PORTFOLIO MANAGEMENT
CLASS 2
HOME WORK SUPPORT
COVERAGE

Question			Answer			Lecture Time
Q. No	Page no.	Book	Q. No	Page no.	Book	
2	44	CLASSWORK QUESTION BOOK	2	76	CLASSWORK ANSWER BOOK	00:00:27 TO 00:15:11
1	121	HOMEWORK ANSWER BOOK	1	122	HOMEWORK ANSWER BOOK	NO VIDEO
2	122	HOMEWORK ANSWER BOOK	2	123	HOMEWORK ANSWER BOOK	NO VIDEO
Case Study 1-4	NOT PRESENT IN BOOK		NOT PRESENT IN BOOK			NO VIDEO

SSEI
A positive NPV Training Center

Topic 2 EXPECTED RETURN AND RISK OF A STOCK

Question 2: CW QUESTION BOOK PAGE 44

A stock costing ₹ 120 pays no dividends. The possible prices that the stock might sell for at the end of the year with the respective probabilities are:

Price	Probability
115	0.1
120	0.1
125	0.2
130	0.3
135	0.2
140	0.1

Required:

i. Calculate the expected return.

ii. Calculate the Standard deviation of returns.

Answer: CW ANSWER BOOK PAGE 76

Here, the probable returns have to be calculated using the formula

$$R = \frac{D}{P_0} + \frac{P_1 - P_0}{P_0}$$

Calculation of Probable Returns

Possible prices (P_1) (₹)	P_1 - P_0 (₹)	[(P_1-P_0)/ P_0] x 100 Return (per cent)
115	-5	-4.17
120	0	0.00
125	5	4.17
130	10	8.33
135	15	12.50
140	20	16.67

Calculation of Expected Returns

Possible return X_i	Probability $p(X_i)$	Product X_1-$p(X_i)$
-4.17	0.1	-0.417
0.00	0.1	0.000
4.17	0.2	0.834
8.33	0.3	2.499
12.50	0.2	2.500
16.67	0.1	1.667
		X = 7.083

Expected return X = 7.083 per

Alternatively, it can also be calculated as follows:

Expected Price = 115 x 0.1 + 120 x 0.1 + 125 x 0.2 + 130 x 0.3 + 135 x 0.2 + 140 x 0.1

= 128.50

$$\text{Return} = \frac{128.50 - 120}{120} \times 100 = 7.0833\%$$

Calculation of Standard Deviation of Returns

Probable return X_i	Probability $p(X_i)$	Deviation $(X_i – X)$	Deviation squared $(X_i – X)^2$	Product $(X_i – X)^2p(X_i)$
-4.17	0.1	-11.253	126.63	12.66
0.00	0.1	-7.083	50.17	5.017
4.17	0.2	-2.913	8.49	1.698
8.33	0.3	1.247	1.56	0.467
12.50	0.2	5.417	29.34	5.869
16.67	0.1	9.587	91.91	9.191
				σ^2 = 34.902

Variance, σ^2 = 34.902 per cent

Standard deviation, $\sigma = \sqrt{34.902} = 5.908$ per cent

PART VII: AMBIGUOUS

Question 1: HW ANSWER BOOK PAGE 121

Following information is available in respect of expected dividend, market price and market condition after one year.

Market condition	Probability	Market Price₹	Dividend per share₹
Good	0.30	132	8
Normal	0.40	115	**6**
Bad	0.30	98	4

The existing market price of an equity share is ₹ 110 (F.V. ₹ 1), which is cum 15% bonus debenture of ₹ 10 each, per share. M/s. X Finance Company Ltd. had offered the buy-back of debentures at face value.

Find out the expected return and variability of returns of the equity shares if buyback offer is accepted by the investor.

And also advise-Whether to accept buy back offer?

(Source: FOD)

ANSWER: HW ANSWER BOOK PAGE 122

The Expected Return of the equity share may be found as follows:

Market Condition	Probability	Total Return	Cost (*)	Net Return
Good	0.30	₹ 140	₹ 100	₹ 40
Normal	0.40	₹ 121	₹ 100	₹ 21
Bad	0.30	₹ 102	₹ 100	₹ 2

Expected Return = (40 × 0.3) + (21 × 0.40) + (2 × 0.3) = 21= (21/100)×100 = 21

The variability of return can be calculated in terms of standard deviation.

VSD $= 0.30\,(40 - 21)^2 + 0.40\,(21 - 21)^2 + 0.3(\,2 - 21)^2$

$= 0.30\,(19)^2 + 0.40\,(0)^2 + 0.30\,(-19)^2$

$= 108.3 + 0 + 108.3$

SD $= \sqrt{216.6}$

SD $= 14.7173$ or say 14.72

(*) The present market price of the share is ₹ 110 cum bonus 15% debenture of ₹ 10 each; hence the net cost is ₹ 100.

M/s X Finance company has offered the buyback of debenture at face value. There is reasonable 15% rate of interest compared to expected return 21% from the market. Considering the dividend rate and market price the creditworthiness of the company seems to be very good. The decision regarding buy-back should be taken considering the maturity period and opportunity in the market. Normally, if the maturity period is low say up to 1 year better to wait otherwise to opt buy back option.

Question 2: HW ANSWER BOOK PAGE 122

The data given below relates to companies "ITC AND HUL ".

	Alpha (₹)	**Beta (₹)**
Expected Dividend	15	12
Current Market price	80	240
Expected market price after one year under two scenarios		
Optimistic scenario	105	420
Pessimistic scenario	73	300

If an investor's holding period is one year, which stock he should buy?

(*Source: FOD)*

ANSWER: HW ANSWER BOOK PAGE 123

Assuming probability to be 0.5, 0.5

	ITC	**HUL**
Optimistic	50%	80%
Pessimistic	10%	30%
E (R)	30%	55%
σ	20%	25%
c.v.	66.67%	45.45%

∴ Investor should buy the stocks of HUL

CASE STUDY 1

Consider the following data for a stock:

Year	Price at Beginning of Year	Price at End of Year	Dividend
1	200	220	10
2	220	240	8
3	240	230	9
4	230	260	11
5	260	280	12

Based on the table above, answer the following questions:

Question 1:

What is the average return of the stock?

A. 9.2%

B. 11.49%

C. 10.0%

D. 7.5%

Question 2:

What is the standard deviation of returns for the stock (rounded to two decimal places)?

A. 8.12%

B. 8.63%

C. 14.21%

D. 6.27%

ANSWER:

Question 1:

B is correct.

Average Return Calculation: Using the formula:

$$\text{Return} = \frac{P_1 - P_0 + D}{P_0} \times 100$$

Calculate the returns for each year and find the average.

Returns:

- Year 1: $\frac{220-200+10}{200} \times 100 = 15\%$
- Year 2: $\frac{240-220+8}{220} \times 100 = 12.73\%$
- Year 3: $\frac{230-240+9}{240} \times 100 = -0.42\%$
- Year 4: $\frac{260-230+11}{230} \times 100 = 17.83\%$
- Year 5: $\frac{280-260+12}{260} \times 100 = 12.31\%$

Average return:

(15+12.73−0.42+17.83+12.31)/5 = 11.49%

Question 2:

D is correct.

Standard Deviation Calculation:

Steps:

1. Compute the deviations from the average return.
2. Square the deviations.
3. Calculate the variance and take the square root.

After calculation:

Variance = 39.31

Standard Deviation = 6.27%

CASE STUDY 2

Given the following information:

- **Stock A**
  - Expected Return: 20%
  - Standard Deviation: 12%
- **Stock B**
  - Expected Return: 30%
  - Standard Deviation: 15%
- **Correlation between Stock A and Stock B**: 0.2
- **Portfolio Composition**
  - 30% invested in Stock A
  - 70% invested in Stock B

Question 1:

What is the expected return of the portfolio?

A. 22%

B. 24%

C. 27%

D. 29%

Question 2:

What is the standard deviation of the portfolio?

A. 11.0%

B. 11.76%

C. 13.5%

D. 14.2%

Answer:

Question 1:

C is correct.

The expected return of a portfolio is calculated as the weighted average of the expected returns of its components:

Expected Return=$(w_A \times E_A)+(w_B \times E_B)$

Where:

- w_A = weight of Stock A = 30% = 0.3
- E_A = expected return of Stock A = 20% = 0.20
- w_B = weight of Stock B = 70% = 0.7
- E_B = expected return of Stock B = 30% = 0.30
-

Expected Return = (0.3×0.20)+(0.7×0.30)
= 0.06+0.21
= 0.27 or 27%

Question 2:

B is correct.

The standard deviation of a two-asset portfolio is calculated using:

$$\sigma_p = \sqrt{(w_A^2\sigma_A^2) + (w_B^2\sigma_B^2) + [2w_Aw_B\rho_{AB}\sigma_A\sigma_B]}$$

Where:

- σ_p = standard deviation of the portfolio
- w_A = weight of Stock A = 0.3
- σ_A = standard deviation of Stock A = 12% = 0.12
- w_B = weight of Stock B = 0.7
- σ_B = standard deviation of Stock B = 15% = 0.15
- ρ_{AB} = correlation between Stock A and B = 0.2

Calculating each component:

1. **Variance of Stock A:**

   $w_A^2\sigma_A^2$ = $(0.3)^2 \times (0.12)^2$
   =0.09×0.0144
   =0.001296

2. **Variance of Stock B:**

   $w_B^2\sigma_B^2$ = $(0.7)^2 \times (0.15)^2$
   = 0.49×0.0225
   = 0.011025

3. Covariance between Stocks A and B:

$2w_Aw_B\rho_{AB}\sigma_A\sigma_B$ = 2×0.3×0.7×0.2×0.12×0.15
= 0.42×0.0036
= 0.001512

Portfolio Variance = 0.001296 + 0.011025 + 0.001512
= 0.013833

Calculating the standard deviation:

σp = $\sqrt{0.013833}$
= 11.76%

CASE STUDY 3

Given the following information:

- **Stock X**
  - Expected Return: 15%
  - Standard Deviation: 10%
- **Stock Y**
  - Expected Return: 25%
  - Standard Deviation: 20%
- **Correlation between Stock X and Stock Y**: -0.3
- **Portfolio Composition**
  - 40% invested in Stock X
  - 60% invested in Stock Y

Question 1:

What is the expected return of the portfolio?

A. 17%

B. 19%

C. 21%

D. 23%

Question 2:

What is the standard deviation of the portfolio?

A. 10.5%

B. 11.46%

C. 12.5%

D. 13.5%

Answer:

Question 1:

C is correct.

The expected return of a portfolio is calculated as the weighted average of the expected returns of its components:

Expected Return=$(w_X \times E_X)+(w_Y \times E_Y)$

Where:

- w_X = weight of Stock X = 40% = 0.4
- E_X = expected return of Stock X = 15% = 0.15
- w_Y = weight of Stock Y = 60% = 0.6
- E_Y = expected return of Stock Y = 25% = 0.25

Expected Return = (0.4×0.15)+(0.6×0.25)
= 0.06+0.15
= 0.21 or 21%

Question 2:

B is correct.

The standard deviation of a two-asset portfolio is calculated using:

$$\sigma_p = \sqrt{(w_X^2\sigma_X^2) + (w_Y^2\sigma_Y^2) + [2w_X w_Y \rho_{XY}\sigma_X\sigma_Y]}$$

Where:
σ_p = standard deviation of the portfolio
w_X = weight of Stock X = 0.4
σ_X = standard deviation of Stock X = 10% = 0.10
w_Y = weight of Stock Y = 0.6
σ_Y = standard deviation of Stock Y = 20% = 0.20
ρ_{XY} = correlation between Stock X and Y = -0.3

Calculating each component:

1. **Variance due to Stock X:**
   $w_X^2\sigma_X^2 = (0.4)^2 \times (0.10)^2$
   $= 0.16 \times 0.01$
   $= 0.0016$

2. Variance due to Stock Y:

$w_Y^2\sigma_Y^2 = (0.6)^2 \times (0.20)^2$

$= 0.36 \times 0.04$

$= 0.0144$

3. Covariance between Stocks X and Y:

$2w_X w_Y \rho_{XY} \sigma_X \sigma_Y = 2 \times 0.4 \times 0.6 \times (-0.3) \times 0.10 \times 0.20$

$= -0.00288$

4. Total Portfolio Variance:

Portfolio Variance $= 0.0016 + 0.0144 + (-0.00288)$

$= 0.01312$

5. Standard Deviation of the Portfolio:

$\sigma p = \sqrt{0.01312}$

$= 11.46\%$

CASE STUDY 4

Given the following information:

- **Stock A**
  - Expected Return: 10%
  - Standard Deviation: 8%
- **Stock B**
  - Expected Return: 12%
  - Standard Deviation: 10%
- **Stock C**
  - Expected Return: 14%
  - Standard Deviation: 12%
- **Correlations Between Stocks:**
  - Correlation between Stock A and Stock B: 0.3
  - Correlation between Stock A and Stock C: 0.4
  - Correlation between Stock B and Stock C: 0.5
- **Portfolio Composition:**
  - 50% invested in Stock A
  - 30% invested in Stock B
  - 20% invested in Stock C

Question 1:

What is the expected return of the portfolio?

A. 10.8%

B. 11.0%

C. 12.0%

D. 11.4%

Question 2:

What is the standard deviation of the portfolio?

A. 7.27%

B. 6.5%

C. 8.0%

D. 8.5%

Answer:

Question 1:

D is correct.

The expected return of a portfolio is the weighted average of the expected returns of its components:

Expected Return=(w_A×E_A)+(w_B×E_B)+(w_C×E_C)

Where:

- w_A = weight of Stock A = 50% = 0.5
- E_A = expected return of Stock A = 10% = 0.10
- w_B = weight of Stock B = 30% = 0.3
- E_B = expected return of Stock B = 12% = 0.12
- w_C = weight of Stock C = 20% = 0.2
- E_C = expected return of Stock C = 14% = 0.14

Expected Return = (0.5×0.10)+(0.3×0.12)+(0.2×0.14)
= 0.05+0.036+0.028
= 0.114 or 11.4%

Question 2:

A is correct.

The standard deviation of a three-asset portfolio is calculated using:

$$\sigma_p = \sqrt{\sum_{i=1}^{3}\sum_{j=1}^{3} w_i w_j \sigma_i \sigma_j \rho_{ij}}$$

Where:

- σ_p = standard deviation of the portfolio
- w_i,w_j = weights of Stocks i and j
- σ_i,σ_j = standard deviations of Stocks i and j
- ρ_{ij} = correlation between Stocks i and j

Step 1: Individual Variance Terms

1. **Variance due to Stock A:**

   $w_A^2\sigma_A^2$ = (0.5)2×(0.08)2
   = 0.25×0.0064
   = 0.0016

2. **Variance due to Stock B:**

$w_B^2\sigma_B^2$ = (0.3)2×(0.10)2
= 0.09×0.01
= 0.0009

3. **Variance due to Stock C:**

wC2σC2 = (0.2)2×(0.12)2
= 0.04×0.0144
= 0.000576

Step 2: Covariance Terms

1. **Covariance between Stock A and Stock B:**

$2w_Aw_B\sigma_A\sigma_B\rho_{AB}$ = 2×0.5×0.3×0.08×0.10×0.3
= 0.00072

2. **Covariance between Stock A and Stock C:**

$2w_Aw_C\sigma_A\sigma_C\rho_{AC}$ = 2×0.5×0.2×0.08×0.12×0.4
= 0.000768

3. **Covariance between Stock B and Stock C:**

$2w_Bw_C\sigma_B\sigma_C\rho_{BC}$ = 2×0.3×0.2×0.10×0.12×0.5
= 0.00072

Step 3: Sum All Variance and Covariance Terms

Total Variance:

Portfolio Variance = Variance Terms + Covariance Terms
= (0.0016 + 0.0009 + 0.000576) + (0.00072 + 0.000768 + 0.00072)
= 0.005284

Step 4: Calculate Portfolio Standard Deviation

$\sigma_p = \sqrt{\text{Portfolio Variance}}$

$= \sqrt{0.005284}$

= 7.27%