CA FINAL

STRATEGIC FINANCIAL MANAGEMENT

Marathon

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Question 1.

Auto Correlation Test

Mr. X is of the opinion that market has recently shown the Weak Form of Market Efficiency. In order to test the validity of his impression he has collected the following data relating to the movement of the SENSEX for the last 20 days.

Days	Open	High	Low	Close
1	33470.94	33513.79	33438.03	33453.99
2	33453.64	33478.11	33427.82	33434.83
3	33414.06	33440.29	33397.65	33431.93
4	33434.94	33446.18	33377.78	33383.41
5	33372.92	33380.27	33352.12	33370.93
6	33375.85	33389.49	33331.42	33340.75
7	33340.89	33340.89	33310.95	33330.98
8	33326.84	33340.91	33306.17	33335.08
9	33307.16	33328.22	33296.43	33301.97
10	33298.64	33318.60	33254.28	33259.03
11	33260.04	33228.85	33241.66	33251.53
12	33255.92	33289.46	33249.46	33285.89
13	33288.86	33535.67	33255.98	33329.28
14	33335.00	33346.21	33276.72	33284.17
15	33293.83	33310.86	33278.54	33298.78
16	33300.02	33337.79	33300.02	33325.38
17	33323.36	33356.34	33322.44	33329.95
18	33322.81	33345.98	33317.44	33319.67
19	33317.51	33321.18	33294.19	33302.32
20	33290.86	33324.96	33279.62	33319.61

You are required:

To test the Weak Form of Market Efficiency using Auto-Correlation test, taking time lag of 10 days.

Answer:

Period 1	Closing Prices	Change	Period 2	Closing Prices	Change
1	33453.99		11	33251.53	
2	33434.83	-19.16	12	33285.89	34.36
3	33431.93	- 2.90	13	33329.28	43.39
4	33383.41	- 48.52	14	33284.17	- 45.11
5	33370.93	- 12.48	15	33298.78	14.61
6	33340.75	- 30.18	16	33325.38	26.6
7	33330.98	-9.77	17	33329.95	4.57
8	33335.08	4.1	18	33319.67	-10.28
9	33301.97	- 33.11	19	33302.32	-17.35
10	33259.03	- 42.94	20	33319.61	17.29

X	Y	X^2	Y^2	XY
-19.16	34.36	367.11	1180.61	-658.34
-2.90	43.39	8.41	1882.69	-125.83
-48.52	-45.11	2354.19	2034.91	2188.74
-12.48	14.61	155.75	213.45	-182.33
-30.18	26.6	910.83	707.56	-802.79
-9.77	4.57	95.45	20.88	-44.65
4.1	-10.28	16.81	105.68	-42.15
-33.11	-17.35	1096.27	301.02	574.46
-42.94	17.29	1843.84	298.94	-742.43
$\sum X = -194.96$	$\sum Y = 68.08$	$\sum X^2 = 6848.66$	$\sum Y^2 = 6745.74$	$\sum XY = 164.68$
$\overline{X} = -21.66$	$\overline{Y} = 7.56$			

$$b = \frac{\sum XY - n\overline{XY}}{\sum X^2 - n(\overline{X})2} = \frac{164.68 - 9(-21.66)(7.56)}{6848.66 - 9(-21.66)^2} = 0.624$$

$$a = \overline{Y} - b\overline{X} = 7.56 - 0.624(-21.66) = 21.08$$

$$r^2 = \frac{a\sum Y + b\sum XY - n(\overline{Y})^2}{\sum Y^2 - n(\overline{Y})^2} = \frac{21.08(68.08) + 0.624(164.68) - 9(7.56)^2}{6745.74 - 9(7.56)^2}$$

$r^2 = 0.164$

$r = 0.405$

There is moderate degree of correlation between the returns of two periods hence it can be concluded that the market does not show the weak form of efficiency.

Question 2.

Mutual Fund Dividend Equilisation Sum

On 1st January, 2020, an open ended scheme of mutual fund had outstanding units of 300 lakhs with a NAV of ₹ 20.25. At the end of January 2020, it had issued 5 lakhs units at an opening NA V plus a load of 2%, adjusted for dividend equalisation. At the end of February 2020, it had repurchased 2.5 lakhs units at an opening NAV less 2% exit load adjusted for dividend equalisation. At the end of March 2020, it had distributed 70 per cent of its available income.

In respect of January - March quarter, the following additional information is available:

Value appreciation of the portfolio	₹ 460 lakhs
Income for January	₹ 24 lakhs
Income for February	₹ 36 lakhs
Income for March	₹ 47 lakhs

You are required to calculate:

i. Income available for distribution
ii. Issue price at the end of January
iii. Repurchase price at the end of February
iv. Closing Value of Net Assets at the end of March.

Answer:

i. Calculation of Income Available for Distribution

	Units (Lakh)	Per Unit (₹)	Total (₹ In lakh)
Income from January	300	0.0800	24.0000
Add: Dividend equalization collected on issue	5	0.0800	0.4000
	305	0.0800	24.4000
Add: Income from February		0.1180	36.0000
	305	0.1980	60.4000
Less: Dividend equalization paid on repurchase	2.50	0.1980	(0.4950)
	302.50	0.1980	59.9050
Add: Income from March		0.1554	47.0000
	302.50	0.3534	106.9050
Less: Dividend Paid		0.2474	(74.8335)
	302.50	0.1060	32.0715

ii. Calculation of Issue Price at the end of January

	₹
Opening NAV	20.250
Add: Entry Load 2% of ₹ 20.25	0.405
	20.655
Add: Dividend Equalization collected on Issue Price	0.080
	20.735

iii. Calculation of Repurchase Price at the end of February

	₹
Opening NAV	20.250
Less: Exit Load 2% of ₹ 20.250	(0.405)
	19.845
Add: Dividend Equalization paid on Issue Price	0.198
	20.043

iv. Closing NAV at the end of March

		₹ (Lakh)
Opening Net Asset Value (₹ 20.25 × 300)		6075.000
Portfolio Value Appreciation		460.000
Issue of Fresh Units (5 × 20.735)		103.675
Income Received (24 + 36 + 47)		107.000
		6745.675
Less: Units repurchased (2.5 × 20.043)	- 50.1075	
Income Distributed	-74.8335	(-124.941)
Closing Net Asset Value		6620.734
Closing Units (300 + 5 – 2.5) lakh		302.50 lakh
Closing NAV as on 31st March		₹ 21.8867

Question 3.

EFR

The Balance Sheet of M/s. Sundry Ltd. as on 31-03-2020 is follows:

(₹ in lakhs)

Liabilities	₹	Assets	₹
Share Capital	300	Fixed Assets	600
Reserves	200	Inventory	500
Long Term Loan	400	Receivables	240
Short Term Loan	300	Cash	60
Payables & Provisions	200		
Total	**1400**	**Total**	**1400**

Sales for the year was ₹ 600 lakhs. The sales are expected to grow by 20% during the year. The profit margin and dividend pay-out ratio are expected to be 4% and 50% respectively.

The company further desires that during the current year Sales to Short Term Loan and Payables and Provision should be in the ratio of 4 : 3. Ratio of fixed assets to Long Term Loans should be 1.5. Debt Equity Ratio should not exceed 1.5.

You are required to determine:

i. The amount of External Fund Requirement (EFR)

ii. The amount to be raised from Short Term, Long Term and Equity funds.

Answer:

i. External Funds Requirement (EFR):

(₹ in lakhs)

	(₹)
Expected sales (₹ 600 + 20% of ₹ 600)	720.00
Profit margin @ 4%	28.80
Dividend payout ratio @ 50%	14.40
Balance to be ploughed back (A)	14.40
Additional funds required (₹ 1400 - ₹ 200*) x 0.20 (B)	240.00
Balance to be met from external source (B - A)	225.60

* As current liabilities shall also be increased proportionately with increase in sales.

ii. Amount to be raised from different sources with following conditions:

- Sales to short term loans and payables & provisions 4:3
- Ratio of fixed assets to long term loans 1.5
- Debt equity ratio should not exceed 1.5

1. Amount to be raised from short term funds:

	(₹ in lakhs)
New amount of short-term loans and payables & provision $\left(\frac{3}{4} \text{x } 600\right)$	450
Less: Existing Amount of short-term loans and payables & provision	500
Amount to be raised from short term funds	Nil

2. Amount to be raised from Long term funds:

	(₹ in lakhs)
New fixed assets (₹ 600 + 20% of ₹ 600)	720
New long-term loans (₹ 720/1.5)	480
Less: Existing long-term loans	400
Amount to be raised from Long term funds	80

3. Amount to be raised from equity funds:

	(₹ in lakhs)
Amount to be raised from external sources	225.60
Less: Amount to be raised from short term funds	----
Less: Amount to be raised from Long term funds	80.00
Balance amount to be raised from equity funds	145.60

Question 4.

Forex

M/s. Sky products Ltd., of Mumbai, an exporter of sea foods has submitted a 60 days bill for EUR 5,00,000 drawn under an irrevocable Letter of Credit for negotiation. The company has desired to keep 50% of the bill amount under the Exchange Earners Foreign Currency Account (EEFC). The rates for ₹/USD and USD/EUR in inter-bank market are quoted as follows:

	₹/ USD	USD/EUR
Spot	67.8000 - 67.8100	1.0775 - 1.8000
1 month forward	10/11 Paise	0.20/0.25 Cents
2 months forward	21/22 Paise	0.40/0.45 Cents
3 months forward	32/33 Paise	0.70/0.75 Cents

Transit Period is 20 days. Interest on post shipment credit is 8 % p.a. Exchange Margin is 0.1%. Assume 365 days in a year.

You are required to calculate:

i. Exchange rate quoted to the company
ii. Cash inflow to the company
iii. Interest amount to be paid to bank by the company.

Answer:

i. Transit and usance period is 80 days. It will be rounded off to the lower of months and @ months forward bid rate is to be taken

₹/USD	₹ 67.8000
Add: Premium for 2 months	₹ 0.2100
	₹ 68.0100
Less: Exchange margin @ 0.1%	₹ 0.0680
Bid rate for USD	₹ 67.9420
USD/EUR	USD 1.0775
Add: Premium	USD 0.0040
	USD 1.0815
₹/EUR Rate (67.942 x 1.0815)	₹ 73.4793
Amount of Export Bill	EUR 5,00,000
Less: EEFC	EUR 2,50,000
	EUR 2,50,000
Exchange Rate	₹ 73.4793

ii. Cash Inflow ₹ 1,83,69,825

iii. Interest for 80 days @ 8% ₹ 3,22,101

Question 5.

VAR

On Tuesday morning (before opening of the capital market) an investor, while going through his bank statement, has observed that an amount of ₹ 7 lakhs is lying in his bank account. This amount is available for use from Tuesday till Friday. The Bank requires a minimum balance of ₹ 1000 all the time. The investor desires to make a maximum possible investment where Value at Risk (VaR) should not exceed the balance lying in his bank account. The standard deviation of market price of the security is 1.5 per cent per day. The required confidence level is 99 per cent.

Given

Standard Normal Probabilities										
z	0.00	.01	.02	.03	0.04	.05	.06	.07	.08	.09
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9998	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9923	.9925	.9929	.9931	.9932	.9934	.9936

You are required to determine the maximum possible investment.

Answer:

Particulars	Amount (₹)
Amount available in bank account	7,00,000
Minimum balance to be kept	1,000
Available amount which can be used for potential investment for 4 days	6,99,000
Maximum Loss for 4 days at 99% level	6,99,000
Maximum Loss for 1 day at 99 % level = Maximum Loss for 4 days / √No. of days = 699000/ √4	3,49,500
Z Score at 99% Level	2.33
Volatility in terms of Rupees (Maximum Loss/ Z Score at 99% level) = 349500/ 2.33	1,50,000
Maximum Possible Investment (Volatility in Rupees/Std Deviation) = 150000/.015	1,00,00,000

Question 6.

Ratio

AB Industries has Equity Capital of ₹ 12 Lakhs, total Debt of ₹ 8 Lakhs, and annual sales of ₹ 30 Lakhs. Two mutually exclusive proposals are under consideration for the next year. The details of the proposals are as under:

Particulars	Proposal no. 1	Proposal no. 2
Target Assets to Sales Ratio	0.65	0.62
Target Net Profit Margin (%)	4	5
Target Debt Equity Ratio (DER)	2:3	4:1
Target Retention Ratio (of Earnings) (%)	75	-
Annual Dividend (₹ In Lakhs)	-	0.30
New Equity Raised (₹ in Lakhs)	-	1

You are required to calculate sustainable growth rate for both the proposals.

Answer:

Sustainable Growth Rate under Proposal 1

Sales (Given)		₹ 30 Lakhs
Total Assets	₹ 30 Lakhs x 0.65	₹ 19.50 Lakhs
Net Profit	₹ 30 Lakhs x 4%	₹ 1.20 Lakhs
Equity Multiplier	$\frac{\text{Equity}}{\text{Equity + Debt}} = \frac{\text{12 Lakhs}}{\text{12 Lakhs + 8 Lakhs}}$	0.6
ROE	$\frac{\text{1.20 Lakhs}}{\text{19.50 Lakhs}} \times 0.60 \times 100$	3.69%

Sustainable Growth Rate = ROE x Retention Ratio = 3.69% x 0.75 = 2.77%

Sustainable Growth Rate under Proposal 2

New Equity = ₹ 12 Lakhs + ₹ 1 Lakh = ₹ 13 Lakhs
New Debt = ₹ 13 Lakhs x 4 = ₹ 52 Lakhs
Total Assets = ₹ 13 Lakhs + ₹ 52 Lakhs = ₹ 65 Lakhs

Target Assets to Sales Ratio (Given)		0.62
Sales	₹ 65 Lakhs / 0.62	₹ 104.84 Lakhs
Net Profit	₹ 104.84 Lakhs x 5%	₹ 5.242 Lakhs
Equity Multiplier	$\frac{\text{Equity}}{\text{Equity + Debt}} = \frac{\text{13 Lakhs}}{\text{13 Lakhs + 52 Lakhs}}$	0.2
ROE =	$\frac{\text{5.242 Lakhs}}{\text{65 Lakhs}} \times 0.20 \times 100$	1.613%
Retention Ratio	$\frac{\text{5.242 Lakhs - 0.30 Lakhs}}{\text{5.242 Lakhs}}$	0.943

Sustainable Growth Rate = ROE x Retention Ratio
= 1.613% x 0.943 = 1.52%

Question 7.

Interest Rate Risk Management

IB an Indian firm has its subsidiary in Japan and Zaki a Japanese firm has its subsidiary in India and face the following interest rates:

Company	IB	Zaki
INR floating rate	BPLR + 0.50%	BPLR + 2.50%
JPY (Fixed rate)	2%	2.25%

Zaki wishes to borrow Rupee Loan at a floating rate and IB wishes to borrow JPY at a fixed rate. The amount of loan required by both the firms is same at the current exchange rate. A financial institution may arrange a swap and requires 25 basis points as its commission. Gain, if any, is to be shared by the firms equally.

You are required to find out:

i. Whether a swap can be arranged which may be beneficial to both the firms?
ii. What rate of interest will the firms end up paying?

Answer:

Though Company IB has an advantage in both the markets but it has comparative more advantage in the INR floating-rate market. Company Zaki has a comparative advantage in the JPY fixed interest rate market.

However, company IB wants to borrow in the JPY fixed interest rate market and company Zaki wants to borrow in the INR floating-rate market. This gives rise to the swap opportunity.

IB raises INR floating rate at BPLR + 0.50% and Zaki raises JPY at 2.25%
Total Potential Gain = (INR interest differential) - (Yen rate differential)
= (BPLR + 2.50% - BPLR + 0.50%) + (2% - 2.25%) = 1.75%
Less Banker's commission (To be shared equally) = 0.25%

Net gain (To be shared equally: 0.75% each) = 1.50%

i. Yes, a beneficial swap can be arranged
ii. Effective cost of borrowing = pays to lenders + pays to other party -receives from other party + banker's commission

IB = BPLR + 0.50% +1.125%* - (BPLR + 0.50%) + 0.125% = 1.25%
(* has been arrived as 2% - 0.75% - 0.125%)

Zaki = 2.25% + BPLR + 0.50% - 1.125% + 0.125% = BPLR + 1.75%

Note: Candidates can also present the above Swap arrangement in a different manner. In such case they should be awarded due marks provided solution be ended up in correct answer.

Question 8.

Convexity Part

The following data are available for a bond:

Face Value ₹ 10,000 to be redeemed at par on maturity

Coupon rate	8.5 per cent per annum
Years to Maturity	5 years
Yield to Maturity (YTM)	10 per cent

You are required to calculate:

i. Current market price of the Bond,
ii. Macaulay's Duration,
iii. Volatility of the Bond,
iv. Convexity of the Bond,
v. Expected market price, if there is a decrease in the YTM by 200 basis points
   a. By Macaulay's Duration based estimate
   b. By Intrinsic Value Method.

Given

Years	1	2	3	4	5
PVIF (10%, n)	0.909	0.826	0.751	0.683	0.621
PVIF (8%, n)	0.926	0.857	0.794	0.735	0.681

Answer:

i. Current Market Price of Bond

= ₹ 850 (PVIAF 10%, 5) + ₹ 10,000 (PVIF 10%, 5)

= ₹ 850 (3.79) + ₹ 10,000 (0.621) = ₹ 3,221.50 + ₹ 6,210 = ₹ 9,431.5

ii. Macaulay's Duration

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	850	0.909	772.65	0.082	0.082
2	850	0.826	702.10	0.074	0.148
3	850	0.751	638.35	0.068	0.204
4	850	0.683	580.55	0.062	0.248
5	10,850	0.621	6,737.85	0.714	3.57
			9431.50	1.000	4.252

Duration of the Bond is 4.252 years

iii. Volatility of Bond

$$\text{Volatility of Bonds} = \frac{\text{Duration}}{(1+\text{YTM})} = \frac{4.252}{1.10} = 3.865$$

iv. Convexity of Bond

$$C^* \times (\Delta Y)^2 \times 100$$

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0\,(\Delta Y)2}$$

Year	Cash flow	P.V. @ 8%		P.V @12%	
1	850	0.926	787.10	0.892	758.20
2	850	0.857	728.45	0.797	677.45
3	850	0.794	674.90	0.712	605.20
4	850	0.735	624.75	0.636	540.60
5	10,850	0.681	7388.85	0.567	6,151.95
			10204.05		8,733.40

$$C^* = \frac{10{,}204.05 + 8{,}733.40 - 2 \times 9{,}431.50}{2 \times 9{,}431.50 \times (0.02)^2}$$

$$= \frac{74.45}{7.5452}$$

$$= 9.867$$

Convexity of Bond = $9.867 \times (0.02)^2 \times 100 = 0.395\%$

v. The expected market price if decrease in YTM by 200 basis points.

A. By Macaulay's duration-based estimate

= ₹ 9431.50 × 2 (3.865/100) = ₹ 729.05
Hence expected market price is ₹ 9431.50 + ₹ 729.05 = ₹ 10,160.55
Hence, the market price will increase.

B. By Intrinsic Value method

Intrinsic Value at YTM of 10%	₹ 9,431.50
Intrinsic Value at YTM of 8%	₹ 10,204.05
Price increased by	₹ 772.55

Hence, expected market price is ₹ 10,204.05

Question 9.

Mutual Fund Reverse Q

M/S. Corpus an AMC, on 1.04.2015 has floated two schemes viz. Dividend Plan and Bonus Plan. Mr. X, an investor has invested in both the schemes. The following details (except the issue price) are available:

Date	Dividend (%)	Bonus Ratio	NAV	
			Dividend Plan	Bonus Plan
1.04.2015			?	?
31.12.2016		1 :4 (One unit on 4 units held)	47	40
31.03.2017	12		48	42
31.03.2018	10		50	39
31.12.2018		1 :5 (One unit on 5 units held)	46	43
31.03.2019	15		45	42
31.03.2020	-	-	49	44

Additional details		
Investment (₹)	₹ 9,20,000	₹ 10,00,000
Average Profit (₹)	₹ 27, 748.60	
Average Yield (%)		6.40

You are required to calculate the issue price of both the schemes as on 1.04.2015.

Answer:

i. Dividend Plan

a. Average Annual gain over a period of 5 Years — 27748.60
b. Total gain over a period of 5 years (a*5) — 138743
c. Initial Investment — 920000
d. Total value of investment (b+c) — 1058743
e. NAV as on 31.3.2020 — 49
f. Number of units at the end of the period as on 31.03.2019 (d/e) — 21607

	1	2	3	4 = (2*3)	5	6 = 1/ (4+5)*4	7
Period	Units held	Rate	Unit value	Dividend	NAV	New Units*	Balance Units Pre Dividend
31.03.2019	21607	0.15	10	1.5	45	697	20910
31.03.2018	20910	0.1	10	1	50	410	20500
31.03.2017	20500	0.12	10	1.2	48	500	20000

Issue Price as on 01.04.2015 Investment 920000/ Units purchased 20000 (c/i) = ₹ 46

* Let the units issued be X

X = (Closing Units/NAV + Dividend) x Dividend

ii. Bonus Plan

a. Average Yield — 0.064
b. Investment — 1000000
c. Gain over a period of 5 years (a*b*5) — 320000
d. Market Value as on 31.03.2019 (b + c) — 1320000
e. NAV as on 31.03.2020 — 44
f. Total units as on 31.03.2020 (d/e) — 30000
g. No of units as on 31.03.2018 Pre bonus = 30000*5/ (5 + 1) — 25000
h. No of units as on 31.12.2016 Pre bonus = 25000*4/ (4 + 1) — 20000
i. Issue Price as on 01.04.2015 Investment 1000000/ Units purchased 20000 (b/h) — 50

Question 10.

NPV

SS Company is considering the replacement of its existing machine with a new machine. The Purchase price of the New machine is ₹ 26 Lakhs and its expected Life is 8 years. The company follows straight-line method of depreciation on the original investment (scrap value is not considered for the purpose of depreciation). The other expenses to be incurred for the New Machine are as under:

i. Installation Charges ₹ 9,000
ii. Fees paid to the consultant for his advice to buy New Machine ₹ 6,000.
iii. Additional Working Capital required ₹ 17,000. (will be released after 8 years)

The written down value of the existing machine is ₹ 76,000, and its Cash Salvage Value is ₹ 12,500. The dismantling of this machine would cost ₹ 4,500. The Annual Earnings (before tax but after depreciation) from the New Machine would amount to ₹ 3,15,000. Income tax rate is 35%. The Company's required Rate of Return is 13%.

You are required to advise on the viability of the proposal.

PVIF (13%, 8) = 0.376   PVIFA (13%, 8) = 4.80

Answer:

Working Note:

1. Computation of Annual Depreciation-

Particulars	₹
Purchase Price	26,00,000
Add:1. Installation Charges	9,000
2. Fees Paid to Consultant for Advice	6,000
Total Cost of New Machine	26,15,000
Useful Life	8 Years
Annual Depreciation (Total Cost/No. of Years)	3,26,875

2. Computation of Annual Cash Savings-

Particulars	₹
Annual Earnings	3,15,000
Less-Tax @35%	1,10,250
Earning after Tax	2,04,750
Add-Depreciation on New Machine	3,26,875
Annual Cash Savings	5,31,625

3. Tax effect on sale of Old Machine-

Particulars	₹
Proceeds of Sale	12,500
Less: Cost of Removal	4,500
Net Proceeds	8,000
Less: WDV	76,000
Net Loss due to Sale	68,000
Tax savings due to Loss on Sale @35%	23,800
Total Cash Inflow due to Sale (₹ 8,000+₹ 23,800)	31,800

4. Computation of Net Present Value

Particulars	Period	Cash Flow (₹)	PVF @13%	PV (₹)
(a) Annual Cash inflow after Tax	1-8	5,31,625	4.8	25,51,800
(b) Net Salvage Value of Existing Machine	0	31,800	1.0	31,800
(c) Working Capital Realized	8	17,000	0.376	6,392
Present Value of Cash Inflows				25,89,992
Less: 1. Initial Investment	0	26,15,000	1.0	26,15,000
2. Initial Working Capital	0	17,000	1.0	17,000
NPV of the Proposal				(42,008)

Decision: Since NPV of the project is negative it is not viable.

Question 11.

Forex

KGF Bank's Sydney branch has surplus funds of USD $ 7,00,000 for a period of 2 months. Cost of funds to the bank is 6% p.a. They propose to invest these funds in Sydney, New York or Tokyo and obtain the best yield, without any exchange risk to the bank. The Following rates of interest are available at the three centres for investment of domestic funds there for a period of 2 Months.

Sydney	7.5% p.a.
New York	8% p.a.
Tokyo	4% p.a.

The market rates in Australia for US Dollars and Yen are as under:

Sydney on New York:

Spot	0.7100/0.7300
1 Months	10/20
2 Months	25/30

Sydney on Tokyo:

Spot	79.0900/79.2000
1 Months	40/30
2 Months	55/50

At which centre, will the investment be made & what will be the net gain to the bank on the invested funds?

Answer:

i. If investment is made at Sydney

Convert US$ 7,00,000 at Spot Rate (7,00,000/0.7300)		= A$ 9,58,904
Add: A$ Interest for 2 months on A$ 9,58,904 @ 7.5%		= A$ 11,986
		= A$ 9,70,890
Less: Amount Invested	$ 7,00,000	
Interest accrued thereon	$ 7,000	
	= $ 7,07,000	
Equivalent amount of £ required to pay the above sum ($ 7,07,000/0.7125*)		= A$ 9,92,281
Arbitrage Loss		= A$ 21,391
Or Equivalent Amount in US$(21391×0.7125)		= $ 15,241

ii. If investment is made at New York

Gain $ 7,00,000 (8% - 6%) x 2/12	= $ 2,333.33
Or Equivalent amount in £ 3 months ($ 2,333/ 0.7330)	= A$ 3,183

iii. If investment is made at Tokyo

Convert US$ 700,000 at Spot Rate (Cross Rate) 79.0900/0.7300	= ¥ 108.34
Yen equivalent US$ 700,000	= ¥ 7,58,38,000
Add: Interest for 2 months @ 4%	= ¥ 5,05,587
	= ¥ 7,63,43,587
3 month Forward Rate of selling ¥ (1/79.1950)	= A$ 0.0126
Sell ¥ in Forward Market ¥ 7,63,43,587 x A$ 0.0126	= A$ 9,61,929
Less: Amounted invested and interest thereon	= A$ 9,92,281
Arbitrage Loss	= A$ 30,352
Or Equivalent Loss in $(30352×0.7125)	= $ 21,626

Out of three options the profit is in case of investment is made in New York. Hence it should be opted.

* Due to conservative outlook.

Question 12.

Merger & Acquisitions

R Ltd. and S Ltd. operating in same industry are not experiencing any rapid growth but providing a steady stream of earnings. R Ltd.'s management is interested in acquisition of S. Ltd. due to its excess plant capacity. Share of S Ltd. is trading in market at ₹ 3.20 each. Other data relating to S Ltd. is as follows:

Balance Sheet of S Ltd.

Liabilities	Amount (₹)	Assets	Amount (₹)
Current Liabilities	1,59,80,000	Current Assets	2,48,75,000
Long Term Liabilities	1,28,00,000	Other Assets	94,00,000
Reserve & Surplus	2,79,95,000	Property Plants & Equipment	3,45,00,000
Share Capital (80 Lakhs shares of ₹ 1.5 each)	1,20,00,000		
Total	**6,87,75,000**	**Total**	**6,87,75,000**

Particulars	R Ltd. (₹)	S Ltd. (₹)	Combined Entity (₹)
Profit after Tax	86,50,000	49,72,000	1,21,85,000
Residual Net Cash Flows per year	90,10,000	54,87,000	1,85,00,000
Required return on equity	13.75%	13.05%	12.5%

You are required to compute the following:

i. Minimum price per share S Ltd. should accept from R Ltd.

ii. Maximum price per share R Ltd. shall be willing to offer to S Ltd.

iii. Floor Value of per share of S Ltd., whether it shall play any role in decision for its acquisition by R Ltd**.**

Answer:

i. Calculation of Minimum price per share S Ltd. should accept from R Ltd.

$$\text{Value of S Ltd.} = \frac{\text{Residual Cash Flow}}{\text{Ke - g}} = \frac{54,87,000}{0.1305 - 0} = ₹\ 4,20,45,977$$

$$\text{Value per share of S Ltd.} = \frac{4,20,45,977}{80,00,000} = ₹\ 5.26$$

$$\text{Book Value of per share of S Ltd.} = \frac{3,99,95,000}{80,00,000} = ₹\ 4.99 \text{ or } ₹\ 5$$

Therefore, the minimum price per share S ltd. should accept from R Ltd. is ₹ 5 (current book value)

ii. Calculation of Maximum price per share R Ltd. shall be willing to offer to S Ltd.

$$\text{Value of R Ltd.} = \frac{\text{Residual Cash Flow}}{\text{Ke - g}} = \frac{90,10,000}{0.1375 - 0} = ₹\ 6,55,27,273$$

$$\text{Value of Combined entity} = \frac{1,85,00,000}{0.125 - 0} = ₹\ 14,80,00,000$$

Value of synergy = Value of Combined entity – Individual values of R Ltd. and S Ltd.

= ₹ 14,80,00,000 – (₹ 4,20,45,977 + ₹ 6,55,27,273)

= ₹ 4,04,26,750

Maximum price per share R Ltd. shall be willing to offer to S Ltd. shall be computed as follows:

$$= \frac{\text{Value of S Ltd. as per Residual cash flows + Synergy benefits}}{\text{No. of Shares}}$$

$$= \frac{4,20,45,977 + 4,04,26,750}{80,00,000} = ₹\ 10.31$$

iii. Floor value of per share of S Ltd shall be ₹ 3.20 (current market price) and it shall not play any role in decision for the acquisition of S Ltd. as it is lower than its current book value.

Question 13.

Forex

A German subsidiary of an US based MNC has to mobilize 100000 Euro's working capital for the next 12 months. It has the following options:

Loan from German Bank	:	@ 5% p.a.
Loan from US Parent Bank	:	@ 4% p.a.
Loan from Swiss Bank	:	@ 3% p.a.

Banks in Germany charge an additional 0.25% p.a. towards loan servicing. Loans from outside Germany attract withholding tax of 8% on interest payments. If the interest rates given above are market determined, examine which loan is the most attractive using interest rate differential.

Answer :

Net Cost under each of the Options is as follows:

i. Loan from German Bank

Cost = 5% + 0.25% = 5.25%

ii. Loan from US Parent Bank

Effective Rate of Interest $\left(\frac{4\%}{1 - 0.08}\right)$	4.35%
Premium on US\$ $\left(\frac{1.05}{1.04} - 1\right)$	0.96%
Net Cost	5.31%

iii. Loan from Swiss Bank

Effective Rate of Interest $\left(\frac{3\%}{1 - 0.08}\right)$	3.26%
Premium on US\$ $\left(\frac{1.05}{1.03} - 1\right)$	1.94%
Net Cost	5.20%

Thus, loan from Swiss Bank is the best option as the Total Outflow including Interest is Less i.e. €105200

Question 14.

Equity Valuation

The current EPS of M/s VEE Ltd. is ₹ 4. The company has shown an extraordinary growth of 40% in its earnings in the last few year This high growth rate is likely to continue for the next 5 years after which growth rate in earnings will decline from 40% to 10% during the next 5 years and remain stable at 10% thereafter. The decline in the growth rate during the five year transition period will be equal and linear. Currently, the company' s pay-out ratio is 10%. It is likely to remain the same for the next five years and from the beginning of the sixth year till the end of the 10th year, the pay-out will linearly increase and stabilize at 50% at the end of the 10th year. The post tax cost of capital is 17% and the PV factors are given below:

Years	1	2	3	4	5	6	7	8	9	10
PVIF @17%	0.855	0.731	0.625	0.534	0.456	0.390	0.333	0.285	0.244	0.209

You are required to calculate the intrinsic value of the company's stock based on expected dividend. If the current market price of the stock is ₹ 125, suggest if it is advisable for the investor to invest in the company's stock or not.

Answer:

Working Notes:

i. Computation of Growth Rate in Earning and EPS

Year	1	2	3	4	5	6	7	8	9	10
Growth in Earning	40%	40%	40%	40%	40%	34%	28%	22%	16%	10%
EPS (₹)	5.60	7.84	10.98	15.37	21.51	28.82	36.89	45.00	52.20	57.42

ii. Computation of Payout Ratio and Dividend

Year	1	2	3	4	5	6	7	8	9	10
Payout Ratio	10%	10%	10%	10%	10%	18%	26%	34%	42%	50%
Dividend (₹)	0.56	0.78	1.10	1.54	2.15	5.19	9.59	15.30	21.92	28.71

iii. Calculation of PV of Dividend

Year	Dividend (₹)	PVF	PV of Dividend (₹)
1	0.56	0.855	0.48
2	0.78	0.731	0.57
3	1.10	0.625	0.69
4	1.54	0.534	0.82
5	2.15	0.456	0.98
6	5.19	0.390	2.02
7	9.59	0.333	3.19
8	15.30	0.285	4.36
9	21.92	0.244	5.35
10	28.71	0.209	6.00
			24.46

$$TV = \frac{28.71(1.10)}{0.17-0.10} \times 0.209 = ₹\ 94.29$$Intrinsic Value = ₹ 24.46 + ₹ 94.29 = ₹ 118.75

Since the Intrinsic Value of Equity share is less than current market price, it is not advisable to invest in the same.

Question 15.

Portfolio Management

The returns of a portfolio A and market portfolio for the last 12 months are indicated as follows:

Month	Portfolio A	Market Portfolio
January	- 0.52	0.82
February	2.20	0.04
March	2.17	2.80
April	4.17	1.72
May	2.04	0.27
June	3.00	0.39
July	1.99	1.95
August	4.00	0.64
September	-1.38	1.53
October	2.67	2.70
November	3.99	2.52
December	1.86	2.09
Standard Deviation (σ)	1.6223	0.9498

i. You are required to find out the monthly returns attributable to the sheer skill of the Portfolio Manager.

ii. What part of the monthly return is attributable to the higher risk assumed by the Portfolio Manager?

Assume that the risk-free rate of return is 12% per annum and the portfolio is fully diversified.

Answer:

i. The monthly risk free rate of return = (12%/12) = 1%

Month	R_A	R_M
January	-0.52	0.82
February	2.20	0.04
March	2.17	2.80
April	4.17	1.72
May	2.04	0.27
June	3.00	0.39
July	1.99	1.95
August	4.00	0.64
September	-1.38	1.53
October	2.67	2.70
November	3.99	2.52
December	1.86	2.09
	26.19	17.47
Average Returns	2.1825	1.4558

Average Portfolio Return (R_p) = 2.1825

Average Portfolio Return (R_m) = 1.4558

Portfolio Risk (σ_P) = 1.6223

Market Risk (σ_m) = 0.9498

Since portfolio A is fully diversified then it can be computed with a portfolio whose beta (β) can be found as follows:

$$\sigma_m^2 \times \beta^2 = \sigma_P^2$$

$$\beta = \frac{\sigma_P}{\sigma_m} = \frac{1.6223}{0.9498} = 1.708$$

Therefore, portfolio A is comparable to a portfolio whose Beta is 1.708.

Expected monthly returns on such portfolio can be calculated as follows:

$R_P^1 = R_f + \beta(R_m - R_f)$

= 1% + 1.708 (1.4558% - 1.0000%)

= 1.7785%

Return due to the net selectivity = R_P - R_p^1

= 2.1825% - 1.7785%

= 0.404% per month

ii. The returns due to higher risk assumed by the portfolio manager
= 1.7785% - 1.4558% = 0.3227% per month

Question 16.

Mutual Fund

Mr. Alex, a practicing Chartered Accountant, can earn a return of 15 percent by investing in equity shares on his own. He is considering a recently announced equity based mutual fund scheme in which initial expenses are 6 percent and annual recurring expenses are 2 percent.

i. How much should the mutual fund earn to provide Mr. Alex a return of 15 percent per annum?

ii. Mr. Alex's current Annual Professional Income is ₹ 40 Lakhs. His portfolio value is ₹ 50 Lakhs and now he is spending 10% of his time to manage his portfolio. If he spends this time on profession, his professional income will go up in same proportion. He is thinking to invest his entire portfolio into a Multicap Fund, assum ing the fund's NAV will grow at 13% per annum (including dividend).

You are requested to advise Mr. Alex, whether he can invest the portfolio into Multicap Funds ? If so, what is the net financial benefit?

Answer:

i. Personal earnings of Mr. Alex = R_1 = 15%

Mutual Fund earnings = R_2

$$R_2 = \frac{1}{1 - \text{Initial expenses}(\%)} R_1 + \text{Recurring expenses}(\%)$$

$$= \frac{1}{1\text{-}0.06} \times 15\% + 2\%$$

$$= 17.96\%$$

Mutual Fund earnings = 17.96%

ii. Net financial benefit to Mr. Alex if he invests his portfolio in Fund:

Present Income of Mr. Alex

	₹ Lakhs
Annual Professional Income (A)	40.00
Portfolio Value	50.00
Income on his Portfolio @ 15% (B)	7.50
Total Income (A) + (B)	47.50

Expected Income of Mr. Alex after investing the Portfolio in Multi -cap Fund:

	₹ Lakhs
Annual Professional Income (A)	40.00
Additional Professional Income (B)	4.00
Portfolio Value	50.00
Income on his Portfolio @ 13% (C)	6.50
Total Income (A) + (B) + (C)	50.50

It is advisable to invest in Multi-cap Mutual Funds and devote the time on profession. He will get net benefit of ₹ 3 Lakhs (₹50.50 - ₹47.50)

Question 17.

Portfolio Management

Mr. Kapoor owns a portfolio with the following characteristics:

	Security X	Security Y	Security Z
Factor 1 sensitivity	0.75	1.50	0
Factor 2 sensitivity	0.60	1.10	0
Expected Return	15%	20%	10%

It is assumed that security returns are generated by a two factor model.

i. Analyse the sensitivity of Mr. Kapoor's portfolio to the two factors if he has Rs. 1,00,000 to invest and sells short Rs. 50,000 of security Y and purchases Rs. 1,50,000 of security X.

ii. Evaluate the sensitivity of the portfolio to the two factors if Mr. Kapoor borrows Rs. 1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of Rs. 1,00,000 in security X and Y in the same proportion as described in part (i).

iii. Determine the expected return premium of factor 2?

Answer:

i. Mr. Kapoor's position in the two securities is +1.50 in security X and -0.5 in security Y. Hence the portfolio sensitivities to the two factors:-

b prop. 1 =1.50 x 0.75 + (-0.50 x 1.50) = 0.375
b prop. 2 = 1.50 x 0.60 + (-0.50 x 1.10) = 0.35

ii. Mr. Kapoor's current position:

Security XRs. 3,00,000 / Rs. 1,00,000 = 3
Security Y-Rs. 1,00,000 / Rs. 1,00,000 = -1
Risk free asset -Rs. 100000 / Rs. 100000 = -1
b prop. 1 = 3.0 x 0.75 + (-1 x 1.50) + (- 1 x 0) = 0.75
b prop. 2 = 3.0 x 0.60 + (-1 x 1.10) + (-1 x 0) = 0.70

iii. Expected Return = Risk Free Rate of Return + Risk Premium
Let λ_1 and λ_2 are the Value Factor 1 and Factor 2 respectively.

Accordingly

$15 = 10 + 0.75\ \lambda_1 + 0.60\ \lambda_2$
$20 = 10 + 1.50\ \lambda_1 + 1.10\ \lambda_2$

On solving equation, the value of λ1 and λ2 comes 6.67 and 0 respectively.

Accordingly, the expected risk premium for the factor 2 shall be Zero and whatever be the risk the same shall be on account of factor 1.

Alternatively, the risk premium of Securities X & Y can be calculated as follows:

Security X

Total Return = 15%
Risk Free Return = 10%
Risk Premium = 5%

Security Y

Total Return = 20%
Risk Free Return = 10%
Risk Premium = 10%

Question 18.

Bond Valuation

The following data are available for three bonds A, B and C. These bonds are used by a bond portfolio manager to fund an outflow scheduled in 6 years. Current yield is 9%. All bonds have face value of Rs.100 each and will be redeemed at par. Interest is payable annually.

Bond	Maturity (Years)	Coupon rate
A	10	10%
B	8	11%
C	5	9%

i. Calculate the duration of each bond.

ii. Advise the percentage amount to bond portfolio manager to be invested in bonds B and C to immunise the portfolio and he has been asked to keep 45% of the portfolio money in Bond A.

iii. Evaluate whether the portfolio is still immunized if after the portfolio has been formulated, an interest rate change occurs, increasing the yield to 11%. The new duration of bonds are:

Bond A = 7.15 Years, Bond B = 6.03 Years and Bond C = 4.27 years.

iv. Advise the new percentage of B and C bonds that are needed to immunize the portfolio. Bond A remaining at 45% of the portfolio.

Present values be used as follows :

Present Values	t_1	t_2	t_3	t_4	t_5
$PVIF_{0.09,\,t}$	0.917	0.842	0.772	0.708	0.650

Present Values	t_6	t_7	t_8	t_9	t_{10}
$PVIF_{0.09,\,t}$	0.596	0.547	0.502	0.460	0.4224

Answer:

i. Calculation of Bond Duration

Bond A

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	10	0.917	9.17	0.086	0.086
2	10	0.842	8.42	0.079	0.158
3	10	0.772	7.72	0.073	0.219
4	10	0.708	7.08	0.067	0.268
5	10	0.650	6.50	0.061	0.305
6	10	0.596	5.96	0.056	0.336
7	10	0.547	5.47	0.051	0.357
8	10	0.502	5.02	0.047	0.376
9	10	0.460	4.60	0.043	0.387
10	110	0.4224	46.46	0.437	4.370
			106.40	1.000	6.862

Duration of the bond is 6.862 years or 6.86 year

Bond B

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	11	0.917	10.087	0.091	0.091
2	11	0.842	9.262	0.083	0.166
3	11	0.772	8.492	0.076	0.228
4	11	0.708	7.788	0.070	0.280
5	11	0.650	7.150	0.064	0.320
6	11	0.596	6.556	0.059	0.354
7	11	0.547	6.017	0.054	0.378
8	111	0.502	55.772	0.502	4.016
			111.224	1.000	5.833

Duration of the bond B is 5.833 years or 5.84 years

Bond C

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (years)
1	9	0.917	8.253	0.082	0.082
2	9	0.842	7.578	0.076	0.152
3	9	0.772	6.948	0.069	0.207
4	9	0.708	6.372	0.064	0.256
5	109	0.650	70.850	0.709	3.545
			100.00	1.000	4.242

Duration of the bond C is 4.242 years or 4.24 years

ii. Amount of Investment required in Bond B and C

Period required to be immunized	6.000 Year
Less: Period covered from Bond A	3.087 Year
To be immunized from B and C	2.913 Year

Let proportion of investment in Bond B and C is b and c respectively then

b + c = 0.55 (1)

5.883b + 4.242c = 2.913 (2)

On solving these equations, the value of b and c comes 0.3534 or 0.3621 and 0.1966 or 0.1879 respectively and accordingly, the % of investment of B and C is 35.34% or 36.21% and 19.66 % or 18.79% respectively.

iii. With revised yield the Revised Duration of Bond stands

0.45 x 7.15 + 0.36 x 6.03 + 0.19 x 4.27 = 6.20 year

No portfolio is not immunized as the duration of the portfolio has been increased from 6 years to 6.20 years.

iv. New percentage of B and C bonds that are needed to immunize the portfolio.

Period required to be immunized	6.0000 Year
Less: Period covered from Bond A	3.2175 Year
To be immunized from B and C	2.7825 Year

Let proportion of investment in Bond B and C is b and c respectively,

then $b + c = 0.55$

$6.03b + 4.27c = 2.7825$

$b = 0.2466$

On solving these equations, the value of b and c comes 0.2466 and 0.3034 respectively and accordingly, the % of investment of B and C is 24.66% or 25% and 30.34 % or 30.00% respectively.

Question 19.

Interest Rate Risk Management

Derivative Bank entered into a swap arrangement on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 19th August, 2019 and was to commence on 20th August, 2019 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

8.15%, 7.98%, 7.95%, 8.12%, 8.15%, 7.75%.

If Fixed Rate of Interest is 8%, then evaluate

i. the nature of this Swap arrangement.
ii. the Net Settlement amount.

Notes:

1. Sunday is Holiday.
2. Work in rounded rupees and avoid decimal working.
3. Consider 365 days in a year.

Answer:

i. The given swap arrangement is Plain Vanilla Overnight Index Swap (OIS).

ii. To compute the Net Settlement amount we shall compute Interest as per floating rate as follows:

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	10,00,00,000	8.15	22,329
Wednesday	10,00,22,329	7.98	21,868
Thursday	10,00,44,197	7.95	21,790
Friday	10,00,65,987	8.12	22,261
Saturday & Sunday (*)	10,00,88,248	8.15	44,697
Monday	10,01,32,945	7.75	21,261
Total Interest @ Floating Rate (A)			1,54,206
Total Interest @ Fixed Rate (B) $10{,}00{,}00{,}000 \times 8.00\% \times \frac{7}{365}$			1,53,425
Net Settlement Amount Paid			781

Question 20.

Nostro

You as a dealer in foreign exchange have the following position in GBP on 31 st October, 2019:

	GBP
Balance in the Nostro A/c Credit	2,00,000
Opening Position Overbought	1,00,000
Purchased a bill on London	1,60,000
Sold forward TT	1,20,000
Forward purchase contract cancelled	60,000
Remitted by TT	1,50,000
Draft on London cancelled	60,000

Decide the steps would you take, if you are required to maintain a credit Balance of GBP 65,000 in the Nostro A/c and keep as oversold position on GBP 20,000?

Answer:

Exchange Position:

Particulars	*Purchases (GBP)*	*Sales (GBP)*
Opening Balance Overbought	1,00,000	
Bill on London	1,60,000	
Forward Sales – TT		1,20,000
Cancellation of Forward Contract		60,000
TT Sales		1,50,000
Draft on London cancelled	60,000	—
	3,20,000	3,30,000
Closing Balance Oversold	10,000	—
	3,30,000	3,30,000

Cash Position (Nostro A/c)

	Credit	**Debit**
Opening balance credit	2,00,000	—
TT sales	—	1,50,000
	2,00,000	1,50,000
Closing balance (credit)	—	50,000
	2,00,000	2,00,000

The Bank has to buy spot TT GBP 15,000 to increase the balance in Nostro account to GBP 65,000. This would bring the overbought position on GBP to 5,000.

Since the bank requires an oversold position of GBP 20,000, it has to sell forward GBP 25,000.

Question 21.

Mutual Fund

Mr. Y has invested in the three mutual funds (MF) as per the following details:

Particulars	MF 'X'	MF 'Y'	MF 'Z'
Amount of Investment (₹)	2,00,000	4,00,000	2,00,000
Net Assets Value (NAV) at the time of purchase (₹)	10.30	10.10	10
Dividend Received up to 31.03.2018 (₹)	6,000	0	5,000
NAV as on 31.03.2018 (₹)	10.25	10	10.20
Effective Yield per annum as on 31.03.2018 (percent)	9.66	-11.66	24.15

Assume 1 Year = 365 days

Mr. Y has misplaced the documents of his investment. Help him in finding the date of his original investment after ascertaining the following:

i. Number of units in each scheme;
ii. Total NAV;
iii. Total Yield; and
iv. Number of days investment held.

Answer:

i. Number of Units in each Scheme

MF 'X'	$\frac{₹\ 2,00,000}{₹\ 10.30}$	= 19,417.48
MF 'Y'	$\frac{₹\ 4,00,000}{₹\ 10.10}$	= 39,603.96
MF 'Z'	$\frac{₹\ 2,00,000}{₹\ 10.00}$	= 20,000.00

ii. Total NAV on 31.03.2018

MF 'X'	= 19,417.48 x ₹ 10.25	₹ 1,99,029.17
MF 'Y'	= 39,603.96 x ₹ 10.00	₹ 3,96,039.60
MF 'Z'	= 20,000.00 x ₹ 10.20	₹ 2,04,000.00
Total		₹ 7,99,068.77

iii. Total Yield

	Capital Yield	Dividend Yield	Total
MF 'X'	₹ 1,99,029.17- ₹ 2,00,000 = - ₹ 970.83	₹ 6,000	₹ 5,029.17
MF 'Y'	₹ 3,96,039.60 - ₹ 4,00,000 = - ₹ 3,960.40	Nil	- ₹ 3,960.40
MF 'Z'	₹ 2,04,000 - ₹ 2,00,000 = ₹ 4,000	₹ 5,000	₹ 9,000.00
Total			₹ 10,068.77

$$\text{Total Yield} = \frac{₹10,068.77}{₹\ 8,00,000} \times 100 = 1.2586\%$$

iv. No. of Days Investment Held

	MF 'X'	MF 'Y'	MF 'Z'
Let No. of days be	X	Y	Z
Initial Investment (₹)	2,00,000	4,00,000	2,00,000
Yield (₹)	5,029.17	-3,960.40	9,000.00
Yield (%)	2.5146	- 0.9901	4.5
Period of Holding (Days)	$\frac{2.5146}{9.66} \times 365$ = 95 Days	$\frac{-0.9901}{-11.66} \times 365$ = 31 Days	$\frac{4.5}{24.15} \times 365$ = 68 Days
Date of Original Investment	26.12.17	28.02.18	22.01.18

Question 22.

Types of Risk

TRC Cables Ltd. (an Indian Company) is in the business of manufacturing Electrical Cables and Data Cables including Fiber Optics cables. While mainly it exports the manufactured cables to other countries it has also established its production facilities at some African countries' due availability of raw material and cheap labour there. Some of the major raw material such as copper, aluminum and other non-ferrous metals are also imported from foreign countries. Hence overall TRC has frequent receipts and expenditure items denominated in Non-INR currencies.

Though TRC make use of Long-Term Debts and Equity to meet its long term fund requirements but to finance its operations it make use of short-term financial instruments such as Commercial Papers, Bank Credit and Term Loans from the banks etc. If any surplus cash is left with TRC it is invested in interest yielding securities. Recently due to stiff competition from its competitors TRC has relaxed its policy for granting credit and to manage receivables it has formed a separate credit division.

Further to hedge itself against the various risk it has entered into various OTC Derivatives Contracts settled outside the Exchange.

Required:

Evaluate the major risks to which TRC Ltd. is exposed to.

Answer:

Following are main categories of risks to which TRC Cables is exposed to:

i. **Financial Risks**: TRC is exposed to following financial risks:

1. **Currency Risk:** Since most of the Receipts and Payments of TRC are denominated in Non-INR currencies it is exposed to Currency Risk.
2. **Commodity Risk**: As major constituents of production of TRC are commodities such copper, aluminum etc. it is subject to Commodity Risk.
3. **Interest Rate Risk**: As TRC borrows and invest money in short-term instruments it is exposed to Interest Rate Risk.
4. **Counter Party Risk**: Due to relaxation of norms for granting credits certainly the receivable amount must have increased resulting in increased in Credit Risk.
5. **Liquidity Risk**: Since for short-term funding requirements TRC is using Commercial Papers etc. they are exposed to Liquidity Risk as in time of need if funds are not available from these sources then securities shall be sold at discounted price.
6. **Political Risk**: As TRC is operating in various other countries it is also exposed to Political Risks such as Restriction on Conversion of local earnings into foreign currency, restrictions on remittance etc.

ii. **Settlement Risk**: The use of OTC Derivatives by TRC also expose it to the settlement risk as the parties with whom it has entered into the contract may not honor the same.

Question 23.

Commodity

A company is long on 10 MT of copper @ ₹ 534 per kg (spot) and intends to remain so for the ensuing quarter. The variance of change in its spot and future prices are 16% and 36% respectively, having correlation coefficient of 0.75. The contract size of one contract is 1,000 kgs.

Required:

i. Calculate the Optimal Hedge Ratio for perfect hedging in Future Market.
ii. Advice the position to be taken in Future Market for perfect hedging.
iii. Determine the number and the amount of the copper futures to achieve a perfect hedge.

Answer:

i. The optional hedge ratio to minimize the variance of Hedger's position is given by:

$$H = \rho \frac{\sigma S}{\sigma F}$$

Where

σ_S= Standard deviation of ΔS (Change in Spot Prices)

σ_F=Standard deviation of ΔF (Change in Future Prices)

ρ= coefficient of correlation between ΔS and ΔF

H= Hedge Ratio

ΔS = change in Spot price.

ΔF= change in Future price.

Accordingly

Standard deviation of ΔS = $\sqrt{16\%}$ = 4% and

Standard deviation of ΔF = $\sqrt{36\%}$ = 6% and

$$H = 0.75 \times \frac{0.04}{0.06} = 0.5$$

ii. Since the company is long position in Spot (Cash) Market it shall take Short Position in Future Market.

iii. Since contact size of one contract is 1,000 Kg, the

$$\text{No. of contract to be short} = \frac{10{,}000 \text{ Kgs}}{1{,}000 \text{ Kgs}} \times 0.50 = 5 \text{ Contracts}$$

Amount = 5000 x ₹ 534 = ₹ 26,70,000

Question 24.

Portfolio Management

Mr. Abhishek is interested in investing ₹ 2,00,000 for which he is considering following three alternatives:

i. Invest ₹ 2,00,000 in Mutual Fund X (MFX)
ii. Invest ₹ 2,00,000 in Mutual Fund Y (MFY)
iii. Invest ₹ 1,20,000 in Mutual Fund X (MFX) and ₹ 80,000 in Mutual Fund Y (MFY)

Average annual return earned by MFX and MFY is 15% and 14% respectively. Risk free rate of return is 10% and market rate of return is 12%.

Covariance of returns of MFX, MFY and market portfolio Mix are as follow:

	MFX	MFY	Mix
MFX	4.800	4.300	3.370
MFY	4.300	4.250	2.800
Mix	3.370	2.800	3.100

You are required to calculate:

i. variance of return from MFX, MFY and market return,
ii. portfolio return, beta, portfolio variance and portfolio standard deviation,
iii. expected return, systematic risk and unsystematic risk; and
iv. Sharpe ratio, Treynor ratio and Alpha of MFX, MFY and Portfolio Mix

Answer:

i. Variance of Returns

$$\text{Cor}_{i,j} = \frac{\text{Cov}(i, j)}{\sigma_i \sigma_j}$$

Accordingly, for MFX

$$1 = \frac{\text{Cov}(X, X)}{\sigma_X \sigma_X}$$

$$\sigma_X^2 = 4.800$$

Accordingly, for MFY

$$1 = \frac{\text{Cov}(Y, Y)}{\sigma_Y \sigma_Y}$$

$$\sigma_Y^2 = 4.250$$

Accordingly, for Market Return

$$1 = \frac{\text{Cov}(M, M)}{\sigma_M \sigma_M}$$

$$\sigma_M^2 = 3.100$$

ii. Portfolio return, beta, variance and standard deviation

$$\text{Weight of MFX in portfolio} = \frac{1,20,000}{2,00,000} = 0.60$$

$$\text{Weight of MFY in portfolio} = \frac{80,000}{2,00,000} = 0.40$$

Accordingly Portfolio Return

0.60 × 15% + 0.40 × 14% = 14.60%

Beta of each Fund

$$\beta = \frac{\text{Cov(Fund,Market)}}{\text{Variance of Market}}$$

$$\beta_X = \frac{3.370}{3.100} = 1.087$$

$$\beta_Y = \frac{2.800}{3.100} = 0.903$$

Portfolio Beta

0.60 x 1.087 + 0.40 x 0.903 = 1.013

Portfolio Variance

$$\sigma^2_{XY} = w^2_X\sigma^2_X + w^2_Y\sigma^2_Y + 2\,w_X w_Y Cov_{X,Y}$$

$= (0.60)^2 (4.800) + (0.40)^2 (4.250) + 2(0.60)\,(0.40)\,(4.300)$

$= 4.472$

Or Portfolio Standard Deviation

$$\sigma_{XY} = \sqrt{4.472} = 2.115$$

iii. Expected Return, Systematic and Unsystematic Risk of Portfolio

Portfolio Return = 10% + 1.013 (12% - 10%) = 12.03%
MF X Return = 10% + 1.087(12% - 10%) = 12.17%
MF Y Return = 10% + 0.903(12% - 10%) = 11.81%

Systematic Risk = $\beta^2\ \sigma^2$

Accordingly,

Systematic Risk of MFX = $(1.087)^2$ x 3.10 = 3.663

Systematic Risk of MFY = $(0.903)^2$ x 3.10 = 2.528

Systematic Risk of Portfolio = $(1.013)^2$ x 3.10 = 3.181

Unsystematic Risk = Total Risk – Systematic Risk

Accordingly,

Unsystematic Risk of MFX = 4.80 – 3.663 = 1.137

Unsystematic Risk of MFY = 4.250 – 2.528 = 1.722

Unsystematic Risk of Portfolio = 4.472 – 3.181 = 1.291

iv. Sharpe and Treynor Ratios and Alpha

Sharpe Ratio

$$MFX = \frac{15\% - 10\%}{\sqrt{4.800}} = 2.282$$

$$MFY = \frac{14\% - 10\%}{\sqrt{4.250}} = 1.94$$

$$Portfolio = \frac{14.6\% - 10\%}{2.115} = 2.175$$

Treynor Ratio

$$MFX = \frac{15\% - 10\%}{1.087} = 4.60$$

$$MFY = \frac{14\% - 10\%}{0.903} = 4.43$$

$$Portfolio = \frac{14.6\% - 10\%}{1.013} = 4.54$$

Alpha

MFX = 15% - 12.17% = 2.83%

MFY = 14% - 11.81% = 2.19%

Portfolio = 14.6% - 12.03% = 2.57%

Question 25.

Mutual Fund

There are two Mutual Funds viz. D Mutual Fund Ltd. and K Mutual Fund Ltd. Each having close ended equity schemes.

NAV as on 31-12-2019 of equity schemes of D Mutual Fund Ltd. is ₹ 70.71 (consisting 99% equity and remaining cash balance) and that of K Mutual Fund Ltd. is 62.50 (consisting 96% equity and balance in cash).

Following is the other information:

Particular	Equity Schemes	
	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Sharpe Ratio	2	3.3
Treynor Ratio	15	15
Standard deviation	11.25	5

There is no change in portfolios during the next month and annual average cost is ₹ 3 per unit for the schemes of both the Mutual Funds.

If Share Market goes down by 5% within a month, calculate expected NAV after a month for the schemes of both the Mutual Funds.

For calculation, consider 12 months in a year and ignore number of days fo r particular month.

Answer:

Working Notes:

i. Decomposition of Funds in Equity and Cash Components

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
NAV on 31.12.19	₹ 70.71	₹ 62.50
% of Equity	99%	96%
Equity element in NAV	₹ 70	₹ 60
Cash element in NAV	₹ 0.71	₹ 2.50

ii. Calculation of Beta

(a) D Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 2 = \frac{E(R) - R_f}{\sigma_D} = \frac{E(R) - R_f}{11.25}$$

$E(R) - R_f = 22.50$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_D} = \frac{22.50}{\beta_D}$$

$\beta_D = 22.50/15 = 1.50$

(b) K Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 3.3 = \frac{E(R) - R_f}{\sigma_K} = \frac{E(R) - R_f}{5}$$

$E(R) - R_f = 16.50$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_K} = \frac{16.50}{\beta_K}$$

$\beta_K = 16.50/15 = 1.10$

iii. Decrease in the Value of Equity

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Market goes down by	5.00%	5.00%
Beta	1.50	1.10
Equity component goes down	7.50%	5.50%

iv. Balance of Cash after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Cash in Hand on 31.12.19	₹ 0.71	₹ 2.50
Less: Exp. Per month	₹ 0.25	₹ 0.25
Balance after 1 month	₹ 0.46	₹ 2.25

NAV after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Value of Equity after 1 month		
70 x (1 - 0.075)	₹ 64.75	-
60 x (1 - 0.055)	-	₹ 56.70
Cash Balance	0.46	2.25
	65.21	58.95

Question 26.

International Financial Management

Suppose you are a treasurer of XYZ plc in the UK. XYZ have two overseas subsidiaries, one is based in Amsterdam and another in Switzerland. The surplus position of funds in hand is as follows which it does not need for the next three months but will be needed at the end of that period (91 days).

Holding Company	£ 150,000
Swiss Subsidiary	CHF 1,996,154
Dutch Subsidiary	€ 1,450,000

Exchange Rate as on date are as follows:

Spot Rate (€)	£0.6858 - 0.6869
91 day Pts	0.0037 0.0040
Spot Rate (£)	CHF 2.3295 - 2.3326
91 day Pts	0.0242 0.0228

91-Day Interest rates on p.a. basis on the Deposits in Money Market are as follows:

Amount of Currency	£	€	CHF
0 – 200,000	1.00	0.25	Nil
200,001 – 1,000,000	2.00	1.50	0.25
1,000,001 – 2,000,000	4.00	2.00	0.50
Over 2,000,000	5.38	3.00	1.00

You have been approached by your banker wherein the above-mentioned surplus was lying, requesting you to swap the surplus lying with other two subsidiaries and place them in deposit with them.

Determine the minimum interest rate per annuam (upto 3 decimal points) that should be offered by the bank to your organization so that your organization is ready to undertake such swap arrangement.

Note: Consider 360 days a year.

Answer:

XYZ plc shall be ready to undertake this swap arrangement only if it receives the interest on the surplus funds if invested on individual basis as follows:

	Interest	Amt. after 91 days	Conversion in £
Holland € 1,450,000 x 0.02 x 91/360 =	€ 7,330.56	€ 1,457,330.56	£1,004,829.42 (1,457,330.56 x 0.6895)
Switzerland CHF 1,996,154 x 0.005 x 91/360 =	CHF 2,522.92	CHF 1,998,676.92	£865,303.02 (1,998,676.92÷2.3098)
UK £ 150,000 x 0.01 x 91/360 =	£ 379.17	£ 150,379.17	£ 150,379.17
Total GBP at 91 days			£ 2,020,511.61

Swap to Sterling

Sell € 1,450,000 (Spot at 0.6858) buy £	£ 994,410.00
Sell CHF 1,996,154 (Spot at 2.3326) buy £	£ 855,763.53
Independent GBP amount	£ 150,000.00
	£ 2,000,173.53
Amount accrued on Individual Basis (Principal + Interest)	£ 2,020,511.61
Interest Required	£ 20,338.08
Required Interest Rate on Per Annuam Basis $\frac{20{,}338.08}{2{,}000{,}173.53} \times \frac{360}{91} \times 100$	4.023%

Thus, the minimum rate that should be offered is 4.023%.

Question 27.

Interest Rate Risk Management

Two companies ABC Ltd. and XYZ Ltd. approach the DEF Bank for FRA (Forward Rate Agreement). They want to borrow a sum of ₹ 100 crores after 2 years for a period of 1 year. Bank has calculated Yield Curve of both companies as follows:

Year	XYZ Ltd.	ABC Ltd.*
1	3.86	4.12
2	4.20	5.48
3	4.48	5.78

*The difference in yield curve is due to the lower credit rating of ABC Ltd. compared to XYZ Ltd.

i. You are required to calculate the rate of interest DEF Bank would quote under 2V3 FRA, using the company's yield information as quoted above.

ii. Suppose bank offers Interest Rate Guarantee for a premium of 0.1% of the amount of loan, you are required to calculate the interest payable by XYZ Ltd. if interest rate in 2 years turns out to be

   a. 4.50%

   b. 5.50%

Answer:

i. DEF Bank will fix interest rate for 2V3 FRA after 2 years as follows:

XYZ Ltd.

$(1+r)(1+0.0420)^2 = (1+0.0448)^3$

$(1+r)(1.0420)^2 = (1.0448)^3$

$r = 5.04\%$

Bank will quote 5.04% for a 2V3 FRA.

ABC Ltd.

$(1+r)(1+0.0548)^2 = (1+0.0578)^3$

$(1+r)(1.0548)^2 = (1.0578)^3$

$r = 6.38\%$

Bank will quote 6.38% for a 2V3 FRA.

ii.

		4.50% Allow to Lapse	**5.50% Exercise**
Interest	₹ 100 crores X 4.50% ₹ 100 crores X 5.04%	₹ 4.50 crores -	- ₹ 5.04 crores
Premium (Cost of Option)	₹ 100 crores X 0.1%	₹ 0.10 crores 4.60 crores	₹ 0.10 crores 5.14 crores

Question 28.

Interest Rate Risk Management

Espaces plc is consumer electronics wholesaler. The business of the firm is highly seasonal in nature. In 6 months of a year, firm has a huge cash deposits and especially near Christmas time and other 6 months firm cash crunch, leading to borrowing of money to cover up its exposures for running the business.

It is expected that firm shall borrow a sum of £25 million for the entire period of slack season in about 3 months.

The banker of the firm has given the following quotations for Forward Rate Agreement (FRA):

Spot	5.50% - 5.75%
3 × 6 FRA	5.59% - 5.82%
3 × 9 FRA	5.64% - 5.94%

3-month £50,000 future contract maturing in a period of 3 months is quoted at 94.15.

You are required to:

a. Advise the position to be taken in Future Market by the firm to hedge its interest rate risk and demonstrate how 3 months Future contract shall be useful for the firm, if later interest rate turns out to be (i) 4.5% and (ii) 6.5%

b. Evaluate whether the interest cost to Espace plc shall be less had it adopted the route of FRA instead of Future Contract.

Note:- Ignore the time value of money in settlement amount for future contract.

Answer:

a.

i. Since firm is a borrower it will like to off-set interest cost by profit on Future Contract. Accordingly, if interest rate rises it will gain hence it should sell interest rate futures.

$$\text{No. of Contracts} = \frac{\text{Amount of Borrowing}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{3 \text{ months}}$$

$$= \frac{£\ 25,000,000}{£\ 50,000} \times \frac{6}{3} = 1000 \text{ Contracts}$$

ii. The final outcome in the given two scenarios shall be as follows:

	If the interest rate turns out to be 4.5%	If the interest rate turns out to be 6.5%
Future Course Action :		
Sell to open	94.15	94.15
Buy to close	95.50 (100 - 4.5)	93.50 (100 - 6.5)
Loss/ (Gain)	1.35%	(0.65%)
Cash Payment (Receipt) for Future Settlement	£ 50,000×1000× 1.35%×3/12 = £1,68,750	£ 50,000×1000×0.65%×3/12 = (£81,250)
Interest for 6 months on £50 million at actual rates	£ 25 million × 4.5% × ½ = £ 5,62,500	£ 25 million × 6.5% × ½ = £ 8,12,500
	£ 7,31,250	£ 7,31,250

Thus, the firm locked itself in interest rate $\frac{£\ 7,31,250}{£\ 25,000,000} \times 100 \times \frac{12}{6} = 5.85\%$

b. No, the interest cost shall not be less for Espace plc had it taken the route of FRA, as the 3 x 9 FRA contract are available at 5.64% – 5.94% i.e. borrowing rate of 5.94%. Hence, the interest cost under this option shall be nearby by 5.94% which is more than interest rate under Future contract rate of 5.85%.

Question 29.

Forex

Telereal Trillium, a UK Company is in the process of negotiating an order amounting €5.5 million with a large German retailer on 6 month's credit. If successful, this will be first time for Telereal Trillium has exported goods into the highly competitive German Market. The Telereal Trillium is considering following 3 alternatives for managing the transaction risk before the order is finalized.

i. Mr. Grand, the Marketing head has suggested that in order to remove transaction risk completely Telereal Trillium should invoice the German firm in Sterling using the current €/£ average spot rate to calculate the invoice amount.

ii. Mr. John, CE is doubtful about Mr. Grand's proposal and suggested an alter native of invoicing the German firm in € and using a forward exchange contract to hedge the transaction risk.

iii. Ms. Royce, CFO is agreed with the proposal of Mr. John to invoice the German first in €, but she is of opinion that Telereal Trillium should use sufficient 6 month sterling future contracts (to the nearest whole number) to hedge the transaction risk.

Following data is available

Spot Rate	€ 1.1980 - €1.1990/£
6 months forward points	0.60 – 0.55 Euro Cents.
6 month future contract is currently trading at	€ 1.1943/£
6 month future contract size is	£70,500
After 6 month Spot rate and future rate	€ 1.1873/£

You are required to

a. Advise the alternative you consider to be most appropriate.
b. Interpret the proposal of Mr. Grand from non-financial point of view.

Note: Calculate (to the nearest £) the £ receipt.

Answer:

a. (i) Receipt under three proposals

(a) Proposal of Mr. Grand

Invoicing in £ will produce = $\frac{€5.5\text{ million}}{1.1990}$ = £ 45, 87,156

(b) Proposal of Mr. John

Forward Rate= €1.1990 - 0.0055 = 1.1935

Using Forward Market hedge Sterling receipt would be $\frac{€5.5\text{ million}}{1.1935}$ = £ 46,08,295

(c) Proposal of Ms. Royce

The equivalent sterling of the order placed based on future price (€1.1943)

= $\frac{€5.5\text{ million}}{1.1943}$ = £ 46, 05,208 (rounded off)

Number of Contracts = $\frac{£46,05,208}{70,500}$ = 65 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 65 × £70,500 = £45,82,500

Buy Future at	€1.1943
Sell Future at	€1.1873
	€0.0070

Total loss on Future Contracts = 65 × £70,500 × €0.0070 = €32,078

After 6 months

Amount Received	€55, 00,000
Less: Loss on Future Contracts	€ 32,078
	€ 54, 67,922

Sterling Receipts

On sale of € at spot = $\frac{€54,67,922}{1.1873}$ = £46, 05,342

Proposal of option (ii) is preferable because the option (i) & (iii) produces least receipts.

b. Further, in case of proposal (i) there must be a doubt as to whether this would be acceptable to German firm as it is described as a competitive market and Telereal Trillium is moving into it first time.

Question 30.

Mutual Fund

The following particulars relating to S Fund Schemes:

Particulars			Value ₹ in Crores
1.	Investment in Shares (at cost)		
	a.	Pharmaceuticals companies	158
	b.	Construction Industries	62
	c.	Service Sector Companies	112
	d.	IT Companies	68
	e.	Real Estate Companies	20
2.	Investment in Bonds (Fixed Income)		
	a.	Listed Bonds (8000, 14% Bonds of ₹ 15,000 each)	24
	b.	Unlisted Bonds	14
3.	No. of Units outstanding (crores)		8.4
4.	Expenses Payable		7
5.	Cash and Cash equivalents		3
6.	Market expectations on listed bonds		8.842%

The fund has incurred the following expenses:

Consultancy and Management fees	₹ 520 Lakhs
Office Expenses	₹ 180 Lakhs
Advertisement Expenses	₹ 48 Lakhs

Particulars relating to each sector are as follows:

Sector	Index on Purchase date	Index on Valuation date
Pharmaceutical companies	300	500
Construction Industries	275	490
Service Sector Companies	285	500
IT Companies	270	515
Real Estate Companies	265	440

Required:

i. Calculate the Net Asset Value of the fund

ii. Calculate the Net Asset Value per unit

iii. Determine the Net return (Annualized), if the period of consideration is 4 years, and the fund has distributed ₹ 2 per unit per year as cash dividend during the same period.

Note: Calculate figure in ₹ Crore upto 3 decimal points.

Answer:

i. Calculation of NAV of the Fund

			(in ₹ Crore)
1.	Value of Shares		
	a. Pharmaceutical Companies	$158 \times \frac{500}{300}$	263.333
	b. Construction Companies	$62 \times \frac{490}{275}$	110.473
	c. Service Sector Companies	$112 \times \frac{500}{285}$	196.491
	d. IT Companies	$68 \times \frac{515}{270}$	129.704
	e. Real Estate Companies	$20 \times \frac{440}{265}$	33.208
2.	Investment in Bonds		
	a. Listed Bonds	$\frac{14}{8.842} \times 24$	38.00
	b. Unlisted Bonds		14.000
3.	Cash and Cash Equivalents		3.00
			788.209
	Less: Expense Payable		7.000
	NAV of the Fund		781.209

ii. NAV of the Fund per Unit

NAV of the Fund	₹ 781.209 crore
Number of Units	8.40 crore
NAV Per Unit (₹ 781.209 crore/ 8.40 crore)	₹ 93.00

iii. Net Return

Initial Cost Per Unit		
Investment in Shares	₹ 420 crore	
Bonds	₹ 38 crore	₹ 458 crore
Number of Units		8.40 crore
Cost Per Unit		₹ 54.52
Return		
Capital Gain	(₹ 93.00 – ₹ 54.52)	₹ 38.48
Dividend	₹ 4x 2	₹ 8.00
		₹ 46.48
Annualised Return	$\frac{46.48}{54.52} \times \frac{1}{4}$	21.31%

Question 31.

Bond Valuation

In March 2020, XYZ Bank sold some 7% Interest Rate Futures underlying Notional 7.50% Coupon Bonds. The exchange provides following details of eligible securities that can be delivered:

Security	Quoted Price of Bonds	Conversion Factor
7.96 GOI 2023	1037.40	1.0370
6.55 GOI 2025	926.40	0.9060
6.80 GOI 2029	877.50	0.9195
6.85 GOI 2026	972.30	0.9643
8.44 GOI 2027	1146.30	1.1734
8.85 GOI 2028	1201.70	1.2428

Recommend the Security that should be delivered by the XYZ Bank if Future Settlement Price is 1000.

Answer:

The XYZ Bank shall choose those CTD (Cheapest-to-Deliver) Bonds from the basket of deliverable Bonds which gives maximum profit computed as follows:

Profit = Future Settlement Price x Conversion Factor – Quoted Spot Price of Deliverable Bond

Accordingly, the profit of each bond shall be computed as follows:

Security (1)	Future Settlement Price (2)	Conversion Factor (3)	(4) = (2) x (3)	Quoted Price of Bonds (5)	Profit (6)
7.96 GOI 2023	1000	1.0370	1037.00	1037.40	- 0.40
6.55 GOI 2025	1000	0.9060	906.00	926.40	- 20.40
6.80 GOI 2029	1000	0.9195	919.50	877.50	42.00
6.85 GOI 2026	1000	0.9643	964.30	972.30	- 8.00
8.44 GOI 2027	1000	1.1734	1173.40	1146.30	27.10
8.85 GOI 2028	1000	1.2428	1242.80	1201.70	41.10

Since maximum profit to the Bank is in case of 6.80 GOI 2029, same should be opted for.

Question 32.

Derivatives

Mr. Dayal is interested in purchasing equity shares of ABC Ltd. which are currently selling at Rs. 600 each. He expects that price of share may go upto Rs. 780 or may go down to Rs. 480 in three months. The chances of occurring such variations are 60% and 40% respectively. A call option on the shares of ABC Ltd. can be exercised at the end of three months with a strike price of Rs. 630.

i. Advise what combination of share and option should Mr. Dayal select if he wants a perfect hedge?
ii. Evaluate the value of option today (the risk free rate is 10% p.a.)?
iii. Interpret the expected rate of return on the option?

Answer:

i. To compute perfect hedge we shall compute Hedge Ratio (Δ) as follows:

$$\Delta = \frac{C_1 - C_2}{S_1 - S_2} = \frac{150 - 0}{780 - 480} = \frac{150}{300} = 0.50$$

Mr. Dayal should purchase 0.50 share for every 1 call option.

ii. Value of Option today

If price of share comes out to be Rs.780 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x Rs. 780)	Rs. 390
Loss on account of Short Position (Rs. 780 – Rs. 630)	Rs. 150
	Rs. 240

If price of share comes out to be Rs. 480 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x Rs. 480)	Rs. 240

Accordingly, Premium say P shall be computed as follows:

(Rs. 300 – P) 1.025 = Rs. 240

P = Rs.65.85

iii. Expected Return on the Option

Expected Option Value = (Rs. 780 – Rs. 630) × 0.60 + Rs. 0 × 0.40 = Rs. 90

$$\text{Expected Rate of Return} = \frac{90 - 65.85}{65.85} \times 100 = 36.67\%$$

Question 33.

EMH

The closing value of Sensex for the month of October, 2007 is given below :

Date Closing	Sensex Value
1.10.07	2800
3.10.07	2780
4.10.07	2795
5.10.07	2830
8.10.07	2760
9.10.07	2790
10.10.07	2880
11.10.07	2960
12.10.07	2990
15.10.07	3200
16.10.07	3300
17.10.07	3450
19.10.07	3360
22.10.07	3290
23.10.07	3360
24.10.07	3340
25.10.07	3290
29.10.07	3240
30.10.07	3140
31.10.07	3260

With the help of above data evaluate the weak form of efficient market hypothesis by applying the run test at 5% and 10% level of significance.

Following value can be used:

Value of t at 5% is 2.101 at 18 degrees of freedom
Value of t at 10% is 1.734 at 18 degrees of freedom

Answer:

Date	Closing Sensex	Sign of Price Charge
1.10.07	2800	
3.10.07	2780	-
4.10.07	2795	+
5.10.07	2830	+
8.10.07	2760	-
9.10.07	2790	+
10.10.07	2880	+
11.10.07	2960	+
12.10.07	2990	+
15.10.07	3200	+
16.10.07	3300	+
17.10.07	3450	+
19.10.07	3360	-
22.10.07	3290	-
23.10.07	3360	+
24.10.07	3340	-
25.10.07	3290	-
29.10.07	3240	-
30.10.07	3140	-
31.10.07	3260	+

Total of sign of price changes (r) = 8

No of Positive changes = n_1 = 11

No. of Negative changes = n_2 = 8

$$\mu_r = \frac{2n_1n_2}{n_1+n_2}+1$$

$$\mu = \frac{2\times11\times8}{11+8}+1 = 176/19 + 1 = 10.26$$

$$\hat{\sigma}_r = \sqrt{\frac{2n_1n_2(2n_1n_2-n_1-n_2)}{(n_1+n_2)^2(n_1+n_2-1)}}$$

$$\hat{\sigma}_r = \sqrt{\frac{(2\times11\times8)\,(2\times11\times8-11-8)}{(11+8)^2(11+8-1)}} = \sqrt{\frac{176\times157}{(19)^2(18)}} = \sqrt{4.252} = 2.06$$

Since too few runs in the case would indicate that the movement of prices is not random. We employ a two- tailed test the randomness of prices.

Test at 5% level of significance at 18 degrees of freedom using t- table

The lower limit

$= \mu - t \times \hat{\sigma}_r = 10.26 - 2.101 \times 2.06 = 5.932$

Upper limit

$= \mu + t \times \hat{\sigma}_r = 10.26 + 2.101 \times 2.06 = 14.588$

At 10% level of significance at 18 degrees of freedom

Lower limit

$= 10.26 - 1.734 \times 2.06 = 6.688$

Upper limit

$= 10.26 + 1.734 \times 2.06 = 13.832$

As seen r lies between these limits. Hence, the market exhibits weak form of efficiency.

*For a sample of size n, the t distribution will have n-1 degrees of freedom.

Question 34.

VAR

ABC Ltd. is considering a project X, which is normally distributed and has mean return of Rs. 2 crore with Standard Deviation of Rs. 1.60 crore.

In case ABC Ltd. loses on any project more than Rs. 1.00 crore there will be financial difficulties. Determine the probability the company will be in financial difficulty.

Given: Standard Normal Distribution Table (Z-Score) providing area between Mean and Z score

Z Score	Area
1.85	0.4678
1.86	0.4686
1.87	0.4693
1.88	0.4699
1.89	0.4706

Answer:

For calculating probability of financial difficulty, we shall calculate the area under Normal Curve corresponding to the Z Score obtained from the following equation (how many SD is away from Mean Value of financial difficulty):

$$z = \frac{X - \mu}{\sigma}$$

$$= \frac{-1.00 \text{ crore} - 2.00 \text{ crore}}{1.60 \text{ crore}}$$

$$= -1.875 \text{ say } 1.875$$

Corresponding area from Z Score Table by using interpolation shall be found as follows:

Z Score	Area under Normal Curve
1.87	0.4693
1.88	0.4699
0.01	0.0006

The corresponding value of 0.005 Z score = $0.005 \times \frac{0.0006}{0.01} = 0.0003$

Thus the Value of 1.875 shall be = 0.4693 + 0.0003 = 0.4696

Thus the probability the company shall be in financial difficulty is 46.96%.

Question 35.

Forex

On 1st February 2020, XYZ Ltd. a laptop manufacturer imported a particular type of Memory Chips from SKH Semiconductor of South Korea. The payment is due in one month from the date of Invoice, amounting to 1190 Million South Korean Won (SKW). Following Spot Exchange Rates (1st February) are quoted in two different markets:

USD/ INR	75.00/ 75.50	in Mumbai
USD/ SKW	1190.00/ 1190.75	in New York

Since hedging of Foreign Exchange Risk was part of company's strategic policy and no contract for hedging in SKW was available at any in-shore market, it approached an off-shore Non- Deliverable Forward (NDF) Market for hedging the same risk.

In NDF Market a dealer quoted one-month USD/ SKW at 1190.00/1190.50 for notional amount of USD 100,000 to be settled at reference rate declared by Bank of Korea.

After 1 month (1st March 2020) the dealer agreed for SKW 1185/ USD as rate for settlement and on the same day the Spot Rates in the above markets were as follows:

USD/ INR	75.50/ 75.75	in Mumbai
USD/ SKW	1188.00/ 1188.50	in New York

Analyze the position of company under each of the following cases, comparing with Spot Position of 1st February:

i. Do Nothing.
ii. Opting for NDF Contract.

Note: Both Rs./ SKW Rate and final payment (to be computed in Rs. Lakh) to be rounded off upto 4 decimal points.

Answer:

i. Do Nothing

We shall compute the cross rates in Spot Market on both days and shall compare the amount payable in INR on these two days.

On 1st February 2020

Rupee – Dollar selling rate	= Rs. 75.50
Dollar – SKW	= SKW 1190.00
Rupee – SKW cross rate	= Rs. 75.50 / 1190.00
	= Rs. 0.0634

Amount payable to Importer as per above rate (1190 Million x Rs. 0.0634) Rs. 754.4600 Lakh

On 1st March 2020 Rupee – Dollar selling rate	= Rs. 75.75
Dollar – SKW	= SKW 1188.00
Rupee – SKW cross rate	= Rs. 75.75 / 1188.00
	= Rs. 0.0638

Amount payable to Importer as per above rate (1190 Million x Rs. 0.0638) Rs. 759.2200 Lakh

Thus, Exchange Rate Loss = (Rs. 759.2200 Lakh - Rs. 754.4600 Lakh) Rs. 4.7600 Lakh

ii. Hedging in NDF

Since company needs SKW after one month it will take long position in SKW at quoted rate of SKW 1190/ USD and after one-month it will reverse its position at fixing rate of SKW 1187/USD. The profit/ loss position will be as follows:

Buy SKW 1190 Million and sell USD (1190 Million/ 1190)	USD 1,000,000
Sell SKW 1190 Million and buy USD at Fixing Rate (1190 Million/ 1185)	USD 1,004,219
Profit	USD 4,219

Final Position

Amount Payable in Spot Market (as computed earlier)	Rs. 759.2200 Lakh
Less: Profit form NDF Market USD 4219 x 75.50	Rs. 3.1853 Lakh
	Rs. 756.0347 Lakh

Thus, Exchange Rate Loss = (Rs. 756.0347 Lakh - Rs. 754.4600 Lakh) Rs. 1.5747 Lakh

Decision: Since Exchange Loss is less in case of NDF same can be opted for.