PORTFOLIO MANAGEMENT

CLASS 3

HOME WORK SUPPORT

COVERAGE

Question			Answer			Lecture Time
Q. No	Page no.	Book	Q. No	Page no.	Book	
3	30	HW Q BOOK	3	88	HW ANS BOOK	00:00:33 TO 00:45:34
4	31	HW Q BOOK	4	89	HW ANS BOOK	00:45:35 TO 01:20:07
5	31	HW Q BOOK	5	90	HW ANS BOOK	01:20:08 TO 01:20:42
3	123	HW ANS BOOK	3	123	HW ANS BOOK	01:20:43 TO 01:21:56
3	44	CW Q BOOK	3	78	CW ANS BOOK	01:21:57 TO 01:33:28
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10	48	CW Q BOOK	10	86	CW ANS BOOK	No Video
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12	48	CW Q BOOK	12	87	CW ANS BOOK	01:34:48 TO 01:44:47

Question 3: HW QUESTION BOOK PAGE 30

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?

(Source: ICAI)

Answer:

We have $E_p = W_1E_1 + W_3E_3 + \ldots\ldots\ldots W_nE_n$

and for standard deviation $\sigma^2_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \sigma_{ij}$

$$\sigma^2_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \rho_{ij} \sigma_i \sigma_j$$

Two asset portfolio

$$\sigma^2_p = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + 2w_1w_2\sigma_1\sigma_2\rho_{12}$$

Substituting the respective values we get,

i. All funds invested in B

Ep = 12%

σ_p = 10%

ii. 50% of funds in each of B & D

Ep = 0.50 X 12% + 0.50 X 20% = 16%

$$\sigma^2_p = (0.50)^2(10\%)^2 + (0.50)^2(18\%)^2 + 2(0.50)(0.50)(0.15)(10\%)(18\%)$$

σ^2_p = 25 + 81 + 13.5 = 119.50

$\sigma_p = 10.93\%$

iii. 75% in B and 25% in D

Ep = 0.75% X 12% + 0.25% X 20 = 14%

$\sigma^2_p = (0.75)^2(10\%)^2 + (0.25)^2(18\%)^2 + 2(0.75)(0.25)(0.15)(10\%)(18\%)$

σ^2_p = 56.25 + 20.25 + 10.125 = 86.625

$\sigma_p = 9.31\%$

iv. All funds in D

Ep = 20%

$\sigma_p = 18.0\%$

Portfolio	i	ii	iii	iv
Return	12	16	14	20
σ	10	10.93	9.31	18

In the terms of return, we see that portfolio (iv) is the best portfolio. In terms of risk we see that portfolio (iii) is the best portfolio.

Question 4: HW QUESTION BOOK PAGE 31

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.

(Source: ICAI)

Answer:

Calculation of return on portfolio for 2009-10	(Calculation in ₹ / share)		
	M	N	
Dividend received during the year	10	3	
Capital gain/loss by 31.03.10			
Market value by 31.03.10	220	290	
Cost of investment	200	300	
Gain/loss	20	(-)10	
Yield	30	(-)7	
Cost	200	300	
% return	15%	(-)2.33%	
Weight in the portfolio	57	43	
Weighted average return			7.55%
Calculation of estimated return for 2010-11			
Expected dividend	20	3.5	
Capital gain by 31.03.11			
(220x0.2)+ (250x0.5)+(280x0.3) – 220=(253-220)	33	-	
(290x0.2)+(310x0.5)+(330x0.3) – 290= (312 – 290)	-	22	
Yield	**53**	**25.5**	
*Market Value 01.04.10	220	290	
% return	24.09%	8.79%	
*Weight in portfolio (1,000x220): (500x290)	60.3	39.7	
Weighted average (Expected) return			18.02%
(*The market value on 31.03.10 is used as the base for calculating yield for 10-11)			

Calculation of Standard Deviation

M Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp Yield (1)	Prob. Factor (2)	(1) X (2)	Dev. $\left(P_M - \overline{P_M}\right)$	Square of dev. (3)	(2) X (3)
220	0	20	20	0.2	4	-33	1089	217.80
250	30	20	50	0.5	25	-3	9	4.50
280	60	20	80	0.3	24	27	729	218.70
					53			$\sigma^2_M = 441.00$

Standard Deviation (σ_M) **21**

N Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp Yield (1)	Prob. Factor (2)	(1) X (2)	Dev. $\left(P_N - \overline{P_N}\right)$	Square of dev. (3)	(2) X (3)
290	0	3.5	3.5	0.2	0.7	-22	484	96.80
310	20	3.5	23.5	0.5	11.75	-2	4	2.00
330	40	3.5	43.5	0.3	13.05	18	324	97.20
					25.5			$\sigma^2_N = 196.00$

Standard Deviation (σ_N) **14**

Share of company M Ltd. is more risky as the S.D. is more than company N Ltd.

Question 5: HW QUESTION BOOK PAGE 31

M is interested to construct a Portfolio of Securities A and B. He has collected the following information:

	A	B
Expected Return (ER)	19%	23%
Risk (σ)	14%	18%

M has 4 Portfolio options of A and B as follows:

i. 50% of funds in each A and B
ii. 75% of funds in A and 25% in B
iii. 25% of funds in A and 75% in B
iv. 60% of funds in A and 40% in B

Co-efficient of correlation (r) between A and B is 0.16. You are required to calculate:

i. Expected Return under different Portfolio Options.
ii. Risk Factor associated with these Portfolio Options.
iii. Which Portfolio is best from the point of view of Risk?
iv. Which Portfolio is best from the point of view of Return?

(Source: ICAI)

Answer:

We have $E_p = W_1E_1 + W_3E_3 + \ldots\ldots\ldots\ldots W_nE_n$

and for standard deviation $\sigma^2_p = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_{ij}$

$$\sigma^2_p = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \rho_{ij} \sigma_i \sigma_j$$

Two asset portfolio

$$\sigma^2_p = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + 2\, w_1w_2\sigma_1\sigma_2\rho_{12}$$

OR

$$\sigma_p = \sqrt{w_1\sigma_1 + w_2\sigma_2 + 2\, w_1w_2\sigma_1\sigma_2\rho_{12}}$$

Substituting the respective values we get,

i. 50% of funds in each of A and B

$Ep = 0.50 \times 19\% + 0.50 \times 23\% = 21\%$

$\sigma^2_P = (0.50)^2(14\%)^2 + (0.50)^2(18\%)^2 + 2(0.50)(0.50)(0.16)(14\%)(18\%)$

$\sigma^2_P = 49 + 81 + 20.16 = 150.16$

$\sigma_p = 12.25\%$

ii. 75% in A and 25% in B

$Ep = 0.75 \times 19\% + 0.25 \times 23\% = 20\%$

$\sigma^2_P = (0.75)^2(14\%)^2 + (0.25)^2(18\%)^2 + 2(0.75)(0.25)(0.16)(14\%)(18\%)$

$\sigma^2_P = 110.25 + 20.25 + 15.12 = 145.62$

$\sigma_p = 12.07\%$

iii. 25% in A and 75% in B

$Ep = 0.25 \times 19\% + 0.75 \times 23\% = 22\%$

$\sigma^2_P = (0.25)^2(14\%)^2 + (0.75)^2(18\%)^2 + 2(0.25)(0.75)(0.16)(14\%)(18\%)$

$\sigma^2_P = 12.25 + 182.25 + 15.12 = 209.62$

$\sigma_p = 14.48\%$

iv. 60% in A and 40% in B

$Ep = 0.60 \times 19\% + 0.40 \times 23\% = 20.6\%$

$\sigma^2_P = (0.60)^2(14\%)^2 + (0.40)^2(18\%)^2 + 2(0.60)(0.40)(0.16)(14\%)(18\%)$

$\sigma^2_P = 70.56 + 51.84 + 19.35 = 141.75$

$\sigma_p = 11.91\%$

Portfolio	(i)	(ii)	(iii)	(iv)
Return	21	20	22	20.6
σ	12.25	12.07	14.48	11.91

In the terms of return, we see that portfolio (iii) is the best portfolio.

In terms of risk we see that portfolio (iv) is the best portfolio.

Question 3: HW ANSWER BOOK PAGE 123

The return of security 'L' and security 'K' for the past five years are given below:

Year	Security-L Return %	Security-K Return %
2017	10	09
2018	14	- 02
2019	11	18
2020	09	10
2021	16	15

Calculate the risk and return of portfolio consisting above information.

(Source: FOD)

ANSWER:

If it is assumed 50% investment in each of the two securities then Return and Risk of Portfolio shall be computed as follows:

Year	Return of L	Deviation $(R_L - \overline{R_L})$	Deviation $(R_L - \overline{R_L})^2$	Return of K	Deviation $(R_K - \overline{R_K})$	Deviation $(R_K - \overline{R_K})^2$	Product of deviations
2017	10	2	4	09	1	1	2
2018	14	2	4	-02	-12	144	-24
2019	11	-1	1	18	8	64	-8
2020	09	-3	9	10	0	0	0
2021	16	4	16	15	5	25	20
	Σ = 60		Σ= 34	Σ=50		Σ=234	
60/5 = 12			50/5 = 10				-10

$$\text{Covariance} = \frac{\sum_{i=1}^{N}\left[R_1 - \overline{R_1}\right]\left[R_2 - \overline{R_2}\right]}{N} = \textbf{-10/5 = -2}$$

CORRELATION COEFFICIENT(r) = -2/(2.61 × 6.84) = -0.11

Return and Standard Deviation of Security L

$R_L = 60/5 = 12$

$$\sigma_L = \sqrt{\frac{\left(R_{\wedge L} - \overline{R_L}\right)^2}{N}}$$

$\sigma_L = \sqrt{34/5} = 2.61$

Standard Deviation of Security K

$$\sigma_K = \sqrt{\frac{\left(R_K - \overline{R_K}\right)^2}{N}}$$

$\sigma_K = \sqrt{234/5} = 6.84\%$

Portfolio Return

$R_P = 0.50 \times 12 + 0.50 \times 10 = 11.00\%$

Portfolio Standard Deviation

$\sigma_{LK} = (0.50^2 \text{ X } 2.61^2 + 0.50^2 \text{ X } 6.84^2 + 2\text{X } 0.5 \text{ X } 0.5 \text{ X } (-0.11) \text{ X } 2.61 \text{ X } 6.84)^{½} = 3.52$

Question 3: CW QUESTION BOOK PAGE 44

On 01/04/2020 Mr. K Invested in the following companies to make his portfolio:

Name of Company	No. of Equity Share Purchase	Face Value per Equity Share	Purchase Price per Equity Share
PK Ltd.	2000	₹ 10	₹ 210
KD Ltd.	1000	₹ 10	₹ 290

Mr. K expects that:

i. Dividend for the financial year 2020-21 of PK Ltd. & KD Ltd. will be 40% & 50% respectively.

ii. Probabilities of the Market Price as on 31/03/2021 as under-

Probability Factor	Market Value per Equity Share of PK Ltd.	Market Value per Equity Share of KD Ltd.
0.4	₹ 200	₹ 300
0.4	₹ 240	₹ 320
0.2	₹ 260	₹ 350

You are required to:

i. Calculate the Expected Market Price of Equity Shares of both the Companies as on 31/03/2021.

ii. Calculate the Expected Average Return of the Portfolio for the year 2020-21.

(Source: ICAI)

Answer:

i. Expected Market Price of Shares on 31/03/2021

	PK Ltd.	KD Ltd.
(200 x 0.4) + (240 x 0.4) + (260 x 0.2)	228.00	-
(300 x 0.4) + (320 x 0.4) + (350 x 0.2)	-	318.00

ii. Calculation of estimated return on Portfolio for 2020-21

	PK Ltd.	**KD Ltd.**
Expected dividend	4.00	5.00
Capital gain by 31.03.21	(228 – 210) = 18.00	(318 – 290) = 28.00
Yield	22.00	33.00
Market Value 01.04.20	210	290
% return	10.48%	11.38%
Weight in portfolio (2,000 x 210) : (1000 x 290)	59.15	40.85
Weighted average (Expected) return (59.15 x 10.48%) + (40.85 x 11.38%)	10.85%	

Question 9: CW QUESTION BOOK PAGE 47

Mr. A, a HNI invested on 1.4.2014 in certain equity shares as below:

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

In September 2014, 10% dividend was paid out by X Ltd. and in October 2014, 30% dividend paid out by Y Ltd. On 31.3.2015 market quotations showed a value of ₹ 220 and ₹ 290 per share for X Ltd. and Y Ltd. respectively.

On 1.4.2015, a technical analyst indicated as follows:

1. that the probabilities of dividends from X Ltd. and Y Ltd. for the year ending 31.3.2016 are as below:

Probability factor	Dividend from X Ltd. (%)	Dividend from Y Ltd. (%)
0.2	10	15
0.3	15	20
0.5	20	35

2. that the probabilities of market quotations on 31.3.2016 are as below:

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

You are required to:

i. Analyze the average return from the portfolio for the year ended 31.3.2015;
ii. Analyze the expected average return from the portfolio for the year 2015-16; and
iii. Advise Mr. A, of the comparative risk in the two investments.

(Source: ICAI)

Answer:

i. Average return from the portfolio for the year ended 31.3.2015
Calculation of return on portfolio for 2014-15 (Calculation in ₹ / share)

	X Ltd.	Y Ltd.	
Dividend received during the year	10	3	
Capital gain/loss by 31.03.15			
Market value by 31.03.15	220	290	
Cost of investment	200	300	
Gain/loss	20	(-)10	
Yield	30	(-)7	
Cost	200	300	
% return	15%	(-)2.33%	
Weight in the portfolio	57	43	
Weighted average return			7.55%

ii. Average return from the portfolio for the year ended 2015-16 shall be calculated using the concept of joint probability as follows:

X Ltd.

Path	Income from Dividend (₹)	Gain from Market Price (₹)	Total Yield (₹)	Joint Prob.	Exp. Yield (₹)
1	10	220 – 220 = 0	10	0.20 x 0.20 = 0.04	0.40
2	10	250 – 220 = 30	40	0.20 x 0.50 = 0.10	4.00
3	10	280 – 220 = 60	70	0.20 x 0.30 = 0.06	4.20
4	15	220 – 220 = 0	15	0.30 x 0.20 = 0.06	0.90
5	15	250 – 220 = 30	45	0.30 x 0.50 = 0.15	6.75
6	15	280 – 220 = 60	75	0.30 x 0.30 = 0.09	6.75
7	20	220 – 220 = 0	20	0.50 x 0.20 = 0.10	2.00
8	20	250 – 220 = 30	50	0.50 x 0.50 = 0.25	12.50
9	20	280 – 220 = 60	80	0.50 x 0.30 = 0.15	12.00
Expected Yield (₹)					49.50
Market Value on 01.04.2015 (₹)					220
% Return					22.50

Y Ltd.

Path	Income from Dividend (₹)	Gain from Market Price (₹)	Total Yield (₹)	Joint Prob.	Exp. Yield (₹)
1	1.50	290 – 290 = 0	1.50	0.20 x 0.20 = 0.04	0.06
2	1.50	310 – 290 = 20	21.50	0.20 x 0.50 = 0.10	2.15
3	1.50	330 – 290 = 40	41.50	0.20 x 0.30 = 0.06	2.49
4	2.00	290 – 290 = 0	2.00	0.30 x 0.20 = 0.06	0.12
5	2.00	310 – 290 = 20	22.00	0.30 x 0.50 = 0.15	3.30
6	2.00	330 – 290 = 40	42.00	0.30 x 0.30 = 0.09	3.78
7	3.50	290 – 290 = 0	3.50	0.50 x 0.20 = 0.10	0.35
8	3.50	310 – 290 = 20	23.50	0.50 x 0.50 = 0.25	5.88
9	3.50	330 – 290 = 40	43.50	0.50 x 0.30 = 0.15	6.52
Expected Yield (₹)					24.65
Market Value on 01.04.2015 (₹)					290
% Return					8.50

Weight in portfolio (1,00,000 x 220): (50,000 x 290) 60.30 : 39.70

Weighted average (Expected) return (0.6030 x 22.50 + 0.3970 x 8.50) 16.94%

iii. To analyze the risk of each investment we need to calculate the Standard Deviation of each investment as follows:

X Ltd.

Path	*Prob. (1)*	*Yield (₹)*	*Dev. ($P_X - \overline{P_X}$)*	*Square of dev. (2)*	(1) X (2)
1	0.04	10	-39.50	1560.25	62.41
2	0.10	40	-9.50	90.25	9.03
3	0.06	70	20.50	420.25	25.22
4	0.06	15	-34.50	1190.25	71.42
5	0.15	45	-4.50	20.25	3.04
6	0.09	75	25.50	650.25	58.52
7	0.10	20	-29.50	870.25	87.03
8	0.25	50	0.50	0.25	0.06
9	0.15	80	30.50	930.25	139.54
					σ^2_M = 456.27

Standard Deviation (σ_X) 21.36

Y Ltd.

Path	Prob. (1)	Yield (₹)	Dev. (P_Y-$\overline{P_Y}$)	Square of dev. (2)	(1) X (2)
1	0.04	1.50	-23.15	535.92	21.44
2	0.10	21.50	-3.15	9.92	0.99
3	0.06	41.50	16.85	283.92	17.04
4	0.06	2.00	-22.65	513.02	30.78
5	0.15	22.00	-2.65	7.02	1.05
6	0.09	42.00	17.35	301.02	27.09
7	0.10	3.50	-21.15	447.32	44.73
8	0.25	23.50	-1.15	1.32	0.33
9	0.15	43.50	18.85	355.32	53.30
					σ^2_N = 196.75

iv. Although Expected Return is higher in case of X Ltd. but it also has higher risk due to High S.D.

Question 10: **CW QUESTION BOOK PAGE 48**

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

(Source: ICAI)

Answer:

	A				B				
Year	Market Price Per Share in ₹	Return (%)	Return - $\bar{A}$	Squared	Market Price Per Share in ₹	Return (%)	Return - $\bar{B}$	Squared	(Return - $\bar{A}$) x (Return - $\bar{B}$)
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	12.65	-3.54	12.5316	-48.1440
2017	43.25	1.43	-12.56	157.7536	15.60	-14.52	-30.71	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
		83.95		6226.6883		97.14		3582.1748	-96.3718
Mean ($\bar{A}$)		13.99	Variance	1037.7814	Mean ($\bar{B}$)	16.19	Variance	597.0291	Cov.= -16.0620

i. Return A = 13.99% and Risk (SD) = √1037.7814 = 32.2146 and Return B = 16.19% and Risk (SD) = √597.0291= 24.4342

ii. Return of Portfolio = 0.60 x 13.99% + 0.40 x 16.19% = 14.87%
Risk (Standard Deviation) of Portfolio = [0.602 x 1037.7814 + 0.402 x 597.0291 + 2 x 0.60 x 0.40 x (-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 11: **CW QUESTION BOOK PAGE 48**

An Indian investor invests in American and British securities in the proportion of 75% and 25%. The expected return is 15% from the former and 12% from the latter. The risk manifesting in variance is 15% in US securities and 18% in UK securities. Correlation is 0.6. Determine the Portfolio Return and Portfolio risk.

(Source: ICAI)

Answer:

Portfolio Return

$0.75 \times 0.15 + 0.25 \times 0.12 = 0.1425 = 14.25\%$

Portfolio Risk

$(0.75)^2 (0.15)^2 + (0.25)^2 (0.18)^2 + 2(0.75)(0.25)(0.15)(0.18)(0.6)$

$= \sqrt{0.020756}$

$= 0.1441 = 14.41\%$

Question 12: CW QUESTION BOOK PAGE 48

Assume that you have half your money invested in T, the media company, and the other half invested in U, the consumer product giant. The expected returns and standard deviations on the two investments are summarized below:

	T	U
Expected Return	14%	18%
Standard Deviation	25%	40%

Estimate the variance of the portfolio as a function of the correlation coefficient (Start with -1 and increase the correlation to +1 in 0.2 increments).

(Source: ICAI)

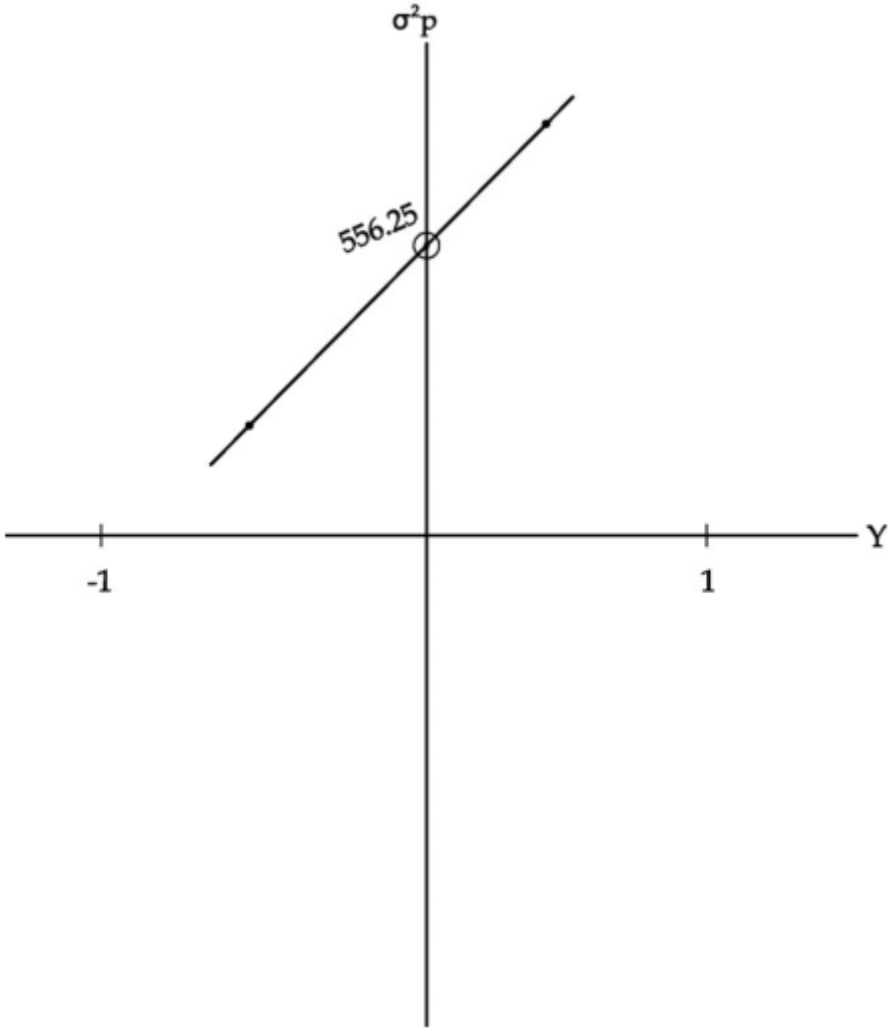
Answer:

$$\sigma_p^2 = \frac{1^2}{2} \times 25^2 \times \frac{1^2}{2} \times 40^2 \times 2 \times \frac{1}{2} \times \frac{1}{2} \times 25 \times 40 \times (r)$$

$$= 156.25 + 400 + 500r$$

$$\sigma_p^2 = 556.25 + 500r$$

r	σ^2_p
-1	56.25
-0.8	156.25
-0.6	256.25
-0.4	356.25
-0.2	456.25
0	556.25
0.2	656.25
0.4	756.25
0.6	856.25
0.8	956.25
1	1056.25


σ²p
556.25
Y
-1
1