$$R_{xy} = \frac{COV_{xy}}{\sigma_x \times \sigma_y}$$

$$= \frac{-0.8}{4.56 \times 2.90}$$

$$= -0.060$$

Question – 03

An investor has decided to invest to invest ₹ 1,00,000 in the shares of two companies, namely, ABC and XYZ. The projection of returns from the shares of the two companies along with their probabilities are as follows:

Probabilities	ABC (%)	XYZ (%)
.20	12	16
.25	14	10
.25	-7	28
.30	28	-2

You are required to

(i) Comment on return and risk of investment in individual shares.

(ii) Compare the risk and return of these two shares with a Portfolio of these shares in equal proportion.

(iii) Construct minimum risk portfolio.

(SM TYK – 07 & RTP May – 2019)

Solution:

Calculation of ER, S.D. of Cov_{xy}

P	x	P(x)	$(x - \bar{x})$	$(x - \bar{x})^2p$	y	P(y)	$(y - \bar{y})$	$(y - \bar{y})^2p$	$(x - \bar{x})(y - \bar{y})p$
0.20	12	2.4	-0.55	0.0605	16	3.2	3.90	3.042	-0.429
0.25	14	3.5	1.45	0.5256	10	2.50	-2.10	1.1025	-0.761
0.25	-7	-1.75	-19.55	95.5506	28	7	15.90	63.20	-77.71
0.30	-28	8.40	15.45	71.6107	-2	-0.60	-14.10	59.64	-65.95
	$\bar{x}$ =	12.55%	Variance	167.75 $(\%)^2$	$\bar{y}$	12.10 %	Variance	126.99	Cov_{xy}= 144.85

$$\sigma_x = \sqrt{\text{Variance}}$$

$= \sqrt{167.75}$

$= 12.95\%$

$\sigma_y = \sqrt{126.99}$

$= 11.27\%$

(i) Return & Risk of Individual Stock

ABC Stock

ER = 12.55 %

Risk = 12.95%

XYZ Stock

ER = 12.10%

Risk = 11.27%

(ii) Risk & Return of Portfolio

$W_{ABC} = 50\%, \quad W_{xyz} = 50\%$

$ER_P = (ER_A \times W_A)\ (ER_B \times W_B)$

$= (12.55 \times 0.5) + (12.10 \times 0.5)$

$= 12.325\%$

$$R_{xy} = \frac{COV_{xy}}{\sigma_x \sigma_y} = \frac{-144.25}{12.95 \times 11.27} = -0.99$$

$$\sigma_p = \sqrt{\sigma_A^2 \times W_A^2 \times \sigma_B^2 \times W_B^2 + 2\, W_A W_B \times COV_{AB}}$$

$$= \sqrt{12.95^2 \times 0.5^2 + 11.27^2 \times 0.5^2 + 2 \times 0.5 \times 0.5 \times -144.24}$$

$= 1.25\%$

The Expected Return of portfolio is 12.325% and Standard Deviation is 1.25% hence portfolio results in the reduction of risk by the combination of two shares.

(iii) Minimum Variance Portfolio

$$W_A = \frac{\sigma_B^2 - COV_{AB}}{\sigma_A^2 + \sigma_B^2 - 2COV_{AB}}$$

$$= \frac{(11.27)^2 - (144.25)}{12.95^2 + 11.27^2 - (2 \times -144.25)}$$

$$= \frac{271.23}{583.21} = 0.46$$

$$W_B = 0.54$$

Question – 04

Ramesh has identified stocks of two companies A and B having good investment potential:

Following data is available for these stocks:

Year	A (Market Price per Share in ₹)	B (Market Price per Share in ₹)
2013	19.60	8.70
2014	18.75	12.80
2015	33.42	16.20
2016	42.64	18.25
2017	43.25	15.60
2018	44.60	13.25
2019	34.75	18.60

You are required to calculate:

(i) The Risk and Return by investing in Stock A and B

(ii) The Risk and Return by investing in a portfolio of these Stocks if he invests in Stock A and B in proportion of 6 : 4.

(iii) The better opportunity for investment

(Exam January – 2021)

Solution:

	A				B				
Year	Market Price Per Share in ₹	Return (%)	Return - $\bar{A}$	Squared	Market Price Per Share in ₹	Return (%)	Return - B	Squared	(Return - A) ×(Return – B)
2013	19.60				8.70				
2014	18.75	-4.34	-18.33	335.9889	12.80	47.13	30.94	957.2836	-567.1302
2015	33.42	78.24	64.25	4128.0625	16.20	26.56	10.37	107.5369	666.2725
2016	42.64	27.59	13.60	184.9600	18.25	12.56	-3.54	12.5316	-48.1440
2017	43.25	1.43	-12.56	157.7536	15.60	-14.52	-30.70	943.1041	385.7176
2018	44.60	3.12	-10-87	118.1569	13.25	-15.06	-31.25	976.5625	339.6875
2019	34.75	-22.09	-36.08	1301.7664	18.60	40.38	24.19	585.1561	-872.7752
Mean ($\bar{A}$)		83.95		6226.6883	Mean ($\bar{B}$)	97.14		3582.1748	-96.3718
		13.99	Variance	037.7814		16.19	Variance	597.0291	Cov.= -16.0620

(i) Return A = 13.99% and Risk (SD) = $\sqrt{1037.7814}$= 32.2146 and Return B = 16.19% and Risk (SD) = $\sqrt{597.0291}$ = 24.4342

(ii) Return of Portfolio = 0.60 × 13.99% + 0.40 × 16.19% = 14.87%

Risk (Standard Deviation) of Portfolio = $[0.60^2 \times 1037.7814 + 0.40^2 \times 597.0291 + 2 \times 0.60 \times 0.40 \times (-16.0620)]^{½}$

= $[373.6013 + 95.5247 - 7.7098]^{½}$ = 21.4806

(iii) On the basis of Return 'B' is preferable and on the basis of Risk 'Portfolio Investment' is preferable over the individual stocks.

Question – 05

Consider the following information on two stocks, X and Y.

Year	2016	2017
Return on X (%)	10	16

Return on Y (%)	12	18

You are required to calculate:

(i) The expected return on a portfolio containing X and Y in the proportion of 40% and 60% respectively.

(ii) The Standard Deviation of return from each of the two stocks.

(iii) The Covariance of returns from the two stocks.

(iv) The Correlation coefficient between the returns of the two stocks.

(v) The risk of a portfolio containing X and Y in the proportion of 40% and 60%.

(SM TYK – 04 & Exam May – 2018)

Solution:

Year	x	$(x - \bar{x})$	$(x - \bar{x})^2$	Y	$(y - \bar{y})$	$(y - \bar{y})^2$	$(x - x)(y - y^-)$
1	10	-3	9	12	-3	9	9
2	16	3	9	18	3	9	9
	26		18	30		18	18

$\bar{x} = \frac{26}{2} = 13\%$

$\sigma_x = \sqrt{\frac{18}{2}} = 3\%$

$\bar{y} = \frac{30}{2} = 15\%$

$\sigma_y = \sqrt{\frac{18}{2}} = 3\%$

$Cov_{xy} = \frac{18}{2} = 9$

$\sigma_{xy} = \frac{9}{3 \times 3} = 1$

$ER_P = (13 \times 0.4) + (15 \times 0.6)$

$= 14.2\%$

$\sigma_p = \sqrt{3^2 \times 0.4^2 + 3^2 \times 0.6^2 + 2 \times 3 \times 0.4 \times 3 \times 0.6 \times 1}$

$\sigma_p = 3\%$

Question – 06

Mr. A is interested to invest ₹ 1,00,000 in the securities market. He selected two securities B and D for this purpose. The risk return profile of these securities are as follows :

Security	Risk (σ)	Expected Return (ER)
B	10%	12%
D	18%	20%

Co-efficient of correlation between B and D is 0.15.

You are required to calculate the portfolio return of the following portfolios of B and D to be considered by A for his investment.

(i) 100 percent investment in B only;

(ii) 50 percent of the fund in B and the rest 50 percent in D;

(iii) 75 percent of the fund in B and the rest 25 percent in D; and

(iv) 100 percent investment in D only.

Also indicate that which portfolio is best for him from risk as well as return point of view?

(SM TYK – 03)

Solution:

$ER_P = ER_A \times W_A + ER_B W_B$

$\sigma_p = \sqrt{\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2 + 2 \times \sigma_A \times W_A \times \sigma_B \times W_B \times r_{AB}}$

(i) 100 % in B Only

ER_p = 12% σ_P = 10 %

(ii) 50 % in B & 50% in D

$ER_p = (12 \times 0.5) + (20 \times 0.5) = 16\%$

$\sigma_p = \sqrt{10^2 \times 0.5^2 + 18^2 \times 0.5^2 + 2 \times 10 \times 0.5 \times 18 \times 0.5 \times 0.15}$

= 10.93%

(iii) 75% in B & 25% in D

$ER_p = (12 \times 0.75) + (20 \times 0.25) = 14\%$

$\sigma_p = \sqrt{10^2 \times 0.75^2 + 18^2 \times 0.25^2 + 2 \times 10 \times 0.75 \times 18 \times 0.25 \times 0.15}$

= 9.31%

(iv) 100 % in D Only

ER_p = 20% σ_P = 18 %

From the point of view of return 100% in D is the best due to the highest return & from the point of view risk 75% in B & 25 % in D is the best due to the Lowest Risk.

Question – 07

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	0.25	115	9
Normal	0.50	107	5
Bad	0.25	97	3

The existing market price of an equity share is ₹ 106 (F.V. ₹ 1), which is cum 10% bonus debenture of ₹ 6 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?

(SM TYK – 02)

Solution:

Calculation of return

Good $= \frac{(115-100)+9}{100} \times 100 = 24\%$

Normal $= \frac{(107-100)+5}{100} \times 100 = 12\%$

Bad $= \frac{(97-100)+3}{100} \times 100 = 0\%$

ER & SD

P	X	P (X)	$(X - \bar{X})$	$(X-\bar{X})^2P$
0.25	24	6	12	36
0.50	12	6	0	0
0.25	0	0	-12	36
		$\bar{X}$ - 12		72

$\sigma_x = \sqrt{72} = 8.485\%$

It yield of similar debenture is more than 10% then investor should accept the buyback offer, if yield of similar debenture is less than 10% the investor should not accept the buyback offer.

Question – 08

X Co., Ltd., invested on 1.4.2009 in certain equity shares as below:

Name of Co.	No. of shares	Cost (₹)
M Ltd.	1,000 (₹ 100 each)	2,00,000
N Ltd.	500 (₹ 10 each)	1,50,000

In September, 2009, 10% dividend was paid out by M Ltd. and in October, 2009, 30% dividend paid out by N Ltd. On 31.3.2010 market quotations showed a value of ₹ 220 and ₹ 290 per share for M Ltd. and N Ltd. respectively.

On 1.4.2010, investment advisors indicate (a) that the dividends from M Ltd. and N Ltd. for the year ending 31.3.2011 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.3.2011 are as below:

Probability factor	Price/share of M Ltd.	Price/share of N Ltd.
0.2	220	290
0.5	250	310
0.3	280	330

You are required to:

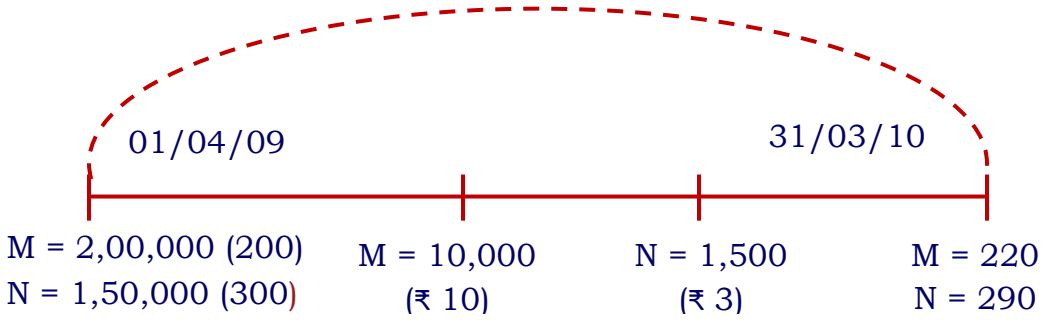
(i) Calculate the average return from the portfolio for the year ended 31.3.2010;

(ii) Calculate the expected average return from the portfolio for the year 2010-11; and

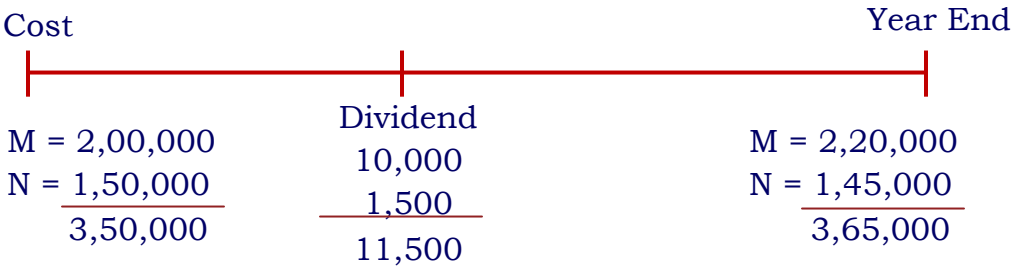
(iii) Advise X Co. Ltd., of the comparative risk in the two investments by calculating the standard deviation in each case.

(SM TYK – 32)

Solution:



(1) Portfolio Return [2009 – 10]



$$\text{Portfolio} = \frac{(3,65,000 - 3,50,000) + 11,500}{3,50,000} \times 100$$

$$= 7.57\%$$

Alternative

$$\text{Stock M} = \frac{(220 - 200) + 10}{200} \times 100 = 15\%$$

$$\text{Stock N} = \frac{(290 - 300) + 3}{300} \times 100 = -2.34\%$$

$$W_M = \frac{2,00,000}{3,50,000} = 0.571 \qquad W_N = \frac{1,50,000}{3,50,000} = 0.429$$

(2) Portfolio Return = (15 × 0.571) + (-2.34 × 0.429) = 7.56%

2010 – 2011

M = 220
N = 290

M = ₹ 20
N = ₹ 3.50

M = (220 × 0.2) + (250 × 0.5) + (280 × 0.3) = 253

N = (290 × 0.2) + (310 × 0.5) + (330 × 0.3) = 312

$$ER_M = \frac{(253 - 220) + 20}{220} \times 100 = 24.10\%$$

$$ER_N = \frac{(312 - 290) + 3.50}{290} \times 100 = 8.79\%$$

$$W_M = \frac{2,20,000}{3,65,000} = 0.603$$

$$W_N = \frac{1,45,000}{3,65,000} = 0.397$$

$$ER_P = (24.10 \times 0.603) + (3.79 \times 0.397) = 18.02\%$$