME WORK SUPPORT

COVERAGE

Question			Answer			Lecture Time
Q. No	Page no.	Book	Q. No	Page no.	Book	
18	51	CW Q BOOK	18	93	CW ANS BOOK	00:00:30 TO 00:10:56
24	52	CW Q BOOK	24	97	CW ANS BOOK	00:10:57 TO 00:11:56
8	33	HW Q BOOK	8	93	HW ANS BOOK	00:11:57 TO 00:12:31
10	33	HW Q BOOK	10	94	HW ANS BOOK	00:12:32 TO 00:22:46
11	33	HW Q BOOK	11	94	HW ANS BOOK	00:22:47 TO 00:24:40
EQ	-	-	-	-	-	-

Topic 9 SML

Question 18: CW Q BOOK PAGE 51

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

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

You are required to calculate:

a. The Betas of the two stocks.
b. Expected return of each stock, if the market return is equally likely to be 7% or 25%.
c. The Security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.
d. The Alphas of the two stocks.

(Source: ICAI)

Answer: CW ANS BOOK PAGE 93

i. The Betas of two stocks:

Aggressive stock - 40% - 4%/25% - 7% = 2
Defensive stock - 18% - 9%/25% - 7% = 0.50

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 Aggressive Stock

4% = α + β(7%)
40% = α + β(25%)
36% = β(18%)
β = 2

For Defensive Stock

9% = α + β(7%)
18% = α + β(25%)
9% = β(18%)
β =0.50

ii. Expected returns of the two stocks:

Aggressive stock - 0.5 x 4% + 0.5 x 40% = 22%
Defensive stock - 0.5 x 9% + 0.5 x 18% = 13.5%

iii. Expected return of market portfolio = 0.5 x 7% + 0.5% x 25% = 16%

∴ Market risk prem. = 16% - 7.5% = 8.5%
∴ SML is, required return = 7.5% + βi 8.5%

iv. $R_s = \alpha + \beta R_m$

For Aggressive Stock

$22\% = \alpha_A + 2(16\%)$
$\alpha_A = -10\%$

For Defensive Stock

$13.5\% = \alpha_D + 0.50(16\%)$
$\alpha_D = 5.5\%$

Note: Food for thought

Logically the alpha as per characteristic line is not useful. It would be more prudent to calculate alpha as E(R) – Re

Re of aggressive stock = 7.5 + 2×8.5 = 24.5%

E(R) of aggressive stock = 22%

Alpha = -2.5% so overpriced

Re of defensive stock = 7.5 + 0.5×8.5 = 11.75%

E(R) of defensive stock = 13.5%

Alpha = 1.75% so underpriced

Question 24: CW Q BOOK PAGE 52

Information related to an investment is as follows:

Risk free rate	10%
Market Return	15%
Beta	1.2

i. What would be the return from this investment?

ii. If the projected return is 18%, is the investment rightly valued?

iii. What is your strategy?

(Source: ICAI)

Answer: CW ANS BOOK PAGE 97

i. Required rate of Return as per CAPM is given by

$R_j = R_f + \beta (R_m - R_f)$

$= 10 + 1.2 (15-10) = 16\%$

ii. Since projected return is 18%, the stock is not rightly valued rather undervalued as return as per CAPM less than Projected Return.

iii. Had this Project Return is considered as expected return, the decision should be to BUY the share.

Topic 9 SML

Question 8: HW Q BOOK PAGE 33

The risk premium for the market is 10%. Assuming Beta values of Security K are 0, 0.25, 0.42, 1.00 and 1.67. Compute the risk premium on Security K.

(Source: ICAI)

Answer: HW ANS BOOK PAGE 93

Market Risk Premium is 10%

β Value of K	Risk Premium of K
0.00	0%
0.25	2.50%
0.42	4.20%
1.00	10.00%
1.67	16.70%

Question 10: HW Q BOOK PAGE 33

The following information is available in respect of Security X

Equilibrium Return	15%
Market Return	15%
7% Treasury Bond Trading at	$140
Covariance of Market Return and Security Return	225%
Coefficient of Correlation	0.75

You are required to determine the Standard Deviation of Market Return and Security Return.

(Source: ICAI)

Answer: HW ANS BOOK PAGE 94

First we shall compute the β of Security X.

$$\text{Risk Free Rate} = \frac{\text{Coupon Payment}}{\text{Current Market Price}} = \frac{7}{140} = 5\%$$

Assuming equilibrium return to be equal to CAPM return then:

$15\% = R_f + \beta_X(R_m - R_f)$

$15\% = 5\% + \beta_X(15\% - 5\%)$

$\beta_X = 1$

or it can also be computed as follows:

$$\frac{R_m}{R_s} = \frac{15\%}{15\%} = 1$$

i. Standard Deviation of Market Return

$$\beta_m = \frac{Cov_{x,m}}{\sigma_m^2} = \frac{225\%}{\sigma_m^2} = 1$$

$$\sigma^2_m = 225$$

$$\sigma_m = \sqrt{225} = 15\%$$

ii. Standard Deviation of Security Return

$$\beta x = \frac{\sigma_X}{\sigma_m} \times \rho_{Xm} = \frac{\sigma_X}{15} \times 0.75 = 1$$

$$\sigma_X = \frac{15}{0.75} = 20\%$$

Question 11: HW Q BOOK PAGE 33

Assuming that two securities X and Y are correctly priced on SML and expected return from these securities are 9.40% (Rx) and 13.40% (Ry) respectively. The Beta of these securities are 0.80 and 1.30 respectively.

Mr. A, an investment manager states that the return on market index is 9%.

You are required to determine:

i. Whether the claim of Mr. A is right. If not then what is correct return on market index.

ii. Risk Free Rate of Return.

(Source: ICAI)

Answer: HW ANS BOOK PAGE 94

$$9.40 = R_f + (R_m - R_f) \times 0.8 \quad \ldots\ldots\ldots\ldots\ldots\ldots 1$$

$$13.40 = R_f + (R_m - R_f) \times 1.30 \quad \ldots\ldots\ldots\ldots\ldots\ldots 2$$

$-4 = -0.5\,(R_m - R_f)$

$R_m - R_f = 8$

Putting the value of $R_m - R_f$ in equation..... (1)

$9.40 = R_f + 8 \times 0.8$

$\therefore R_m = 11\%$

$R_f = 3\%$

i. No, the claim of R_m= 9% MV A is not right.
The correct return on market index is 11%

ii. Risk free rate = 3%

EXTRA QUESTION

Question:

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.

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,

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

Topic 9 SML

Question 18: CW Q BOOK PAGE 51

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Answer: CW ANS BOOK PAGE 93

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$$\sigma^2_m = 225$$

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ii. Standard Deviation of Security Return

$$\beta x = \frac{\sigma_X}{\sigma_m} \times \rho_{Xm} = \frac{\sigma_X}{15} \times 0.75 = 1$$

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Question 11: HW Q BOOK PAGE 33

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$R_m - R_f = 8$

Putting the value of $R_m - R_f$ in equation..... (1)

$9.40 = R_f + 8 \times 0.8$

$\therefore R_m = 11\%$

$R_f = 3\%$

i. No, the claim of R_m= 9% MV A is not right.
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EXTRA QUESTION

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

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)
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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
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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
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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%