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CA FINAL

PROF.RAHUL MALKAN

Version 6.0

STRATEGIC FINANCIAL MANAGEMENT COMPILER

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: Key Features :

- Covers RTP and Past Papers
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INDEX

No.	Chapter Name	Page No.
1	Financial Policy & Corporate Strategy	1 – 4
2	Security Analysis	5 – 11
3	Equity & Corporate Valuations	12 – 73
4	Bond Analysis & Valuations	74 – 113
5	Mergers & Acquisitions	114 – 169
6	Mutual Funds	170 – 200
7	Forex	201 – 264
8	International Finance Management	265 – 285
9	Interest Risk	286 – 291
10	Derivative – Future	292 – 323
10	Derivative – Option	324 – 354
10	Derivative – Swaps	355 – 373
11	Portfolio Management	374 – 430
12	Risk Management	431 – 434
13	Securitization	435 – 439
14	Startup Finance	440 – 445
15	Other Topics	446 – 449

CHP - 1

FINANCIAL POLICY & CORPORATE STRATEGY

Question 1 :
May 2018 - Paper

Explain the interface of Financial Policy and Strategic Management

Solution :

The interface of strategic management and financial policy will be clearly understood if we appreciate the fact that the starting point of an organization is money and the end point of that organization is also money. No organization can run an existing business and promote a new expansion project without a suitable internally mobilized financial base or both i.e. internally and externally mobilized financial base.

Sources of finance and capital structure are the most important dimensions of a strategic plan. The need for fund mobilization to support the expansion activity of firm is very vital for any organization. The generation of funds may arise out of ownership capital and or borrowed capital. A company may issue equity shares and / or preference shares for mobilizing ownership capital and debenture to raise borrowed capital.

Policy makers should decide on the capital structure to indicate the desired mix of equity capital and debt capital. There are some norms for debt equity ratio.

However this ratio in its ideal form varies from industry to industry. Another important dimension of strategic management and financial policy interface is the investment and fund allocation decisions. A planner has to frame policies for regulating investments in fixed assets and for restraining of current assets. Investment proposals mooted by different business units may be divided into three groups. One type of proposal will be for addition of a new product, increasing the level of operation of an existing product and cost reduction and efficient utilization of resources through a new approach and or closer monitoring of the different critical activities. Dividend policy is another area for making financial policy decisions affecting the strategic performance of the company. A close interface is needed to frame the policy to be beneficial for all. Dividend policy decision deals with the extent of earnings to be distributed as dividend and the extent of earnings to be retained for future expansion scheme of the organization. It may be noted from the above discussions that financial policy of a company cannot be worked out in isolation of other functional policies.

It has a wider appeal and closer link with the overall organizational performance and direction of growth. As a result preference and patronage for the company depends significantly on the financial policy framework. Hence, attention of the corporate planners must be drawn while framing the financial policies not at a later stage but during the stage of corporate planning itself.

Question 2 :
Nov 2018 - Paper

How different stakeholders view the financial risk?

Solution :

The financial risk can be viewed by different stakeholders as follows:

(i) From shareholder's and lender's point of view: Major stakeholders of a business are equity shareholders and they view financial gearing i.e. ratio of debt in capital structure of company as risk since in the event of winding up of a company they will be least be given priority. Even for a lender, existing gearing is also a risk since company having high gearing faces more risk in default of payment of interest and principal repayment.

(ii) From Company's point of view: From company's point of view if a company borrows excessively or lend to someone who defaults, then it can be forced to go into liquidation.

(iii) From Government's point of view: From Government's point of view, the financial risk can be viewed as failure of any bank (like Lehman Brothers) or down grading of any financial institution leading to spread of distrust among society at large. Even this risk also includes willful defaulters. This can also be extended to sovereign debt crisis.

Question 3 :
Nov 2019 - Paper

Discuss briefly the key decisions which fall within the scope of financial strategy

Solution :

The key decisions falling within the scope of financial strategy include the following:

1. **Financing decisions :** These decisions deal with the mode of financing or mix of equity capital and debt capital.
2. **Investment decisions:** These decisions involve the profitable utilization of firm's funds especially in long-term projects (capital projects). Since the future benefits associated with such projects are not known with certainty, investment decisions necessarily involve risk. The projects are therefore evaluated in relation to their expected return and risk.
3. **Dividend decisions:** These decisions determine the division of earnings between payments to shareholders and reinvestment in the company.
4. **Portfolio decisions:** These decisions involve evaluation of investments based on their contribution to the aggregate performance of the entire corporation rather than on the isolated characteristics of the investments themselves.

Question 4 :
May 2020 - RTP

How financial goals can be balanced vis-à-vis sustainable growth?

Solution :

The concept of sustainable growth can be helpful for planning healthy corporate growth. This concept forces managers to consider the financial consequences of sales increases and to set sales growth goals that are consistent with the operating and financial policies of the firm. Often, a conflict can arise if growth objectives are not consistent with the value of the organization's sustainable growth.

Question concerning right distribution of resources may take a difficult shape if we take into consideration the rightness not for the current stakeholders but for the future stakeholders also. To take an illustration, let us refer to fuel industry where resources are limited in quantity and a judicial use of resources is needed to cater to the need of the future customers along with the need of the present customers. One may have noticed the save fuel campaign, a demarketing campaign that deviates from the usual approach of sales growth strategy and preaches for conservation of fuel for their use across generation. This is an example of stable growth strategy adopted by the oil industry as a whole under resource constraints and the long run objective of survival over years. Incremental growth strategy, profit strategy and pause strategy are other variants of stable growth strategy.

Sustainable growth is important to enterprise long-term development. Too fast or too slow growth will go against enterprise growth and development, so financial should play important role in enterprise development, adopt suitable financial policy initiative to make sure enterprise growth speed close to sustainable growth ratio and have sustainable healthy development.

Question 5 :
Nov 2020 (New) - RTP

Explain key decisions that fall within the scope of financial strategy.

Solution :

The key decisions falling within the scope of financial strategy are as follows:

1. **Financing decisions:** These decisions deal with the mode of financing or mix of equity capital and debt capital.
2. **Investment decisions:** These decisions involve the profitable utilization of firm's funds especially in long-term projects (capital projects). Since the future benefits associated with such projects are not known with certainty, investment decisions necessarily involve risk. The projects are therefore evaluated in relation to their expected return and risk.
3. **Dividend decisions:** These decisions determine the division of earnings between payments to shareholders and reinvestment in the company.
4. **Portfolio decisions:** These decisions involve evaluation of investments based on their contribution to the aggregate performance of the entire corporation rather than on the isolated characteristics of the investments themselves.

Question 6 :
Jan 2021 (New) - Paper

As a financial strategist you will depend on certain key financial decisions. Discuss.

Solution :

The key decisions falling within the scope of financial strategy are the following:

1. **Financing decisions:** These decisions deal with the mode of financing or mix of equity capital and debt capital.
2. **Investment decisions:** These decisions involve the profitable utilization of firm's funds especially in long-term projects (capital projects). Since the future benefits associated with

such projects are not known with certainty, investment decisions necessarily involve risk. The projects are therefore evaluated in relation to their expected return and risk.

3. **Dividend decisions:** These decisions determine the division of earnings between payments to shareholders and reinvestment in the company.
4. **Portfolio decisions:** These decisions involve evaluation of investments based on their contribution to the aggregate performance of the entire corporation rather than on the isolated characteristics of the investments themselves.

Thanks ....

CHP - 2 SECURITY ANALYSIS

Question 1 :
Nov 2008 - Paper

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

You are required to test the week 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
Value of t at 5% is 2.086 at 20 degrees of freedom.
Value of t at 10% is 1.725 at 20 degrees of freedom.

Solution :

Date	Closing Sensex	Movement	N1	N2	R
1	2800				
3	2780	-		1	1
4	2795	+	1		
5	2830	+	2		2
8	2760	-		2	3

9	2790	+	3		
10	2880	+	4		
11	2960	+	5		
12	2990	+	6		
15	3200	+	7		
16	3300	+	8		
17	3450	+	9		4
19	3360	-		3	
22	3290	-		4	5
23	3360	+	10		6
24	3340	-		5	
25	3290	-		6	
29	3240	-		7	
30	3140	-		8	7
31	3260	+	11		8

1. N1 = No of "+" Signs = 11
2. N2 = No of "-" Signs = 8
3. r = No of runs = 8
4. μ (Average) $= \frac{2n1n2}{n1+n2} + 1 = \frac{2x11x8}{11+8} + 1 = 10.26$
5. σ (SD) $= \sqrt{\frac{(\mu-1)x(\mu-2)}{n1+n2-1}} = \sqrt{\frac{(10.26-1)x(10.26-2)}{11+8-1}} = 2.06$

- 2.06 +2.06

8.2 10.26 12.32

@ 1 SD @ 1 SD

Note :

1. If the no of runs to less – we can predict the market – market is inefficient
2. If the no of runs are too high – we can predict the market – market is inefficient
3. If the no of runs are average – we cannot predict the market – market is efficient.

RUN TEST

1. 5% Run test

Degree of freedom = N1 + N2 – 1 = 11 + 8 – 1 = 18% degree of freedom

At 5% test, At 18% degree of freedom, t = 2.101

Lower limit $= \mu - t(\sigma)$ = 10.26 – 2.101(2.06) = 5.93

Upper Limit $= \mu + t(\sigma)$ = 10.26 + 2.101(2.06) = 14.58

5.93 10.26 14.58

@ 2.101 SD @ 2.101 SD

Note :

1. Runs below 5.93 are low no of runs and above 14.58 are high number of runs, i.e we can predict the market, i.e the market is inefficient.
2. Runs between 5.93 and 14.58 are average number of runs, i.e we cannot predict the market, i.e market is efficient
3. We have 8 runs in the data, which is between 5.93 and 14.58 which indicates that the market is efficient, i.e we cannot predict the market.

2. 10 % Run test

Degree of freedom = N1 + N2 – 1 = 11 + 8 – 1 = 18% degree of freedom

At 10 % test, At 18% degree of freedom, t = 1.734

Lower limit	$= \mu - \boldsymbol{t}(\sigma)$	= 10.26 – 1.734 (2.06)	= 6.69
Upper Limit	$= \mu + \boldsymbol{t}(\sigma)$	= 10.26 + 1.734 (2.06)	= 13.83

6.69 @ 1.734 SD — 10.26 — 13.83 @ 1.734 SD

Note :

1. Runs below 6.69 are low no of runs and above 13.83 are high number of runs, i.e we can predict the market, i.e the market is inefficient.
2. Runs between 6.69 and 13.83 are average number of runs, i.e we cannot predict the market, i.e market is efficient
3. We have 8 runs in the data, which is between 6.69 and 13.83 which indicates that the market is efficient, i.e we cannot predict the market.

Question 2 :
Nov 2009 - Paper / May 2017 – RTP / Nov 2019 (New) – PAPER

Closing values of BSE Sensex from 6th to 17th day of the month of January of the year 200X were as follows :

Days	Date	Day	Sensex
1	6	THU	14522
2	7	FRI	14925
3	8	SAT	No Trading
4	9	SUN	No Trading
5	10	MON	15222
6	11	TUE	16000
7	12	WED	16400
8	13	THU	17000
9	14	FRI	No Trading
10	15	SAT	No Trading

11	16	SUN	No Trading
12	17	MON	18000

Calculate Exponential Moving Average (EMA) of Sensex during the above period. The 30 days simple moving average of Sensex can be assumed as 15,000. The value of exponent for 30 days EMA is 0.062. Give detailed analysis on the basis of your calculations.

Solution :

Date	1 Sensex	2 EMA for Previous Day	3 = 1 – 2	4 3 x 0.062	5 EMA 2 +/- 4
6	14522	15000	(478)	(29.636)	14970.364
7	14925	14970.364	(45.364)	(2.812)	14967.55
10	15222	14967.55	254.45	15.776	14983.32
11	16000	14983.32	1016.68	63.034	15046.354
12	16400	15046.354	1353.646	83.926	15130.28
13	17000	15130.28	1869.72	115.922	15246.203
17	18000	15246.203	2753.797	170.735	15416.938

Conclusion – The market is bullish. The market is likely to remain bullish for short term to medium term if other factors remain the same. On the basis of this indicator (EMA) the investors/brokers can take long position.

Question 3 :
Nov 2020 (New) – RTP

Explain various "Market Indicators".

Solution :

The various market indicators are as follows:

(i) **Breadth Index:** It is an index that covers all securities traded. It is computed by dividing the net advances or declines in the market by the number of issues traded. The breadth index either supports or contradicts the movement of the Dow Jones Averages. If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the averages, it is a sign of technical weakness i.e. a sign that the market will move in a direction opposite to the Dow Jones Averages. The breadth index is an addition to the Dow Theory and the movement of the Dow Jones Averages.

(ii) **Volume of Transactions:** The volume of shares traded in the market provides useful clues on how the market would behave in the near future. A rising index/price with increasing volume would signal buy behaviour because the situation reflects an unsatisfied demand in the market. Similarly, a falling market with increasing volume signals a bear market and the prices would be expected to fall further. A rising market with decreasing volume indicates a bull market while a falling market with dwindling volume indicates a bear market. Thus, the volume concept is best used with another market indicator, such as the Dow Theory.

(iii) **Confidence Index*:*** It is supposed to reveal how willing the investors are to take a chance in the market. It is the ratio of high-grade bond yields to low-grade bond yields. It is used by market analysts as a method of trading or timing the purchase and sale of stock, and also, as a forecasting device to determine the turning points of the market. A rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop in stock prices. A fall in the confidence index represents the fact that low-grade bond yields are rising faster or falling more slowly than high grade yields. The confidence index is usually, but not always a leading indicator of the market. Therefore, it should be used in conjunction with other market indicators.

(iv) **Relative Strength Analysis:** The relative strength concept suggests that the prices of some securities rise relatively faster in a bull market or decline more slowly in a bear market than other securities i.e. some securities exhibit relative strength. Investors will earn higher returns by investing in securities which have demonstrated relative strength in the past because the relative strength of a security tends to remain undiminished over time.

Relative strength can be measured in several ways. Calculating rates of return and classifying those securities with historically high average returns as securities with high relative strength is one of them. Even ratios like security relative to its industry and security relative to the entire market can also be used to detect relative strength in a security or an industry.

(v) **Odd - Lot Theory*:*** This theory is a contrary - opinion theory. It assumes that the average person is usually wrong and that a wise course of action is to pursue strategies contrary to popular opinion. The odd-lot theory is used primarily to predict tops in bull markets, but also to predict reversals in individual securities.

Question 4 :
Nov 2020 (New) – Paper

In an efficient market, technical analysis may not work perfectly. However, with imperfections, inefficiencies and irrationalities, which characterises the real world, technical analysis may be helpful. Critically analyse the statement.

Solution :

Yes, this statement is correct.

Arguments for technical analysis:

(a) Under influence of crowd psychology trend persists for some time. Technical analysis helps in identifying these trends early which is helping decision making.

(b) Shift in demand and supply is gradual rather than instantaneous. Technical analysis helps in detecting this shift rather early

(c) Fundamental information about a company is observed and assimilated by the market over a period of time. Hence price movements tend to more or less in same direction till the information is fully assimilated in the price of the stock.

Arguments against technical analysis:

(a) Technical are not able to offer a convincing explanation for tools employed by them.

(b) Empirical evidence in support of random walk hypothesis cast its shadow on it

(c) By the time trends are signaled by technical analysis, trends have already taken place.

Question 5 :
Jan 2021 (New) – Paper

Mr.X 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	33340.5
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.

Solution :

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

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
ΣX = -194.96	ΣY = 68.08	ΣX^2 = 6848.66	ΣY^2 = 6745.74	ΣXY = 164.68
$\overline{X}$ = -21.66	$\overline{Y}$ = 7.56			

$$b = \frac{\sum XY - n\overline{XY}}{\sum X^2 - n\overline{(X)2}} = \frac{164.68 - 9(-21.66)(7.56)}{68.8.66 - 9(-21.66)^2} = 0.624$$

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

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

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.

Thanks ....

CHP - 3 EQUITY ANALYSIS AND VALUATION

Question 1
Nov 2008 - RTP / Nov 2011 – RTP / May 2015 - RTP

The total market value of the equity share of Raheja Company is Rs.90,00,000 and the total value of the debt is Rs.60,00,000. The treasurer estimated that the beta of the stock is currently 1.9 and that the expected risk premium on the market is 12 per cent. The treasury bill rate is 9 per cent.

Required :

(1) What is the beta of the Company's existing portfolio of assets?

(2) Estimate the Company's Cost of capital and the discount rate for an expansion of the company's present business.

Solution :

1) Beta of Company's existing Portfolio

β Assets = β Liabilities

β Liabilities = Wt β Equity + wt β Debt

Since β Debt is not given to us, we assume it to be Zero

Equity = 90,00,000

Debt = 60,00,000

Total = 1,50,00,000

Therefore, β Assets = 1.9 x 90/150 = 1.14

2) Cost of Capital

Ke = Rf + β (RM – Rf)

Ke = Cost of Capital

Rf = Risk Free Rate

RM = Market Return

Rm – RF = Market Risk Premium

Therefore, K_e = 9% + 1.14 x 12% = 22.68%

Question 2
Nov 2008 RTP / Nov 2018 (New) - RTP

Truly Plc presently paid a dividend of £1.00 per share and has a share price of £. 20.00.

(i) If this dividend were expected to grow at a rate of 12% per annum forever, what is the firm's expected or required return on equity using a dividend-discount model approach?

(ii) Instead of this situation in part (i), suppose that the dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter. Now what is the firm's expected, or required, return on equity?

Solution :

1. Dividend are expected to grow at 12% PA forever

IV = $\frac{D1}{Re-G}$ 20 = $\frac{1(1.12)}{Re-0.12}$ 20Re – 2.4 = 1.12 therefore Re 17.6%.

2. Dividend are expected to grow @20% for 5 years and 10% thereafter

To calculate Re, we will have to use the concept of IRR. Lets use the discounting rate of 18% and 20%.

Stage 1 : First 5 years

Years	Dividend	PV @ 18%	PV @ 20%
1	1.2	1.012	1
2	1.44	1.034	1
3	1.728	1.052	1
4	2.0736	1.070	1
5	2.48832	1.088	1
Total		**5.256**	**5**

Stage 2 :

	PV @ 18%	PV @ 20%
IV5 = $\frac{D6}{Re-G}$	= $\frac{2.48832(1.1)}{0.18-0.10}$	= $\frac{2.48832(1.1)}{0.20-0.10}$
	= Rs 34.2144	= 27.37152
IV0 = $\frac{IV5}{(1+Re)^5}$	= $\frac{34.2144}{(1.18)^5}$	= $\frac{27.37152}{(1.2)^5}$
	= 14.955	= 11
Total IV (Stage 1 + 2)	= 20.211	= 16

Since IV @ 18% is 20.211, which is close to 20, we can safely assume that Re is a bit higher than 18, Lets say 18.1%. We can also calculate the same by interpolation formula.

IRR = LR + $\frac{+NPV}{\Sigma NPV}$ x x difference of rate

K = 18% + $\frac{(\text{Rs.}20.23 + \text{Rs.}20)}{\text{Rs.}20.23 - \text{Rs.}17.89} \times 1\%$

= 18% + $\frac{\text{Rs.}0.23}{\text{Rs.}2.34} \times 1\%$

= 18% + 0.10%

= 18.10%

Question 3
May 2009 – RTP / Nov 2014 – Paper – 6 Marks / May 2016 - Paper

An investor is holding 2000 shares of X ltd. Current year dividend rate is Rs. 2 per share. Market price of the share is Rs. 30 each. The investor is concerned about several factors are likely to change during the next financial year as indicated below :

	Current Year	Next Year
Dividend paid / anticipated per share (Rs.)	2	1.8
Risk free rate	12%	10%
Market Risk Premium	5%	4%
Beta Value	1.3	1.4
Expected growth	9%	7%

In view of the above, advise whether the investor should buy, hold or sell the shares.

Solution :

	Current Year	Next Year
Re = Rf + β(Rm – Rf)	12 + 1.3(5) = 18.5%	10 + 1.4(4) = 15.6%
IV = $\frac{D_1}{Re - g}$	= $\frac{2(1.09)}{0.185 - 0.09}$	= $\frac{1.8(1.07)}{0.156 - 0.07}$
	= Rs.22.95 /sh.	= Rs.22.40/sh.

Question 4
May 2009 Paper – 6 Marks / Nov 2013 – RTP / Nov 2014 – RTP / May 2016 – Paper / May 2020 (New) - RTP

Calculate the value of share from the following information:

Profit of the company	Rs. 290 crores
Equity capital of company	Rs. 1,300 crores
Par value of share	Rs. 40 each
Debt ratio of company	27%
Long run growth rate of the company	8%
Beta 0.1; risk free interest rate	8.7%
Market returns	10.3%
Capital expenditure per share	Rs. 47
Depreciation per share	Rs. 39
Change in Working capital	Rs. 3.45 per share

Solution :

IV $= \frac{FCFE_1}{K_e - g}$

FCFE = PAT – NI (Net Investment)

PAT = 290 Crores

PAT/Shares i.e EPS =

No of shares = 1300 / 40 = 32.5 Crores

EPS $= \frac{PAT}{No.of\ shares} = \frac{290}{32.5}$ = Rs. 8.923 per share

NI = [(Capital Spending – Depreciation) + Δ Working Capital] (1 – 0.27)

= [(47 – 39) + 3.45] (1-0.27)

= 11.45 (1 – 0.27)

= 8.3585

FCFE = 8.923 – 8.3585 = 0.5645

Re = Rf + β (RM – Rf)

= 8.7 + 0.1 (10.3– 8.7) = 8.86%

IV $= \frac{0.5645(1.08)}{0.0886 - 0.08}$ = Rs.70.89 / shares

Question 5

Nov 2009 – RTP / May 2010 – Paper – 12 Marks / Nov 2013 - RTP

Consider the following operating information gathered from 3 companies that are identical except for their capital structures:

	P Ltd.	Q Ltd.	R Ltd.
Total invested capital	€ 100,000	€ 100,000	€ 100,000
Debt/assets ratio	0.80	0.50	0.20
Shares outstanding	6,100	8,300	10,000
Before-tax cost of debt	14%	12%	10%
Cost of equity	26%	22%	20%
Operating income,(EBIT)	€ 25,000	€ 25,000	€ 25,000
Net Income	€ 8,970	€ 12,350	€ 14,950
Tax rate	35%	35%	35%

(a) Compute the weighted average cost of capital, WACC, for each firm.

(b) Compute the Economic Value Added, EVA, for each firm.

(c) Based on the results of your computations in part b, which firm would be considered the best investment? Why?

(d) Assume the industry PIE ratio generally is 15 x. Using the industry norm, estimate the price for each share.

(e) What factors would cause you to adjust the PIE ratio value used in part d so that it is more appropriate?

Solution :

(a)

	P Ltd.	Q Ltd.	R Ltd.
Kd = i(l – t)	14(1 – 0.35) 9.1	12(1 – 0.35) 7.8	10(1 – 0.35) 6.5
Ke	26%	22%	20%

Kc = w + Ke + w + Kd	= 9.1 × 0.8 + 26 × 0.2 = 12.48%	= 7.8 × 0.5 + 22 × 0.5 = 14.9%	= 6.5 × 0.2 + 20 × 0.8 = 17.3%

(b)

	P Ltd.	Q Ltd.	R Ltd.
EVA = NOPAT – Kc NOPAT = EBIT – Tax	25000 (1 – 0.35) = 16250	16250	16250
Kc = Capital × Kc	100000 × 12.48% = 12480	100000 ×14.9% = 14900	100000 × 17.3% = 17300
EVA	3770	1350	–1050

(c) EVAP > EVAQ > EVAR; Thus, P Ltd. would be considered the best investment. The result should have been obvious, given that the firms have the same EBIT, but WACCP < WACCQ < WACCR.

(d)

	P Ltd.	Q Ltd.	R Ltd.
Net income	€ 8,970	€ 12,350	€ 14,950
Shares	6,100	8,300	10,000
EPS	€ 1.470	€ 1.488	€ 1.495
Stock price: P/E = 15x	€ 22.05	€ 22.32	€ 22.425

(e) Given the three firms have substantially different capital structures, we would expect that they also have different degrees of financial risk. Therefore, we might want to adjust the P/E ratios to account for the risk differences.

Question 6

Nov 2009 – RTP / Nov 2010 – Paper – 8 Marks / May 2011 – Paper – 8 Marks / Nov 2015 - RTP

Associated Advertising Agency (AAA) just announced that the current financial year's income statement reports its net income to be Rs.12,00,000. AAA's marginal tax rate is 40 percent, and its interest expense for the year was Rs.15,00,000. The company has Rs.80,00,000 of invested capital, of which 60 percent is debt. In addition, AAA tries to maintain a weighted average cost of capital (WACC) near 12 percent.

(a) Compute the operating income, or EBIT, AAA earned in the current year.

(b) What is AAA's Economic Value Added (EVA) for the current year?

(c) AAA has 5,00,000 equity share outstanding. According to the EVA value you computed in part b, how much can AAA pay in dividends per share before the value of the firm would start to decrease? If AAA does not pay any dividends, what would you expect to happen to the value of the firm?

Solution :

(a) Taxable income =Net income/(1- 0.40)

Taxable income= (Rs. 12,00,000)/(1- 0.40) = Rs. 20,00,000

EBIT = Taxable income + Interest
= Rs. 20,00,000 + Rs. 15,00,000
= Rs. 35,00,000

(b) EVA = EBIT(1- T)- (WACC X Invested capital)
= Rs. 35,00,000(1- 0.40)- (0.12 X Rs. 80,00,000)
= Rs. 21,00,000 - Rs. 9,60,000
= Rs. 11,40,000

(c) EVA dividend = (Rs. 11,40,000)/500,000 = Rs. 2.28.
If AAA does not pay a dividend, we would expect the value of the firm to increase because it will achieve higher growth, hence a higher level of EBIT. If EBIT is higher, then, all else equal, the value of the firm will increase. (This assumes the firm has positive NPV projects in which to invest.)

Question 7
Nov 2009 Paper – 6 Marks / Nov 2012 – Paper – 8 Marks / May 2016 – RTP / May 2019 (New) – Paper / May 2020 (Old) – RTP

Following Financial data are available for PQR Ltd. for the year 2008 :

	(Rs. in lakh)
8% debentures	125
10% bonds (2007)	50
Equity shares (Rs. 10 each)	100
Reserves and Surplus	300
Total Assets	600
Assets Turnovers ratio	1.1
Effective interest rate	8%
Effective tax rate	40%
Operating margin	10%
Dividend payout ratio	16.67%
Current market Price of Share	14
Required rate of return of investors	15%

You are required to:

(i) Draw income statement for the year
(ii) Calculate its sustainable growth rate
(iii) Calculate the fair price of the Company's share using dividend discount model, and
(iv) What is your opinion on investment in the company's share at current price?

Solution :

(i) Income Statement :

Asset turnover ratio $= \frac{\text{Sales}}{\text{Assets}} = 1.1$

Total Assets = Rs. 600

Turnover Rs. 600 lakhs × 11 = Rs. 660 lakhs

Effective interest rate $= \frac{\text{Interest}}{\text{Liabilities}} = 8\%$

Liabilities = Rs. 125 lakhs+50 lakhs = 175 lakh

Interest =Rs. 175 lakhs× 0.08 = Rs. 14 lakh

Operating Margin = 10%

Hence operating cost = (1-0.10) Rs. 660 lakhs = Rs. 594 lakh

Dividend Payout = 16.67%

Tax rate = 40%

Income statement	**(Rs. Lakhs)**
Sale	660
Operating Exp	594
EBIT	66
Interest	14
EBT	52
Tax @ 40%	20.80
EAT	31.20
Dividend @ 16.67%	5.20
Retained Earnings	26.00

(ii) G = br

G = Growth

b = Retention Ratio

r = ROE

ROE $= \frac{\text{PAT}}{\text{Equity}} = \frac{31.20}{100+300} = 7.8\%$

Retention Ratio = 100 – 16.67 = 83.33%

Growth = 83.33 x 7.8% = 6.5%

(iii) IV $= \frac{D_1}{Re - g}$

D = 5.2/10 = 0.52 per share

Ke = 15%

G = 6.5%

IV $= \frac{0.52 + 6.5\%}{0.15 - 0.065}$ = Rs.6.51 per share

(iv) Since the current market price of share is Rs.14, the share is overvalued. Hence the investor should not invest in the company.

Question 8

Nov 2009 - Paper – 6 Marks

A firm had been paid dividend at Rs.2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. Determine the estimated market price of the equity share if

the estimated growth rate of dividends (i) rises to 8%, and (ii) falls to 3%. Also find out the present market price of the share, given that the required rate of return of the equity investors is 15.5%.

Solution :

Current IV	$= \frac{D_1}{Re - g}$	$= \frac{2(1.05)}{0.155 - 0.05}$ = Rs.20/share
IV (growth rate = 8%)	$= \frac{D_1}{Re - g}$	$= \frac{2(1.08)}{0.155 - 0.08}$ = Rs.28.8 /share
IV (growth rate = 3%)	$= \frac{D_1}{Re - g}$	$= \frac{2(1.03)}{0.155 - 0.03}$ = Rs.16.48 /share

Note : IV and growth share direct relationship. Higher the growth, higher the share price and vice versa.

Question 9
May 2010 - RTP

ABC (India) Ltd., a market leader in printing industry, is planning to diversify into defense equipment businesses that have recently been partially opened up by the GOI for private sector. In the meanwhile, the CEO of the company wants to get his company valued by a leading consultants, as he is not satisfied with the current market price of his scrip.

He approached a consultant with a request to take up valuation of his company with the following data for the year ended 2009:

Share Price	Rs.66 per share
Outstanding debt	1934 lakh
Number of outstanding shares	75 lakh
Net income	17.2 lakh
EBIT	245 lakh
Interest expenses	218.125 lakh
Capital expenditure	234.4 lakh
Depreciation	234.4 lakh
Working capital	44 lakh
Growth rate 8% (from 2010 to 2014)	
Growth rate 6% (beyond 2014)	
Free cash flow	240.336 lakh (year 2014 beyond)

The capital expenditure is expected to be equally offset by depreciation in future and the debt is expected to decline by 30% by 2014.

Required:

Estimate the value of the company and ascertain whether the ruling market price is undervalued as felt by the CEO based on the foregoing data. Assume that the cost of equity is 16%, and 30% of debt repayment is made in the year 2014.

Solution :

1) EBIT 245
– Int. 218.125
EBT 26.875
– Tax 9.675
EAT 17.2

2) Tax rate = $\frac{9.675}{26.875} \times 100 = 36\%$

3) % Interest = $\frac{218.125}{1934} \times 100 = 11.28\%$

4)

Kc for 1st 5 years		Kc beyond 5 yrs.	
Ke = 16%		Ke = 16%	
Kd = 11.28(1 – 0.36) = 7.22%		Debt = 1934 × 0.7	= 1353.8
MV of equity = 75 × 66	= Rs. 4950	Equity	= 4950
Debt	= 1934	Total	6303.8
Total	= 6884	$Kc = \frac{4950}{6303.8} \times 16\% + \frac{1353.8}{6303.8} \times 7.22\%$	= 14.11%
$Kc = \frac{4950}{6884} \times 16 \frac{1934}{6884} + \times 7.22$	= 13.53%		

5)

Stage 1

	2009	2010	2011	2012	2013	2014	2015
1) NOPAT							
EBIT	245	264.6	285.768	308.629	333.32	359.98	
	245 × (8%)						
-Tax (30%)							
NOPAT		169.34	182.89	197.5	213.32	230.39	
2) NI							
CS-Dep.		-	-	-	-	-	
ΔWC		3.52	3.801	4.11	4.43	4.79	
		(44 × 8%)					
NI		3.52	3.801	4.11	4.43	4.79	
FCFF		165.82	179.089	193.39	208.89	225.6	240.336
DF		0.881	0.776	0.683	0.602	0.530	
DCF		146.08	138.97	132.09	125.75	119.56	

Total = 662.45

6) **Stage 2**

$V5 = \frac{FCFF6}{Ke - g} = \frac{240.336}{0.1411 - 0.06}$

= 2963.45

V0 = 2963.45 × 0.530 = 1570.6298

7) Total value of firm = 662.45 + 1570.6298 = 2233.0798

Less Value of debt 1934

Value of 299.0798

Value of equity $\frac{299.0798}{75}$ = Rs.3.9877 /share

Question 10
Nov 2010 - RTP

From the following data compute the value of business using EVA method.

	Current Period		Projected Periods
	2010	**2011**	**2012**
Total Invested Capital	90,00,000	1,00,00,000	1,10,00,000
Adjusted NOPAT	12,60,000	14,00,000	16,00,000
WACC	8.42%		

Capital Growth (g) is projected = 6.5% per year after 2012.

Solution :

Valuation Equation

EVAt = NOPATt – (Total Invest Capitalt x WACCt)

EVA1 = Rs.14,00,000 – (Rs.1,00,00,000 X 0.0842) = Rs.5,58,000

EVA2 = Rs.16,00,000 – (Rs.1,10,00,000 X 0.0842) = Rs.6,73,800

Total Valuation Equation

$$= \frac{558000}{1.0842} + \frac{673800}{(1.0842)^2} + \left[\frac{673800(1+0.065)}{\frac{0.0842-0.065}{(1.0842)^2}}\right]$$

= Rs.5,14,665 + Rs.5,73,207 + Rs.3,17,95,128 + Rs.90,00,000

= Rs.4,18,83,000

Question 11
Nov 2010 – RTP / Nov 2011 – Paper – 8 Marks

Using the chop shop approach (or break up value approach) assign a value for Cranberry Ltd. Whose stock is currently trading at a total market price of €4 million. For Cranberry Ltd. The accounting data set forth three business segments consumer wholesale, retail and general centers. Data for the firms three segments are as follows :

Business Segment	Segment sales	Segment assets	Segment operating income
Whole sale	€225,000	€600,000	€75,000
Retail	€720,000	€500,000	€150,000
General	€2,500,000	€4,000,000	€700,000

Industry data for pure play firms have been compiled and are summarized as follows :-

Business Segment	Capitalization/Sales	Capitalization Assets	Capitalization / Operating Income
Wholesale	0.85	0.7	9
Retail	1.2	0.7	8
General	0.8	0.7	4

Solution :

Wholesale				
Sales	225000 × 0.85	=	191250	
Assets	600000 × 0.7	=	420000	428750 (avg.)
Op.Inc.	75000 × 9	=	675000	
Retail				
Sales	720000 × 1.2	=	864000	
Assets	500000 × 0.7	=	350000	804666.67
Op.Inc.	150000 × 8	=	1200000	
General				
Sales	2500000 × 0.8	=	2000000	
Assets	4000000 × 0.7	=	2800000	2533333.33
Op.Inc.	700000 × 4	=	2800000	_____
Total				3766750

Question 12
Nov 2010 - Paper – 5 Marks

Amal Ltd. has been maintaining a growth rate of 12% in dividends. The company has paid dividend @ Rs.3 per share. The rate of return on market portfolio is 15% and the risk free rate of return in the market has been observed as10% . The beta co-efficient of the company's share is 1.2. You are required to calculate the expected rate of return on the company's shares as per CAPM model and the equilibrium price per share by dividend growth model.

Solution :

Re = Rf + β(Rm – Rf)
= 10 + 1.2 (15 – 10)
= 10 + 6 = 16%

IV $= \frac{D_1}{Re - g}$

$= \frac{3 \times (1.12)}{0.16 - 0.12}$ = Rs.84/share

Question 13
May 2011 – RTP / Nov 2012 – Paper – 4 Marks

Calculate Economic Value Added (EVA) with the help of the following information of Hypothetical Limited:

Financial leverage	:	1.4 times
Capital structure	:	Equity Capital Rs.170 lakhs
Reserves and surplus	:	Rs.130 lakhs
10% Debentures	:	Rs.400 lakhs
Cost of Equity	:	17.5%
Income Tax Rate	:	30%.

Solution :

EBIT	140	1.4
– Int	40	0.4
EBT	100	1.0

EBIT $= \frac{40}{0.4} \times 1.4 = 140$

NOPAT = EBIT (1 – t) = 140(1 – 0.3) = 98

Ke = 17.5%

Kd = 10(1 – 0.3) – 7%

WACC = $\frac{300}{700} \times 17.5 + \frac{400}{700} \times 7\%$

$\therefore$ Cost of capital = 700 × 11.5% = 80.5

EVA = 98 – 80.5 = 17.5

Question 14
Nov 2008 – RTP / May 2011 – RTP / May 2011 - Paper – 8 Marks / May 2012 – Paper / Nov 2013 – Paper – 8 Marks / Nov 2018 (New) - Paper

A share of Voyage Ltd. is currently quoted at, a price earning of 8 times. The retained earnings per share being 45% is 5 per share. Compute

(i) The company's cost of equity, if investors expect annual growth rate of 15%

(ii) If anticipated growth rate is 16% p.a, calculate the indicated market price, with same cost of capital.

(iii) If the company's cost of capital is 20% and the anticipated growth rate is 19% p.a. calculate the market price per share, assuming other conditions remaining the same.

Solution :

Retained Earning = Rs.5 = 45%

$\therefore$ Earnings = Rs.11.11 $\left(\frac{5}{45\%}\right)$

∴ Dividend = Rs.6.11 (11.11 – 5) (Since Dividend is calculated from Earnings it should be taken as D_1)

P.E. ratio = 8

MPs = EPS × P.E. = 11.11 × 8

= Rs.88.88/share

A) Re = ?, if g = 15%

$$IV = \frac{D_1}{Re - g}$$

$$\therefore 88.88 = \frac{6.11}{Re - 0.15} \qquad \therefore Re = 21.87\%$$

B) If g = 16%

$$\therefore IV = \frac{6.11}{0.2287 - 0.16} = Rs.104.08/share$$

C) If Re = 20%, g = 19%

$$\therefore IV = \frac{6.11}{0.20 - 0.19} = Rs.611/share$$

Question 15
Nov 2011 - Paper - 5 Mark

A company has a book value per share of Rs. 137.80. Its return on equity is 15% and follows a policy of retaining 60 percent of its annual earnings. If the opportunity cost of capital is 18 percent, what is the price of its share?[adopt the perpetual growth model to arrive at your solution].

Solution :

EPS = 137.80 x 15% = 20.67

Dividend = 20.67 x 40% (Retention is 60%) = 8.268

G = br

= 60 x 15% = 9%

$$IV = \frac{D_1}{Re - g}$$

$$= \frac{8.27}{0.18 - 0.09} = Rs.91.89/share$$

Question 16
May 2012 - RTP

The following data pertains to XYZ Inc. engaged in software consultancy business as on 31 December 2010

	$ Million
Income from consultancy	935.00
EBIT	180.00
Less : Interest on Loan	18.00

EBT	162.00
Tax @ 35%	56.70
	105.30

Liabilities	Amount	Assets	Amount
Equity share (10 million shares of Rs.10 each)	100	Land and Building	200
Reserves	325	Computers & Software	295
Bank Loan	180	Current Assets :	
Creditors	180	Debtors	150
		Bank	100
		Cash	40
	785		**785**

With the above information and following assumption you are required to compute

(a) Economic Value Added®

(b) Market Value Added.

Assuming that:

(i) WACC is 12%.

(ii) The share of company currently quoted at Rs. 50 each

Solution :

1) EVA = NOPAT – Cost of Capital

NOPAT = EBIT (1 – t)

= 180 (1 – 0.35)

= 117

Kc = Capital = 100 + 325 + 180 = 605

= 605 × 12% = 72.6

EVA = 117 – 72.6 = 44.4

2) MVA

	MV	BV
Equity Capital	500	100
Reserves	-	325
Debt	180	180
Total	**680**	**605**

MVA = MV – BV

= 680 – 605

= 75

Question 17
May 2012 - RTP

Following informations are available in respect of XYZ Ltd. which is expected to grow at a higher rate for 4 years after which growth rate will stabilize at a lower level:

Base year information:

Revenue - Rs. 2,000 crores
EBIT - Rs. 300 crores
Capital expenditure - Rs. 280 crores
Depreciation - Rs. 200 crores

Information for high growth and stable growth period are as follows:

	High Growth	Stable Growth
Growth in Revenue & EBIT	20%	10%
Growth in capital expenditure and Depreciation	20%	Capital expenditure are offset by depreciation
Risk free rate	10%	9%
Equity beta	1.15	1
Market risk premium	6%	5%
Pre tax cost of debt	13%	12.86%
Debt equity ratio	1 : 1	2 : 3

For all time, working capital is 25% of revenue and corporate tax rate is 30%.

What is the value of the firm?

Solution :

1)

Satge 1 Ke	Stage 2 Kc
Re = Rf + β(Rm – Rf) = 10 + 1.15 (6) = 16.9% Kd = i (1 – t) = 13 (1 – 0.3) = 9.1% Kc = Kc 0.5 x 9.1 + 0.5 x 16.9 = 13%	Re = 9 + 1 (5) = 14% Kd = 12.86 (1 – 0.3) = 9% Kc = $\frac{2}{5}$ x 9 + $\frac{3}{5}$ x 14 = 12%

2) Stage 1

		Base	1	2	3	4	5
1) NOPAT							
	EBIT	300	360	432	518.4	622.08	684.288
		(300 + 20%)				(622.08 + 10%)	
	-Tax (30%)		103	129.6	155.52	186.62	205.286

	NOPAT		252	302.4	362.88	435.46	479
2) Net Invest							
	Capital Sp	280					
	–Dep	200	-	-	-	-	
i)		80	96	115.2	138	165.8	Nil
		(80 + 10%)					
	Revenue	2000	2400	2880	3456	4147.2	4561.92
		(2000 + 20%)				(4147.2 + 10%)	
	WC	500	600	720	864	1036.8	1140.48
ii)	ΔWC		100	120	144	172.8	103.68
	NI(i +ii)		196	235.2	282	338.6	103.68
	FCFF = (NOPAT – NI)		56	67.2	80.88	96.856	375.32
	PV @ 13%		49.56	52.61	56.05	59.4	

Total = 217.63

3) Stage 2

$$V_4 = \frac{FCFF_5}{Kc - g} = \frac{375.32}{0.12 - 0.1} = 18766$$

$$V_0 = \frac{18766}{(1.13)^4} = 11509.54$$

Total = Stage 1 + Stage 2

= 217.63 + 11509.54 = Rs.11727.17

Question 18

May 2012 – RTP / Nov 2018 (New) - RTP

AB Limited's shares are currently selling at Rs.130 per share. There are 10,00,000 shares outstanding. The firm is planning to raise Rs.2 crores to Finance new project.

Required

What is the ex-right price of shares and value of a right, if.

(i) The firm offers one right share for every two shares held.

(ii) The firm offers one right share for every four shares held.

(iii) How does the shareholder's wealth change from (i) to (ii)? How does right issue increase shareholder's wealth.

Solution :

1. Firm offer one right share for 2 shares held

No of shares to be issued = $\frac{10,00,000}{2}$ = 5,00,000 shares

Subscription Price = $\frac{2,00,00,000}{5,00,000}$ = Rs. 40 / shares

Ex Right Price = $\frac{(10,00,000 \times 130) + 2,00,00,000}{15,00,000}$ = Rs.100

Value of Right = 100 – 40 = Rs. 60/share

2. Firm offer one right share for 2 shares held

No of shares to be issued = $\frac{10,00,000}{4}$ = 2,50,000 shares

Subscription Price = $\frac{2,00,00,000}{2,50,000}$ = Rs.80 / shares

Ex Right Price = $\frac{13,00,00,000 + 2,00,00,000}{12,50,000}$ = Rs.120

Value of Right = 120 – 80 = Rs. 40/share

3. Calculation of effect of right issue on shareholders wealth (Assuming he is holding 100 shares)

	One share for 2 held	One share for 4 held
Value of shares after right	15000 (150 x 100)	15000 (125 x 120)
Less cost of right	2000 (50 x 40)	2000 (25 x 80)
Net Value after right	13000	13000
Value before right	13000 (100 x 130)	13000 (100 x 130)
Effect of right issue	NIL	NIL

Question 19
May 2012 - Paper - 6 Marks

In December, 2011 AB Co.'s share was sold for Rs. 146 per share. A long term earnings growth rate of 7.5% is anticipated. AB Co. is expected to pay dividend of Rs. 3.36 per share.

(i) What rate of return an investor can expect to earn assuming that dividends are expected to grow along with earnings at 7.5% per year in perpetuity?

(ii) It is expected that AB Co. will earn about 10% on book Equity and shall retain 60% of earnings. In this case, whether, there would be any change in growth rate and cost of Equity?

Solution :

(i) According to Dividend Discount Model approach the firm's expected or required return on equity is computed as follows:

$$\textbf{Re} = \frac{D_1}{P_0} + \textbf{g}$$

Where

Ke = Cost of equity share capital

D1 = Expected dividend at the end of year 1

P0 = Current market price of the share.

g = Expected growth rate of dividend.

Therefore Ke = $\frac{3.36}{146}$ + 7.5 = 9.80%

(ii) With rate of return on retained earnings (r) 10% and retention ratio (b) 60%, new growth rate will be as follows:

g = br i.e.

= 0.10 x 0.60 = 0.06

Accordingly dividend will also get changed and to calculate this, first we shall calculate previous retention ratio (b1) and then EPS assuming that rate of return on retained earnings (r) is same.

With previous Growth Rate of 7.5% and r =10% the retention ratio comes out to be:

0.075 =b1 X 0.10

b_1 = 0.75 and payout ratio = 0.25

With 0.25 payout ratio the EPS will be as follows:

3.36 = 13.44

0.25

With new 0.40 (1 – 0.60) payout ratio the new dividend will be

D_1 = 13.44 × 0.40 = 5.376

Accordingly new Ke will be ke = $\frac{5.376}{146}$ + 6.0 Ke = 9.68%

Question 20

Nov 2012 – RTP / May 2018 (New) - RTP

BRS Inc deals in computer and IT hardwares and peripherals. The expected revenue for the next 8 years is as follows

Years	Sales Revenue ($ Million)
1	8
2	10
3	15
4	22
5	30
6	26
7	23
8	20

Summarized financial position as on 31st March 2012 was as follows

Liabilities	Amount	Assets	Amount
Equity Stocks	12	Fixed Assets (Net)	17
12% Bond	8	Current Assets	3
	20		20

Additional Information:

(a) Its variable expenses is 40% of sales revenue and fixed operating expenses (cash) are estimated to be as follows:

Period	Amount ($ Million)
1 – 4 years	1.6
5 – 8 years	2

(b) An additional advertisement and sales promotion campaign shah be launched requiring expenditure as per following details:

Period	Amount ($ Million)
1 year	0.50
2-3years	1.50
4-6years	3.00
7-8years	1.00

(c) Fixed Assets are subject to depreciation at 15% as per WDV method.

(d) The company has planned capital expenditure for the coming 8 years as follows

Period	Amount ($ Million)
1	0.50
2	0.60
3	2.00
4	2.50
5	3.50
6	2.50
7	1.50
8	1.00

(e) Investment in working capital to be 20% of Revenue

(f) Applicable tax rate for the company is 30%

(g) Cost of Equity is estimated to be 16%

(h) The free cash flows of the firm is expected to grow at 5% per annum after 8 years

With above information you are required to determine the

(i) Value of the firm

(ii) Value of Equity

Solution :

1) Working note for depreciation

	Year	1	2	3	4	5	6	7	8
Assets	Op.	17	14.875	13.15375	12.881	13.074	14.088	14.1	13.26
+ Cap.sp.		0.5	0.6	2	2.5	3.5	2.5	1.5	1
Assets		17.5	15.475	15.15375	15.381	16.57	16.588	15.6	14.26
- Dep.		2.625	2.32125	2.273	2.3071	2.486	2.488	2.34	2.139
Assets Clo.		14.875	13.15375	12.881	13.074	14.088	14.1	13.26	12.121

2) Kc = 16%

Kd = i(1 – t)

= 12(1 – 0.3)

= 8.4%

$$\text{WACC} = \frac{12}{20} \times 16\% + \frac{8}{20} \times 8.4\%$$

= 12.96%

3) Calculation for NOPAT

Year	1	2	3	4	5	6	7	8
Sales	8	10	15	22	30	26	23	20
VC	3.2	4	6	8.8	12	10.4	9.2	8
FC	1.6	1.6	1.6	1.6	2	2	2	2
Adv.	0.5	1.5	1.5	3	3	3	1	1
Dep.	2.625	2.32125	2.2730	2.3071	2.4860	2.488	2.34	2.139
EBIT	0.075	0.58	3.627	6.2929	10.514	8.112	8.46	6.861
tax (30%)								
NOPAT	0.0525	0.405	2.538	4.405	7.359	5.678	5.922	4.8027

4) Calculation for Net Investments

Year	1	2	3	4	5	6	7	8
Cap. Sp.	0.5	0.6	2	2.5	3.5	2.5	1.5	1
-Dep.	2.625	2.32125	2.273	2.3071	2.4860	2.488	2.34	2.139
	(2.125)	(1.72125)	(0.2730)	0.1929	1.012	0.01	(0.84)	(1.139)
+ΔWC	1.6	2	3	4.4	6	5.2	4.6	4
NI	(0.525)	0.27875	2.727	4.5929	7.014	5.212	3.76	2.861

5) FCFF

Year	1	2	3	4	5	6	7	8
(NOPAT – NI)	0.5775	0.13225	(0.189)	(0.1879)	0.345	0.466	2.162	1.9417

PV @ 12.96%	0.511	0.0989	(0.131)	(0.115)	0.188	0.224	0.921	0.732

Total = 2.4305

6) V8 $= \frac{FCFF9}{Kc - g}$

$= \frac{1.9417(1.05)}{0.1296 - 0.05}$

= 25.612

V0 (Stage 2) $= \frac{25.612}{(1.1296)^8} = 9.66$

7) Value of firm = Stage I + Stage II

= 2.4305 + 9.6607

= 12.0912

= 12.09

Value of equity = Value of Firm – Value of Debt

= 12.09 – 8

= 4.09

Question 21
Nov 2012 Paper – 8 Marks

Tiger Ltd. is presently working with an Earning before Interest and Taxes (EBIT) of Rs.90 lakhs. Its present borrowings are as follows

	Rs.in lakhs
12% term Loan	300
Working Capital Borrowings	
From Bank at 15%	200
Public Deposit at 11%	100

The sales of the company are growing and to support this, the company proposes to obtain additional borrowing of Rs.100 lakhs expected to cost 16%.The increase in EBIT is expected to be 15%.

Calculate the change in interest coverage ratio after the additional borrowing is effected and comment on the arrangement made.

Solution :

1) Calculation of Present Interest Coverage Ratio

Present EBIT = Rs.90 lakh

Interest charges (present)	**Rs.in lakhs**
Term loan @ 12%	36.00
Bank Borrowing @ 15%	30.00
Public Deposit @ 11%	11.00

	77.00

Present Interest Coverage Ratio $= \frac{\text{EBIT}}{\text{Inerest Charges}}$

$= \frac{\text{Rs.90 lakhs}}{\text{Rs.77 lakhs}}$

= 1.169

2) Calculation of Revised Interest Coverage Ratio

Revised EBIT (115% of Rs.90 lakh)	Rs.103.50 lakh
Proposed Interest Charges	
Existing Interest Charges	77.00 lakh
(+) Additional charges	
(16% of Additional Borrowing i.e. 100 lakhs	16.00 lakh
Total	93.00 lakh

Revised Interest Coverage Ratio $= \frac{\text{Rs.103.50 lakhs}}{\text{Rs.93.00 lakhs}}$

= 1.113

Change in interest coverage ratio = 1.169 – 1.113 = 0.056

Note : Decrease in interest coverage ratio is adverse for entity.

Question 22

Nov 2012 - Paper – 8 Marks

On the basis of the following information :

Current dividend (Do) = Rs.2.50

Discount rate (k) = 10.5%

Growth rate (g) = 2%

(i) Calculate the present value of stock of ABC Ltd.

(ii) Is its stock overvalued if stock price is Rs.35, ROE = 9% and EPS = Rs.2.25? Show detailed calculation.

Solution :

(i) Present Value of the stock of ABC Ltd. is :

$V_0 = \frac{2.50(1.02)}{0.105 - 0.02}$ = Rs.30/-

(ii) Value of stock under the PE Multiple Approach :

Particulars	
Actual Stock Price	Rs.35.00
Return on equity	9%
EPS	Rs.2.25
PE Multiple (1/Return on Equity) = 1/9%	11.11
Market Price per Share	Rs.25.00

Since, Actual Stock Price is higher, hence it is overvalued.

(iii) Value of the Stock under the Earnings Growth Model :

Particulars	
Actual Stock Price	Rs.35.00
Return on equity	9%
EPS	Rs.2.25
Growth Rate	2%
Market Price per Share [EPS × (1 + g)]/(K_e – g)	Rs.32.79
= Rs.2.25 × 1.02/0.07	

Since, Actual Stock Price is higher, hence it is overvalued.

Question 23
May 2014 - Paper – 5 Marks

MNP Ltd. has declared and paid annual dividend of Rs. 4 per share. It is expected to grow @ 20% for the next two years and 10% thereafter. The required rate of return of equity investors is 15%. Compute the current price at which equity shares should sell.

Note: Present Value Interest Factor (PVIF) @ 15%:

For year 1 = 0.8696;

For year 2 = 0.7561

Solution :

Stage 1 : Explicit Stage

Year	Dividend	PV of Dividend (15%
1	4.80	4.17408
2	5.76	4.355136
Total		8.529216

Stage 2 : Horizon Stage

$$IV_2 = \frac{D_3}{Re - g} = \frac{5.76 + 10\%}{0.15 - 0.1} = 126.72$$

IV_0 = 126.72 x 0.7561 = 95.812992

Total IV = Stage 1 + Stage 2 = 8.529216 + 95.812992 = Rs.104.342208

Question 24
May 2014 Paper – 8 Marks / Nov 2020 (New) - RTP

Following information is given in respect of WXY Ltd., which is expected to grow at a rate of 20% p.a. for the next three years, after which the growth rate will stabilize at 8% p.a. normal level, in perpetuity.

	For the year ended March 31, 2014
Revenues	Rs. 7,500 Crores
Cost of Goods Sold (COGS)	Rs. 3,000 Crores

Operating Expenses	Rs. 2,250 Crores
Capital Expenditure	Rs. 750 Crores
Depreciation (included in COGS & Operating Expenses)	Rs. 600 Crores

During high growth period, revenues & Earnings before Interest & Tax (EBIT) will grow at 20% p.a. and capital expenditure net of depreciation will grow at 15% p.a. From year 4 onwards, i.e. normal growth period revenues and EBIT will grow at 8% p.a. and incremental capital expenditure will be offset by the depreciation. During both high growth & normal growth period, net working capital requirement will be 25% of revenues.

The Weighted Average Cost of Capital (WACC) of WXY Ltd. is 15%.

Corporate Income Tax rate will be 30%.

Required: Estimate the value of WXY Ltd. using Free Cash Flows to Firm (FCFF) & WACC methodology.

The PVIF @ 15 % for the three years are as below:

Year	T1	T2	T3
PVIF	0.8696	0.7561	0.6575

Solution :

Working Note 1 :

FCFF = NOPAT – NI

(i) NOPAT = EBIT (I – t)

	Year 1	Year 2	Year 3	Year 4
Revenue	9000.00	10800.00	12960.00	13996.80
Less : COGS	3600.00	4320.00	5184.00	5598.72
Less : Operating Expenses	1980.00	2376.00	2851.20	3079.30
Less : Depreciation	720.00	864.00	1036.80	1119.74
EBIT	2700.00	3240.00	3888.00	4199.04
Less : Tax (30%)	810.00	972.00	1166.40	1259.71
NOPAT	1890.00	2268.00	2721.60	2939.33

(ii) Net Investment = Capital Spending – Depreciation + Change in Working Capital

	Base	Year 1	Year 2	Year 3	Year 4
Capital Spending – Dep		172.50	198.38	228.13	–
Rev.	7500	9000	10800	12960	13996.80
Working Capital	1875	2250	2700	3240	3499.2
Δ Working Capital		375	450	540	259.2

(iii) FCFF

	Year 1	Year 2	Year 3	Year 4
NOPAT – NI	1342.50	1619.62	1953.47	2680.13

Stage 1 : Explicit

Year	FCFF	PV @ 15%
1	1342.50	1167.44
2	1619.62	1224.59
3	1953.47	1284.41
Total		3676.44

Stage 2 : Horizon Stage

$V_3 = \frac{FCFF_4}{Kc - g} = \frac{2680.13}{0.15-0.08} = 38287.57$

$V_0 = \frac{38287.57}{(1.15)^3} =$ Rs.25174.08 Crore

Total Value of Firm

= Stage 1 + Stage 2 = 3676.44 + 25,174.70 = Rs.28,851.14 Crores

Question 25
May 2014 - Paper – 8 Marks

RST Ltd.'s current financial year's income statement reported its net income as Rs.25,00,000. The applicable corporate income tax rate is 30%.

Following is the capital structure of RST Ltd. at the end of current financial year:

	Rs.
Debt (Coupon rate = 11%)	40 lakhs
Equity (Share Capital + Reserves & Surplus)	125 lakhs
Invested Capital	165 lakhs

Following data is given to estimate cost of equity capital:

	Rs.
Beta of RST Ltd.	1.36
Risk –free rate i.e. current yield on Govt. bonds	8.5%
Average market risk premium (i.e. Excess of return on market portfolio over risk-free rate)	9%

Required:

(i) Estimate Weighted Average Cost of Capital (WACC) of RST Ltd.; and

(ii) Estimate Economic Value Added (EVA) of RST Ltd

Solution :

(i) WACC

Cost of Equity as per CAPM

ke = Rf + β (Rm – Rf)

= 8.5% + 1.36 x 9%

= 8.5% + 12.24%

= 20.74%

Cost of Debt

kd = 11%(1 – 0.30) = 7.70%

$$WACC = Wt\ Ke + Wt\ Kd = 20.74 \times \frac{125}{165} + 7.70 \times \frac{40}{165} = 17.58\%$$

(ii) Economic Value Added

Net Profit Before Tax = 35,71,429 (25,00,000 × 100 / 70)

Add Interest = 4,40,000

EBIT = 40,11,429

EVA = Nopat – Kc (Amount

Nopat = EBIT (1 – t) = 40,11,429 (1-0.3) = 28,08,000

Kc (Amount) = 125,00,000 + 40,00,000) x 17.58% = 29,00,700

EVA = 28,08,000 – 29,00,700 = - 92,700

Question 26

Nov 2011 – RTP / May 2015 – RTP

ABC Ltd. has divisions A,B & C. The division C has recently reported on annual operating profit of Rs.20,20,00,000. This figure arrived at after charging Rs.3 crores full cost of advertisement expenditure for launching a new product. The benefits of this expenditure is expected to be lasted for 3 years.

The cost of capital of division C is 11% and cost of debt is 8%.

The Net Assets (Invested Capital) of Division C as per latest Balance Sheet is Rs.60 crore, but replacement cost of these assets is estimated at Rs. 84 crore.

You are required to compute EVA of the Division C.

Solution :

First necessary adjustment of the data as reported by historical accounting system shall be made as follows:

	Rs.
Operating Profit	20,20,00,000
Add: Cost of unutilized Advertisement Expenditures	2,00,00,000
	22,20,00,000

Invested Capital (as per replacement cost) is Rs. 84 crore.

Accordingly, EVA = Operating Profit – (Invested Capital x Cost of Capital)

= Rs. 22,20,00,000 – Rs. 84 crore x 11%

= Rs. 22.2 crore – Rs. 9.24 crore

= Rs. 12.96 crore

Question 27

Nov 2011 – RTP / Nov 2015 – RTP

Two companies A Ltd. and B Ltd. paid a dividend of Rs. 3.50 per share. Both are anticipating that dividend shall grow @ 8%. The beta of A Ltd. and B Ltd. are 0.95 and 1.42 respectively.

The yield on GOI Bond is 7% and it is expected that stock market index shall increase at annual rate of 13%. You are required to determine:

(a) Value of share of both companies.

(b) Why there is a difference in the value of shares of two companies.

(c) If current market price of share of A Ltd. and B Ltd. are Rs. 74 and Rs. 55 respectively. As an investor what course of action should be followed?

Solution :

(a) First of all we shall compute Cost of Capital (Ke) of these companies using CAPM as follows:

Ke = Rf + β (RM – Rf)

Ke (A) = 7.00% + (13% -7%)0.95

= 7.00% + 5.70% = 12.7%

Ke (B) = 7.00% + (13% -7%)1.42

= 7.00% + 8.52% = 15.52%

(b) Value of shares

$$Va = \frac{D1}{Re - g} = \frac{3.5 + 8\%}{0.127 - 0.08} = \text{Rs. } 80.43$$

$$Vb = \frac{D1}{Re - g} = \frac{3.5 + 8\%}{0.1552 - 0.08} = \text{Rs. } 50.27$$

(c) The valuation of share of B Ltd. is lower because systematic risk is higher though both have same growth rate.

(d) If the price of share of A Ltd. is Rs.74, the share is undervalued and it should be bought. If price of share of B Ltd. is Rs.55, it is overvalued and should not be bought.

Question 28

Nov 2015 – Paper / May 2019 (Old) – RTP / May 2020 (Old) - RTP

X Ltd is a shoe manufacturing company. It is all equity financed and has a paid up capital of Rs. 10,00,000 @ 10 per share)

X Ltd. has hired swastika consultants to analyse the future earnings. The report of swastika consultants states as follows :

(i) The earnings and dividend will grow at 25% for next two years

(ii) Earnings are likely to grow at the rate of 10% from 3rd year and onwards

(iii) Further, if there is reduction in earnings growth, dividend payout ratio will increase to 50%

The other data related to the company are as follows

Year	EPS (Rs.)	Dividend Per share (Rs.)	Share Price (Rs.)
2010	6.30	2.52	63.00
2011	7.00	2.80	46.00
2012	7.70	3.08	63.75
2013	8.40	3.36	68.75
2014	9.60	3.84	93.00

You may assume that the tax rate is 30% (not expected to change in future) and post tax cost of capital is 15%

By using the Dividend Valuation Model, Calculate

(i) Expected Market Price per share

(ii) P.E. Ratio

Solution :

1) Stage 1 : Explicit Stage

On the basis of the information given, the following projection can be made:

Year	EPS (Rs.)	DPS (Rs.)	PV of DPS @15%
2015	12.00 (9.60 x 125%)	4.80 (3.84 x 125%)	4.176
2016	15.00 (12.00 x 125%)	6.00 (4.80 x 125%)	4.536
2017	16.50 (15.00 x 110%)	8.25* (50% of Rs. 16.50)	5.429
			14.141

*Payout Ratio changed to 50%.

Stage 2 : Horizon

After 2017, the perpetuity value assuming 10% constant annual growth is:

D4 = Rs. 8.25 × 110% = Rs. 9.075

$$IV3 = \frac{D4}{Ke - g} = \frac{9.075}{0.15 - 0.10} = 181.50$$

$$Iv0 = \frac{181.50}{(1.15)^3} = 119.43$$

Total IV = Stage 1 + Stage 2 = 14.141 + 119.43 = 133.57

2) PE Ratio $= \frac{MPS}{EPS}$

$= \frac{133.57}{9.60}$

= 13.91 times

Question 29
May 2016 – Paper

XYZ Ltd. paid a dividend of 2 for the current year. The dividend is expected to grow at 40% for the next 5 years and at 15% per annum thereafter. The return on 182 days T-bills is 11% per annum and the market return is expected to be around 18% with a variance of 24%.

The co-variance of XYZ's return with that of the market is 30%. You are required to calculate the required rate of return and intrinsic value of the stock.

Solution :

$\beta = \frac{\text{Covariance of Market return and Security return}}{\text{Variance of Market return}}$

$\beta = \frac{30\%}{24\%} = 1.25$

Expected return $= R_f + \beta(R_m - R_f)$

= 11% + 1.25(18% - 11%)

= 11% + 8.75%

= 19.75%

Intrinsic Value

Year	Dividend (Rs.)	Present Value (Rs.)
1	2.80	2.34
2	3.92	2.73
3	5.49	3.19
4	7.68	3.73
5	10.76	4.37
		16.36

$IV_5 = \frac{10.76(1.15)}{0.1975-0.15}$ = Rs.260.51

$IV_0 = \frac{260.51}{(1.1975)^5}$ = 105.79

Intrinsic Value = Rs.16.36 + Rs.105.79

= Rs.122.15

Question 30

May 2016 – Paper

Kanpur Shoe Ltd. is having sluggish sales during the last few years resulting in drastic fall in market share and profit. The marketing consultant has drawn out a new marketing strategy that will be valid for next four years. If the new strategy is adopted, it is expected that sales will grow @ 20% per year over the previous year for the coming two years and @ 30% from the third year. Other parameters like gross profit margin, asset turnover ratio, the capital structure and the rate of Income tax @ 30% will remain unchanged. Depreciation would be 10% of the net fixed assets at the beginning of the year. The targeted return of the company is 15%.

The financials of the company for the just concluded financial year 2015-16 are given below:

Income Statement	Amount (Rs.)
Turnover	2,00,000
Gross margin (20%)	40,000
Admin, Selling & Distribution expense (10%)	20,000
PBT	20,000
Tax (30%)	6,000
PAT	14,000

Balance Sheet Information	
Fixed Assets	80,000
Current Assets	40,000
Equity Share Capital	1,20,000

You are required to assess the incremental value that will accrue subsequent to the adoption of the new marketing strategy and advise the Board accordingly.

PV @ 15% for 1, 2 & 3 years are: 0.870, 0.756, 0.658 respectively.

Solution :

1) Value of firm before strategy

$$Vf = \frac{PAT(FCFE)}{Re} = \frac{14000}{0.15} = 93,333.33$$

2) Value of firm after strategy

A) Stage 1

Year	1	2	3	4
PAT	16800	20160	26208	34070.4
	(14000 + 20%)		(20160 + 30%)	
- NI	24000	28800	51840	67392
	(120000 × 20%)	(24,000 × 1.2)	(120000 × 1.2 × 1.2 × 1.3 – 172800)	(51840 × 1.3)
FCFE	(7200)	(8640)	(25632)	(33,321.6)
PV @ 15%	(6260.87)	(6533.08)	(16853.46)	(19051.73)

Total = (48,699.14)

B) Stage 2

$$Vf_4 = \frac{FCFE_5(PAT)}{Re} = \frac{34070.4}{0.15} = 227136$$

$$Vf_0 = \frac{227136}{(1.15)^4} = 129865.75$$

Total= 129865.75 – 48699.14 = 81,166.61

3) Value of strategy

= Value of firm after strategy = 81166.61

= Value of firm before strategy = 93333.33

–12166.72

Note : Since value of strategy is negative it should not be implemented.

Question 31

Nov 2011 – Paper / May 2017 – RTP / May 2020 (New) - RTP

ABC Co. is considering a new sales strategy that will be valid for the next 4 years. They want to know the value of the new strategy. Following information relating to the year which has just ended, is available:

Income Statement	Rs.
Sales	20,000
Gross Margin (20%)	4,000
Administration, Selling & Distribution expenses (10%)	2,000
PBT	2,000
Tax (30%)	6000
PAT	1,400
Balance Sheet Information	
Fixed Assets	8,000
Current Assets	4,000
Equity	12,000

If it adopts the new strategy, sales will grow at the rate of 20% per year for three years. The gross margin ratio, Assets turnover ratio, the Capital structure and the income tax rate will remain unchanged.

Depreciation would be at 10% of net fixed a ssets at the beginning of the year.

The Company's target rate of return is 15%.

Determine the incremental value due to adoption of the strategy.

Solutions :

Value of Strategy

= Value of strategy firm After Strategy – Value of firm Before strategy

= 8,643.31 – 9,333.33 = - Rs 690.01 decision

Decision : Since the value of strategy is negative the firm should not implement the strategy.

A. Value of the firm before the strategy

Vf = $\frac{FCFE\ (PAT)}{Re}$ = $\frac{1400}{15\%}$ = Rs 9,333.33

B. Value of the firm after the strategy

Stage 1 :

Years	1	2	3	5
FCFE				
1. PAT	1,680	2016	2419.2	2,419.2
	(1400 + 20)	(1,680 + 20%)	(2016 + 20%)	(constant)
2. NI	2400	2880	3456	Nil
	(12,000 x 20%)	(2,400 + 20%)	(2880 + 20%)	(no change)
FCFE (1 – 2)	(720)	(864)	(1036.8)	2419.20
PV @15%	(626.09)	(653.31)	(681.71)	
Total	(1961.11)			

Stage 2

Vf3 = $\frac{FCFE4}{Re} = \frac{2419.20}{15\%}$ = Rs 16,128

Vf0 = $\frac{16,218}{(1.15)^3}$ = 10,604.42

Total Stage 1 + Stage 2 = 10,604.42 – 1961.11 = Rs 8643.31

Question 32

May 2017 – RTP / May 2018 (New) - Paper

Sunrise Limited last year paid dividend of Rs.20 per share with an annual growth rate of 9%. The risk-free rate is 11% and the market rate of return is 15%. The company has a beta factor of 1.50. However, due to the decision of the Board of Director to grow inorganically in the recent past beta is likely to increase to 1.75.

You are required to find out under Capital Asset Pricing Model

(i) The present value of the share

(ii) The likely value of the share after the decision.

Solution :

The value of Cost of Equity with the help of CAPM

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

With the given data the Cost of Equity using CAPM will be:

$K_e = 0.11 + 1.5(0.15 – 0.11)$

$K_e = 0.11 + 1.5(0.04)$

$= 0.17$ or 17%

The value of share using the Growth Model:

$P = \frac{D_0\ (1+g)}{K_e - g}$

$P = \frac{20(1+0.09)}{0.17-0.09}$

$P = \frac{21.80}{0.08}$ = Rs.272.50

However, if the decision of the Board of Directors is implemented, the beta factor is likely to increase to 1.75.

Therefore,

$K_e = 0.11 + 1.75(0.15 – 0.11)$

$K_e = 0.11 + 1.75(0.04)$

$= 18\%$

The value of share using the Growth Model:

$P = \frac{D_0\ (1+g)}{K_e - g}$

P $= \frac{20(1+0.09)}{0.18-0.09}$

P $= \frac{21.80}{0.09}$ = Rs.242.22

Question 33
May 2011 – RTP / May 2017 – RTP

Given below is the Balance Sheet of S Ltd. as on 31.3.2008:

Liabilities	Rs. (in lakhs)	Assets	Rs. (in lakhs)
Share capital (share of Rs.10)	100	Land and building	40
Reserves and surplus	40	Plant and machinery	80
Long Term Debts	30	Investments	10
		Stock	20
		Debtors	15
		Cash at bank	5
Total	**170**	**Total**	**170**

You are required to work out the value of the Company's, shares on the basis of Net Assets method and Profit-earning capacity (capitalization) method and arrive at the fair price of the shares, by considering the following information:

(i) Profit for the current year Rs.64 lakhs includes Rs.4 lakhs extraordinary income and Rs.1 lakh income from investments of surplus funds; such surplus funds are unlikely to recur.

(ii) In subsequent years, additional advertisement expenses of Rs.5 lakhs are expected to be incurred each year.

(iii) Market value of Land and Building and Plant and Machinery have been ascertained at Rs.96 lakhs and Rs.100 lakhs respectively. This will entail additional depreciation of Rs.6 lakhs each year.

(iv) Effective Income-tax rate is 30%.

(v) The capitalization rate applicable to similar businesses is 15%.

Solution :

	Rs.in Lakhs
Net Assets Method	
Assets: Land & Buildings	96
Plant & Machinery	100
Investments	10
Stocks	20
Debtors	15
Cash & Bank	5
Total Assets	246
Less: Long Term Debts	30

Net Assets	216

Value per share

(i) Number of shares $\frac{1,00,00,000}{10}$ = 10,00,000

(ii) Net Assets Rs.2,16,00,000

$\frac{Rs.2,16,00,000}{10,00,000}$ = Rs.21.6

Profit – Earning Capacity Method		Rs.in lakhs
Profit before tax		64.00
Less : Extraordinary income	4.00	
Investment income (not likely to recur)	1.00	5.00
		59.00
Less : Additional expenses in forthcoming years		
Advertisement	5.00	
Depreciation	6.00	11.00
Expected earnings before taxes		48.00
Less: Income - tax @ 30%		14.40
Future maintainable profits (after taxes)		**33.60**

Value of business

Capitalisation factor $= \frac{33.60}{0.15} =$ 224

Value per share

$\frac{224}{10}$ = Rs.22.40

Fair Price of share	Rs.
Value as per Net Assets Method	21.60
Value as per Profit earning capacity (Capitalisation) method	22.4
Fair Price = $\frac{21.6+22.4}{2}$	Rs.22/sh.

Question 34
Nov 2017 – RTP

T Ltd. Recently made a profit of Rs.50 crore and paid out Rs.40 crore (slightly higher than the average paid in the industry to which it pertains). The average PE ratio of this industry is 9. As per Balance Sheet of T Ltd., the shareholder's fund is Rs.225 crore and number of shares is 10 crore. In case company is liquidated, building would fetch Rs.100 crore more than book value and stock would realize Rs.25 crore less.

The other data for the industry is as follows:

Projected Dividend Growth	4%
Risk Free Rate of Return	6%
Market Rate of Return	11%
Average Dividend Yield	6%

The estimated beta of T Ltd. is 1.2. You are required to calculate valuation of T Ltd. using

(i) P/E Ratio

(ii) Dividend Yield

(iii) Valuation as per:

a) Dividend Growth Model

b) Book Value

c) Net Realizable Value

Solution :

(i) Rs.50 crore x 9 = Rs.450 crore

(ii) Rs.50 crore x $\frac{0.80}{0.06}$ = Rs.666.70

= 0.060.80

(iii) (a) Ke = 6% + 1.2 (11% - 6%) = 12%

Value of firm = $\frac{\textbf{40 crore x 1.04}}{\textbf{0.12−0.04}}$ = Rs.520 crore

(b) Rs.225 crore

(c) Rs.225 crore + Rs.100 crore – Rs.25 crore = 300 crore

Question 35
Nov 2017 – Paper

Sea Rock Ltd. has an excess cash of Rs.30,00,000 which it wants to invest in short-term marketable securities.

(i) Expenses resulting to investment will be Rs.45,000. The securities invested will have an annual yield of 10%. The company seeks your advice as to the period of investment so as to earn a pre-tax income of 6%.

(ii) Also find the minimum period for the company to break-even its investment expenditure. Ignore time value of money

Solution :

(i) Pre-tax Income required on investment of Rs.30,00,000 is Rs.1,80,000.

Let the period of Investment be 'P' and return required on investment Rs.1,80,000 (Rs.30,00,000 x 6%)

Accordingly,

(Rs.30,00,000 x $\frac{10}{100}$x $\frac{P}{12}$) – Rs.45,000 = Rs.1,80,000

P = 9 months

(ii) Break-Even its investment expenditure

(Rs.30,00,000 x $\frac{10}{100}$x $\frac{P}{12}$) – Rs.45,000 = 0

P = 1.80 months

Question 36
May 2018 – RTP

SAM Ltd. has just paid a dividend of Rs.2 per share and it is expected to grow @ 6% p.a. After paying dividend, the Board declared to take up a project by retaining the next three annual dividends. It is expected that this project is of same risk as the existing projects. The results of this project will start coming from the 4th year onward from now. The dividends will then be Rs.2.50 per share and will grow @ 7% p.a.

An investor has 1,000 shares in SAM Ltd. and wants a receipt of at least Rs.2,000 p.a. from this investment.

Show that the market value of the share is affected by the decision of the Board. Also show as to how the investor can maintain his target receipt from the investment for first 3 years and improved income thereafter, given that the cost of capital of the firm is 8%.

Solution :

Value of share at present = $\frac{D_1}{K_e - g}$

= $\frac{2(1.06)}{0.08-0.06}$ = Rs.106

However, if the Board implement its decision, no dividend would be payable for 3 years and the dividend for year 4 would be Rs.2.50 and growing at 7% p.a. The price of the share, in this case, now would be:

$P_0 = \frac{2.50}{0.08-0.07} \times \frac{1}{(1+0.08)^3}$ = Rs.198.46

So, the price of the share is expected to increase from Rs.106 to Rs.198.45 after the announcement of the project. The investor can take up this situation as follows:

Expected market price after 3 years	$= \frac{2.50}{0.08-0.07}$	Rs.250.00
Expected market price after 2 years	$\frac{2.50}{0.08-0.07} \times \frac{1}{(1+0.08)}$	Rs.231.48
Expected market price after 1 years	$\frac{2.50}{0.08-0.07} \times \frac{1}{(1+0.08)^2}$	Rs.214.33

In order to maintain his receipt at Rs.2,000 for first 3 year, he would sell

10 shares in 1st year @ Rs.214.33 for Rs.2,143.30

9 shares in 1st year @ Rs.231.48 for Rs.2,083.32

8 shares in 1st year @ Rs.250 for Rs.2,000.00

At the end of 3rd year, he would be having 973 shares valued @ Rs.250 each i.e. Rs.2,43,250. On these 973 shares, his dividend income for year 4 would be @ Rs.2.50 i.e. Rs.2,432.50.
So, if the project is taken up by the company, the investor would be able to maintain his receipt of at least Rs.2,000 for first three years and would be getting increased income thereafter.

Question 37
May 2010 – RTP / May 2018 (New) – Paper

Herbal World is a small, but profitable producer of beauty cosmetics using the plant Aloe Vera. Though it is not a high-tech business, yet Herbal's earnings have averaged around Rs.18.5 lakh after tax, mainly on the strength of its patented beauty cream to remove the pimples.
The patent has nine years to run, and Herbal has been offered Rs.50 lakhs for the patent rights. Herbal's assets include Rs.50 lakhs of property, plant and equipment and Rs.25 lakhs of working capital. However, the patent is not shown in the books of Herbal World. Assuming Herbal's cost of capital being 14 percent, calculate its Economic Value Added (EVA).

Solution :

EVA = NOPATA – WACC x Capital Employed.

Capital Employed	**Rs.lacs**
Property, etc.	50
Working Capital	25
Patent Value	50
Effective or Invested Capital	**125**

WACC x CE = 14% x Rs.125 lacs = Rs.17.5 lacs
EVA = Rs.18.5 lacs – Rs.17.5 lacs = Rs.1 lac

Question 38
May 2010 – RTP / Nov 2010 – Paper / May 2014 – RTP / Nov 2014 – RTP / May 2018 (New) – Paper / Nov 2019 (New) – RTP / Nov 2019 (Old) - RTP

An established company is going to be de merged in two separate entities. The valuation of the company is done by a well-known analyst. He has estimated a value of Rs.5,000 lakhs, based on the expected free cash flow for next year of Rs.200 lakhs and an expected growth rate of 5%. While going through the valuation procedure, it was found that the analyst has made the mistake of using the book values of debt and equity in his calculation. While you do not know the book value weights he used, you have been provided with the following information:

(i) The market value of equity is 4 times the book value of equity, while the market value of debt is equal to the book value of debt,
(ii) Company has a cost of equity of 12%,
(iii) After tax cost of debt is 6%.

You are required to advise the correct value of the company.

Solution :

Value of the Company = $\frac{FCFF_1}{Kc - g}$,

5000 = $\frac{200}{Kc - 0.05}$

Kc = 9%

We do not know the weights the analyst had taken for arriving at the cost of capital. Let w be the proportion of equity. Then, (1-w) will be the proportion of debt.

Kc = 9 = w x 12 + (1-w) x 6

9 = 6 + 6w

6w = 3

Hence w = 3/ 6 = 0.5 = 50 % or 1:1

The weights are equal i.e. 1:1 for equity and debt.

The correct weights should be market value of equity : market value of debts.

i.e. 4 times book value of equity : book value of debts. i.e. 4:1 equity : debt

Revised Kc = 4/5 x 12 + 1/5 x 6= 10.8 %

Revised value of the company = $\frac{200}{10.8-5}$ = 200 / 5.8% = 3448.28 lacs.

Question 39

Nov 2014 – Paper / May 2018 (New) – Paper

The risk free rate of return is 5 percent. The expected rate of return on the market portfolio is 11 percent. The expected rate of growth in dividend of X Ltd. is 8 percent. The last dividend paid was Rs.2.00 per share. The beta of X Ltd. equity stock is 1.5

(i) What is the present price of the equity stock of X Ltd.?

(ii) How would the price change when

- The inflation premium increases by 3 percent?
- The expected growth rate decreases by 3 percent?
- The beta decreases to 1.3?

Solution :

(i) Present Price of Stock

Re = Rf + β(Rm - Rf)

= 5 + 1.5(11 - 5)

= 5 + 9= 14%

IV = $\frac{D1}{Re - g}$ = $\frac{2.00(1.08)}{0.14-0.08}$ = Rs.36/share

(ii) Inflation premium = 3%

Rf = 5 x 1.03 = 5.15%

g = 8 – 3 = 5%

β = 1.3

Re = 5.15 + 1.3(11 – 5.15) = 12.755%

IV $= \frac{D1}{Re - g} = \frac{2.00(1.05)}{0.12755-0.05}$ = Rs.27.81/share

Question 40
May 2018 (Old) – Paper

Constant Engineering Ltd. has developed a high tech product which has reduced the Carbon emission from the burning of the fossil fuel. The product is in high demand. The product has been patented and has a market value of Rs.100 Crore, which is not recorded in the books. The Net Worth (NW) of Constant Engineering Ltd. is Rs.200 Crore. Long term debt is Rs.400 Crore. The product generates a revenue of Rs.84 Crore. The rate on 365 days Government bond is 10 percent per annum. Bond portfolio generates a return of 12 percent per annum. The stock of the company moves in tandem with the market. Calculate Economic Value added of the company.

Solution :

EVA = NOPAT – Kc.
= 85 – 75.95
= Rs.8.05 Cr.

a) Kc

Total Investments

	Rs. Cr.
Net Worth	200
Long Term debt	400
Patent Rights	100
	700

Kc = wtKe + wtKd

$= \frac{300}{700} \times 12 + \frac{400}{700} \times 10 = 10.85\%$

$\therefore$ ke = 700 × 10.85% = 75.95

b) NOPAT = Rs.85 Crore

Question 41
Nov 2018 (Old) – RTP

Pragya Limited has issued 75,000 equity shares of Rs.10 each. The current market price per share is Rs.24. The company has a plan to make a rights issue of one new equity share at a price of Rs.16 for every four share held.

You are required to:

(i) Calculate the theoretical post-rights price per share;

(ii) Calculate the theoretical value of the right alone;

(iii) Show the effect of the rights issue on the wealth of a shareholder, who has 1,000 shares assuming he sells the entire rights @ Rs6.4/share; and

(iv) Show the effect, if the same shareholder does not take any action and ignores the issue.

Solution :

(i) Calculation of theoretical Post-rights (ex-right) price per share:

Ex-Right Value = $\left[\frac{MN+SR}{N+R}\right]$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

= $\left[\frac{(24 \times 4)+(16 \times 1)}{4+1}\right]$ = Rs.22.40

(ii) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= Rs.22.40 – Rs.16

= Rs.6.40

(iii) Calculation of effect of the rights issue on the wealth of a shareholder who has 1,000 shares assuming he sells the entire rights:

		Rs.
(a)	Value of shares before right issue (1,000 shares × Rs.24)	24,000
(b)	Value of shares after right issue (1,000 shares × Rs.22.40)	22,400
	Add: Sale proceeds of rights renunciation (250 shares × Rs.6.40)	1,600
		24,000

There is no change in the wealth of the shareholder even if he sells his right.

(iv) Calculation of effect if the shareholder does not take any action and ignores the issue:

	Rs.
Value of shares before right issue (1,000 shares × Rs.24)	24,000
Value of shares after right issue (1,000 shares × Rs.22.40)	22,400
Loss of wealth to shareholders, if rights ignored	1,600

Question 42

May 2013 – Paper / Nov 2018 (Old) – RTP / May 2021 (New) – RTP

ABC Limited, just declared a dividend of Rs. 28.00 per share. Mr. A is planning to purchase the share of ABC Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years. He also expects the market price of this share to be Rs. 720.00 after three years.

You are required to determine:

(i) the maximum amount Mr. A should pay for shares, if he requires a rate of return of 13% per annum.

(ii) the maximum price Mr. A will be willing to pay for share, if he is of the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.

(iii) the price of share at the end of three years, if 9% growth rate is achieved and assuming other conditions remaining same as in (ii) above.

Note : Calculate rupee amount up to two decimal points and use PVF upto 3 decimal points.

Solution :

(i) Expected dividend for next 3 years.

Year 1 (D_1) Rs. 28.00 (1.09) = Rs. 30.52

Year 2 (D_2) Rs. 28.00 $(1.09)^2$ = Rs. 33.27

Year 3 (D_3) Rs. 28.00 $(1.09)^3$ = Rs. 36.26

Required rate of return = 13% (Ke)

Market price of share after 3 years = (P_3) = Rs. 720

The present value of share

$$P_0 = \frac{D_1}{(1+ke)} + \frac{D_2}{(1+ke)^2} + \frac{D_3}{(1+ke)^3} + \frac{P_3}{(1+ke)^3}$$

$$P_0 = \frac{30.52}{(1+0.13)} + \frac{33.27}{(1+0.13)^2} + \frac{36.26}{(1+0.13)^3} + \frac{720}{(1+0.13)^3}$$

P_0 = 30.52(0.0885) + 33.27(0.783) + 36.26(0.693) + 720(0.693)

P_0 = 27.01 + 26.05 + 25.13 + 498.96

P_0 = Rs.577.15

(ii) If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr.A willing be to pay is

$$P_0 = \frac{D_1}{(ke - g)} = \frac{Rs.30.52}{0.13 - 0.09} = \frac{Rs.30.52}{0.04} = Rs.763$$

(iii) Assuming that conditions mentioned above remain same, the price expected after 3 years will be :

$$P_3 = \frac{D_4}{k_e - g} = \frac{D_3(1.09)}{0.13 - 0.09} = \frac{36.26 \times 1.09}{0.04} = \frac{39.52}{0.04} = = Rs.988$$

Question 43
Nov 2018 (Old) – Paper

Eager Ltd. has a market capitalization of Rs.1,500 crores and the current market price of its share is Rs.1,500. It made a PAT of 200 crores and the Board is considering a proposal to buy back 20% of the shares at a premium of 10% to the current market price. It plans to fund this through a 16% bank loan. You are required to calculate the post buy back Earnings Per Share (EPS). The company's corporate tax rate is 30%

Solution :

A.	Market Cap	= 1500
B.	MPS	= 1500
C.	No (Cap/MPS)	= 1 crore
D.	No. of shares to be brought back = 1 x 0.2	= 0.2 crore
E.	Funds needed = 0.20 x 1650 (1500 + 10%)	= 330 crore
F.	Interest post tax = 330 x 16% x 70%	= 36.96
G.	PAT after buy back = 200 – 36.96	= 163.04
H.	EPS = $\frac{PAT}{No}$ = $\frac{163.04}{0.8}$	= Rs.203.80

Question 44
Nov 2018 (Old) – Paper

A company has an EPS of Rs.2.5 for the last year and the DPS of Rs.1. The earnings is expected to grow at 2% a year in long run. Currently it is trading at 7 times its earnings. If required rate of return is 14%, compute the following:

(i) An estimate of the P/E ratio using Gordon growth model.

(ii) The Long term growth rate implied by the current P/E ratio.

Solution :

1. PE using Gordon growth

IV = $\frac{D_1}{R_e - g}$ = $\frac{1(1.02)}{0.14-0.02}$ = 8.5

PE = $\frac{MPS}{EPS}$ = $\frac{8.5}{2.5}$ = 3.4 times

2. Current PE = 7 times

∴MPS = 2.5 x 7 = 17.5

Assuming market is at equilibrium

17.5 = $\frac{1(1+g)}{0.14-g}$

2.45 – 17.5g = 1 + 1g

1.45 = 18.5g

∴g = 7.84%

Question 45
Nov 2018 (Old) – Paper / May 2021 (New) - RTP

KLM Limited has issued 90,000 equity shares of Rs. 10 each. KLM Limited's shares are currently selling at Rs. 72. The company has a plan to make a rights issue of one new equity share at a price of Rs. 48 for every four shares held.

You are required to:

(a) Calculate the theoretical post-rights price per share and analyse the change

(b) Calculate the theoretical value of the right alone.

(c) Suppose Mr. A who is holding 100 shares in KLM Ltd. is not interested in subscribing to the right issue, then advice what should he do.

Solution :

(a) Calculation of theoretical Post-rights (ex-right) price per share

Ex-right value = $\left[\frac{MN+SR}{N+R}\right]$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

$= \left[\frac{Rs.72\times 4+Rs.48\times 1}{4+1}\right]$ = Rs.67.20

Thus, post right issue the price of share has reduced by Rs.4.80 per share.

(b) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= Rs. 67.20 – Rs. 48 = Rs. 19.20

Or

$= \frac{Rs.67.20-Rs.48}{4}$ = Rs.4.80

(c) If Mr. A is not interested in subscribing to the right issue, he can renounce his right eligibility @ Rs. 19.20 per right and can earn a gain of Rs. 480.

Question 46
Nov 2012 – Paper – 8 Marks / Nov 2016 – Paper / Nov 2018 (New) – RTP / May 2019 (Old) - Paper

Eagle Ltd. reported a profit of Rs.77 lakhs after 30% tax for the financial year 2016-17. An analysis of the accounts revealed that the income included extraordinary items of Rs.8 lakhs and an extraordinary loss of Rs.10 lakhs. The existing operations, except for the extraordinary items, are expected to continue in the future. In addition, the results of the launch of a new product are expected to be as follows:

	Rs.in lakhs
Sales	70
Material costs	20
Labour costs	12
Fixed costs	10

You are required to:

(i) CALCULATE the value of the business, given that the capitalization rate is 14%.

(iii) CALCULATE the market price per equity share, assuming Eagle Ltd.'s share capital being comprised of 1,00,000 13% preference shares of Rs.100 each and 50,00,000 equity shares of Rs.10 each and the P/E ratio being 10 times.

Solution :

(i) Computation of Business Value

			Rs.in lakhs
Profit before tax (77/1-0.30)			110
Less: Extraordinary income			(8)
Add: Extraordinary losses			10
			112
Profit from new product		Rs.in lakhs	
Sales		70	
Less: Material costs	20		
Labour costs	12		
Fixed costs	10	(42)	28
			140.00
Less: Taxed @ 30%			42.00
Future Maintainable Profits after taxes			**98.00**
Relevant Capitalisation Factor			0.14
Value of Business (Rs.98/0.14)			700

(ii) Computation of Market Price of Equity Share

Future Maintainable profits (After Tax)	Rs.98,00,000
Less: Preference share dividends 1,00,000 shares of Rs.100 @ 13%	Rs.13,00,000
Earnings available for Equity Shareholders	Rs.85,00,000
No. of Equity Shares	50,00,000
Earnings per share = $\frac{\text{Rs.85,00,000}}{\text{50,00,000}}$	Rs.1.70
PE ratio	10
Market Price per share	Rs.17

Question 47
Nov 2018 (New) – Paper

Income statement for the year ended 31st March, 2018

Particulars	Amount
Sales	40,000
Gross Profit	12,000
Administrative Expenses	6,000
Profit Before Tax	6,000
Tax @ 30%	1,800
Profit After Tax	4,200

Balance sheet as on 31st March, 2018

Particulars	Amount
Fixed Assets	10,000
Current Assets	6,000
Total	**16,000**
Equity share capital	15,000
Sundry Creditors	1,000
Total	**16,000**

The company is contemplating for new sales strategy as follows

1. Sales to grow by 30% per year for next 4 years
2. Assets turnover ratio, net profit ratio and tax rate will remain the same
3. Depreciation will be 15% of value of Asset at the beginning of the year
4. Required rate of return for the company is 15%

Evaluate the viability of new strategy

Solution :

1. Value of firm before strategy

VF $= \frac{FCFF}{K_e} = \frac{PAT}{K_e} = \frac{4200}{15\%}$ = Rs.28,000

2. Value of firm after strategy

Stage 1

Year	1	2	3	4	5
PAT	5460	7098	9227.4	11995.62	11995.62
- NI (△ in capital Employed)	4500	5850	7605	9886.5	-
FCFE	960	1248	1622.5	2109.12	11995.62
PV @ 15%	834.78	943.67	1066.82	1205.90	-

Total = 4051.17

Stage 2

VF4 $= \frac{\text{FCFF (PAT)}}{K_e} = \frac{11995.62}{0.15}$ = 79,970.8

VF0 $= \frac{79970.8}{(1.15)^4}$ = 45,723.56

Total IV = 4,051.17 + 45,723.56 = 49,774.73

3. Value of Strategy = 49,774.73 – 28,000

= 21,774.74

Note: Since the value of strategy is positive we should implement the strategy.

Question 48
May 2019 (New) – RTP

Seawell Corporation, a manufacturer of do-it-yourself hardware and housewares, reported earnings per share of € 2.10 in 2013, on which it paid dividends per share of €0.69. Earnings are expected to grow 15% a year from 2004 to 2008, during this period the dividend payout ratio is expected to remain unchanged. After 2018, the earnings growth rate is expected to drop to a stable rate of 6%, and the payout ratio is expected to increase to 65% of earnings. The firm has a beta of 1.40 currently, and is expected to have a beta of 1.10 after 2018. The market risk premium is 5.5%. The Treasury bond rate is 6.25%.

(a) What is the expected price of the stock at the end of 2018?

(b) What is the value of the stock, using the two-stage dividend discount model?

Solution :

1) Calculation of Re

(a) Stage 1

Re = Rf + β(Rm – Rf)

= 6.25 + 1.14(5.5) = 13.95%

Stage 2

= 6.25 + 1.1(5.5) = 12.3

(b) Stage 1

Year	EPS	DPS @32.857%	PV @13.95%
2014	2.415	0.7935	0.696
2015	2.777	0.9125	0.703
2016	3.194	1.049	0.709
2017	3.673	1.207	0.716
2018	4.224	1.388	0.722
			3.546

(c) Stage 2

$Vf_{18} = \frac{4.224 \times 1.06 \times 0.65}{0.123 - 0.06}$ = 46.195

$Vf_{13} = \frac{46.196}{(1.1395)^5} = 24.045$

(d) Total IV = 24.045 + 3.546

= 27.59

2) Calculation of Payout Ratio

$= \frac{0.69}{2.10} \times 100 = 32.857\%$

Question 49

Nov 2014 – Paper / May 2019 (New) – RTP

The valuation of Hansel Limited has been done by an investment analyst. Based on an expected free cash flow of Rs.54 lakhs for the following year and an expected growth rate of 9 percent, the analyst has estimated the value of Hansel Limited to be Rs.1800 lakhs. However, he committed a mistake of using the book values of debt and equity. The book value weights employed by the analyst are not known, but you know that Hansel Limited has a cost of equity of 20 percent and post tax cost of debt of 10 percent. The value of equity is thrice its book value, whereas the market value of its debt is ninetenths of its book value. What is the correct value of Hansel Ltd?

Solution :

1) $Vf = \frac{FCFF_1}{Kc - g}$

$1800 = \frac{54}{Kc - 0.09}$

$\therefore Kc = 12\%$

2) Let the wt for debt be x

$\therefore$ Equity = 1 – x

10x + 20(1 – x) = 12

10x + 20 – 20x = 12

$\therefore$ x = 0.8

1 – x = 0.2

3) The above were book value with the market value wts shall be

Debt	0.8×0.9	= 0.72
Equity	$\frac{0.2}{1} \times 3$	= 0.6
		1.32

4) Kc based on market value wts

$= 20 \times \frac{0.6}{1.32} + 10 \times \frac{0.72}{1.32} = 14.545\%$

5) $Vf = \frac{FCFF_1}{Kc - g} = \frac{54}{0.14545 - 0.09} = Rs.973.85$

Question 50
May 2019 (New) – Paper

Compute Economic Value Added (EVA) of Goodluck Ltd. From the following information :

Profit & Loss Statement

	Particulars	Rs. In Lakhs
(a)	Income -	
	Revenue from Operations	2,000
(b)	Expenses -	
	Direct Expenses	800
	Indirect Expenses	400
(c)	Profit before interest & tax (a - b)	800
(d)	Interest	30
(e)	profit before tax (c - d)	770
(f)	Tax	231
(g)	Profit after tax (e - f)	539

Balance Sheet

	Particulars	Rs. In Lakhs
	Equity and Liabilities :	
(a)	Shareholders' Fund -	
	Equity Share Capital	1,000
	Reserves & Surplus	600
(b)	Non - Current Liabilities -	
	Long Term Borrowings	200
(c)	Current Liabilities	800
	Total	**2,600**
	Assets :	
(a)	Non - Current Assets	2,000
(b)	Current Assets	600
	Total	**2,600**

Other Information :

(1) Cost of Debts is 15%.

(2) Cost of Equity (i.e. shareholders' expected return) is 12%

(3) Tax Rate is 30%

(4) Bad Debts Provision of Rs.40 lakhs is included in indirect expenses and Rs.40 lakhs reduced from receivables in current assets.

Solution :

EVA = NOPAT – Kc

= 609 – 217.86

= Rs.391.14 lakhs

W.N.1. NOPAT = EBIT – Tax + Non Cash Expenses

= 800 – 231 + 40 = 609

W.N.2. Kc(%)

Capital Invested	Amt.	Cost
Equity (1,000 + 600)	1,600	12%
Debt	200	15%

$$Kc = \frac{1,600}{1,800} \times 12 + \frac{200}{1,800} \times 15\% (1 - 0.3) = 11.84\%$$

W.N.3. Kc (Amt.)

= 1,800 + 40 (No Cash Expense) × 11.84% = 217.86

Question 51
May 2019 (New) – Paper

The shares of G Ltd. Are currently being traded at Rs.46. The company published its results for the year ended 31st March 2019 and declared a dividend of Rs.5. The company made a return of 15% on its capital and expects that to be the norm in which it operates. G Ltd. Also expects the dividends to grow at 10% for the first three years and thereafter at 5%.

You are required to advise whether the share of the company is being traded at premium or discount. PVIF @ 15% for the next 3 years is 0.870, 0.756 and 0.658 respectively.

Solution :

1) Stage 1

Year	Div	PV @15%
1	5.5	4.78
2	6.05	4.57
3	6.655	4.38
		13.73

2) Stage 2

$IV_3 = \frac{D_4}{Re - g} = \frac{6.655(1.05)}{0.15 - 0.05} = 69.8775$

$IV_0 = \frac{69.8775}{(1.15)^3} = 45.95$

Total IV = 45.95 + 13.73 = 59.68

Advise : Since MP = 46, the stock is under priced and investor should go long.

Question 52
May 2019 (New) – Paper

ABB Ltd. has a surplus cash balance of Rs.180 lakhs and wants to distribute 50% of it to the equity shareholders. The company decides to buyback equity shares. The company estimates that its equity share price after re-purchase is likely to be 15% above the buyback price. If the buyback route is taken.

Other information is as under:

1. Number of equity shares outstanding at present (Face value Rs.10 each) is Rs.20 lakhs.
2. The current EPS is Rs.5.

You are required to calculate the following:

I. The price at which the equity shares can be re-purchased, if market capitalization of the company should be Rs.400 lakhs after buy back.

II. Number of equity shares that can be re-purchased.

III. The impact of equity shares re-purchase on the EPS, assuming that the net income remains unchanged.

Solution :

(i) Let P be the buyback price decided by ABB Ltd.

Market Capitalisation after Buyback

400 lakhs = 1.15P (Original Shares – Shares Bought Back)

$$= \left(20\text{lakhs} - \frac{50\% \text{ of } 180 \text{ lakhs}}{P}\right)$$

= 23 lakhs × P – 90 lakhs × 1.15

= 23 lakhs P – 130.50 lakhs

Again, 23 lakhs P – 130.50 lakhs

or 23 lakhs P = 400 lakhs + 130.50 lakhs

or $P = \frac{503.50}{23}$ = Rs.21.89 per share

(ii) Number of Shares to be Bought Back :-

Rs. 90 lakhs/ 21.89 = 4.111 lakhs (Approx.) or 411147 shares

(iii) Shares after buyback

= 20 lakhs – 4.111 lakhs = 15.889 lakhs

or 20,00,000 – 4,11,147 = 15,88,853 shares

∴ EPS = 5 × 20 lakhs/ 15.889 lakhs = Rs.6.29

Thus, EPS of ABB Ltd., increases to Rs.6.29.

So, EPS of ABB Ltd. is increased by Rs.1.29 (6.29 – 5.00)

Question 53
May 2019 (Old) – Paper / May 2021 (New) – RTP

Equity of KGF Ltd. (KGFL) is Rs.410 Crores, its debt is worth Rs.170 Crores. Printer Division segments value is attributable to 74%, which has an Asset Beta (β_P) of 1.45, balance value is applied on Spares and Consumables Division, which has an Asset beta (β_{SC}) of 1.20 KGFL Debt beta (β_D) is 0.24.

You are required to calculate :

(i) Equity Beta (β_E).

(ii) Ascertain Equity Beta (β_E). If KFG Ltd. decides to change its Debt Equity position by raising further debt and buying back of equity to have its Debt Equity Ratio at 1.90. Assume that the present Debt Beta (β_{D1}) is 0.35 and any further funds raised by way of Debt will have a Beta (β_{D2}) of 0.40.

(iii) Whether the new Equity Beta (β_E) justifies increase in the value of equity on account of leverage?

Solution :

(i) $\beta_A = \beta_L$

$\beta_A = 1.45 \times 74\% + 1.2 \times 26\% = 1.385$

$\beta_L = 1.385$

$\beta_L = w + \beta_E + w + \beta_D$

$1.385 = \frac{170}{580} \times 0.24 + \frac{410}{580}\beta_E$

$1.314655 = 0.70689655\ \beta_E$

$\therefore \beta_E = 1.860$

(ii) β_E = ? New Debt : Equity = 1.90, β_D = 0.35 New β_D = 0.40

Existing capital = 580

Existing Debt = 170

New Debt Equity = 1.9 : 1

New Debt = $580 \times \frac{1.9}{2.9} = 380$

New funds revised by debt = 380 – 170 = 210.

$\beta_D = \frac{170}{380} \times 0.35 + \frac{210}{380} \times 0.4 = 0.38$

Total Capital Remains at 580

$\beta_L = 1.385$

$\beta_L = wt\beta_E + wt\beta_D$

$1.385 = \frac{200}{580} \times \beta_E + \frac{380}{580} \times 0.38$

$\beta_E = 3.29$

(iii) Since β_E will increase cost of equity i.e. Re will also increase, it will decrease the value of equity.

Question 54
May 2019 (Old) – Paper / Nov 2020 (New) – Paper

An investor is considering purchasing the equity shares of Lx Ltd., whose current market price (CMP) is 150. The company is proposing a dividend of Rs.6 for the next year. LX is expected to grow @ 18 per cent per annum for the next four years. The growth will decline linearly to 14 per cent per annum after first four years. Thereafter, it will stabilize at 14 per cent per annum infinitely. The required rate of return is 18 per cent per annum.

You are required to determine :

(i) The intrinsic value of one share

(ii) Whether it is worth to purchase the share at this price

t	1	2	3	4	5	6	7	8
PVIF (18, t)	0.847	0.718	0.609	0.516	0.437	0.370	0.314	0.266

Solution :

Stage 1 :

Years	Growth	Dividend	PVIF @18%	PV
1	-	6	0.847	5.082
2	18%	7.08	0.718	5.082
3	18 %	8.35	0.609	5.082
4	18%	9.86	0.516	5.082
5	17%	11.54	0.437	5.043
6	16%	13.38	0.370	4.9506
7	15%	15.39	0.314	4.83246
8	14%	17.54	0.266	4.66564
Total				34.7767

Stage 2 :

IV8 = $\frac{D9}{Re-G} = \frac{17.54(1.14)}{0.18-0.14}$ = 499.89

IV0 = 499.89 x 0.266 = 132.97

Total IV = 34.7767 + 132.97 = 167.7467

Note : Since IV is greater than the current market price of Rs 150, the stock is underpriced in market and therefore investor should go long.

Question 55
Nov 2019 (New) – RTP

Mr. A is thinking of buying shares at Rs.500 each having face value of Rs.100. He is expecting a bonus at the ratio of 1 : 5 during the fourth year. Annual expected dividend is 20% and the same rate is expected to be maintained on the expanded capital base. He intends to sell the shares at the end of seventh year at an expected price of Rs. 900 each. Incidental expenses for purchase and sale of shares are estimated to be 5% of the market price. He expects a minimum return of 12% per annum.
Should Mr. A buy the share? If so, what maximum price should he pay for each share? Assume no tax on dividend income and capital gain.

Solution :

P.V. of dividend stream and sales proceeds

Year	Dividend / Sale	PVF (12%)	PV (Rs.)
1	Rs.20/-	0.893	17.86
2	Rs.20/-	0.797	15.94
3	Rs.20/-	0.712	14.24
4	Rs.24/-	0.636	15.26
5	Rs.24/-	0.567	13.61
6	Rs.24/-	0.507	12.17
7	Rs.24/-	0.452	10.85
7	Rs.1026/- (Rs.900 x 1.2 x 0.95)	0.452	463.75
			Rs.563.68
	Less : Cost of Share (Rs.500 x 1.05)		Rs.525.00
	Net gain		Rs.38.68

Since Mr. A is gaining Rs.38.68 per share, he should buy the share.
Maximum price Mr. A should be ready to pay is Rs.563.68 which will include incidental expenses. So the maximum price should be Rs.563.68 x 100/105 = Rs.536.84

Question 56
Nov 2019 (New) – Paper

Following information is available of M/s.TS Ltd.

	(Rs. in crores)
PBIT	5.00
Less : Interest on Debt. (10%)	1.00
PBT	4.00
Less : Tax @ 25%	1.00
PAT	3.00
No. of outstanding shares of Rs.10 each	40 lakh
EPS (Rs.)	7.5
Market price of share (Rs.)	75
P/E Ratio	10 Times

TS Ltd. Has an undistributed reserves of Rs.8 crores. The company requires Rs.3 crores for the purpose of expansion which is expected to earn the same rate of return on capital employed as present. However, if the debt to capital employed ratio is higher than 35%, then P/E ratio is expected to decline to 8 Times and rise in the cost of additional debt to 14%. Given this data which of the following options the company would prefer, and why?

Option (i) : If the required amount is raised through debt, and

Option (ii) : If the required amount is raised through equity and the new shares will be issued at a price of Rs.25 each.

Solution :

1. Calculation of New EBIT

ROCE = $\frac{EBIT}{Capital\ Employed}$ x 100 = $\frac{5}{4+8+10}$ x 100 = 22.73%

Revised EBIT = 22 + 3 x 22.73% = 5.6825

2. Capital Structure

	Existing	Option 1 = Debt	Option 2 : Equity
Equity	4	4	4 + 1.2
Reserves and surplus	8	8	8 + 1.8
10% Debt	10	10	10
14% Debt	-	3	-
Total	22	25	25

A. Debt option

Debt – Equity ratio = $\frac{10+3}{25}$ x 100 = 52%

PE Ratio = 8 times and New debt rate = 14%

B. Equity option

Debt – Equity ratio = $\frac{10}{25}$ x 100 = 40%

PE Ratio = 8 times and Issue price = 25

No of shares to be issued = $\frac{3\ cr}{25}$ = 12 lakh shares

3. Income statement

	Option 1 Debt option	Option 2 Equity Option
EBIT	5.6825	5.6825
Less Interest	1.42	1
EBT	4.2625	4.6825
Less Tax (25%)	1.065625	1.170625
EAT	3.196875	3.511875
No of shares	40 lakh	52 lakh

EPS	7.99	6.75
PE Ratio	8	8
MPS	Rs 63.9375 / share	Rs 54 / share

Decision : M/s TS Ltd. should opt for option 1.

Question 57
Nov 2019 (New) – Paper

Mr.X, a financial analyst, intends to value the business of PQR Ltd. In terms of the future cash generating capacity. He has projected the following after tax cash flows :

Year :	**1**	**2**	**3**	**4**	**5**
Cash flows (Rs. in lakhs)	1,760	480	640	860	1,170

It is further estimated that beyond 5th year, cash flows will perpetuate at a constant growth rate of 8% per annum, mainly on account of inflation. The perpetual cash flow is estimated to be Rs.10,260 lakh at the end of the 5th year.

Required :

(i) What is the value of the firm in terms of expected future cash flows, if the cost of capital of the firm is 20%.

(ii) The firm has outstanding debts of Rs.3,620 lakh and cash / bank balance of Rs.2,710 lakh. Calculate the shareholder value per share if the number of outstanding shares is 151.50 lakh.

(iii) The firm has received a takeover bid from XYZ Ltd. of Rs.225 per share. Is it a good offer?
[Given : PVIF at 20% for year 1 to Year 5 : 0.833, 0.694, 0.579, 0.482, 0.402]

Solution :

1) Value of firm

Stage 1

Year	CF	PV @ 20%
1	1,760	1,466.67
2	480	333.33
3	640	370.37
4	860	414.74
5	1,170	470.20
		3055.31

Stage 2 :

$$V_5 = \frac{CF_6}{Kc - g} = \frac{10{,}260(1+0.08)}{0.20 - 0.08} = 92{,}340$$

$$V_0 = \frac{92{,}340}{(1.2)^5} = 37{,}109.375$$

Total Value of firm = 3,055.31 + 37,109.375
= 40,164.685

2) Value / Share

$$= \frac{V_F - V_{Debt}}{\text{No.of share}} = \frac{40{,}164.685 - 3{,}620}{151.50}$$

= 241.22/Sh.

3) Takeover bid is than value/share and therefore we should not accept the offer.

Question 58
Nov 2019 (Old) – Paper

XY Ltd., a Cement manufacturing company has hired you as a financial consultant of the company. The Cement Industry has been very stable for some time and the cement companies SK Ltd. and AS Ltd. are similar in size and have similar product market mix characteristic. Use comparable method to value the equity of XY Ltd. In performing analysis, use the following ratios :

(i) Market to book value (ii) Market to replacement cost
(iii) Market to sales (iv) Market to Net income

The following data are available for your analysis :

	SK Ltd.	AS Ltd.	XY Ltd.
Market Value	450	400	
Book Value	400	300	250
Replacement Cost	600	550	500
Sales	550	450	500
Net Income	18	16	14

Solution :

Market value of XY using comparable method

1) Market to Book Value

$$SK = \frac{450}{400} \times 100 = 112.5\%$$

$$AS = \frac{400}{300} \times 100 = 133.33\%$$

$$\text{Average} = \frac{112.5 + 133.33}{2} = 122.92\%$$

$\therefore$ MV of XY = 250 $\times$122.92% = 307.3

2) Market value to Replacement Cost

$$SK = \frac{450}{600} \times 100 = 75\%$$

$$AS = \frac{400}{550} \times 100 = 72.73\%$$

$$\text{Average} = \frac{75 + 72.73}{2} = 73.86\%$$

XY = 500 × 73.86% = 369.3

3) Market to Sales

SK = $\frac{450}{550} \times 100$ = 81.82%

AS = $\frac{400}{450} \times 100$ = 88.89%

Average = $\frac{81.82 + 88.89}{2}$ = 85.355%

XY = 500 × 85.355% = 426.775

4) Market to Net Income

SK = $\frac{450}{18} \times 100$ = 2,500%

AS = $\frac{400}{16} \times 100$ = 2,500%

Average = 2,500%

XY = 14 × 2,500% = 350

5) Average MV of XY = $\frac{307.3 + 369.3 + 426.775 + 350}{4}$

= 363.34375

Question 59
Nov 2019 (Old) – Paper

The current EPS of M/s.VEE Ltd. is Rs.4. The company has shown an extraordinary growth of 40% in its earnings in the last few years. This high growth 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 to 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 require to calculate the intrinsic value of the company's stock based on expected dividend. If the current market price of the stock is Rs.125, suggest if it is advisable for the investor to invest in the company's stock or not.

Solution :

Stage 1 :

Year	GR.	EPS	PO	DPS	PV @ 17%
1	40	5.6	10	0.56	0.48
2	40	7.84	10	0.78	0.57
3	40	10.976	10	1.0976	0.69
4	40	15.37	10	1.54	0.82
5	40	21.51	10	2.15	0.98
6	34	28.83	18	5.19	2.02
7	28	36.90	26	9.59	3.19
8	22	45.02	34	15.30	4.36
9	16	52.22	42	21.92	5.35
10	10	57.44	50	28.71	6.00
					24.46

Stage 2 :

$V_{10} = \frac{D_{11}}{Re - g} = \frac{28.71(1.10)}{0.17 - 0.10} = 451.16$

$V_0 = \frac{451.16}{(1.17)^{10}} = 93.86$

Total IV = 24.46 + 93.86 = Rs.118.32/Sh.

Question 60

Nov 2019 (Old) – Paper

You are interested in buying some equity stocks of RK Ltd. The company has 3 divisions operating in different industries. Division A captures 10% of its industries sales which is forecasted to be Rs.50 crore for the industry. Division B and C captures 30% and 2% of their respective industry's sales, which are expected to be Rs.20 crore and Rs.8.5 crore respectively. Division A traditionally had a 5% net income margin, whereas divisions B and C had 8% and 10% net income margin respectively. RK Ltd. has 3,00,000 shares of equity stock outstanding, which sell at Rs.250.

The company has not paid dividend since it started its business 10 years ago. However from the market sources you come to known that RK Ltd. will start paying dividend in 3 years time and the pay-out ratio is 30%. Expecting this dividend, you would like to hold the stock for 5 years. By analyzing the past financial statements, you have determined that RK Ltd's required rate of return is 18% and that P/E ratio of 10 for the next year and on ending P/E ratio of 20 at the end of the fifth year are appropriate.

Required :

(i) Would you purchase RK Ltd. equity at this time based on your one year forecast?

(ii) If you expect earnings to grow @15% continuously, how much are you willing to pay for the stock of RK Ltd.?

Ignore taxation.

PV Factors are given below :

Years	1	2	3	4	5
PVIF @18%	0.847	0.718	0.609	0.516	0.437

Solution :

1) Computation of Earning Per Share

Division	Margin	Amount
A	50 × 10% × 5%	25,00,000
B	20 × 30% × 8%	48,00,000
C	8.5 ×2% × 10%	1,70,000
		74,70,000

$$EPS = \frac{74,70,000}{3,00,000} = Rs.24.90/-$$

2) Market price at Year end

= 24.90 × 10 = Rs.249

$$PV \text{ of } MP = \frac{249}{1.18} = Rs.211.01$$

Note : We should not but the share since it is currently available in market at Rs.250.

3) Maximum price at which share should be purchased

Stage 1 :

Year	EPS	Div.	PV @ 18%
1	28.64	–	–
2	32.93	–	–
3	37.87	11.36	6.92
4	43.55	13.07	6.74
5	50.08	15.02	6.56
			20.22

Stage 2:

$$IV_5 = \frac{15.02(1.15)}{0.18 - 0.15} = Rs.575.77/Sh.$$

$$IV_0 = \frac{575.77}{(1.18)^5} = 251.61$$

Total IV = 20.22 + 251.61 = Rs.271.83/Sh.

Question 61
Nov 2020 (New) – Paper

AB industries equity capital of Rs 12,00,000, total debt of Rs 8,00,000 and annual sales of Rs 30,00,000. Two mutually exclusive proposals are under consideration for next year. The details of proposal are as under.

	Proposal No 1.	Proposal No. 2
Target Assets to sales ratio	0.65	0.62
Target Net profit Margin (%)	4	5
Target debt to Equity Ratio (DER)	2 : 3	4 : 1
Target Retention Ratio (of Earnings %)	75	-
Annual Dividend (Rs in Lakhs)	-	0.30
New Equity Raised (Rs in Lakhs)	-	1

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

Solution :

Sustainable Growth Rate under Proposal 1

Sales (Given)		Rs. 30 Lakhs
Total Assets	Rs. 30 Lakhs x 0.65	Rs. 19.50 Lakhs
Net Profit	Rs. 30 Lakhs x 4%	Rs. 1.20 Lakhs
Equity Multiplier	$\frac{\text{Equity}}{\text{Equity + Debt}} = \frac{12 \text{ Lakhs}}{12 \text{ Lakhs} + 8 \text{ Lakhs}}$	0.6
ROE	$\frac{1.20 \text{ Lakhs}}{19.50 \text{ Lakhs}} \times 0.60 \times 100$	3.69%
Sustainable Growth Rate	= ROE x Retention Ratio = 3.69% x 0.75 = 2.77%	

Sustainable Growth Rate under Proposal 2

New Equity = Rs. 12 Lakhs + Rs. 1 Lakh = Rs. 13 Lakhs

New Debt = Rs. 13 Lakhs x 4 = Rs. 52 Lakhs

Total Assets = Rs. 13 Lakhs + Rs. 52 Lakhs = Rs. 65 Lakhs

Target Assets to Sales Ratio (Given)		0.62
Sales	Rs. 65 Lakhs / 0.62	Rs. 104.84 Lakhs
Net Profit	Rs. 104.84 Lakhs x 5%	Rs. 5.242 Lakhs
Equity Multiplier	$\frac{\text{Equity}}{\text{Equity + Debt}} = \frac{13 \text{ Lakhs}}{13 \text{ Lakhs} + 52 \text{ Lakhs}}$	0.2
ROE	$\frac{5.242 \text{ Lakhs}}{65 \text{ Lakhs}} \times 0.20 \times 100$	1.613%
Retention Ratio	$\frac{5.242 \text{ Lakhs} - 0.30 \text{ Lakhs}}{5.242 \text{ Lakhs}}$	0.943
Sustainable Growth Rate	= ROE x Retention Ratio = 1.613% x 0.943 = 1.52%	

Question 62
Nov 2020 (New) – Paper

Differentiate between Economic Value Added (EVA) and Market Value Added (MVA)

Solution :

Economic Value Added (EVA) – EVA is a holistic method of evaluating a company's financial performance in terms of its contribution to the society at large. The core concept behind EVA is that a company generates 'value' only if there is a creation of wealth in terms of returns in excess of its cost of capital. The formula is as below-

EVA = NOPAT – (Invested Capital * WACC)

Or

NOPAT – Capital Charge

Market Value Added (MVA) – MVA means Current Market Value of the firm minus Invested Capital. It is an alternative way to gauge performance efficiencies of an enterprise, albeit from a market capitalization point of view, the logic being that the market will discount the efforts taken by the management fairly. Hence, MVA is the true value added that is perceived by the market while EVA is a derived value added that is for the more discerning investor.

Question 63
Jan 2021 (New) – Paper

M/s.Roly Ltd. wants to acquire M/s.Poly Ltd. the following is the Balance Sheet of Poly Ltd. as on 31st March, 2020 :

Liabilities	**Rs.**	**Assets**	**Rs.**
Equity Capital (Rs.10 per share)	10,00,000	Cash	20,000
Retained Earnings	3,00,000	Debtors	50,000
12% Debentures	3,00,000	Inventories	2,00,000
Creditors & other liability	3,20,000	Plant & Machinery	16,50,000
Total	**19,20,000**		**19,20,000**

Shareholders of Poly Ltd. will get one share of Roly Ltd. at current Market Price of Rs.20 for every two shares. External liabilities are expected to be settled at a discount of Rs.20,000. Sundry debtors and Inventories are expected to realise Rs.2,00,000

Poly Ltd. will run as an independent unit. Cash Flow After Tax is expected to be Rs.4,00,000 per annum for next 6 years. Assume the disposal value of the plan after 6 years will be Rs.1,50,000.

Poly Ltd. requires a return of 14%

n	**1**	**2**	**3**	**4**	**5**	**6**
PVIF(14%, n)	0.5877	0.769	0.675	0.592	0.519	0.456

Advise the Board of Directors on the financial feasibility of the Proposal.

Solution :

Calculation of Purchase Consideration

	Rs.
Issue of Share 50000 x Rs. 20	10,00,000
External Liabilities settled	3,00,000
12% Debentures	3,00,000

		16,00,000
Less:	Realization of Debtors and Inventories	2,00,000
	Cash	20,000
		13,80,000

Net Present Value = PV of Cash Inflow + PV of Demerger of Roly Ltd. – Cash Outflow
= Rs. 4,00,000 PVAF(14%,6) + Rs. 1,50,000 PVF(14%, 6) – Rs. 13,80,000
= Rs. 4,00,000 x 3.888 + Rs. 1,50,000 x 0.456 – Rs. 13,80,000
= Rs. 15,55,200 + Rs. 68,400 – Rs. 13,80,000
= Rs. 2,43,600
Since NPV of the decision is positive it is advantageous to acquire Poly Ltd.

Question 64
May 2021 (New) – RTP

Sun Ltd. recently made a profit of Rs. 200 crore and paid out Rs. 80 crore (slightly higher than the average paid in the industry to which it pertains). The average PE ratio of this industry is 9. The estimated beta of Sun Ltd. is 1.2. As per Balance Sheet of Sun Ltd., the shareholder's fund is Rs. 450 crore and number of shares is 10 crore. In case the company is liquidated, building would fetch Rs. 200 crore more than book value and stock would realize Rs. 50 crore less.
The other data for the industry is as follows:
Projected Dividend Growth 4%
Risk Free Rate of Return 6%
Market Rate of Return 11%
Calculate the valuation of Sun Ltd. using
(a) P/E Ratio
(b) Dividend Growth Model
(c) Book Value
(d) Net Realizable Value

Solution :
(a) Rs. 200 crore x 9 = Rs. 1800 crore
(b) K_e = 6% + 1.2 (11% - 6%) = 12%

$$= \frac{80 \text{ crore} \times 1.04}{0.12 - 0.04} = \text{Rs. } 1040$$

(c) Rs. 450 crore
(d) Rs. 450 crore + Rs. 200 crore – Rs. 50 crore = Rs. 600 crore

Thanks ....

CHP - 4 BOND ANALYSIS AND VALUATION

Question 1
Nov 2008 – RTP / Nov 2011 – RTP / Nov 2012 – RTP / May 2016 - RTP

The following data are available for a bond

Face value	Rs.1,000
Coupon Rate	15%
Years to Maturity	6
Redemption value	Rs.1,000
Yield to maturity	17%

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if increase in required yield is by 75 basis points.

Solution :

(1) Current Market Price = PV of Coupons + PV of Redemption
= 150 (PVIFA 17%) + 1,000 (PVIFA 17,6)
= 150 (3.589) + 1,000 (0.390)
= 538.35 +390 = 928.35

(2) Duration

Year (x)	Cash flow	P.V. @ 17% (w)		wx
1	150	.855	128.25	128.25
2	150	.731	109.65	219.3
3	150	.624	93.60	280.8
4	150	.534	80.10	320.4
5	150	.456	68.40	342
6	1150	.390	448.50	2691
			928.50	3981.75

$$D = \frac{\sum wx}{\sum w} = \frac{3981.75}{928.50} = 4.288 \text{ yrs.}$$

3. Volatility $= \frac{\text{Duration}}{\text{YTM Factor}} = \frac{4.288}{1.17} = 3.67$

4. The expected market price if increase in required yield is by 75 basis points.
= Rs.928.35 – (3.67 × 0.75%) = Rs.902.797

Note : Yield increase market rise decreases.

Question 2
Nov 2008 – RTP

The Investment portfolio of a REG EPF Trust is as follows:

Government Bond	Coupon Rate	Purchase rate (F.V. Rs.100 per Bond)	Duration (Years)
G.O.I. 2008	11.68	106.50	3.50
G.O.I. 2012	7.55	105.00	6.50
G.O.I. 2017	7.38	105.00	7.50
G.O.I. 2024	8.35	110.00	8.75
G.O.I. 2034	7.95	101.00	13.00

Face value of total Investment is Rs.5 crores in each Government Bond.

Calculate actual Investment in portfolio.

What is a suitable action to churn out investment portfolio in the following scenario?

1. Interest rates are expected to lower by 25 basis points.
2. Interest rates are expected to raise by 75 basis points.

   Also calculate the revised duration of investment portfolio in each scenario.

Solution :

Calculation of Actual investment of Portfolio

Security	Purchase price	Investment (Rs. in lakhs)
G.O.I. 2008	106.50	532.50*
G.O.I. 2012	105.00	525.00
G.O.I. 2017	105.00	525.00
G.O.I. 2024	110.00	550.00
G.O.I. 2034	101.00	505.00
Total		**2,637.50**

$5 \times 106.5 = 532.50$

Average Duration = $\frac{3.5+6.5+7.5+8.75+13.00}{5}$ = 7.85

Suitable action to churn out investment portfolio in following scenario.

To reduce risk and to maximize profit or minimize losses.

(1) Interest rates are expected to be lower by 25 basis points in such case increase the average duration by purchasing GOI 2034 and Disposing of GOI 2008.

Revised Average Duration shall be = $\frac{39.25-3.5+13.00}{5}$ = 9.75 years

(2) Interest rates are expected to rise by 75 basis points in such case reduce the average duration by (*) Purchasing GOI 2012 and disposing of GOI 2034.

Revised Average Duration shall be = $\frac{39.25-13.00+3.50}{5}$ = 6.55 years

(*) Purchasing of GOI 2008 is not beneficial as maturity period is very short and 75 basis points is comparatively higher change.

Question 3
Nov 2008 Paper – 4 Marks / Nov 2009 – RTP / Nov 2016 - RTP

The following is the Yield structure of AAA rated debenture:

Period	Yield (%)
3 months	8.5%
6 months	9.25
1 year	10.50
2 years	11.25
3 years and above	12.00

(i) Based on the expectation theory calculate the implicit one-year forward rates in year 2 and year 3.

(ii) If the interest rate increases by 50 basis points, what will be the percentage change in the price of the bond having a maturity of 5 years? Assume that the bond is fairly priced at the moment at Rs.1,000.

Solution :

(i) Implicit rate of Interest for Year 2 and Year 3

For Year 2 $= \frac{(1 + r^2)^2}{(1 + r^1)} - 1$

$= \frac{(1.1125)^2}{(1.1050)} - 1 = 12\%$

For Year 3 $= \frac{(1 + r^3)^3}{(1 + r^1)(1 + f^2)} - 1$

$= \frac{(1.12)^3}{(1.1125)^2} - 1 = 13.52\%$

(ii) If fairly priced at Rs.1000 and rate of interest increases to 12.5% the percentage charge will be as follows:

Price $= \frac{1000(1\ 12)^5}{(1.125)^5} = \text{Rs.}978$

% Change $= \frac{1000 - 978}{1000} \times 100 = 2.2\%$

Question 4
Nov 2008 – Paper – 6 Marks / Nov 2009 – RTP / May 2012 – RTP / May 2018 (New) - RTP

XL Ispat Ltd. Has made an issue of 14 % non – convertible debentures on Jan 1, 2007. These debentures have a face value of Rs.100 and is currently traded in the market at a price of Rs.90. Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for

the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2011 at the end of 5 years.

Required

i. Estimate the current yield at the YTM of the Bond.

ii. Calculate the duration of the NCD

iii. Assuming that intermediate coupon payments are, not available for reinvestment calculate the realized yield on the NCD.

Solution :

1. A) Current yield = $\frac{coupon}{Market\ price}$ x 100 = $\frac{7}{90}$ x 100 x $\frac{12}{6}$ = 15.56%

B) YTM = $\frac{i+(FV-P)/n}{(FV+P)/2}$ = $\frac{7+(100-90)/10}{(100+90)/2}$ = 8.42% for 6 months i.e 16.84% PA

2. Duration

Period	Cash Flow	PV @ 8.42%	WX
1	7	6.456	6.456
2	7	5.955	11.91
3	7	5.492	16.476
4	7	5.066	20.264
5	7	4.673	23.365
6	7	4.310	25.86
7	7	3.975	27.825
8	7	3.666	29.328
9	7	3.382	30.438
10	7 + 100	47.675	476.75
Total		**90.65**	**668.672**

Duration = $\frac{\Sigma wx}{\Sigma w}$ = $\frac{668.672}{90.65}$ = 7.37 period of 6 months i.e 3.69 years

3. If intermediate coupon are not available for reinvestment then the total will be available at the end of 5 years. It will function like a ZCB Bond.

90 = $\frac{170}{(1+r)^{10}}$ therefore r = $(\frac{170}{90})^{\frac{1}{10}}$ = 6.38% for 6 months i.e 12.76% PA

Question 5
May 2009 – RTP / Nov 2011 - RTP

A 9% 5 years bond is issued in the market at Rs.90 and redemption price Rs.105. For an investor with marginal income tax rate of 30% and capital gain tax 10% (assuming no indexation), what is the post-tax yield to maturity ?

Solution :

I = 100 × 9% × 0.7 = 6.3

CGT = (105 – 90) × 10% = 1.5

F = 105 – 1.5 = 103.5

$$\text{YTM} = \frac{I + \frac{F-P}{n}}{\frac{F+P}{2}} = \frac{6.3 + \frac{103.5-90}{5}}{\frac{103.5+90}{2}} = 9.30\%$$

Question 6

May 2009 – Paper – 6 Marks / May 2020 (Old) - RTP

ABC Ltd. has Rs.300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a Rs.300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be Rs.6 million and the call premium is 4 per cent. Rs.9 million being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

Solution :

Initial Cash Movements		
A)	Net proceeds of fresh issue (300 – 6)	294
B)	Redemption of old bonds	(312)
C)	Tax shield on bond premium (12 × 30%)	3.6
D)	Tax shield on unamortised portion of issue cost (9 × 0.3)	2.7
		(11.7)

Recurring Cash Flows			
		Old	New
A)	Post tax coupon	25.2	21
B)	Tax shield on unamortized discount, floating cost	0.45	0.3
		$(9 \times \frac{1}{6} \times 0.3)$	$(6 \times \frac{1}{6} \times 0.3)$
		24.75	20.7

4.05

= 4.05 × PVIFA (7%, 6)

= 4.05 × 4.767

= 19.30

Net Savings = 19.3

$$-\ \frac{11.7}{7.6}$$

Since the decision is Positive we should go ahead with bond refunding decision

Question 7
May 2009 Paper – 20 Marks

(a) Consider two bonds, one with 5 years to maturity and the other with 20 years to maturity. Both the bonds have a face value of Rs.1,000 and coupon rate of 8% (with annual interest payments) and both are selling at par. Assume that the yields of both the bonds fall to 6%, whether the price of bond will increase or decrease? What percentage of this increase/decrease comes from a change in the present value of bond's principal amount and what percentage of this increase/decrease comes from a change in the present value of bond's interest payments?

(b) Consider a bond selling at its par value of As. 1.000, with 6 years to maturity and a 7% coupon rate (with annual interest payment), what is bond's duration?

(c) If the YTM of the bond in (b) above increases to 10%, how it affects the bond's duration?

And why?

(d) Why should the duration of a coupon carrying bond always be less than the time to its maturity?

Solution :

A) Since bond is trading at par, redeemable at pat

CY = YTM = Coupon = 8%

5 Yr. Bond					
Yield	P.V. of coupon	+	P.V. of redemption	=	Bond
8%	319.42	+	680.88	=	1000
	(80 × 3.99)		(1000 × 0.681)		
6%	336.99	+	747	=	1090
	(80 × 4.212)		(1000 × 0.747)		
Change	17.57		66.42		83.99
% Δ	20.92%		79.08%		100%

20 Yr Bond					
Yield	P.V. of coupon	+	P.V. of redemption	=	Bond
8%	786	+	214	=	1000
	(80 × 9.818)		(1000 × 0.214)		
6%	917.6	+	312	=	1229.6
	(80 × 11.47)		(1000 × 0.312)		
Change	131.6		98		229.6
% Δ	57.32%		42.68%		100%

B) D = YR × AF × YTM Factor + (1 – YR)n $\because \frac{CY}{YTM} = 1$

= 4.767 × 1.07 = 5.1 yrs.

C) D = 4.8 yrs. = 4.356 × 1.1

Question 8
Nov 2009 Paper - 4 Marks

An investors is considering the purchase of the following Bond:

Face value	Rs.100
Coupon rate	11%
Maturity	3 years

(i) If he wants a yield of 13% what is the maximum price he should be ready to pay for?

(ii) If the Bond is selling for Rs.97.60, what would be his yield?

Solution :

Value of bond = P.V. of coupons + P.V. of redemption

= 11 × PVIFA (13%, 3) + 100 × PVIF (13%, 3)

= Rs.95.27/-

$$\text{YTM} = \frac{I + \frac{F-P}{n}}{\frac{F+P}{2}} = \frac{11 + \frac{100-97.6}{3}}{\frac{100+97.6}{2}} = 11.94\%$$

Question 9
May 2010 RTP

Phototech plc has in issue 9% bonds which are redeemable at their par value of £100 in five years' time. Alternatively, each bond may be converted on that date into 20 ordinary shares of the company. The current ordinary share price of Phototech plc is £4·45 and this is expected to grow at a rate of 6·5% per year for the foreseeable future. Phototech plc has a cost of debt of 7% per year.

Required:

Calculate the following current values for each £ 100 convertible bond:

(i) market value; (ii) floor value; (iii) conversion premium.

Solution :

(a) Calculation of market value of each convertible bond

Expected share price in five years' time = £4·45 x(1·065)5 =£6·10

Conversion value = £6·10 x 20 =£122

Compared with redemption at par value of £100, conversion will be preferred

The current market value will be the present value of future interest payments, plus the present value of the conversion value, discounted at the cost of debt of 7% per year.

Market value of each convertible bond = (£ 9 x 4·100) + (£ 122 x 0·713)

= £123·89

(b) Calculation of floor value of each convertible bond

The current floor value will be the present value of future interest payments, plus the present value of the redemption value, discounted at the cost of debt of 7% per year.

Floor value of each convertible bond = (£ 9 x 4·100) + (£ 100 x 0·713)

= £108·20

(c) Calculation of conversion premium of each convertible bond

Current conversion value = £ 4·45 x 20 =£89·00

Conversion premium = £123·89–£89·00 =£34·89

This is often expressed on a per share basis,

i.e.£34·89/20 =£1·75 per share

Question 10
May 2010 RTP

On 1 June 2003 the financial manager of Gadgets Corporation's Pension Fund Trust is reviewing strategy regarding the fund. Over 60% of the fund is invested in fixed rate long-term bonds. Interest rates are expected to be quite volatile for the next few years.

Among the pension fund's current investments are two AAA rated bonds:

1) Zero coupon June 2018
2) 12% Gilt June 2018 (interest is payable semi-annually)

The current annual redemption yield (yield to maturity) on both bonds is 6%. The semi-annual yield may be assumed to be 3%. Both bonds have a par value and redemption value of $100.

Required:

Estimate the market price of each of the bonds if interest rates (yields):

(i) increase by 1%; (ii) decrease by 1%.

[Given PVF (2.5%, 30) = 0.4767, PVF (3%, 30) = 0.412, PVF (3.5%,30) = 0.3563]

Solution :

1) Current Market Price

A) ZCB = $\frac{\$100}{(1.06)^{15}}$ = 41.73 $

B) 12% Semi Annual Coupon Bond

Coupon = 100 × 12% × 6/12 = 6

Period = 15 years i.e. 30 period of 6 months

IV = PV of coupon + PV of Redemption

= 6 × PVIFA (3%, 30) + 100 × PVIF (3%, 30)

= 117.60 + 41.20 = $ 158.80

2) If Market Rate increase by 1% (i.e. YTM increases by 1%)

A) ZCB = $\frac{\$100}{(1.07)^{15}}$ = Rs.36.25 (Price fall)

B) 12% Semi Annual Bond

Coupon = 6, Period = 30 Period

Yield = 3% + 0.5(1/2) = 3.5%

IV = PV of Coupon + PV of Redemption

= 6 × PVIFA(3.5%, 30) + 100 × PVIF (3.5%, 30)

= 110.35 + 35.63 = Rs.145.98 (Price fall)

3) If market falls by 1% (YTM falls by 1%)

A) ZCB = $\frac{\$100}{(1.05)^{15}}$ = $ 48.10 (Price Rises)

B) 12% Semi Annual Bond

Coupon = $6

Period = 30 Period of 6 months

Yield = 3 – 0.5(1.2) = 2.5%

IV = 6 × PVIFA (2.5%, 30) + 100 × PVIF (2.5%, 30)

= 125.58 + 47.67 = Rs.173.25/Bond

4) **Conclusion :** Bond Price falls with Risk in YTM are Bond Price Risk with falls in YTM.

Question 11

May 2010 Paper – 8 Marks / Nov 2015 - RTP

Consider the following data for government securities

Face value	Interest (Rate %)	Maturity (Years)	Current Price (Rs.)
1,00,000	0	1	90,000
1,00,000	10.5	2	98,000
1,00,000	11.0	3	98,500
1,00,000	11.5	4	98,900

Calculate the forward interest rates.

Solution :

Bond A $90000 = \frac{100000}{(1 + r_{01})}$

r01 $= \frac{100000}{90000} - 1 = 11.11\%$

Bond B $98000 = \frac{10500}{(1 + r_{01})} + \frac{110500}{(1 + r_{02})^2} +$

$98000 - 9450.1 = \frac{110500}{(1 + r_{02})^2}$

r02 $= \left(\frac{110500}{88549.9}\right)^{\frac{1}{2}} - 1 = 11.71\%$

Bond C $98500 = \frac{11000}{(1 + r_{01})} + \frac{11000}{(1 + r_{02})^2} + \frac{11000}{(1 + r_{03})^3}$

$98500 - 9900.1 - 8814.72 = \frac{11000}{(1 + r_{03})^3}$

r03 $= \left(\frac{111000}{79785.18}\right)^{\frac{1}{3}} 1 = 11.64\%$

Bond D $98900 = \frac{11500}{(1+r_{01})} + \frac{11500}{(1+r_{02})^2} + \frac{11500}{(1+r_{03})^3} + \frac{111500}{(1+r_{04})^4}$

$98900 - 10350.1 - 9215.39 - 8264.91 = \frac{111500}{(1+r_{04})^4}$

$r0^4 = \left(\frac{111500}{71069.6}\right)^{\frac{1}{4}} - 1$

$= 11.92\%$

Term Structure

Bond	Maturity	Rate
A	1	11.11
B	2	11.71
C	3	11.64
D	4	11.92

$f_{12} = \frac{(1.1171)^2}{1.1111}) - 1 = 12.31\%$

$f_{13} = \sqrt{\left[\frac{(1.1164)^3}{1.1171}\right]} - 1 = 11.90\%$

$f_{14} = \left[\frac{(1.1192)^4}{1.1111}\right]^{\frac{1}{3}} - 1 = 12.19\%$

$f_{23} = \frac{(111.64)^3}{(111.71)^2} - 1 = 11.5\%$

$f_{24} = \left[\frac{(1.1192)^4}{(1.1171)^2}\right]^{\frac{1}{2}} - 1 = 12.13\%$

$f_{34} = \frac{(1.1192)^4}{(1.1164)^3} - 1 = 12.76\%$

Question 12
Nov 2010 - RTP

NewChem Corporation has issued a fully convertible 10% debenture of Rs.10,000 face value, convertible into 20 equity shares. The current market price of the debenture is Rs.10,800, whereas the current market price of equity share price is Rs.480.

You are required to calculate (i) the conversion premium and (ii) the conversion value.

Solution :

As per the conversion terms 1 Debenture = 20 equity share (known as the conversion ratio.)

The conversion terms can also be expressed as: 1 Debenture of Rs.500 = 1 equity share.

(i) The conversion premium measures how much more expensive it is to buy the convertible debenture than the underlying equity share.

(ii) The cost of buying Rs.500 debenture (one equity share) is:

$$Rs.500 \times \frac{108}{100} = Rs.540$$

Comparing this with the cost of buying one equity share from market at Rs.480.

Thus, conversion premium is therefore:

$$\frac{540 - 480}{480} \times 100 = 12.5\%$$

Therefore, it is more expensive to buy the debenture and get it converted, than to purchase one equity share directly.

(iii) The conversion value is calculated as the market value of equity shares that is equivalent to one unit of the convertible debenture.

Conversion value = conversion ratio X MPS (equity shares)
= 20 x Rs.480
= Rs.9,600

From this calculation of conversion value, the conversion premium may also be calculated as below:

$$\frac{10800 - 9600}{9600} \times 100 = 12.5\%$$

Question 13
Nov 2010 - Paper – 5 Marks

Calculate Market Price of:

(i) 10% Government of India security currently quoted at 110 but interest rate is expected to go up by 1 %.

(ii) A bond with 7.5% coupon interest. Face Value 10,000 & term to maturity of 2 years, presently yielding 6% interest payable half yearly.

Solution :

Assuming Bond to be perpetual

i) Yield $= \frac{\text{Coupen}}{\text{MP}}$

$\therefore \quad = \frac{10}{110}$

$= 0.09\%$

New Yield = 9.09 + 1 = 10.09%

New Price $= \frac{10}{10.09\%}$

= Rs.99.11/-

ii) Value = P.V. of coupons + P.V. of redemption
= 375 × PVIFA (3%, 4) + 10000 × PVIF(3%, 4)
= 10278.78

Question 14
May 2011 - RTP

ABC Ltd. has the following outstanding Bonds.

Bond	Coupon	Maturity
Series X	8%	10 Years
Series Y	Variable changes annually comparable To prevailing rate	10 Years

Initially these bonds were issued at face value of Rs.10,000 with yield to maturity of 8%.

Assuming that:

(i) After 2 years from the date of issue, interest on comparable bonds is 10%, then what should be the price of each bond?

(ii) If after two additional years, the interest rate on comparable bond is 7%, then what should be the price of each bond?

(iii) What conclusions you can draw from the prices of Bonds, computed above.

Solution :

Here we shall compare two bonds, one with fixed copoun rate and another as per with prevailing interest rate.

(i) After 2 Years passed (8 years remaining) Value of Bond Series – X

= Rs.800 PVIAF (10% ,8) + Rs.10,000 PVIF (10%, 8)

= Rs.4,268 + Rs.4,665 = Rs.8,933

Since Bond-Series Y has a variable interest rates, so the interest amount will increase and decrease with the movement of interest rates. As given presently rate of interest is 10%, the value of Bond will be:

= Rs.1,000 PVIAF (10%, 8) + Rs.10,000 PVIF (10%, 8)

= Rs.5,335 + Rs.4,665 = Rs.10,000

(ii) After 2 additional years at the yield rate of 7%, the value of Bond shall be as follows:

Bond-Series X

= Rs.800 PVIAF (7%, 6) + Rs.10,000 PVIF (7%, 6)

= Rs.3,813 + Rs.6,663

= Rs.10,476

Bond-Series Y

= Rs.700 PVIF (7%, 6) + Rs.10,000 PVIF (7%, 6)

= Rs.700 x 4.767 + Rs.10,000 x 0.666

= Rs.3,337 + Rs.6,663 = Rs.10,000

(iii) From above prices it can be concluded that price of Bond-Series X moves inversely with change in interest rate. Whereas, the price of Bond Series Y does not fluctuate, reason being its interest (coupon) adjusted according to change in interest rates.

Question 15
May 2011 - RTP / Nov 2018 - RTP

Pet feed plc has outstanding, a high yield Bond with following features:

Face Value	£ 10,000
Coupon	10%
Maturity Period	6 Years
Special Feature	Company can extend the life of Bond to 12 years.

Presently the interest rate on equivalent Bond is 8%.

(a) If an investor expects that interest will be 8%, six years from now then how much he should pay for this bond now.

(b) Now suppose, on the basis of that expectation, he invests in the Bond, but interest rate turns out to be 12%, six years from now, then what will be his potential loss/gain.

Solution :

(i) If the current interest rate is 8%, the company will not extent the duration of Bond and the maximum amount the investor would ready to pay will be:

= £ 1,000 PVIAF (8%, 6) + £ 10,000 PVIF (8%, 6)

= £ 1,000 x 4.623 + £ 10,000 x 0.630

= 4,623 + 6,300

= £ 10,925

(ii) If the current interest rate is 12%, the company will extent the duration of Bond. After six years the value of Bond will be

= £ 1,000 PVIAF (12%, 6) + £ 10,000 PVIF (12%, 6)

= 4,111 + 5,070

= £ 9,177

Thus, potential loss will be £ 9,177 - £ 10,925 = £1,748

Question 16
Nov 2011 - RTP

M Ltd. has to make a payment on 30th January, 2011 of Rs.80 lakhs. It has surplus cash today, i.e. 31st October, 2010; and has decided to invest sufficient cash in a bank's Certificate of Deposit scheme offering an yield of 8% p.a. on simple interest basis. What is the amount to be invested now?

Solution :

Calculation of Investment Amount

Amount required for making payment on 30th January, 2011= Rs.80,00,000

Investment in Certificates of Deposit (CDs) on 31st October, 2010

Rate of interest	= 8% p.a.
No. of days to maturity	= 91 days
Interest on Rs.1 of 91 days	
(Rs.1 × 0.08 × 91/365)	= 0.0199452

Amount to be received for Re. 1

(Rs.1.00 + Rs.0.0199452) = 1.0199452

Calculation of amount to be invested now to get Rs.80 lakhs after 91 days:

$$= \frac{\text{Rs.80,00,000}}{\text{Rs.1.0199452}}$$

= Rs.78,43,558.65

Question 17

Nov 2011 - Paper – 5 Marks

The six months forward price of a security is Rs.208.18. The rate of borrowing is 8 percent per annum payable at monthly rates. What will be the spot price?

Solution :

Calculation of spot price

The formula for calculating forward price is: $A = P\left(1 + \frac{r}{n}\right)^{mn}$

Using the above formula,

$$P = \frac{208.18}{(1.0067)^6} = 200$$

$$r = \frac{8}{12} = 0.67\% \text{ per month.}$$

Hence, the spot price should be Rs.200.

Question 18

Nov 2011 - Paper – 6 Marks

Pineapple Ltd has issued fully convertible 12 percent debentures of Rs. 5,000 face value, convertible into 10 equity shares. The current market price of the debentures is Rs.5,400. The present market price of equity shares is Rs. 430.

Calculate:

(i) the conversion percentage premium, and

(ii) the conversion value

Solution :

(i) The conversion value can be calculated as follows:

Conversion value = Conversion ratio X Market Price of Equity Shares

= 10 × Rs.430 = Rs.4300

(ii) Conversion Premium %

$$= \frac{5400 - 4300}{4300} \times 100$$

= 25.58%

Question 19

Nov 2011 - Paper – 8 Marks / May 2019 (New) - RTP

Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

Credit Rating	Discount Rate
AAA	364 T Bill rate + 3% Spread
AA	AAA + 2% Spread
A	AAA + 3% Spread

He is considering to invest in AA rated, Rs.1,000 face value bond currently selling at Rs.1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 384 day T-bill rate to be 9%).

You are required to calculate the intrinsic value of the bond for Mr. Z Should he invest in the bond? Also calculate the current yield and the Yield to Maturity (YTM) of the bond.

Solution :

AA Rated yield 9 + 3 + 2 = 14%

1) Value of bond = P.V. of coupons + P.V. of redemption

$= 150 \times PVIFA\ (14\%, 5) + 1000 \times PVIF(14\%, 5)$

$= 150 \times 3.433 + 1000 \times 0.519$

= Rs.1034.36/-

Current MP = Rs.1025.86/-

2) The bond is trading cheap, therefore the investor should go long.

$$CY = \frac{Coupen}{MP} \times 100$$

$$= \frac{150}{1025.86} \times 100$$

= 14.62%

3) YTM

$$= \frac{I + \frac{F-P}{n}}{\frac{F+P}{2}}$$

$$= \frac{150 + \frac{1000 - 1025.86}{5}}{\frac{1000 + 1025.86}{2}} = \frac{144.828}{1012.93}$$

= 14.3%

Question 20

Nov 2012 – RTP / May 2013 – RTP / May 2015 – RTP / Nov 2016 – RTP / May 2018 - RTP

The following data is related to 8.5% Fully Convertible (into Equity shares) Debentures issued by JAC Ltd. at Rs.1000.

Market Price of Debenture	Rs.900
Conversion Ratio	30
Straight Value of Debenture	Rs.700
Market Price of Equity share on the date of Conversion	Rs.25
Expected Dividend Per Share	Rs.1

You are required to calculate:

(a) Conversion Value of Debenture

(b) Market Conversion Price

(c) Conversion Premium per share

(d) Ratio of Conversion Premium

(e) Premium over Straight Value of Debenture

(f) Favourable income differential per share

(g) Premium pay back period

Solution :

(a) Conversion Value of Debenture

= Market Price of one Equity Share X Conversion Ratio

= Rs.25 X 30 = Rs.750

(b) Market Conversion Price

$$= \frac{\text{Market Price of Convertible Debenture}}{\text{Convertion Ratio}} = \frac{900}{30} = \text{Rs.30}$$

(c) Conversion Premium per share

= Market Conversion Price – Market Price of Equity Share

= Rs.30 – Rs.25 = Rs.5

(d) Ratio of Conversion Premium

$$= \frac{\text{Conversion Premium Per Share}}{\text{Market Price of Equity Share}} = \frac{5}{25} = 20\%$$

(e) Premium over Straight Value of Debenture

$$= \frac{\text{Market Price of Convertible Bond}}{\text{Straight Value of Bond}} - 1 = \frac{900}{700} - 1 = 28.6\%$$

(f) Favourable income differential per share

$$= \frac{\text{Coupon Interest from Debenture} - \text{Convertion Ratio} - \text{Dividend Per Share}}{\text{Convertion Ratio}}$$

$$= \frac{85 - 30 - 1}{30} = \text{Rs.1.833}$$

(g) Premium pay back period

$$= \frac{\text{Conversion Premium Per Share}}{\text{Favaourable Income Differential Per Share}} = \frac{5}{1.833} = 2.73 \text{ years}$$

Question 21
Nov 2012 - Paper – 5 Marks

Calculate the Current price and the Bond equivalent yield (using simple compounding) of a money market instrument with face value of Rs.100 and discount yield of 8% in 90 days. Take 1 year 360 days.

Solution :

1) Current price

$$IV = \frac{100}{1.08}$$

$$= 92.59$$

2) Bond Equivalent Yield

$$BEY = \frac{100 - V}{V} \times \frac{300}{\text{Days of Maturity}}$$

$$BEY = \frac{100 - 92.59}{92.59} \times \frac{360}{90} = 32\%$$

Question 22
May 2013 - Paper – 6 Marks

M/s. Earth Limited has 11% bond worth of Rs.2 crores outstanding with 10 years remaining to maturity.

The company is contemplating the issue of a Rs.2 crores 10 year bond carring the coupon rate of 9% and use the proceeds to liquidate the old bonds.

The unamortized portion of issue cost on the old bonds is Rs.3 lakhs which can be written off no sooner the old bonds are called. The company is paying 30% tax and it's after tax cost of debt is 7%. Should Earth Limited liquidate the old bonds?

You may assume that the issue cost of the new bonds will be Rs.2.5 lakhs and the call premium is 5%.

Solution :

1. Initial outlay

A)	Redemption of old Bonds (2,00,00,000 × 1.05)	(2,10,00,000)
B)	Tax shield on POR (2,00,00,000 × 0.5 × 30%)	3,00,000
C)	Issue of New Bonds (2,00,00,000 – 2,50,000)	1,97,50,000
D)	Tax on unamortised portion of issue cost of old bonds.	
	(3,00,000 × 30%)	90,000
	Net	(8,60,000)

2. Future Cash Flows

	New	Old
Post tax Interest	(12,60,000) (18,00,000 × 70%)	(15,40,000) (22,00,000 × 70%)
Amortisation of Issue Cost	7,500 (2,50,000 / 10 × 30%)	9,000 (3,00,000 / 10 × 30%)
Net	12,52,500	15,31,000

Saving 2,78,500

× PVI FA (7% 10 yrs) – 19,56,068

3. Net Savings = 19,56,068 – 8,60,000 = 10,96,068

Question 23
May 2014 - RTP

Mr. A is planning for making investment in bonds of one of the two companies X Ltd. and Y Ltd. The detail of these bonds is as follows:

Company	Face Value	Coupon Rate	Maturity Period
X Ltd.	Rs.10,000	6%	5 Years
Y Ltd.	Rs.10,000	4%	5 Years

The current market price of X Ltd.'s bond is Rs.10,796.80 and both bonds have same Yield To Maturity (YTM). Since Mr. A considers duration of bonds as the basis of decision making, you are required to calculate the duration of each bond and you decision.

Solution :

To calculate duration of bond we need YTM.

$$\text{YTM} = \frac{i + (FV - P)/n}{(FV + P)/2}$$

$$= \frac{600+(10,000 - 10796.80)/5}{(10,000 + 10796.80)/2}$$

$$= \frac{600 - 159.36}{10398.4}$$

= 4.2%

Duration of X Ltd.' s Bond

Year	Cash Flows	P.V @ 4.2%	Wx
1	600	575.82	575.82
2	600	552.60	1105.20
3	600	530.34	1591.02
4	600	508.98	2035.92
5	10600	8,629.46	43147.30

Total	**10,797.20**	**48455.26**

$$D = \frac{\sum wx}{\sum w} = \frac{48455.26}{10797.20} = 4.49 \text{ Yrs.}$$

Duration of Y Ltd.'s Bond

Year	Cash Flows	P.V @ 4.2%	Wx
1	400	383.88	383.88
2	400	368.40	736.8
3	400	353.56	1060.68
4	400	339.32	1357.28
5	10400	8466.64	42333.2
Total		**9,911.80**	**45871.84**

$$D = \frac{\sum wx}{\sum w} = \frac{45871.84}{9911.8} = 4.628 \text{ Yrs.}$$

Decision: Since the duration of Bond of X Ltd. is lower hence it should be preferred.

Question 24
May 2014 - Paper – 8 Marks / May 2017 - RTP /

GHI Ltd., AAA rated company has issued, fully convertible bonds on the following terms, a year ago:

Face value of bond	Rs.1,000
Coupon (interest rate)	8.50%
Time to Maturity (remaining)	3 years
Interest Payment	Annual, at the end of year
Principal Repayment	At the end of bond maturity
Conversion ratio (Number of shares per bond)	25
Current market price per share	Rs.45
Market price of convertible bond	Rs.1175

AAA rated company can issue plain vanilla bonds without conversion option at an interest rate of 9.5%.

Required: Calculate as of today:

(i) Straight Value of bond.

(ii) Conversion Value of the bond.

(iii) Conversion Premium.

(iv) Percentage of downside risk.

(v) Conversion Parity Price.

t	1	2	3
$PVIF_{0.095,t}$	0.9132	0.8340	0.7617

Solution :

(i) Straight Value of Bond

= Rs.85 x 0.9132 + Rs.85 x 0.8340 + Rs.1085 x 0.7617 = Rs.974.96

(ii) Conversion Value

= Conversion Ratio x Market Price of Equity Share

= Rs.45 x 25 = Rs.1,125

(iii) Conversion Premium

Conversion Premium = Market Conversion Price - Market Price of Equity Share

$= \frac{1175}{25} - \text{Rs.45} = \text{Rs.2}$

(iv) Percentage of Downside Risk

$= \frac{1,175 - 974.96}{974.96} \times 100 = 20.52\%$

(v) Conversion Parity Price

$= \frac{\text{Bond Price}}{\text{No of shares on Conversion}}$

$= \frac{1175}{25} = \text{Rs.47}$

Question 25

May 2015 - Paper – 8 Marks

On 31st March, 2013, the following information about Bonds is available

Name of Security	Face Value	Maturity Date	Coupon Rate	Coupon Date
Zero Coupon	10,000	31st March, 2023	N.A	N.A
T – Bill	1,00,000	20th June, 2013	N.A	N.A
10.71% GOI 2023	100	31st March, 2023	10.71	31st March
10% GOI 2018	100	31st March, 2018	10.00	31st March & 31st October

Calculate

1. If 10 years yield is 7.5% p.a. What price the Zero coupon Bond would fetch on 31st March, 2013?
2. What will be the annualized yield if the T – bill is traded @98,500?
3. If 10.71% GOI 2023 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March?
4. If 10% GOI 2018 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March?

Solution :

1. Value of Zero Coupon Bond for 10 years yield @ 7.5%

$\frac{10,000}{(1.075)^{10}} = \text{Rs.4,852}$

2. Annualized yield

$$BEY = \frac{(FV - P)}{P} \times \frac{360}{\text{Days of Maturity}}$$

$$BEY = \frac{10000 - 98500}{98500} \times \frac{361}{81} = 6.86\%$$

3. Value of GOI 2023 Bond
   = PV of Coupons + PV of Redemption
   = 10.71 PVAF (8%, 10) + 100 PVF (8%, 10)
   = 10.71 x 6.71 + 100 x 0.4632
   = Rs.118.18
4. Value of GOI 2018 Bond
   = PV of Coupons + PV of Redemption
   = 5 PVAF (4%, 10) + 100 PVF (4%, 10)
   = 5 x 8.11 + 100 x 0.6756 = Rs.108.11

Question 26
Nov 2015 Paper – 5 Marks / May 2018 (Old) - RTP

The following data is available for a Bond

Face Value	Rs.1000
Coupon Rate	11%
Years to Maturity	6
Redemption Value	Rs.1,000
Yield to Maturity	15%

(Round of your answers to 3 decimals)

Calculate the following with respect to the Bond

1. Current Market Price
2. Duration of Bond
3. Volatility of Bond
4. Expected market price if increase in required yield is by 100 basis points.
5. Expected market price if decrease in required yield is by 75 basis points.

Solution :

1. Current Price of the Bond
   = PV of Coupon + PV of Redemption
   = 110 x PVAF (15%, 6) + 1,000 x PVF (15%, 6)
   = 110 x 3.7845 + 1,000 x 0.4323
   = 416.29 + 432.3 = 848.59
2. Duration of the Bond

Year	Cash Flows	P.V @ 15%	Wx
1	110	95.70	95.70
2	110	83.16	166.32
3	110	72.38	217.14

4	110	62.92	251.68
5	110	54.67	273.35
6	1110	479.52	2877.12
Total		**848.35**	**3881.31**

$$D = \frac{\sum wx}{\sum w} = \frac{3881.31}{848.35} = 4.575 \text{ Yrs.}$$

3. Volatility of the Bond

$$= \frac{\text{Duration}}{\text{YTM Factor}} = \frac{4.570}{1.15} = 3.974 \text{ yrs.}$$

4 Expected market price if increase in required yield is by 100 basis points.

= 848.35 x 3.974% = 33.162

Market Price will decrease as Market price and yield are inversely related.

Hence the expected market price = 848.35 – 33.162 = Rs.801.318

5. Expected market price if decrease in required yield is by 75 basis points.

= 848.35 x 75% of (3.974) = 24.87

Market Price will increase as Market price and yield are inversely related.

Hence the expected market price = 848.35 + 24.87 = Rs.859.35

Question 27
Nov 2015 – Paper – 6 Marks

Mr A will need Rs.1,00,000 after 2 years for which he wants to make one time necessary investment now. He has choice of 2 types of bonds. The details of which are as follows.

	Bond X	**Bond Y**
Face Value	Rs.1000	Rs.1000
Coupon	7% Payable annually	8% Payable annually
Years to maturity	1	4
Current Price	Rs.972.73	Rs.936.52
Current Yield	10%	10%

Advice Mr. A whether he should all his money in one type of bond or he should buy both the bonds and if so, in which quantity?

Assume that there will be no call risk or default risk?

Solution :

Duration of Bond X

Year	**Cash Flows**	**P.V @ 10%**		**Wx**
1	1070	.909	972.63	972.63
Total			**972.63**	**972.63**

$$D = \frac{\sum wx}{\sum w} = \frac{972.63}{972.63} = 1 \text{ yrs.}$$

Duration of Bond Y

Year	Cash Flows	P.V @ 10%	Wx
1	80	72.72	72.72
2	80	66.08	132.16
3	80	60.08	180.24
4	1080	737.64	2950.56
Total		**936.52**	**3335.68**

$$D = \frac{\sum wx}{\sum w} = \frac{3335.68}{936.52} = 3.56 \text{ yrs.}$$

Let a be the investment in bond X and therefore investment in Bond Y will be (1-a)

Since the required duration is 2 years, the proportion of investment in each security shall be calculated as follows

2 = a x 1 + (1-a) 3.563

A = 0.61

B = 1 – 0.61 = 0.39

Therefore, the proportion of investment shall be 61% in X and 39% in Y

Amount of Investments

Bond X $= \frac{1,00,000}{(1.1)^2} = 82,644.63$

$= 82,644.63 \times 0.61$

= Rs.50,413

Bond y = 82,644.63 – 50413

= Rs.32,232

Question 28

May 2016 Paper / May 2020 (New) - RTP

Bright Computers Limited is planning to issue a debenture series with a face value of Rs.1,000 each for a term of 10 years with the following coupon rates:

Years	Rates
1 – 4	8%
5 – 8	9%
9 – 10	13%

The current market rate on similar debenture is 15% p.a. The company proposes to price the issue in such a way that a yield of 16% compounded rate of return is received by the investors. The redeemable price of the debenture will be at 10% premium on maturity. What should be the issue price of debenture?

PV @ 16% for 1 to 10 years are: .862, .743, .641, .552, .476, .410, .354, .305, .263, .227 respectively.

Solution :

Present Value of Debenture

Year	Cash Outflow (Rs.)	PVF @ 16%	Present Value (Rs.)
1 – 4	80	2.798	223.84
5 – 8	90	1.545	139.05
9 – 10	130	0.490	63.70
10	1100	0.227	249.70
			676.29

Question 29

Nov 2016 – Paper / May 2019 (Old) - RTP

A Ltd. has issued convertible bonds, which carries a coupon rate of 14%. Each bond is convertible into 20 equity shares of the company A Ltd. The prevailing interest rate for similar credit rating bond is 8%. The convertible bond has 5 years maturity. It is redeemable at par at Rs.100.

The relevant present value table is as follows.

Present Value	t_1	t_2	t_3	t_4	t_5
$PVIF_{0.14,t}$	0.877	0.769	0.675	0.592	0.519
$PVIF_{0.08,t}$	0.926	0.857	0.794	0.735	0.681

You are required to estimate:

(Calculations be made upto 3 decimal places)

(i) Current market price of the bond, assuming it being equal to its fundamental value,

(ii) Minimum market price of equity share at which bond holder should exercise conversion option; and

(iii) Duration of the bond.

Solution :

(i) Current Market Price of Bond

Time	CF	PVIF *% PV (CF)	PV (CF)
1	14	0.926	12.964
2	14	0.857	11.998
3	14	0.794	11.116
4	14	0.735	10.290
5	114	0.681	77.634
		ΣPV (CF) i.e. $P_0 =$	124.002

Say Rs.124.00

(ii) Minimum Market Price of Equity shares at which Bondholder should exercise conversion option:

$\frac{124.00}{20.00}$ = Rs.6.20

(iii) Duration of the Bond

Year	Cash Flow	PV @ 8%	Wx
1	14	12.964	12.964
2	14	11.998	23.996
3	14	11.116	33.348
4	14	10.290	41.16
5	114	77.634	388.17
		124.002	**499.638**

$$D = \frac{\sum Wx}{\sum W} = \frac{499.638}{124.002} = 4.029 \text{ yrs.}$$

Question 30
May 2017 - RTP

G holds securities as detailed herein below:

Security	Face Value (Rs.)	Numbers	Coupon Rate (%)	Maturity Years	Annual Yield (%)
Bonds A	1,000	100	9	3	12
Bond B	1,000	100	10	5	12
Preference shares C	100	1,000	11	*	13*
Preference shares C	100	1,000	12	*	13*

* Likelihood of being called (redeemed) at a premium over par.

Compute the current value of G's portfolio.

Solution :

Computation of current value of G's portfolio

(i) 100 Nos. Bond A, Rs.1,000 par value, 9% Bonds maturity 3 years:

	Rs.
Current value of interest on bond A	
1-3 years: Rs.9000 × Cumulative P.V. @ 12% (1-3 years)	21,618
= Rs.9000 × 2.402	
Add: Current value of amount received on maturity of Bond A	
End of 3rd year: Rs.1,000 × 100 × P.V. @ 12% (3rd year)	71,200
= Rs.1,00,000 × 0.712	
	92,818

(ii) 100 Nos. Bond B, Rs.1,000 par value, 10% Bonds maturity 5 years: Current value of interest on bond B

1-5 years: Rs.10,000 × Cumulative P.V. @ 12% (1-5 years)

= Rs.10,000 × 3.605 36,050

Add: Current value of amount received on maturity of Bond B

End of 5th year: Rs.1,000 × 100 × P.V. @ 12% (5th year) 56,700

= Rs.1,00,000 × 0.567 92,750

(iii) 100 Preference shares C, Rs.1,000 par value, 11% coupon

$\frac{11\% \text{ x } 1000\text{Nos.x Rs.}100}{13\%} = \frac{11,000}{0.13}$ Rs.84,615

(iv) 100 Preference shares D, Rs.1,000 par value, 12% coupon

$\frac{12\% \text{ x } 1000\text{Nos.x Rs.}100}{13\%} = \frac{12,000}{0.13}$ Rs.92,308

Total current value of his portfolio [(i) + (ii) + (iii) + (iv)] 3,62,491

Question 31

May 2017 - Paper

Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2018 @ 5.65% for Rs.8 crore. Assuming that clean price be Rs.99.42 and initial Margin be 2% and days of accrued interest be 262 days. You are required to determine

(i) Dirty Price

(ii) Repayment at maturity (consider 360 days in a year)

Solution :

(a) Dirty Price

Clean price + Interest accrued

$= 99.42 + 100 \text{ x } \frac{10}{100} \text{ x } \frac{262}{360}$

= 106.70

(b) First leg (Start Proceed)

$= \text{Nominal Value x } \frac{\text{Dirty Price}}{100} \text{ x } \frac{100-\text{Initial Margin}}{100}$

$= \text{Rs.8,00,00,000 x } \frac{106.70}{100} \text{ x } \frac{100-2}{100}$

= Rs.8,36,52,800 or, rounded off to Rs.8,36,53,000

(c) Second leg (Repayment at Maturity)

$= \text{Start Proceed x } \left(1 + \text{Repo rate x } \frac{\text{No.of days}}{360}\right)$

$= \text{Rs.8,36,53,800 x } \left(1 + 0.0565 \text{ x } \frac{14}{360}\right)$

= Rs.8,38,36,804

Question 32
May 2017 - Paper

RC Ltd. is able to issue commercial paper of Rs.50,00,000 every 4 months at a rate of 15% p.a. The cost of placement of commercial paper issue is Rs.2,000 per issue. RC Ltd. is required to maintain line of credit Rs.2,00,000 in bank balance. The applicable income tax rate for RC Ltd. is 30%. What is the cost of funds (after taxes) to RC Ltd. for commercial paper issue? The maturity of commercial paper is four months.

Solution :

	Rs.
Issue Price	50,00,000
Less: Interest @ 15% for 4 months	2,50,000
Issue Expenses	2,000
Minimum Balance	2,00,000
	45,48,000

Cost of Funds = $\frac{2,52,000(1-0.30)}{45,48,000} \times \frac{12}{4} \times 100$

$= \frac{5,29,200}{45,48,000} \times 100 \qquad = 11.636\%$

Question 33
May 2017 - Paper

P Ltd. has current earnings of Rs.6 per share with 10,00,000 shares outstanding. The company plans to issue 80,000, 8% convertible preference shares of Rs.100 each at par. The preference shares are convertible into 2 equity shares for each preference share held. The equity share has a current market price of Rs.42 per share.

Calculate:

(i) What is preference share's conversion value?

(ii) What is conversion premium?

(iii) Assuming that total earnings remain the same, calculate the effect of the issue on the basic earnings per share (A) before conversion (B) after conversion.

(iv) If profits after tax increases by Rs.20 Lakhs what will be the basic EPS, (A) before conversion and (B) on a fully diluted basis?

Solution :

(i) Conversion value of preference share

Conversion Ratio x Market Price

2 × Rs.42

= Rs.84

(Or Rs.67,20,000)

(ii) Conversion Premium

(Rs.100/Rs84)–1 = 19.05%

(Or Rs.12,80,000 or Rs.16 per share)

(iii) Effect of the issue on basic EPS

	Rs.
Before Conversion	
Total (after tax) earnings Rs.6 x 10,00,000	60,00,000
Dividend on Preference Shares	6,40,000
Earnings available to equity holders	53,60,000
No. of shares	10,00,000
EPS	5:36
On diluted Basis	
Earnings	60,00,000
No. of shares (10,00,000 + 1,60,000)	11,60,000
EPS	5:17

(iv) EPS with increase in Profit

	Rs.
Before Conversion	
Earnings	80,00,000
Dividend on Preference Shares	6,40,000
Earnings for equity shareholders	73,60,000
No. of shares	10,00,000
EPS	7:36
On diluted Basis	
Earnings	80,00,000
No. of shares	11,60,000
EPS	6:90

Question 34
May 2018 Paper

A bond is held for a period of 45 days. The current discount yield is 6 per cent per annum. It is expected that current yield will increase by 200 basis points and current market price will come down by Rs.2.50.

Calculate:

(i) Face value of the Bond and

(ii) Bond Equivalent Yield

Solution :

1. Bond with discount yield of 6% matures in 45 days

Therefore, yield of 45 days = 6 x $\frac{45}{365}$ = 0.7397%

So the Present value of the bond today
PV = x/1.007397 = 0.9927x

2. If yield increases by 2% price falls by Rs.2.5
   A. So at 8% yield price will be 0.9927x – 2.5
   B. Also with discount yield of 8% maturing in 45 days
      The yield for 45 days shall be = 8 x $\frac{45}{365}$ = 0.9863%

      So the Present value of the bond today
      PV = x/1.009863 = 0.9902x

3. So 0.9927x – 2.5 = 0.9902x
   Therefore x = 1000 ------- Face Value = 1000

Question 35
May 2018 (New) – Paper

Sabanam Ltd. has issued convertible debentures with coupon rate 11%. Each debenture has an option to convert to 16 equity shares at any time until the date of maturity. Debentures will be redeemed at Rs.100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5-year security. As an advisor, when will you advise the investor to exercise conversion for given market prices of the equity share of

(i) Rs.5,
(ii) Rs.6
(iii) Rs.7.10.

Cumulative PV factor for 8% for 5 years	:	3.993
PV factor for 8% for year 5	:	0.681

Solution :

Investor wants a return of 8%
On Investment
∴IV of Bond
= PV of coupon + PV of Redemption
= 11 × PVIFA (8%, 5) + 100 × PVIFA (8%, 5)
= 112.023
For investor to break even and convert share the price would be
= 112.023 / 16 = Rs.7.
The Investor should convert at price of Rs.7.10/share

Question 36
Nov 2013 – Paper / Nov 2018 – Paper

Sonic Ltd. issued 8% 5 year bonds of Rs.1,000 each having a maturity of 3 years. The present rate of interest is 12% for one year tenure. It is expected that forward rate of interest for one year tenure is going to fall by 75 basis points and further by 50 basis points for next year. This bond has a beta value of 1.02 and is more popular in the market due to less credit risk.

Calculate:

(i) Intrinsic Value of bond

(ii) Expected price of bond in the market

Solution :

Discounting rates

Year	Forward Rate
1	12%
2	11.25%
3	10.75%

A. IV of Bond = PV of future cash flow

Year	CF	PV	
1	80	71.43	-@12%
2	80	64.21	-@12%, 11.25%
3	1080	782.64	-@12%, 11.25%, 10.75%
		918.28	

B. Expected value of Bond = 918.20 x 1.02 = Rs.936.6456

Question 37
Nov 2016 – RTP / Nov 2018 (New) - Paper

Tangent Ltd. is considering calling Rs.3 crores of 30 years, Rs 1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of Rs 1,150 and had initially collected proceeds of Rs.2.91 crores since a discount of Rs 30 per bond was offered. The initial floating cost was Rs.3,90,000. The Company intends to sell Rs.3 crores of 12 per cent coupon rate, 25 years bonds to raise funds for retiring the old bonds. It proposes to sell the new bonds at their par value of Rs.1,000. The estimated floatation cost is Rs.4,25,000. The company is paying 40% tax and its after tax cost of debt is 8 per cent. , As the new bonds must first be sold and then their proceeds to be used to retire the old bonds, the company expects a two months period of overlapping interest during which interest must be paid on both the old and the new bonds. You are required to evaluate the bond retiring decision. [PVIFA 8%,25= 10.675]

Solution :

Part 1 : Initial Cash Flows

1	Redemption of Old Bonds (30000000 / 1000 x 1150)	3,45,00,000	Outflow
2	Tax Shield on POR of OLD Bonds (45,00,000 x 40%)	18,00,000	Inflow
3	Issue of New Bonds (3,00,00,000 - 4,25,000)	2,95,75,000	Inflow
4	Tax shield on unamortised floatation cost on old bonds (9,00,000 + 3,90,000) x 25/30 x 40%)	4,30,000	Inflow
5	Post tax overlapping interest (3,00,00,000 x 14% x 2/12 x 60%)	4,20,000	Outflow
	NET	**-31,15,000**	

Part 2 : Recurring Cash Flows

		OLD	NEW
1	Post Tax Coupon	25,20,000	21,60,000
	OLD = 30000000 x 14% x 60%		
	New = 30000000 x 12% x 60%		
2	Tax Shield on Amortization	17,200	6800
	of floatation cost/Discount		
	OLD = (900000 + 390000)/30)x40%		
	New = 425000 / 25 x 40%		
	NET	**25,02,800**	**21,53,200**

Difference of Old and New	3,49,600	
PVIFA for 25 years	37,31,980	
NET Cash flows of Part 1 and Part 2		6,16,980

Since the cash flows are positive we should go ahead with the project.

Question 38
Nov 2018 (New) - Paper

The following data are available for three bonds A, B and C. These bonds are used by a bold 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) The bond portfolio manager has been asked to keep 45% of the portfolio money in Bond A. Calculate the percentage amount to be invested in bonds B and C that need to be purchased to immunize the portfolio.

(iii) After the portfolio has been formulated, an interest rate change occurs, increasing the yield to 11%. The new duration of these bonds are : Bond A = 7.15 Years, Bond B = 6.03 Years and Bond C = 4.27 years.
Is the portfolio still immunized ? Why or why not ?

(iv) Determine 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 :

PV	T1	T2	T3	T4	T5
PVIF0.09	0.917	0.842	0.772	0.708	0.650

PV	T6	T7	T8	T9	T10
PVIF0.09	0.596	0.547	0.502	0.460	0.4224

Solution :

A) Duration of each bond

$$D = \frac{\sum wx}{\sum w}$$

Bond A

Year	CF	PV @ 9%	Wx
1	10	9.17	9.17
2	10	8.42	16.84
3	10	7.72	23.16
4	10	7.08	28.32
5	10	6.50	32.5
6	10	5.96	35.75
7	10	5.47	38.29
8	10	5.02	40.16
9	10	4.60	41.4
10	110	46.47	464.7
		106.61	730.3

$$D = \frac{730.3}{106.61} = 6.85 \text{ year}$$

Bond B

Year	CF	PV @ 9%	Wx
1	11	10.09	10.09
2	11	9.26	18.52
3	11	8.49	25.47
4	11	7.79	31.16
5	11	7.15	35.75

6	11	6.56	39.39
7	11	6.02	42.14
8	11	55.71	445.66
		111.07	648.15

D = $\frac{648.15}{111.07}$ = 5.84 year

Bond C

Year	CF	PV @ 9%	Wx
1	9	8.26	8.26
2	9	7.56	15.12
3	9	6.95	20.85
4	9	6.38	25.52
5	109	70.84	354.2
		100	423.95

D = $\frac{423.95}{100}$ = 4.24 year

B) Interest Immunization

Step 1 : Duration of liability = 6 years

Step 2 : To immunize to school match

DA = DL = 6 years

Step 3 : Duration of each Bond

DA = 6.85 years

DB = 5.84 years

DC = 4.24 years

Step 4 : Proportion of funds to be invested in each bond.

i.e. $(6.85 \times 0.45) + (5.84 \times x) + (4.24 \times (0.55 - x) = 6$

$= 3.0825 + 5.84x + 2.332 - 4.24x = 6$

$1.6x = 0.5855$

$\therefore x = \frac{0.5855}{1.6} = 0.366$

$\therefore 0.55 - 0.366 = 0.184$

C) New Duration of Assets (Bonds)

$= 7.15 \times 0.45 + 6.03 \times 0.366 + 4.27 \times 0.184$

= 6.20 years

Note : The portfolio is no longer immunized as duration of bonds is immunized to 6.2 years.

D) New Proportion of funds to be invested

$= (7.15 \times 0.45) + (6.03 \times x) + (4.27 \times (0.55 - x) = 6$

$= 3.2175 + 6.03x + 2.3485 - 4.27x = 6$

$1.7x = 0.434$

$\therefore x = 0.25$

i.e. $0.55 - 0.25 = 0.30$

Question 39

Nov 2008 – Paper / Nov 2015 – RTP / Nov 2017 – RTP / May 2019 (Old) - RTP

The data given below relates to a convertible bond:

Face value	Rs.250
Coupon rate	12%
No. of shares per bond	20
Market price of share	Rs.12
Straight value of bond	Rs.235
Market price of convertible bond	Rs.265

Calculate:

(i) Stock value of bond.

(ii) The percentage of downside risk.

(iii) The conversion premium

(iv) The conversion parity price of the stock.

Solution :

(i) Stock value of Bond

= Conversion Rates × M.P. of share

= 20 × 12 = Rs.240

(ii) Conversion premium

= M.P. of Bond – Stock value of Bond

= 265 – 240 = Rs.25

(iii) Conversion parity price

$$= \frac{\text{M.P.of Bond}}{\text{Conversion Ratio}} = \frac{265}{20} = 13.25$$

(iv) % downside risk

$$= \frac{265 - 235}{235} \times 100 = 12.766\%$$

Question 40

Nov 2019 (New) – RTP / Nov 2019 (Old) - RTP

A hypothetical company ABC Ltd. issued a 10% Debenture (Face Value of Rs.1000) of the duration of 10 years is currently trading at Rs.850 per debentnure. The bond is convertible into 50 equity shares being currently quoted at Rs.17 per share.

If yield on equivalent comparable bond is 11.80%, then calculate the spread of yield of the above bond from this comparable bond.

The relevant present value table is as follows.

Present Values	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}
$PVIF_{0.11, t}$	0.901	0.812	0.731	0.659	0.593	0.535	0.482	0.434	0.391	0.352
$PVIF_{0.13, t}$	0.885	0.783	0.693	0.613	0.543	0.480	0.425	0.376	0.333	0.295

Solution :

Conversion Price = Rs.50 x 17 = rs.850

Intrinsic Value = Rs.850

Accordingly the yield (r) on the bond shall be:

Rs.850 = Rs.100 PVAF (r, 10) + Rs.1000 PVF (r, 10)

Let us discount the cash flows by 11%

850 = 100 PVAF (11%, 10) + 1000 PVF (11%, 10)

850 = 100 x 5.890 + 1000 x 0.352

= 91

Now let us discount the cash flows by 13%

850 = 100 PVAF (13%, 10) + 1000 PVF (13%, 10)

850 = 100 x 5.426 + 1000 x 0.295

= –12.40

Accordingly, IRR

$$11\% + \frac{90.90}{90.90-(-12.40)} \times (13\% - 11\%)$$

$$11\% + \frac{90.90}{103.30} \times (13\% - 11\%)$$

= 12.76%

The spread from comparable bond = 12.76% – 11.80% = 0.96%

Question 41
Nov 2019 (Old) - Paper

(a) The nominal value of 10% Bonds issued at par by M/s. SK Ltd. is Rs.100. The bonds are redeemable at Rs.110 at the end of year 5.

(i) Determine the value of bond if required yield is :

(a) 8% (b) 9% (c) 10% (d) 11%

(ii) When will the value of the bond be highest?

Give below are Present Value Factors :

Year	1	2	3	4	5
PV Factor @8%	0.926	0.857	0.794	0.735	0.681
PV Factor @9%	0.917	0.842	0.772	0.708	0.650
PV Factor @10%	0.909	0.826	0.751	0.683	0.621
PV Factor @11%	0.901	0.812	0.731	0.659	0.593

Solution :

1) IV of Bond = PV of Coupon + PV of Redemption

a) If TM = 8%

IV = 10 × PVIFA(8%, 5) + 110 × PVIF(8%, 5)

= 39.93 + 74.91 = 114.84

b) If YTM = 9%

IV = 10 × PVIFA(9%, 5) + 110 × PVIF (9%, 5)

= 38.89 + 71.50 = 110.39

c) If YTM = 10%

IV = 10 × PVIFA(10%, 5) + 110 × PVIF (10%, 5)

= 37.90 + 68.31 = 106.21

d) If YTM = 11%

IV = 10 × PVIF(11%, 5) + 110 × PVIF (11%, 5)

= 36.96 + 65.23 = 102.19

2) Value of Bond will be highest when YTM is lowest. i.e. @ 8% YTM value = Rs.114.84

Question 42
Nov 2020 (New) - RTP

Today being 1st January 2019, Ram is considering to purchase an outstanding Corporate Bond having a face value of Rs.1,000 that was issued on 1st January 2017 which has 9.5% Annual Coupon and 20 years of original maturity (i.e. maturing on 31st December 2027). Since the bond was issued, the interest rates have been on downside and it is now selling at a premium of Rs.125.75 per bond. Determine the prevailing interest on the similar type of Bonds if it is held till the maturity which shall be at Par.

PV Factors :

	1	2	3	4	5	6	7	8	9
6%	0.943	0.890	0.840	0.792	0.747	0.705	0.665	0.627	0.592
8%	0.926	0.857	0.794	0.735	0.681	0.630	0.583	0.540	0.500

Solution :

Prevailing interest rate can be found by interpolation using concept of

Year	CF	PV @ 6%	PV @ 8%
1	95	89.62	87.96
2	95	84.55	81.45
3	95	79.76	75.41
4	95	75.25	69.83
5	95	70.99	64.66
6	95	66.97	59.87
7	95	63.18	55.43
8	95	59.60	51.33

9	1000 + 95	648.13	547.77
		1238.05	1093.71
	–CP	1125.75	1125.75
		112.3	(32.04)

IRR $= LR + \frac{NPV}{\sum NPV} \times$ Diff. of rate

$= 6 + \frac{112.3}{144.34} \times 2 = 7.556\%$

Question 43
Nov 2020 (New) - RTP

The following data is available for NNTC bond:

Face value : Rs.1000
Coupon rate : 7.50%
Years to maturity : 8 years
Redemption Value : Rs.1000
YTM: 8%

Calculate:

(i) The current market price, duration and volatility of the bond.
(ii) The expected market price if there is a decrease in required yield by 50 bps.

Solution :

Working Note :

Year	CF	PV @ 8%	WX
1	75	69.44	69.44
2	75	64.30	128.6
3	75	59.54	178.62
4	75	55.13	220.52
5	75	51.04	255.2
6	75	47.26	283.56
7	75	43.76	306.32
8	1000 + 75	580.79	4646.32
		971.26	6088.58

1) CP = Rs.971.26

2) $D = \frac{\sum WX}{\sum W} = \frac{6088.58}{971.26}$ = 6.2687 years.

3) Volatility (MD) = $\frac{D}{1+YTM} = \frac{6.2687}{1.08}$ = 5.8%

4) New price if yield decrease by 50 bps.
971.26 + (0.5 × 5.8%) = Rs.999.42

Question 44
Nov 2020 (New) - Paper

The following data are available for a bond:

Face Value	Rs 10,000 to be redeemed at par on maturity
Coupon Rate	8.5% PA
Years to Maturity	5 years
Yield to maturity	10%

You are required to calculate
1. Current price of the bond
2. Macaulay's duration
3. Volatility of the bond
4. Convexity of the bond
5. 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

Solution :

(i) Current Market Price of Bond
= Rs. 850 (PVIAF 10%, 5) + Rs. 10,000 (PVIF 10%, 5)
= Rs. 850 (3.79) + Rs. 10,000 (0.621) = Rs. 3,221.50 + Rs. 6,210 = Rs. 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	6737.85	0.714	3.57
			9431.50	1.000	4.252

Duration of the Bond is 4.252 years

(iii) Volatility of Bond

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

(iv) Convexity of Bond

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

$C^* = \frac{V_+ + V_- - 2V_0}{2V0(\Delta Y)2}$

Year	Cash flow	P.V. @ 8%		P.V. @ 12%	
1	850	0.926	787.10	0.892	758.2
2	850	0.857	728.45	0.797	677.45
3	850	0.794	674.90	0.712	605.2
4	850	0.735	624.75	0.636	540.6
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 x (0.02)2 x 100 = 0.395%

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

(A) By Macaulay's duration-based estimate

= Rs. 9431.50 × 2 (3.865/100) = Rs. 729.05

Hence expected market price is Rs. 9431.50 + Rs. 729.05 = Rs. 10,160.55

Hence, the market price will increase.

(B) By Intrinsic Value method

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

Hence, expected market price is Rs.10,204.05

Question 45
Jan 2021 (New) - Paper

Following are the yields on Zero Coupon Bonds (ZCB) having a face value of Rs.1,000 :

Maturity (Years)	Yield to Maturity (YTM)
1	10%
2	11%
3	12%

Assume that the term structure of interest rate will remain the same.

You are required to

(i) Calculate the implied one year forwards rates

(ii) Expected Yield to Maturity and prices of one year and two year Zero Coupon Bonds at the end of the first year.

Solution :

(i) Calculation of Forward Rates

Maturity	YTM (%)	PVIF	Face value	Price	Forward rate	
1	10	0.909	1,000	909.09		
2	11	0.812	1,000	811.62	0.1201 i.e.	12.01%
3	12	0.712	1,000	711.78	0.1403 i.e.	14.03%

(ii) Calculation of Expected Prices and YTM

Maturity	Forward rate	Face value	Price	YTM	
2	0.1201	1,000	$\frac{1,000}{(1+0.1201)}$ = 892.78	0.1201 i.e.	12.1%
3	0.1403	1,000	$\frac{1,000}{(1+0.1201)(1+0.1403)}$ = 782.93	0.1302* i.e.	13.02%

$$* \sqrt{\left(\frac{1,000}{782.93}\right)} - 1 = 0.1302$$

Thanks ....

CHP - 5 MERGERS AND ACQUISITION

Question 1
Nov 2008 – RTP / May 2012 – Paper / Nov 2019 (New) – Paper

XYZ Ltd., is considering merger with ABC Ltd. XYZ Ltd.'s share are currently traded at Rs.20. It has 2,50,000 shares outstanding and its earnings after taxes (EAT) amount to Rs.5,00,000. ABC Ltd., has 1,25,000 shares outstanding :its current market price is Rs.10 and its EAT are Rs.1,25,000 the merger will be effected by means of a stock swap (exchange). ABC Ltd., has agreed to a plan under which XYZ Ltd., will offer the current market value of ABC Ltd.'s shares:

1. What is the pre – merger earning per share (EPs) and P/E ratio of both the companies?
2. If ABC Ltd.' P/E ratio 6.4, what is the current market price? What is the exchange ratio? What will XYZ Ltd.'s post – merger EPS be?
3. What should be the exchange ratio; if XYZ Ltd.'s pre – merger and post merger EPS are to be the same?

Solution :

	Particulars	XYZ	ABC
A	Earning After Tax	5,00,000	1,25,000
B	No of Shares	2,50,000	1,25,000
C	EPS (A/B)	2	1
D	Market Price	20	10
E	P.E. Ratio (D/C)	10	10

1) Pre merger PE and EPS of both the companies : Calculated Above

2) If ABC Ltd P.E Ratio is 6.4

i) Current Market Price = EPS x PE = 1 x 6.4 = 6.4

ii) Swap Ratio (Based on Market Price) = $\frac{\text{Target Company}}{\text{Acquiring Company}} = \frac{6.4}{20} = 0.32$

iii) EPS of the Merged Firm

$= \frac{5,00,000 + 1,25,000}{2,50,000 + (12,50,000 \times 0.32)}$ = Rs.2.155

3) Exchange Ratio if the pre-merger and the post merger EPS of XYZ is to be same

For Pre and Post merger EPS to be same, the exchange ratio should be based in EPS

Swap Ratio(Based on EPS) = $\frac{\text{Target Company}}{\text{Acquiring Company}} = \frac{1}{2} = 0.5$

Check = $\frac{5,00,000 + 1,25,000}{2,50,000 + (12,50,000 \times 0.5)}$ = Rs.2/sh.

Question 2
Nov 2008 – RTP / Nov 2009 – RTP

ABC Ltd. is intending to acquire XYZ Ltd .by merger and the following information is available in respect of the companies :

Particulars	ABC Ltd	XYZ Ltd
Number of equity shares	10,00,000	6,00,000
Earning after tax (Rs.)	50,00,000	18,00,000
Market value per shares (Rs.)	42	28

Required:

1. What is the EPS of both Companies?
2. If the proposed merger takes place, What would be the new earning per share for ABC Ltd.? Assume that the merger takes place by exchange of equity shares and the exchange ratio based on the current market price.
3. What should be exchange ratio, if XYZ Ltd. wants to ensure the earning to member are as before the merger takes place?

Solution :

1) EPS of both the companies

	Particulars	ABC Ltd	XYZ Ltd
A	Earnings After Tax	50,00,000	18,00,000
B	No of Shares	10,00,000	6,00,000
C	Earnings per share (A/B)	5	3
D	Market Price per share	42	28

2) Earnings Per Share of Merged Firm

Swap Ratio (Based on Market Price) = $\frac{\text{Target Company}}{\text{Acquiring Company}}$

= $\frac{20}{42}$ = 0.67 i.e. 2/3rd

EPS = $\frac{50,00,000 + 18,00,000}{10,00,000 + (6,00,000 \times 2/3)}$ = Rs.4.857/sh.

3) Exchange Ratio so that the shareholders for XYZ Ltd would not be at loss

For the shareholders not to suffer any loss, the Swap ratio should be based on EPS

Swap Ratio(Based on EPS Price) = $\frac{3}{5}$ = 0.6

EPS = $\frac{50,00,000 + 18,00,000}{10,00,000 + (6,00,000 \times 0.6)}$ = Rs.5/sh.

Equivalent EPS of XYZ = 5 × 0.6 = Rs.3/sh.

Question 3

Nov 2008 – Paper / May 2009 – RTP / Nov 2009 – RTP / Nov 2010 – Paper / Nov 2011 – Paper / May 2019 (Old) – RTP

K LTD. is considering acquiring N. LTD., the following information is available:

Company	Profit after tax	Number of Equity Shares	Market value per Share
K. Ltd.	50,00,000	10,00,000	200
N. Ltd.	15,00,000	2,50,000	160

Exchange of equity shares for acquisition is based on current market value as above. There is no synergy advantage available:

1) Find the earning per share for company K. Ltd after merger.

2) Find the exchange ratio so that shareholders of N. Ltd. would not be at a loss.

Solution :

	Particulars	K Ltd	N Ltd
A	Earnings After Tax	50,00,000	15,00,000
B	No of Shares	10,00,000	2,50,000
C	Earnings per share (A/B)	5	6
D	Market Price per share	200	160

1) Earnings Per Share of Merged Firm

Swap Ratio(Based on Market Price) $= \dfrac{\text{Target Company}}{\text{Acquiring Company}}$

$= \dfrac{160}{200} = 0.8$

EPS $= \dfrac{50,00,000 + 15,00,000}{10,00,000 + (2,50,000 \times 0.8)}$ = Rs.5.42/sh.

2) Exchange Ratio so that the shareholders for N Ltd would not be at loss

For the shareholders not to suffer any loss, the Swap ratio should be based on EPS

Swap Ratio(Based on EPS Price) $= \dfrac{6}{5} = 1.2$

EPS $= \dfrac{50,00,000 + 15,00,000}{10,00,000 + (2,50,000 \times 1.2)}$ = Rs.5/sh.

Equivalent EPS for N Ltd. = 5 × 1.2 = Rs.6/sh.

Question 4
May 2009 – RTP

R Ltd is considering taking over S Ltd for better synergy in marketing the product. The information for both the companies are as follows

	R Ltd.	S Ltd.
EAT	30	12
Equity shares (in Lakhs)	10	6
EPS	3	2
P.E. Ratio	10	5

Required :

1. What is the market value of each firm before merger?
2. Management of R Ltd. assumes that the management of S Ltd. will accept offer of one share of R Ltd. for 3 share of S Ltd. What will be the post merger Market value of R Ltd?
3. What is the gain from the merger in terms of market value of the merger firm?
4. What will be the gain of shareholders of R Ltd. in terms of share price?

Solution :

1. Market value of each firm before merger.

		R Ltd	S Ltd
A	No of Shares	10	6
B	Earnings per share	3	2
C	P.E.Ratio	10	5
D	Market Price Per share (b x c)	30	10
E	Market Value of each Firm (d x a)	300 Lakhs	60 Lakhs

2. No of shares to be issued to the shareholders of S Ltd. = 6,00,000 / 3 = 2,00,000

Total No of shares (Lakhs) = 12 Lakhs
Total earnings Rs. in Lakhs = 30 + 12 = 42 Lakhs
Therefore Post merger EPS = 42 /12 = Rs. 3.5 per share
P.E Ratio = 10
M.P.S (EPS x PE) = Rs. 35 Per share Market
Value (MPS x No) = 35 x 12 = Rs. 420 Lakhs

3. Gain in terms of market value from merger

Pre Merger Market Value 360
Post Merger Market Value 420
60

4. Gain for shareholders of R

Post merger MPS = 35
Pre merger MPS = 30
Gain 5
Gain % (5/30 × 100) = 16.67%

Question 5
May 2009 – RTP

X Ltd. made an attempt to acquire Y Ltd. Following information is available for both the companies

	X Ltd.	Y Ltd.
Price per share	30	20
P/E Ratio	5	4
No of shares (Lakhs) (F.V.10)	3	2
Reserves and Surplus	30	20
Promoters holding	1.2	0.75

Board of directors of both the companies have decided that a workable swap ratio is to be based on weights of 30%, 30% and 40% respectively for Earnings, Book Value and Market Price of share of each company.

Required.

1. Swap Ratio
2. After merger, promoters holding
3. Post merger EPS
4. Gain in capital market value of merged, assuming Price Earning ratio will remain same.

Solution :

		X Ltd.	Y Ltd.
(A)	MPS	30	20
(B)	P/E Ratio	5	4
(C)	EPS (A/B)	6	5
(D)	No. of Shares	3	2
(E)	F.V.	10	10
(F)	Share Capital (D × E)	30	20
(G)	Reserves and Surplus	30	20
(H)	Net Worth (f + y)	60	40
(I)	B.V./Sh. (H/D)	20	20
(J)	PAT (C × D)	18	10
(K)	Promoters holding	1.2	0.75

1) Swap Ratio = $\frac{\text{Target Company}}{\text{Acquiring Company}}$

EPS = 5/6 = 0.83 × 30% = 0.25

BV = 20/20 = 1 × 30% = 0.30

MPS = 20/30 = 0.67 × 40% = 0.267

0.817

2) Post Merger Promoters Holding $= \dfrac{3+(2\times 0.817)}{1.2+(0.75\times 0.817)}$

$= \dfrac{4.634}{1.81275} = 39.12\%$

3) Post Merger EPS = $\dfrac{18+10}{4.634}$ = Rs.6.04/sh.

4) Gain in Capital Market Value

Pre Merger Market Capitalisation

X (3 × 30)	90	
Y (2 × 20)	40	130

Post Merger Market Capitalisation

(4.634 × 6.04 × 5) 140

∴ Gain = 140 – 130 = 10 lakh

Question 6

May 2009 – Paper – 20 Marks / May 2020 (New) – RTP / May 2020 (Old) – RTP

The following information relating to the acquiring Company Abhiman Ltdand the target Company Abhishek Ltd. are available. Both the companies are promoted by Multinational company. Trident Ltd. The promoter's holding is 50% and 60% respectively in Abhiman Ltd and Abhishek Ltd:

	Abhiman Ltd	Abhishek Ltd
Share Capital (Rs.)	200 lakh	100 lakh
Free Reserves and surplus (Rs.)	800 lakh	500 lakh
Paid up value per share (Rs.)	100	10
Free float market capitalization (Rs.)	400 lakh	128 lakh
P/E Ratio (times)	10	4

Trident Ltd .is interested to do justice to the shareholder of both Companies. For the swap ratio weights are assigned to different parameters by the Board of Directors as follows:

Book value	25%
EPS (Earning per share)	50%
Market Price	25%

1. What is the swap ratio based on above weights?
2. What is the book value, EPS and expected Market price of Abhiman Ltd
3. After acquisition of Abhishek Ltd.(assuming P>E ratio of Abhiman Ltdremains unchanged and all assets and liabilities of Abhishek Ltd. are taken over at book value).
4. Calculate:
   1. promoter's revised holding in the Abhiman Ltd.
   2. free float market capitalization.
   3. Also calculate No. share . Earning per share (EPS)and book value (B.V) if after acquisition of Abhishek Ltd., Abhiman Ltd., decided to:

a) Issue Bonus share in the ratio of 1 : 2 ; and

b) Split the stock (share) as Rs.5 each fully paid.

Solution :

	Particulars	Abhiman Ltd	Abhishek Ltd
A	Share Capital	200 lakhs	100 lakhs
B	Free Reserves and Surplus	800 lakhs	500 lakhs
C	Net Worth	1000 lakhs	600 lakhs
D	Paid up Value per share	100	10
E	No of shares (A/D)	2 lakhs	10 lakhs
F	**B.V (Net worth / No)**	**500**	**60**
G	Promoters Holding	50%	60%
H	Free float Market Capitalization	400	128
I	Total Market Capitalization	800	320
J	**MPS (Market Cap / No.)**	**400**	**32**
K	PE Ratio	10	4
L	**EPS (MPS / PE)**	**40**	**8**
M	Net Profit After Tax (EPS x No)	80	80

1) Swap Ratio

Basis	Abhiman	Abhishek			Swap
BV	500	60	60 / 500	0.12×0.25	0.03
EPS	40	8	8 / 40	0.2×0.5	0.1
MPS	400	32	32 / 400	0.08×0.25	0.02
Total					**0.15**

2) EPS of the Merged Firm Total Earnings = $\frac{80+80}{2+(10\times 0.15)}$ = Rs.45.71

3) BV of shares = 1600/3.5 = 457.14

4) Market Price Per share = EPS x PE = 45.71 x 10 = Rs. 457.1

Market Capitalization = 457.1 x 3.5 = 1600 lakhs

5) Promoters Holding in Abhiman Ltd

	Post Merger
Total Shares	3.5 [(2 + (10 x 0.15)]
Promoters	1.9[1 + (60 % of 10 x .15)]

Promoters holding = 1.9/3.5 x 100 = 54.29%

6) Free Float Market Capitalization

Free Float Capital = 100 – 54.29% = 45.71%

i.e. 1600 x 45.71% = 731.36

7) Revised EPS and BV after Bonus and Share split

Total no of shares in before bonus and split = 3.5

Bonus = 1 : 2

i.e. $\frac{3.5 \times 1}{2}$

= 1.75, so now the total no of shares after bonus will 3.5 + 1.75 = 5.25 Stock Split into shares of Rs.5 each i.e 1 share of share = 20 shares of 5

i.e 5.25 x 20 = 105 lakhs

Revised EPS = 160/105 = 1.523 per share

Revised BV= 1600/105 = 15.238 per share

Question 7

Nov 2009 Paper – 10 Marks / May 2014 – RTP / May 2018 – RTP / Nov 2019 (New) – RTP

You have been provided the following Financial data of two companies:

	Krishna Ltd.	Rama Ltd.
Earnings after taxes	Rs. 7,00,000	Rs. 10,00,000
Equity shares (outstanding)	Rs. 2,00,000	Rs. 4,00,000
EPS	3.5	2.5
P/E ratio	10 times	14 times
Market price per share	Rs. 35	Rs. 35

Company Rama Ltd. is acquiring the company Krishna Ltd., exchanging its shares on a one-to-one basis for company Krishna Ltd. The exchange ratio is based on the market prices of the shares of the two companies.

Required:

(i) What will be the EPS subsequent to merger?

(ii) What is the change in EPS for the shareholders of companies Rama Ltd. and Krishna Ltd.?

(iii) Determine the market value of the post-merger firm. PE ratio is likely to remain the same.

(iv) Ascertain the profits accruing to shareholders of both the companies.

Solution :

		Krishna Ltd	Rama Ltd
A	Earning After Tax	7,00,000	10,00,000
B	No of Shares	2,00,000	4,00,000
C	EPS (A/B)	3.5	2.5
D	P.E. Ratio	10	14
E	Market Price per share	35	35

Swap Ratio = $\frac{35}{35}$ = 1

1) EPS of the Merged Firm Total = $\frac{10,00,000 + 7,00,000}{4,00,000 + (2,00,000 \times 1)}$

= Rs.2.83 /sh.

2) Change in EPS for shareholder of companies Rama and Krishna Ltd

	Krishna	Rama Ltd
Pre Merger EPS	3.5	2.5
Post Merger EPS	2.83(2.83 × 1)	2.83
Gain / (Loss)	(0.67)	0.33
% Gain / (Loss)	(19.14%)	13.2%

3) Market Value of Post Merged Firm = EPS × PE × No. of shares = Rs.2,40,00,000

4) Profit / Loss to the shareholder of both the companies

	Krishna	Rama Ltd
Pre Merger MPS	35	35
Post Merger MPS	39.66	39.66
Gain	4.66	4.66
Gain %	13.33%	13.33%

Question 8
May 2010 Paper – 16 Marks / May 2018 (New) – RTP / Nov 2018 (New) – Paper

T Ltd and E Ltd are in the same industry. The former is in negotiation for acquisition of the latter. Important information about the two companies as per their latest financial statement is given below:

	T Ltd	E Ltd.
Rs.10 Equity share outstanding	12 Lakhs	6 lakhs
Debt :		
10% Debentures (Rs.Lakhs)	580	--
12.5% institutional Loan(Rs.Lakhs)	--	240
Earning before interest, depreciation and tax (EBIDAT) (Rs.Lakhs)	400.86	115.71
Market Price / share(Rs.)	220	110

T Ltd. plans to offer a price for E Ltd., business as whole which will be 7 times EBIDATE reduced by outstanding debt, to be discharged by own shares at market price.

E Ltd planning to seek one share in T Ltd. For every 2 shares in E Ltd. based on the market price. Tax rate for the two companies may be assumed as 30%

Calculate and show the following under both alternatives – T Ltd offer and E Ltd.' plan:

1. Net consideration payable.
2. No. of share to be issued by T Ltd.
3. EPS of T Ltd. after acquisition.
4. Expected market price per share of T Ltd. after acquisition.
5. State briefly the advantage to T Ltd. from the acquisition.

Calculation (except EPS) may be rounded off to 2 decimals lakhs.

Solution :

		T Ltd	E Ltd.
A	Rs.10 Equity share	12 Lakhs	6 lakhs
B	10% Debentures	580 lakhs	--
C	12.5% Loans	--	240
D	Earnings before Interest and Tax	400.86	115.71
E	Interest	58	30
F	Earnings before tax (D - E)	342.86	85.71
G	Tax (30% of F)	102.86	25.71
H	Earnings after Tax (F - G)	240	60
I	EPS (Earnings/No)	20	10
J	MPS	220	110
K	PE Ratio (MPS/EPS)	11	11

Alternative 1 : T Limited's Plan

7 times EBIDAT of E Ltd = 115.71 x 7 = 809.97

Less Debt = 240

569.97

Discharge by Shares = $\frac{569.64}{220}$ = 2,59,077 shares

1) Consideration Payable = 569.97 lakhs

2) No of shares to be issued by T Ltd = 2,59,077 shares

3) EPS of T Ltd After Acquisition = $\frac{240+60}{12+2.59}$ = Rs.20.56/sh.

4) Expected Market Price after acquisition = EPS × PE = 20.56 x 11

= 226.18

Alternative 2 : E Ltd's Plan

Swap Ratio as given = 1/ 2 = 0.5

1) No of shares to be issued by T Ltd. = 6 x 0.5 = 3 lakhs

2) Net consideration Payable = 3 x 220 = 660 lakhs

3) EPS of T Ltd After Acquisition = $\frac{240+60}{12+3}$ = Rs.20/sh.

4) Expected Market Price after acquisition = EPS x PE = 20 x 11 = 220

5) Advantage to T Ltd after acquisition

a) Economics in production

b) Economics in scale

c) Market share etc.

Question 9
Nov 2010 – RTP / Nov 2011 – RTP

There are two companies ABC Ltd. and XYZ Ltd. are in same in industry. On order to increase its size ABC Ltd. made a takeover bid for XYZ Ltd.

Equity beta of ABC and XYZ is 1.2 and 1.05 respectively. Risk Free Rate of Return is 10% and Market Rate of Return is 16%. The growth rate of earnings after tax of ABC Ltd. in recent years has been 15% and XYZ's is 12%. Further both companies had continuously followed constant dividend policy.

Mr. V, the CEO of ABC requires information about how much premium above the current market price to offer for XYZ's shares.

Two suggestions have forwarded by merchant bankers.

(i) Price based on XYZ's net worth as per B/S, adjusted in light of current value of assets and estimated after tax profit for the next 5 years.

(ii) Price based on Dividend Valuation Model, using existing growth rate estimates.

(Rs.In lacs)

	ABC	XYZ		ABC Ltd.	XYZ Ltd.
Equity Share Capital	2,000	1,000	Land & Building	5,600	1,500
General Reserves	4,000	3,000	Plant & Machinery	7,200	2,800
Share Premium	4,200	2,200			
Long Term Loans	5,200	1,000			
Current Liabilities			Current Assets		
Sundry Creditors	2,000	1,100	Accounts	3,400	2,400
Bank Overdraft	300	100	Receivable	3,000	2,100
Tax Payable	1,200	400	Stock	200	400
Dividend Payable	500	400	Bank/Cash	-	-
	19,400	**9,200**		**19,400**	**9,200**

Profit and Loss Account of both the companies

	ABC Ltd.	XYZ Ltd.		ABC Ltd.	XYZ Ltd.
To Net Interest	1,200	220	By Net Profit	7,000	2,550
To Taxation	2,030	820			
To Distributable Profit	3,770	1,510		-	-
	7,000	2,550		7,000	2,550
To Dividend	1,130	760	By Distributable Profit	3,770	1,510
To Balance c/d	2,640	750		-	-
	3,770	**1,510**		**3,770**	**1,510**

Additional information :

(1) ABC Ltd.'s land & building have been recently revalued. XYZ Ltd.'s have not been revalued for 4 years, and during this period the average value of land & building have increased by 25% p.a.

(2) The face value of share of ABC Ltd. is Rs.10 and of XYZ Ltd. is Rs.25 per share.

(3) The current market price of shares of ABC Ltd. is Rs.310 and of XYZ Ltd.'s Rs.470 per share.

With the help of above data and given information you are required to calculate the premium per share above XYZ's current share price by two suggested valuation methods. Discuss which of these two values should be used for bidding the XYZ's shares.

State the assumptions clearly, you make

Solution :

A. Net Assets Method

To compute the value of shares as per this method we shall compute the Net Assets.

(i) Value of Land & Building of XYZ Ltd. =1,500 lac (1.25)4 = Rs.3,662.11 lac Thus, net asset value will be:

	Rs.
Land & Building	3,662.11 lac
Plant & Machinery	2,800.00 lac
Account Receivable	2,400.00 lac
Stock	2,100.00 lac
Bank/Cash	400.00 lac
	11,362.11 lac
Less: Bank Overdraft	100.00 lac
Sundry Creditors	1,100.00 lac
Tax Payable	400.00 lac
Dividend Payable	400.00 lac
Long Term Loan	1,000.00 lac
	8362.11 lac

(ii) Estimated profit for next 5 years

= Rs.1,510 lac (1.12) + Rs.1,510 lac $(1.12)^2$ +Rs.1,510 lac $(1.12)^3$ +Rs.1,510 lac $(1.12)^4$ + Rs.1,510 lac $(1.12)^5$

= Rs. 1,691.20 lac + Rs. 1,894.14 lac + Rs. 2,121.44 lac + Rs. 2,376.01 lac + Rs. 2,661.14 lac = Rs. 10,743.93 lac.

(iii) The total yield value= Rs. 8,362.11 lac + Rs. 10,743.93 lac = Rs. 19,106.04 lac

XYZ Ltd.s share's current market value = Rs.470 × 40 lacs shares = Rs.1,88,00,00,000 = Rs. 18,800 lac

The premium is thus Rs. 306.04 lac (Rs. 19,106.04 lac – Rs. 18,800 lac) i.e. Rs. 7.65 per share or 1.63% [7.65/470].

This is not a sound basis for valuation as it ignores the time value of money. The premium of 1.63% above the current market price is very small compared to those achieved in many real bids.

B. Dividend Valuation Mode

$$P_0 = \frac{D_1}{Ke - g} = \frac{D_0(1+g)}{ke - g}$$

$$D_0 = \frac{760\,lac}{40\,lac} = \text{Rs.19 per share}$$

Thus D_1 = Rs. 19 (1+0.12) = Rs.21.28

Ke using CAPM

Ke = Rf +βj (Rm - Rf) =10% + 1.05(16% – 10%) = 16.3%

$$P_0 = \frac{Rs.21.28}{16.3\% - 12\%} = \frac{Rs.21.28}{4.3\%} = \text{Rs.494.88 per share}$$

The premium is Rs.24.88 (Rs.494.88 – Rs.470) i.e. 5.29% above the current market price. Thus, this method should be used for bidding shares of XYZ Ltd.'s share

Question 10
May 2011 – RTP / May 2021 (New) – RTP

ABC Ltd. is intending to acquire XYZ Ltd. by way of merger and the following information is available in respect of these companies:

	ABC Ltd.	XYZ Ltd.
Total Earnings (E) (in lakh)	Rs.1200	Rs.400
Number of outstanding shares (S) (in lakh)	400	200
Price earnings ratio (P/E)	8	7

(a) Determine the maximum exchange ratio acceptable to the shareholders of ABC Ltd., if the P/E ratio of the combined firm is expected to be 8?

(b) Determine the minimum exchange ratio acceptable to the shareholders XYZ Ltd., if the P/E ratio of the combined firm is expected to be 10?

Note: Make calculation in lakh multiples and compute ratio upto 4 decimal points.

Solution :

(a) Maximum exchange ratio acceptable to the shareholders of ABC Ltd.

Market Price of share of ABC Ltd. (Rs. 3 x 8)	Rs. 24
No. of Equity Shares	400 lakh
Market Capitalisation of ABC Ltd. (Rs. 24 x 400 lakh)	Rs. 9600 lakh
Combined Earnings (Rs. 1200 + Rs. 400) lakh	Rs. 1600 lakh
Combined Market Capitalisation (Rs. 1600 lakh x 8)	Rs. 12800 lakh
Market Capitalisation of ABC Ltd. (Rs. 24x 400 lakh)	Rs. 9600 lakh
Balance for XYZ Ltd.	Rs. 3200 lakh

Let D be the no. of equity shares to be issued to XYZ Ltd. then,

$$\frac{Rs.3200\ Lakh}{\left(\frac{1600\ Lakh}{D+400}\right)\times 8} = D$$

D = 133.333 lakh Shares

Exchange Ratio = 133.333 / 200 = 0.6666 : 1

(b) Minimum exchange ratio acceptable to the shareholders of XYZ Ltd.

Market Price of share of XYZ Ltd.	Rs. 14.00
No. of Equity Shares	200 lakh
Market Capitalisation of XYZ Ltd. (Rs. 14.00 x 200 lakh)	Rs. 2800 lakh
Combined Earnings (Rs. 1200 + Rs. 400) lakh	Rs. 1600 lakh
Combined Market Capitalisation (Rs. 1600 lakh x 10)	Rs. 16000 lakh
Balance for ABC Ltd.	Rs. 13200 lakh

Let D be the no. of equity shares to be issued to XYZ Ltd. then,

$$\frac{\text{Rs.2800 Lakh}}{\left(\frac{1600\text{ Lakh}}{D+400}\right)\times 10} = D$$

D = 84.8485 lakh Shares

Exchange Ratio = 84.8485 / 200 = 0.4242 : 1

Question 11

May 2011 Paper – 8 Marks

Abhiman Ltd is a subsidiary of Janam Ltd is acquiring Swabhiman Ltd. Which is also a subsidiary of janam Ltd. The following information is given:

	Abhiman Ltd.	**Swabhiman Ltd.**
% Shareholding of promoter	50%	60%
Share capital	Rs.200lacs	100 lacs
Free Reserves and surplus	Rs.900lacs	600 lacs
Paid up value per share	Rs.100	10
Free float market capitalization	Rs.500lacs	156 lacs
P/E Ratio (times)	10	4

Janam Ltd., is interested in doing justice to both companies. The following parameters have been assigned by the board of Janam Ltd., for determining the swap ratio:

Book value 25%

Earning per share 50%

Market price 25%.

You are required to compute

1. The swap ratio.

   The book value, Earning per share and Expected Market price of Swabhiman Ltd.,(assuming P/E Ratio of Abhiman Ltd remains the same and all assets and liabilities of Swabhiman Ltd. are taken over at book value.)

Solution :

	Particulars	Abhiman Ltd	Swabhiman Ltd
A	% Shareholding of Promoters	50%	60%
B	Share Capital	200	100
C	Free Reserves and Surplus	900	600
D	Net Worth	1100	700
E	Paid up value per share	100	10
F	No of shares (B / E)	2 lacs	10 lacs
G	***B.V (Net worth / No)***	***550***	***70***
H	Free float Market Cap	500 lacs	156 lacs
I	Total Market Capitalization	1000 lacs	390 lacs
J	***MPS (Market Cap / No)***	***500***	***39***
K	PE Ratio	10	4
L	***EPS (MPS / PE)***	***50***	***9.75***
M	Earnings After Tax	100 lacs	97.5 lacs

1) Swap Ratio

Basis	Abhiman Ltd.	Swabhiman Ltd			Swap
BV	550	70	70/550	$0.1273 \times 25\%$	0.031825
EPS	50	9.75	9.75/50	$0.195 \times 50\%$	0.097500
MPS	500	39	39/500	$0.078 \times 25\%$	0.019500
Total					**0.148825**

2) EPS of the Merged Firm = $\frac{100+97.5}{2+(10\times 0.1488)}$ = Rs.56.62/sh.

3) BV of shares = 1800/3.488 = 516.02

4) Market Price Per share = EPS x PE = 56.62 x 10 = 566.20

Question 12
May Paper 2011 – 8 Marks / May 2013 – RTP

Simple Ltd. and Dimple Ltd .are planning to merge. The total value of the companies are dependent on the fluctuating business condition. The following information is given for the total value (debt + equity) structure of each of the two companies.

Business Condition	Probability	Simple Ltd.	Dimple Ltd
		Rs.Lacs	Rs.Lacs
High Growth	0.20	820	1050
Medium Growth	0.60	550	825
Slow Growth	0.20	410	590

The current debt of Dimple Ltd. is Rs.65 lacs and of simple Ltd. is Rs.460 lacs. Calculate the expected value of debt and equity separately for the merged entity.

Solution :

W.N.1 : Simple Limited

	High Growth	Medium Growth	Slow Growth
Total	820	550	410
Debt	460	460	410 – Cant pay debt above M.V
Equity	360	90	Nil

Dimple Limited

	High Growth	Medium Growth	Slow Growth
Total 1050	1050	825	590
Debt	65	65	65
Equity	985	760	525

Value of Debt and Equity for Merged Entity Equity

Simple Limited	= 360 x 0.2 + 90 x 0.6 + Nil x 0.2	=	126
Dimple Limited	= 985 x 0.2 + 760 x 0.6 + 525 x 0.2	=	758
	Total	=	884

Debt

Simple Limited	= 460 x 0.2 + 460 x 0.6 + 410 x 0.2	=	450
Dimple Limited	= 65 x 0.2 + 65 x 0.6 + 65 x 0.2	=	65
	Total	=	515

Question 13

May 2012 – RTP

AXE Ltd. is interested to acquire PB Ltd. AXE has 50,00,000 shares of Rs.10 each, which are presently being quoted at Rs.25 per share. On the other hand PB has 20,00,000 share of Rs.10 each currently selling at Rs.17. AXE and PB have EPS of Rs.3.20 and Rs.2.40 respectively.

You are required to:

(a) Show the impact of merger on EPS, in case if exchange ratio is based on relative proportion of EPS.

(b) Suppose, if AXE quote an offer of share exchange ratio of 1:1, then should PB accept the offer or not, assuming that there will be no change in PE ratio of AXE after the merger.

(c) The maximum ratio likely to acceptable to management of AXE.

Solution :

	AXE Ltd.	PB Ltd.
NO	50,00,000	20,00,000
MPS	25	17
EPS	3.20	2.40

PAT	1,60,00,000	48,00,000
PE Ratio	7.8125	7.0833

(a) 1) Exchange Ratio = 2.4 / 3.2 = 0.75

2) EPS after Merger = $\frac{1,60,00,000 + 48,00,000}{50,00,000 + (20,00,000 \times 0.75)}$ = Rs.3.2/sh.

3) Impact of Merger on EPS

	AXE Ltd.	**PB Ltd.**
EPS before merger	3.20	2.40
EPS after merger (Equivalent in case of PB Ltd.)	3.20	2.40

Thus, there is will be no change in EPS for shareholder of both companies

(b) No. of shares to be issued to AB Ltd. (1:1) 20,00,000

	AXE Ltd.	**PB Ltd.**
EAT (Rs.) (A)	1,60,00,000	48,00,000
No. of Shares (B) EPS (A)/(B)	50,00,000	20,00,000

Position after Merger

A.	EAT After Merger (160 + 48) Lakhs	2,08,00,000
B.	No of shares (20 + 50 Lakhs)	70,00,000
C.	EPS After Merger (A/B)	2.97 per share
D.	P.E. Ratio of the Merged Company	7.8125
E.	MPS (C × D)	23.21 per share

Gain to Shareholders of PB Ltd.

	Rs. in lakh
Post Merger Value of PB Ltd (20,00,000 × Rs.23.21)	23.21
Less: Pre Merger Value	17
Gain to Shareholders of PB Ltd.	6.21

Thus PB Ltd. should accept the offer

(c) Maximum share ratio acceptable to AXE Ltd.

Ratio should be such at its MPS is not impacted

∴ MPS = 25

P.E. Ratio = 7.8125

EPS after Merger = 3.2

$$3.2 = \frac{1,60,00,000 + 48,00,000}{50,00,000 + x}$$

$\therefore$ x = 15,00,000

$$\text{Ratio} = \frac{15,00,000}{20,00,000} = 0.75$$

Question 14
Nov 2012 Paper – 12 Marks

H Ltd. agrees to buy over the business of B Ltd. effective 1st April, 2012.The summarized Balance Sheets of H Ltd. and B Ltd. as on 31st March 2012 are as follows:

Balance sheet as at 31st March, 2012 (In Crores of Rupees)

Liabilities:	H. Ltd	B. Ltd.
Paid up Share Capital		
-Equity Shares of Rs.100 each	350.00	
-Equity Shares of Rs.10 each		6.50
Reserve & Surplus	950.00	25.00
Total	1,300.00	31.50

Assets:		
Net Fixed Assets	220.00	0.50
Net Current Assets	1,020.00	29.00
Deferred Tax Assets	60.00	2.00
Total	1,300.00	31.50

H Ltd. proposes to buy out B Ltd. and the following information is provided to you as part of the scheme of buying:

(1) The weighted average post tax maintainable profits of H Ltd. and B Ltd. for the last 4 years are Rs. 300 crores and Rs. 10 crores respectively.

(2) Both the companies envisage a capitalization rate of 8%.

(3) H Ltd. has a contingent liability of Rs. 300 crores as on 31st March, 2012.

(4) H Ltd. to issue shares of Rs. 100 each to the shareholders of B Ltd. in terms of the exchange ratio as arrived on a Fair Value basis. (Please consider weights of 1 and 3 for the value of shares arrived on Net Asset basis and Earnings capitalization method respectively for both H Ltd. and B Ltd.)

You are required to arrive at the value of the shares of both H Ltd. and B Ltd. under:

(i) Net Asset Value Method (ii) Earnings Capitalisation Method

Solution :

(i) Net Asset Value $= \frac{\text{Net Assets for Equity Shareholders}}{\text{No. of Shares}}$

H Ltd. $= \frac{1300-300}{3.5}$ = Rs. 285.71 per share

B Ltd. $= \frac{31.5}{0.65}$ = Rs. 48.46 per share

(ii) Earning Capitalization Method $= \frac{\text{Earnings / NPR}}{\text{No. of Shares}}$

H Ltd. $= \frac{300/0.08}{3.5}$ = Rs. 1071.43 per share

B Ltd. $= \frac{10/0.08}{0.65}$ = Rs. 192.31 per share

(iii) Fair Value $= \frac{\text{Net Assets Value + Earnings Capitalization Method}}{2}$

H Ltd. $= \frac{285.71 \times 1 + 1071.43 \times 3}{4}$ = Rs. 875 per share

B Ltd. $= \frac{48.46 \times 1 + 192.31 \times 3}{4}$ = Rs. 156.3475 per share

Exchange Ratio $= \frac{156.3475}{875} = 0.1787$

H Ltd Should issue its 0.1787 share for each share of B Ltd.

Question 15
Nov 2012 – RTP / May 2019 (New) – RTP

Reliable Industries Ltd. (RIL) is considering a takeover of Sunflower Industries Ltd. (SIL) the Particulars of 2 companies are given below:

Particulars	Reliable Industries Ltd	Sunflower Industries Ltd
Earning After Tax (EAT)	Rs.20,00,000	Rs.10,00,000
Equity share o/s	10,00,000	10,00,000
Earning per share (EPS)	2	1
P E Ratio (Times)	10	5

Required:

1. What is the market value of each Company before merger?
2. Assume that the management of RIL estimates that the shareholder of SIL will accept an offer of one share of RIL for four shares are no synergic effects, what is the market value of the Post- merger RIL? What is the price per share? Are the shareholder of RIL better or worse off than they were before the merger?
3. Due to synergic effects, the management of RIL estimates that the earning will increase by 20% what are the new post – merger EPS and price per share? Will the shareholder better off than be for the merger?

Solution :

		Reliable	Sunflower
A	Earnings After Tax	20,00,000	10,00,000
B	Equity Shares	10,00,000	10,00,000
C	Earning per share	2	1
D	PE Ratio	10	5
E	MPS	20	5
F	Market Value	2,00,00,000	50,00,000

1) Market Value of Each Company – Calculated Above

2) Exchange Ratio 1 : 4 i.e swap 0f 0.25

EPS = $\frac{20,00,000 + 10,00,000}{10,00,000 + (10,00,000 \times 0.25)}$ = Rs.2.4/sh.

MPS = EPS × P.E. = 2.4 × 10 = 24/sh.

Gain in share price = 24 – 20 = Rs.4/sh. i.e. 20%

3) Due to Merger the Earnings will increase by 20% EPS of Reliable Ltd After Acquisition

EPS = $\frac{20,00,000 + 10,00,000}{10,00,000 + (10,00,000 \times 0.25)}$ = Rs.2.88/sh.

Market Price = EPS × PE = 2.88 × 10 = 28.8

Gain in the share price = 28.8 – 20 = Rs. 8.8 per share, i.e 44%

Question 16
Nov 2012 – Paper / Nov 2014 – RTP

Yes Ltd. wants to acquire No Ltd. and the cash flows of Yes Ltd. and the merged entity are given below.

			(Rs. in lakhs)		
Year	**1**	**2**	**3**	**4**	**5**
Yes Ltd	175	200	320	340	350
Merged Entity	400	450	525	590	620

Earnings would have witnessed 5% constant growth rate without merger and 6% with merger on account of economies of operations after 5 years in each case. The cost of capital is 15%.

The number of shares outstanding in both the companies before the merger is the same and the companies agree to an exchange ratio of 0.5 shares of Yes Ltd. for each share of No Ltd.

PV factor at 15% for years 1-5 are 0.870, 0.756; 0.658, 0.572, 0.497 respectively.

You are required to:

(i) Compute the Value of Yes Ltd. before and after merger.

(ii) Value of Acquisition and

(iii) Gain to shareholders of Yes Ltd.

Solution :

(i) Working Notes:

Present Value of Cash Flows (CF) upto 5 years

Year End	CF of Yes Ltd. (Rs. lakhs)	PVF @15%	PV of CF (Rs. lakhs)	CF of Merged Entity	PV of CF of Merged Entity (Rs. lakhs)
1	175	0.87	152.25	400	348
2	200	0.756	151.2	450	340.2
3	320	0.658	210.56	525	345.45
4	340	0.572	194.48	590	337.48
5	350	0.497	173.95	620	308.14
			882.44		**1679.27**

PV of Cash Flows of Yes Ltd. after the forecast period.

$$uf_5 = \frac{CF_6}{Ke - g} = \frac{350(1.05)}{0.15 - 0.05} = 3675$$

$uf_0 = 3675 \times 0.497 = 1826.75$

$$uf_5 = \frac{CF_6}{Ke - g} = \frac{620(1.06)}{0.15 - 0.06} = 7302.22$$

$uf_0 = 7302.22 \times 0.497 = 3629.20$

Value of Yes Ltd.

	Before merger (Rs.lakhs)	After merger (Rs.lakhs)
PV of CF (1-5 years)	882.44	1679.27
Add: PV of TV5	1826.475	3629.2
	2708.915	**5308.47**

(ii) Value of Acquisition

= Value of Merged Entity - Value of Yes Ltd.

= Rs.5308.47 lakhs - Rs.2708.915 lakhs = Rs.2599.555 lakhs

(iii) Gain to Shareholders of Yes Ltd.

Share of Yes Ltd. in merged entity = Rs.5308.47 lakhs x 1/1.5

= Rs.3538.98 lakhs

Gain to shareholder = Share of Yes Ltd. in merged entity – Value of Yes Ltd. before Merger

= Rs.3538.98 lakhs - Rs.2708.915 = Rs.830.065 lakhs

Question 17

May 2013 Paper – 5 Marks

ABC Company is considering acquisition of XYZ Ltd. This has 1.5 Cores shares outstanding and issued. The Market price per share is Rs.400 at present. ABC's average cost of capital is 12%. Available information from XYZ indicates its expected cash accruals for the next 3 years as follows:

Year	Rs.Cr
1	250
2	300
3	400

Calculate the range of valuation that ABC has to consider. (PV factors at 12% for years 1 to 3 respectively: 0.893, 0.797 and 0.712).

Solution :

Option 1 : Valuation Based on Market Price (Minimum Value)

Market Value = 400

Business Value = 400 x 1.5 = 600 Crs

Option 2 : Valuation Based on DCF (Maximum Value)

Business Value = $250/1.12 + 300/(1.12)^2 + 400/(1.12)^3$

= 747.15

Price Per Share = 747.15 / 1.5 = 498.10

So the minimum value that ABC can offer will be 400 per share and maximum value that ABC can offer will be 498.10 per share

Question 18
May 2013 Paper – 8 Marks

Longitude Limited is in the process of acquiring Latitude Limited on a share exchange basis. Following relevant data are available:

		Longitude	Latitude
Profit After Tax (PAT)	Rs.in lakhs	140	60
Number of shares	Lakhs	15	16
Earnings per Share(EPS)	Rs.	8	5
Price Earnings Ratio (P/E Ratio)		15	10

You are required to determine:

(i) Pre-merger Market Value per Share, and

(ii) The maximum exchange ratio Longitude Limited can offer without the dilution of

(1) EPS and (2) Market Value per Share

Calculate Ratio/s up to four decimal points and amounts and number of shares up to two decimal points.

Solution :

(A) Pre Merger Market Value per share = EPS × PE

Longitude = 8 x 15 = Rs.120 per share

Latitude = 5 x 10 = Rs.50 per share

(B) (i) Maximum Exchange Ratio without dilution of EPS

The exchange ratio should be based on MPS for not to dilute MPS

Swap ratio (Based on EPS Price) $= \frac{\text{Target Company}}{\text{Acquiring Company}}$

$= \frac{5}{8} = 0.625$

Check

Earnings per share of Merged Firm = $\frac{140+60}{15+10}$ = Rs.8/sh.

(ii) Maximum Exchange Ratio without dilution of MPS

The exchange ratio should be based on MPS for not to dilute MPS

Swap Ratio(Based on MPS Price) = $\frac{\text{Target Company}}{\text{Acquiring Company}} = \frac{50}{120} = 0.4167$

Therefore maximum no of shares to be issue to Latitude = 16 x 0.4167 = 6.67 Lakhs

Question 19

Nov 2013 – RTP / May 2015 – RTP

Hanky Ltd. and Shanky Ltd. operate in the same field, manufacturing newly born babies's clothes. Although Shanky Ltd. also has interests in communication equipments, Hanky Ltd. is planning to take over Shanky Ltd. and the shareholders of Shanky Ltd. do not regard it as a hostile bid.

The following information is available about the two companies.

	Hanky Ltd.	Shanky Ltd.
Current earnings	Rs.6,50,00,000	Rs.2,40,00,000
Number of shares	50,00,000	15,00,000
Percentage of retained earnings	20%	80%
Return on new investment	15%	15%
Return required by equity shareholders	21%	24%

Dividends have just been paid and the retained earnings have already been reinvested in new projects. Hanky Ltd. plans to adopt a policy of retaining 35% of earnings after the takeover and expects to achieve a 17% return on new investment.

Saving due to economies of scale are expected to be Rs.85,00,000 per annum. Required return to equity shareholders will fall to 20% due to portfolio effects. Requirements

(a) Calculate the existing share prices of Hanky Ltd. and Shanky Ltd.

(b) Find the value of Hanky Ltd. after the takeover

(c) Advise Hanky Ltd. on the maximum amount it should pay for Shanky Ltd.

Solution :

(a) Existing share price of Hanky (P) Ltd.

g = r × b r = 15% b = 20%

g = 0.15 x 0.2 = 0.03

Ex dividend market value = $\frac{D_1}{Re - g} = \frac{6,50,00,000 \times 0.8 \times 1.03}{0.21 - 0.03}$

= 29,75,55,555 = Rs.59.51/sh.

Existing share price Shanky (P) Ltd. g = r x b
= 0.15 x 0.8
= 0.12

Ex dividend market value $= \frac{2,40,00,000 \times 0.2 \times 1.12}{0.24 - 0.12}$
= 4,48,00,000 = Rs.29.37/sh.

(b) Value of Hanky Ltd. after the takeover

Care must be taken in calculating next year's dividend and the subsequent growth rate. Next year's earnings are already determined, because both companies have already reinvested their retained earnings at the current rate of return. In addition, they will get cost savings of Rs.85,00,000.

The dividend actually paid out at the end of next year will be determined by the new 35% retention and the future growth rate will take into account the increased return on new investment.

Growth rate for combined firm, g = 0.17 x 0.35 = 0.0595

New cost of equity = 20%

Next year's earnings = 6,50,00,000 × 1.03 + 2,40,00,000 × 1.12 + Rs.85,00,000
= Rs. 10,23,30,000

Next year's dividend = Rs. 10,23,30,000 x 0.65
= Rs. 6,65,14,500

Market Value $= \frac{6,65,14,500}{0.20 - 0.0595}$
= Rs. 47,34,12,811

(c) Maximum Hanky Ltd. should pay for Shanky Ltd.

Combined value = Rs.47,34,12,811
Present Value of Hanky Ltd. = Rs.29,75,55,556
= Rs.17,58,57,255

Question 20
Nov 2013 Paper – 8 Marks / May 2018 – Paper

Trupti Co. Ltd. promoted by a Multinational group "INTERNATIONAL INC" is listed on stock exchange holding 84% i.e. 63 lakhs shares.

Profit after Tax is Rs.4.80 crores.

Free Float Market Capitalisation is Rs.19.20 crores.

As per the SEBI guidelines promoters have to restrict their holding to 75% to avoid delisting from the stock exchange. Board of Directors has decided not to delist the share but to comply with the SEBI

guidelines by issuing Bonus shares to minority shareholders while maintaining the same P/E ratio. Calculate

(i) P/E Ratio

(ii) Bonus Ratio

(iii) Market price of share before and after the issue of bonus shares

(iv) Free Float Market capitalization of the company after the bonus shares.

Solution :

(1) P.E Ratio

	% Holding	No of shares
Promoters Holding	84%	63 Lakhs
Minority Holding	16%	12 Lakhs
Total Shares	100%	75 Lakhs

Free Float Market Capitalisation = Rs.19.20 Lakhs

Hence Market Price per shares = $\frac{19.20}{12}$ = Rs.160 per share

EPS (PAT / No = $\frac{480}{75}$ = Rs. 6.4 per share

P.E. Ratio (MPS / EPS = 25 times

(2) No of bonus shares to be issued

Promoters holding 84 % = 63 Lakhs

Promoters holding to be reduced to 75% without delisting shares, so the total no of shares should be = $\frac{63}{75\%}$ = 84 Lakhs

Minority Interest in the total = 84 x 25% = 21 Lakhs

So No of bonus shares to be issue to Minority Shareholders = 21 – 12 = 9 lakh shares (3 for every 4 held)

(3) Market Price of share before and After Bonus

Before Bonus = Rs. 160 per share

After Bonus

New EPS = 480/84 = Rs. 5.71 per

Share New MPS = 5.71 x 25 = Rs. 142.75 per share

(4) Free Float Market Capitalization = 142.75 x 21 Lakhs = Rs. 29.9775 Crores

Question 21
Nov 2013 Paper – 10 Marks

M/s Tiger Ltd. wants to acquire M/s. Leopard Ltd. The balance sheet of Leopard Ltd. as on 31st March, 2012 is as follows:

Liabilities	Amount	Assets	Amount
Equity Capital Retained Earnings	7,00,000	Cash Debtors	50,000
12% Debentures	3,00,000	Inventories	70,000
Creditors and	3,00,000	Fixed Assets	2,00,000
other liabilities	3,20,000		13,00,000
	16,20,000		**16,20,000**

(1) Shareholders of Leopard Ltd. will get one share in Tiger Ltd. for every two shares. External liabilities are expected to be settled at Rs. 5,00,000. Shares of Tiger Ltd. would be issued at its current price of Rs. 15 per share. Debenture-holders will get 13% convertible debentures in the purchasing company for the same amount. Debtors and inventories are expected to realize Rs.2,00,000.

(2) Tiger Ltd. has decided to operate the business of Leopard Ltd. as a separate division. The division is likely to give cash flows (after tax) to the extent of Rs.5,00,000 per year for 6 years. Tiger Ltd. has planned that, after 6 years, this division would be demerged and disposed of for Rs.2,00,000.

(3) The company's cost of capital is 16%.

Make a report to the Board of the company advising them about the financial feasibility of this acquisition.

Net present values for 16% for Rs. 1 are as follows:

Years	1	2	3	4	5	6
PV	862	743	641	552	476	410

Solution :

Calculation of Purchase Consideration

	Rs.
Issue of shares (35,000 x 15)	5,25,000
External Liabilities Settled	5,00,000
13% Debentures	3,00,000
	13,25,000
Less : Debtors and Inventories	2,00,000
Cash	50,000
Net	10,75,000

Net Present Value = PV of Cash Inflows + PV of Demerger of Leopard Ltd. – Cash Outflow

= 5,00,000 × PVIFA (16%, 6) + 2,00,000 × PVIF (16%, 6) – 10,75,000

= 5,00,000 × 3,684 + 2,00,000 × 0.410 – 10,75,000

= 8,49,000

Since NPV of the decision is positive it is advantageous to acquire Leopard Ltd.

Question 22
May 2014 Paper – 8 Marks

The equity shares of XYZ Ltd. are currently being traded at Rs.24 per share in the market. XYZ Ltd. has total 10,00,000 equity shares outstanding in number; and promoters' equity holding in the company is 40%. PQR Ltd. wishes to acquire XYZ Ltd. because of likely synergies. The estimated present value of these synergies is Rs.80,00,000. Further PQR feels that management of XYZ Ltd. has been over paid. With better motivation, lower salaries and fewer perks for the top management, will lead to savings of Rs.4,00,000 p.a.

Top management with their families are promoters of XYZ Ltd. Present value of these savings would add Rs.30,00,000 in value to the acquisition.

Following additional information is available regarding PQR Ltd.:

Earnings per share	: Rs.4
Total number of equity shares outstanding	: 15,00,000
Market price of equity share	: Rs.40 Required:

(i) What is the maximum price per equity share which PQR Ltd. can offer to pay for XYZ Ltd.?

(ii) What is the minimum price per equity share at which the management of XYZ Ltd. will be willing to offer their controlling interest?

Solution :

(a) Calculation of maximum price per share at which PQR Ltd. can offer to pay for XYZ Ltd.'s share

Market Value (10,00,000 x Rs.24)	Rs.2,40,00,000
Synergy Gain	Rs.80,00,000
Saving of Overpayment	Rs.30,00,000
	Rs.3,50,00,000
Maximum Price (Rs.3,50,00,000/10,00,000)	Rs.35

(b) Calculation of minimum price per share at which the management of XYZ Ltd.'s will be willing to offer their controlling interest

Value of XYZ Ltd.'s Management Holding	
(40% of 10,00,000 × Rs.24)	Rs.96,00,000
Add: PV of loss of remuneration to top management	Rs.30,00,000
	Rs.1,26,00,000
No. of Shares	4,00,000
Minimum Price (Rs.1,26,00,000/4,00,000)	Rs.31.50

Question 23
Nov 2014 Paper – 5 Marks

Elrond Limited plans to acquire Doom Limited. The relevant financial details of the two firms prior to the merger announcement are:

	Elrond Limited	**Doom Limited**
Market price per share	Rs.50	Rs.25

Number of outstanding shares	20 lakhs	10 Lakhs

The merger is expected to generate gains, which have a present value of Rs. 200 lakhs. The exchange ratio agreed to is 0.5.

What is the true cost of the merger from the point of view of Elrond Limited?

Solution :

Shareholders of Doom Limited will get 5 lakh share of Elrond Limited, so they will get

5 lakhs/20 lakhs + 5 lakhs = 20% of shares of Elrond Limited.

The Value of Elrond after Merger will be :

= Rs. 50 x 20 Lakh + Rs. 25 x 10 Lakh + Rs. 200 Lakh

= Rs. 1000 Lakh + 250 Lakh + Rs. 200 Lakh = Rs. 1,450 Lakhs

Cost of Merger will be = (20% of 1,450) – (10 × 25)

= 290 –250 = Rs. 40 Lakhs

Question 24
May 2015 – RTP

M plc and C plc operating in same industry are not experiencing any rapid growth but providing a steady stream of earnings. M plc's management is interested in acquisition of C plc due to its excess plant capacity. Share of C plc is trading in market at £4 each. Other date relating to C plc is as follows:

Particulars	M plc	C plc	Combined Entity
Profit after tax	£4,800,000	£3,000,000	£9,200,000
Residual Net Cash Flow per year	£6,000,000	£4,000,000	£12,000,000
Required return on Equity	12.50%	11.25%	12.00%

Balance Sheet of C plc

	Amount (£)		Amount (£)
Assets		**Liabilities**	
Current Assets	2,73,00,000	Current Liabilities	1,34,50,000
Other Assets	55,00,000	Long Term Liabilities	1,11,00,000
Property Plants & Equipments	2,15,00,000	Reserve & Surplus	2,47,50,000
		Share Capital (5 million common shares @ £1 each)	50,00,000
	5,43,00,000		**5,43,00,000**

You are required to compute:

(i) Minimum price per share C plc should accept from M plc.

(ii) Maximum price per share M plc shall be willing to offer to C plc.

(iii) Floor Value of per share of C plc. Whether it shall play any role in decision for its acquisition by M plc.

Solution :

Value of C plc = Residual Cash Flow/Ke-g
= 40,00,000/0.1225-0
= £3,55,55,556

Value of per share of C plc = 3,55,55,556/50,00,000
= £7.11

Book value of per share of C plc = 2,97,50,000/50,00,000
= £5.95

Value of M plc = Residual Cash Flow/Ke-g
= 60,00,000/0.1225-0
= £4,80,00,000

Value of combined Entity = 1,20,00,000/0.12-0
= £10,00,00,000

Value of Synergy = Value of Combined Entity – Individual Value of M plc and C plc

Value of Synergy = £100,000,000 – (£48,000,000 + £35,555,556) = £16,444,444

(i) Minimum price per share C plc should accept from M plc is £5.95 (current book value).

(ii) Maximum price per share M plc shall be willing to offer to C plc shall be computed as follows:
= Value of C plc as per Residual Cash Flow Synergy Benefits/No. of shares
= 3,55,55,556 + 1,64,44,444/50,00,000
= 5,20,00,000/50,00,000
= £10.40

(iii) Floor Value of per share of C plc shall be £4 (current market price) and it shall not play any role in decision for the acquisition of C plc as it is lower than its current book value.

Question 25
May 2015 – Paper – 8 Marks

BA Ltd and DA Ltd both the companies operate in the same industry. The financial statements of both the companies for the Current financial year are as follows :

Balance sheet

Particulars	BA Ltd (Rs.)	DA Ltd (Rs.)
Current Assets	14,00,000	10,00,000
Fixed Assets (Net)	10,00,000	5,00,000
Total	24,00,000	15,00,000
Equity Capital (Rs.10 each)	10,00,000	8,00,000
Retained earnings	2,00,000	
14% long term debts	5,00,000	3,00,000
Current liabilities	7,00,000	4,00,000

Total	24,00,000	15,00,000

Income statement

	BA Ltd (Rs.)	DA Ltd (Rs.)
Net sales	34,50,000	17,00,000
Cost of goods sold	27,60,000	13,60,000
Gross profit	6,90,000	3,40,000
Operating expenses	2,00,000	1,00,000
Interest	70,000	42,000
Earnings before taxes	4,20,000	1,98,000
Taxes @ 50%	2,10,000	99,000
Earnings after taxes (EAT)	2,10,000	99,000
Additional Information : No. of Equity shares	1,00,000	80,000
Dividend payment ratios (D/P)	40%	60%
Market price per share	Rs.40	Rs.15

Assume that both companies are in the process of negotiating a merger through an exchange of equity shares. You have been asked to assist in establishing equitable exchange terms and are require to :

(1) Decompose the share price of both the companies into EPS & P/E components : and also segregate their EPS figures into Return on Equity (ROE) and book value/intrinsic value per share components.

(2) Estimate future EPS growth rate for each company.

(3) Based on expected operating synergises BA Ltd estimates that the intrinsic value of DA's equity share would be Rs.20 per share on its acquisition.you are required to develop a range of justifiable equity share exchange ratios that can be offered by BA Ltd to the shareholders of DA Ltd . Based on your analysis an part (1) and (2) would you expect the neghotiated terms to be closer to the upper or the lower exchange ratio limits and why ?

(4) Calculate the post merger EPS based on an exchange ratio 0.4 : 1 being offered by BA Ltd and indicate the immediate EPS accretion or dilution if any that will occur for each group of shareholders.

(5) Based on 0.4:1 exchange ratio and assuming that BA's Ltd pre merger P?E Ratio will continue after the merger estimate the post merger market price.Also show the resulting accretion or dilution in pre merger market prices.

Solution :

		BA Ltd	DA Ltd
A	Earnings After Tax	2,10,000	99,000
B	No of Equity Shares	1,00,000	80,000
C	EPS (A/B)	2.10	1.2375
D	Market Price	40	15
E	PE Ratio(D/ E)	19.05	12.12
F	Net worth (Capital + Reserves)	12,00,000	8,00,000

G	B.V (Net worth / No.	12	10
H	ROE = EAT/Net worth x 100	17.50%	12.375

1) EPS / PE / BV and ROE are calculated above

2) Growth Rate

G = br (Retention Ratio x ROE)

Retention Ratio = 100 – Payout Ratio

BA Ltd. = 100 – 40 = 60%

DA Ltd. = 100 – 60% = 40%

Growth

BA Ltd = 17.5 × 60% = 10.5%

DA Ltd = 12.375 × 40% = 4.97%

3) Range of Prices

Upper Limit = Based on estimated share price for DA at 20

Swap = Target company/Acquiring company = $\frac{20}{40}$ = 0.5

Lower Limit = Based on the market price of Rs.15

Swap = $\frac{15}{40}$ = 0.375

Based on the analysis of EPS, PE, ROE and BV and even the Growth, the exchange ratio should be closer to lower limit.

4) EPS (Based on the swap ratio of 0.4) = 2,10,000 + 99,000

Changes in EPS

	BA	DA
Post Merger	2.341	0.9364 (2.341 × 0.4)
Pre	2.1	1.2375
Gain / (Loss)	0.241	0.3011
% Gain / (Loss)	10.29%	32.155%

5) Market Price assuming the PE ratio remains constant

BA Ltd = 2.341 × 19.05 = 44.59

DA Ltd = 44.59 × 0.4 = 17.84

	BA	DA
Post	44.59	17.84
Pre Merger	40	15
Gain / (Loss)	4.59	2.84
% Gain / (Loss)	10.29%	18.92

Question 26
Nov 2015 – RTP

Two companies Bull Ltd. and Bear Ltd. recently have been merged. The merger initiative has been taken by Bull Ltd. to achieve a lower risk profile for the combined firm in spite of fact that both companies belong to different industries and disclose a little co- movement in their profit earning streams.

Though there is likely to synergy benefits to the tune of Rs.7 crore from proposed merger. Further both companies are equity financed and other details are as follows:

	Market	Beta
Bull Ltd.	Rs.1000 crore	1.50
Bear Ltd.	Rs.500 crore	0.60

Expected Market Return and Risk Free Rate of Return are 13% and 8% respectively. Shares of merged entity have been distributed in the ratio of 2:1 i.e. market capitalization just before merger. You are required to:

1) Calculate return on shares of both companies before merger and after merger.
2) Calculate the impact of merger on Mr. X, a shareholder holding 4% shares in Bull Ltd. and 2% share of Bear Ltd.

Solution :

(a) Expected Return using CAPM

(i) Before Merger

Share of Bull Ltd.	8% + 1.50 (13% - 8%) =	15.50%
Share of Bear Ltd.	8% + 0.60(13% - 8%) =	11.00%

(ii) After Merger

Beta of merged company shall be weighed average of beta of both companies as follows:

$2/3 \times 1.50 + 1/3 \times 0.60 = 1.20$

Thus, expected return shall be: 8% + 1.20 (13% - 8%) = 14%

(b) Impact of Merger on Mr X.

After merger his % holding in merged company shall be:

$2/3 \times 4\% + 1/3 \times 2\%$

= 3.33%

The value of Mr X. Holding before merger was :

Bull Ltd.	4% × Rs.1000 crore	Rs.40 crore
Bear Ltd.	2% × Rs.500 crore	Rs.10 crore
		Rs.50 crore

To compute the value of holding of Mr. X, after merger first we have to compute the value of

merged entity as follows:

Bull Ltd. Bear Ltd.	15.50% x Rs. 1000 crore	Rs. 155 crore
Synergy Benefits	11% x Rs. 500 crore	Rs. 55 crore
		Rs. 217 crore

Market Capitalization of Merged Entity = 217/0.14 = 1550 crore Value of Mr X holding = 1550 × 3.33 % = 51.67 Crore

Question 27
Nov 2015 – Paper

The following information is provided relating to the acquiring company Efficient Ltd. and the target Company Healthy Ltd.

	Efficient Ltd.	**Healthy Ltd.**
No. of shares (F.V. Rs.10 each)	10.00 lakhs	7.5 lakhs
Market capitalization	500.00 lakhs	750.00 lakhs
P/E ratio (times)	10.00	5.00
Reserves and surplus)	300.00 lakhs	165.00 lakhs
Promoter's Holding (No. of share)	4.75 lakhs	5.00 lakhs

Board of Directors of both the companies have decided to give a fair deal to the shareholders and accordingly for swap ratio the weights are decided as 40%, 25% and 35% respectively for Earning , Book value and market Price of share of each Company:

(1) Calculate the swap ratio and also calculate Promoter's holding % after acquisition.

(2) What is the EPS of Efficient Ltd. after acquisition of Healthy Ltd.?

(3) What is the expected market price per share and market capitalization of Efficient Ltd. After acquisition , assuming P/E of firm Efficient Ltd. remains unchanged.

(4) Calculate free float market capitalization of the merged firm.

Solution :

		Efficient Ltd	**Healthy Ltd**
A	No of Shares (F.V – Rs. 10 each)	10 Lakhs	7.5 Lakhs
B	Capital	100 lakhs	75 lakhs
C	Reserves and Surplus	300 lakhs	165 lakhs
D	Net Worth (A + B)	400 lakhs	240 lakhs
E	**BV (Net worth / No)**	**40 per share**	**32 per share**
F	Market Capitalization	500 lakhs	750 lakhs
G	**MPS (Market Cap / No)**	**50**	**100**
H	P / E Ratio	10	5
I	**EPS (MPS / PE)**	**5**	**20**
J	Promoters holdings	4.75 lakhs	5 lakhs
K	% of Promoters Holding	47.50%	66.66%
L	Earnings after tax	50	150

1) Swap Ratio

Basis	Efficient	Healthy			Swap
EPS	5	20	20/5	4×0.4	1.6
BV	40	32	32/40	0.8×0.25	0.2
MPS	50	100	100 / 50	2×0.35	0.7
Total					2.5

2) Promoters Holding post merger

	Pre merger	Post Merger	
Total Shares	10 lakhs	28.75	[(10 + 18.75 (7.5 x 2.5)]
Promoters holding	4.75	17.25	[4.75 + (5 x 2.5)]

Promoters holding = $\frac{17.25}{28.75}$ = 60%

3) EPS of the Merged Firm Total = $\frac{50+150}{28.75}$ = Rs.6.956/sh

4) MPS of the merged firm

= EPS $\times$ PE Ratio = 6.957 $\times$ 10 = Rs.69.565

5) Market Capitalization = MPS $\times$ No of shares

= 69.565 $\times$ 28.75

= 2000 lakhs

6) Free float market Capitalization

It means shares which are floating in market, it means market cap excluding promoters holding. Promoters holding are 60% and therefore free float is 40%.

= 2000 $\times$ 40%

= 800 lakhs

Question 28

Nov 2015 – Paper / Nov 2019 (Old) – RTP

XYZ Ltd. wants to purchase ABC Ltd. by exchanging 0.7 of its share for each share of ABC Ltd. Relevant financial data are as follows:

Equity shares outstanding	10,00,000	4,00,000
EPS (Rs.)	40	28
Market Price per share (Rs.)	250	160

(i) Illustrate the impact of merger on EPS of both the companies.

(ii) The management of ABC Ltd. has quoted a share exchange ratio of 1:1 for the merger. Assuming that P/E ratio of XYZ Ltd. will remain unchanged after the merger, what will be the gain from merger for ABC Ltd.?

(iii) What will be the gain/loss to shareholders of XYZ Ltd.?

(iv) Determine the maximum exchange ratio acceptable to shareholders of XYZ Ltd.

Solution :

(a)

	XYZ Ltd.	ABC Ltd.
Equity shares outstanding (Nos.)	10,00,000	4,00,000
EPS	Rs.40	Rs.28
Profit	Rs.4,00,00,000	Rs.1,12,00,000
PE Ratio	6.25	5.71
Market Price per share	Rs.250	Rs.160

(b) EPS after merger

No. of shares to be issues (4,00,000 × 0.70)	2,80,000
Existing Equity shares outstanding	10,00,000
Equity shares outstanding after merger	12,80,000
Total Profit (Rs.4,00,00,000 + Rs.1,12,22,222)	Rs.5,12,00,000
EPS	Rs.40

(i) Impact of merger on EPS of both the companies

	XYZ Ltd.	ABC Ltd.
EPS after Merger	Rs.40	Rs.28
EPS before Merger	Rs.40	Rs.28*
	Nil	Nil

*Rs40 x 0.70

(ii) Gain from the Merger if exchange ratio is 1:1

No. of shares to be issues	4,00,000
Existing Equity shares outstanding	10,00,000
Equity shares outstanding after merger	14,00,000
Total Profit (Rs.4,00,00,000 + Rs.1,12,22,222)	Rs.5,12,00,000
EPS	Rs.36.57
Market Price of Share (Rs.36.57 x 6.25)	Rs.228.56
Market Price of Share before Merger	Rs.160.00
Impact (Increase/Gain)	Rs.68.56

(iii) Gain/Loss from the Merger to the shareholders of XYZ Ltd.

Market Price of Share after Merger (228.56 × 1)	Rs.228.56
Market Price of Share before Merger	Rs.250.00
Loss from the merger (per share)	Rs.21.44

(iv) Maximum Exchange Ratio acceptable to XYZ Ltd. shareholders

MPS of XYZ = 250

PE Ratio = 6.25

$\therefore$ EPS $= \frac{250}{6.25} = 40$

EPS $= \frac{4,00,00,000 + 1,12,00,000}{10,00,000 + x}$

$\therefore x$ = 2,80,000

Ratio $= \frac{2,80,000}{4,00,000} = 0.7$

Note : Maximum exchange rate acceptable to XYZ should be such that its MPS is not compromised.

Question 29

May 2016 – Paper / Nov 2018 – RTP

The CEO of a company thinks that shareholders always look for EPS. Therefore he considers maximization of EPS as his company's objective. His company's current Net Profits are Rs.80.00 lakhs and P/E multiple is 10.5. He wants to buy another firm which has current income of Rs.15.75 lakhs & P/E multiple of 10.

What is the maximum exchange ratio which the CEO should offer so that he could keep EPS at the current level, given that the current market price of both the acquirer and the target company are Rs.42 and Rs.105 respectively?

If the CEO borrows funds at 15% and buys out Target Company by paying cash, how much should he offer to maintain his EPS? Assume tax rate of 30%.

Solution :

(a)

	Acquired Company	Target Company
Net Profit	Rs.80 lakhs	Rs.15.75 lakhs
PE Multiple	10.50	10.00
Market Capitalization	Rs.840 lakhs	Rs.157.50 lakhs
Market Price	Rs.42	Rs.105
No. of shares	20 lakhs	1.50 lakhs
EPS	Rs.4	Rs.10.50

Maximum Exchange Ratio 4 : 10.50 or 1 : 2.625

Thus, for every one share of Target Company 2.625 shares of Acquirer Company.

(b) Let x lakhs be the amount paid by Acquirer company to Target Company. Then to maintain same EPS i.e. Rs.4 the number of shares to be issued will be:

$$\frac{(80\,\text{lakhs} + 15.75\,\text{lakhs}) - (0.70 \times 15\% \times x)}{20\,\text{lakhs}} = 4$$

$$\frac{95.75 - 0.105x}{20} = 4$$

X = Rs.150 lakhs

Thus, Rs.150 lakhs shall be offered in cash to Target Company to maintain same EPS.

Question 30
Nov 2016 – RTP

XYZ, a large business house is planning to acquire ABC another business entity in similar line of business. XYZ has expressed its interest in making a bid for ABC. XYZ expects that after acquisition the annual earning of ABC will increase by 10%. Following information, ignoring any potential synergistic benefits arising out of possible acquisitions, are available:

	XYZ	ABC	Proxy entity for XYZ & ABC in the same line of business
Paid up Capital (Rs.Crore)	1025	106	-
Face value of share is Rs.10			
Current share price	Rs.129.60	Rs.55	-
Debt: Equity (at market values)	1 : 2	1 : 3	1 : 4
Equity Beta	-	-	1 : 1

Assume Beta of debt to be zero and corporate tax rate as 30%, determine the Beta of combined entity.

Solution :

β ungeared for the proxy company = 1.1 × 4/[4+{1-0.3}]
= 0.9362

0.9362 = $\beta_{\text{Geared of XYZ}}$ × 2/[2+{1-0.3}]

$\beta_{\text{Geared of XYZ}}$ = 1.264

0.9362 = $\beta_{\text{Geared of XYZ}}$ × 3/[3+{1-0.3}]

$\beta_{\text{Geared of XYZ}}$ = 1.155

	XYZ	ABC	Total
No. of share (1)	Rs. 1025 crore Rs. 10 = Rs.102.5 crore	Rs. 106 crore Rs. 10 = Rs.10.60 crore	-
Current share price (2)	Rs.129.60	Rs.55	-
Market values (3) = (1) × (2)	Rs.13284 crore	Rs.583 crore	Rs.13867 crore
Equity beta (4)	14.264	1.155	
Market values x Equity beta	Rs.16790.976 crore	Rs.673.365 crore	Rs.17464.341 crore

Portfolio Beta after Merger = 17,464.341/13,867
= 1.26

Question 31
May 2017 – Paper

XML bank was established in 2001 and doing banking business in India. The bank is facing very critical situation. There are problems of Gross NPA (Non- Performing Assets) at 40% & CAR/CRAR (Capital Adequacy Ratio/Capital. Risk Weight Asset Ratio) at 2%. The net worth of the bank is not good. Shares are not traded regularly. Last week, it was traded @ Rs.4 per share.

RBI Audit suggested that bank has either to liquidate or to merge with other bank.

ZML Bank is professionally managed bank with low gross NPA of 5%. I t has net NPA as 0% and CAR at 16%. Its share is quoted in the market @ Rs.64 per share. The Board of Directors of ZML Bank has submitted a proposal to RBI for takeover of bank XML on the basis of share exchange ratio.

The Balance Sheet details of both the banks are as follows:

PARTICULARS	XML Bank (Rs.) (Amount in Crores)	ZML Bank (Rs.) (Amount in Crores)
Liabilities		
Paid up share capital (Rs.10)	70	250
Reserve and Surplus	35	2,750
Deposits	2,000	20,000
Other Liabilities	445	1,250
Total Liabilities	**2,550**	**24,250**
Assets	200	
Cash in hand and with RBI	0	1,250
Balance with other banks	550	1,000
Investments	1,750	7,500
Advances	50	13,500
Other Assets	2,550	1,000
Total Assets	**2,550**	**24,250**

It was decided to issue shares at Book Value of ZML Bank to the shareholders of XML Bank. All Assets & Liabilities are to be taken over at Book Value.

For the Swap Ratio, weights assigned to different parameters are as follows:

Gross NPA	40%
CAR	10%
Market Price	40%
Book Value	10%

You are required to :

(i) Calculate swap ratio based on above rates.

(ii) Calculate number of shares are to be issued.

(iii) Prepare Balance Sheet after Merger

Solution :

Calculation of book value per share :

	XML	ZML
Assets	2550	24,250
Deposits	(2000)	(20,000)

Other Liability	(445)	(1250)
Net Assets	105	3000
No. of Shares (crores)	7	25
Book value per share (Rs.)	105 / 7 = **15**	3000 / 25 = **120**

(a) Swap Ratio

Gross NPA	5 : 40	i.e.	5/40 × 40% =	0.05
CAR	2 : 16	i.e.	2/16 × 10% =	0.0125
Market Price	4 : 64	i.e.	4/64 × 40% =	0.0250
0Book Value	15 : 120	i.e.	15/120 × 10% =	0.0125
				0.1

Thus for every share of Bank XML 0.1 share of Bank ZML shall be issued.

(b) No. of equity shares to be issued:

70/10 × 0.1 = 0.7crore shares

= 70 lakh number of shares

(c) Balance Sheet after Merger

Calculation of Capital Reserve

Book Value of Shares	Rs.105.00 cr
Value of Shares issued	Rs.7.00 cr
Capital Reserve	Rs.98.00 cr

Balance Sheet as at date after merger

	Rs.in Cr		**Rs.in Cr**
Paid up Share Capital	257	Cash in Hand & RBI	1450
Reserves & Surplus	2750	Balance with other banks	1000
Capital Reserve	98	Investment	8050
Deposits	22000	Advances	15250
Other Liabilities	1695	Other Assets	1050
	26,800		**26,800**

Question 32
Nov 2017 – RTP

Teer Ltd. is considering acquisition of Nishana Ltd. CFO of Teer Ltd. is of opinion that Nishana Ltd. will be able to generate operating cash flows (after deducting necessary capital expenditure) of Rs.10 crore per annum for 5 years.

The following additional information was not considered in the above estimations.

(i) Office premises of Nishana Ltd. can be disposed of and its staff can be relocated in Teer Ltd.'s office not impacting the operating cash flows of either businesses. However, this action will generate an immediate capital gain of Rs.20 crore.

(ii) Synergy Gain of Rs.2 crore per annum is expected to be accrued from the proposed

acquisition.

(iii) Nishana Ltd. has outstanding Debentures having a market value of Rs.15 crore. It has no other debts.

(iv) It is also estimated that after 5 years if necessary, Nishana Ltd. can also be disposed of for an amount equal to five times its operating annual cash flow.

Calculate the maximum price to be paid for Nishana Ltd. if cost of capital of Teer Ltd. is 20%. Ignore any type of taxation.

Solution :

Calculation of Maximum Price to be paid for the acquisition of Nishana Ltd.

(Rs. Crore)

Year	0	1	2	3	4	5
Operating cash flow	-	10.00	10.00	10.00	10.00	10.00
Gain on Sale of office premises	20.00	-	-	-	-	-
Synergy Benefits	-	2.00	2.00	2.00	2.00	2.00
Disposal of Nishana Ltd.	-	-	-	-	-	50.00
Net cash flow	20.00	12.00	12.00	12.00	12.00	62.00
PVF @ 20%	1	0.833	0.694	0.579	0.482	0.402
Present value	20.00	10.00	8.328	6.948	5.784	24.924

Total of Present value	75.984
Less: Market Value of Debentures	(15000)
	60.984

Thus, the maximum price to be paid for acquisition of Nishana Ltd. Rs.60.984 crore.

Question 33
Nov 2017 – RTP

AB Ltd., is planning to acquire and absorb the running business of XY Ltd. The valuation is to be based on the recommendation of merchant bankers and the consideration is to be discharged in the form of equity shares to be issued by AB Ltd. As on 31.3.2006, the paid up capital of AB Ltd. consists of 80 lakhs shares of Rs.10 each. The highest and the lowest market quotation during the last 6 months were Rs.570 and Rs.430. For the purpose of the exchange, the price per share is to be reckoned as the average of the highest and lowest market price during the last 6 months ended on 31.3.06.

XY Ltd.'s Balance Sheet as at 31.3.2006 is summarised below:

	Rs.in lakhs
Sources	
Share Capital	
20 lakhs equity shares of Rs.10 each fully paid	200
20 lakhs equity shares of Rs.10 each fully paid	50
Loans	100
Total	**350**
Uses	
Fixed Assets (Net)	150

Net Current Assets	200
Total	**350**

An independent firm of merchant bankers engaged for the negotiation, have produced the following estimates of cash flows from the business of XY Ltd.:

Year Ended	By way of after tax earnings for equity	Rs.lakhs
31.3.07	do	105
31.3.08	Do	120
31.3.09	Do	125
31.3.10	Do	120
31.3.11	Terminal value estimate	100
		200

It is the recommendation of the merchant banker that the business of XY Ltd. may be valued on the basis of the average of (i) Aggregate of discounted cash flows at 8% and (ii) Net assets value. Present value factors at 8% for years

1-5: 0.93 0.86 0.79 0.74 0.68

You are required to:

(i) Calculate the total value of the business of XY Ltd.

(ii) The number of shares to be issued by AB Ltd.; and

(iii) The basis of allocation of the shares among the shareholders of XY Ltd.

Solution :

Price/share of AB Ltd. for determination of number of shares to be issued: (Rs.570 + Rs.430)/2	Rs.	500
Value of XY Ltd based on future cash flow capitalization (105 × 0.93)+(120 × 0.86)+(125 × 0.79)+(120 × 0.74) × (300 × 0.68)	Rs.lakhs	592.4
Value of XY Ltd based on net assets	Rs.lakhs	250
Average value (592.40+250)/2		421.2
No. of shares in AB Ltd to be issued Rs.4,21,20,000/500	Nos.	84240
Basis of allocation of shares		
Fully paid equivalent shares in XY Ltd. (20 + 5) lakhs		2500000
Distribution to fully paid shareholders 84240 × 20/25		67392
Distribution to partly paid shareholders 84240 – 67392		16848

Question 34

Nov 2017 – Paper

East Co. Ltd. is studying the possible acquisition of Fost Co. Ltd. by way of merger. The following data are available in respect of the companies.

	East Co. Ltd	**Fost Co. Ltd.**
Earnings after tax (Rs.)	2,00,000	60,000
No. of equity shares	40,000	10,000
Market value per share (Rs.)	15	12

(i) If the merger goes through by change of equity share and the exchange ratio is based on the current market price, what are the new earnings per share for East Co. Ltd.·?

(ii) Fort Co. Ltd. wants to be sure that the merger will not diminish the earnings available to its shareholders. What should be the exchange ratio in that case?

Solution :

(i) Calculation of new EPS of East Co. Ltd.

Swap Ratio = $\frac{12}{15}$ = 0.8

EPS (After Acquisition) = $\frac{2,00,000 + 60,000}{40,000 + (10,000 \times 0.8)}$ = Rs.5.42/sh.

(ii) Calculation of exchange ratio which would not diminish the EPS of Fost Co. Ltd. after its merger with East Co. Ltd.

Swap Ratio = $\frac{6}{5}$ (Based on current EPS)

= 1.2

EPS (After Acquisition) = $\frac{2,00,000 + 60,000}{40,000 + (10,000 \times 1.2)}$ = Rs.5/sh.

Equivalent EPS of Fost Co. Ltd. = 5 × 1.2 = Rs.6/sh.

Question 35
May 2018 – Paper

During the audit of the Weak Bank (W), RBI has suggested that the Bank should either merge with another bank or may close down. Strong Bank (S) has submitted a proposal of merger of Weak Bank with itself. The relevant information and Balance Sheets of both the companies are as under:

Particulars	Weak Bank (W)	Strong Bank (S)	Assigned Weights (%)
Gross NPA (%)	40	5	30
Capital Adequacy Ratio (CAR/Capital risk Weight Asset Ratio)	5	16	28
Market price per share (MPS)	12	96	32
Book Value			10
Trading on Stock Exchange	Irregular	Frequent	

Balance Sheet

(Rs.in lakhs)

Particulars	Weak Bank (W)	Strong Bank (S)
Paid up share capital (Rs.10 per share)	150	500
Reserves & Surplus	80	5,500
Deposits	4,000	44,000
Other liabilities	890	2,500
Total Liabilities	**5,120**	**52,500**
Cash in hand & with RBI	400	2,500

Balance with other banks	-	2,000
Investment	1,100	19,000
Advance	3,500	27,000
Other assets	70	2,000
Preliminary expenses	50	-
Total Assets	**5,120**	**52,500**

You are required to

(a) Calculate Swap ratio based on the above weights:

(b) Ascertain the number of Shares to be issued to Weak Bank;

(c) Prepare Balance Sheet after merger; and

(d) Calculate CAR and Gross NPA of Strong Bank after merger.

Solution :

(a) Swap Ratio

Gross NPA	5 : 40	5/40 × 30%	0.0375
CAR	5 : 16	5/16 × 28%	0.0875
Market Price	12 : 96	12/96 × 32%	0.0400
Book value per share	12 : 120	12/120 × 10%	0.0100
			0.1750

Thus for every share of Weak Bank, 0.1750 share of Strong Bank shall be issued.

Calculation of Book Value per Share

Particulars	**Weak Bank (W)**	**Strong Bank (S)**
Share Capital Reserves & Surplus	150	500
	80	5,500
	230	6,000
Less: Preliminary Expenses	50	-
Net worth or book value	180	6,000
No. of outstanding shares Book value per share (Rs.)	15	50
	12	120

(b) No. of equity shares to be issued:

150/10 × 0.1750 = 2.625 lakh shares

(c) Balance sheet after merger

Calculation of Capital Reserve

Book value of Shares	Rs.180.00 lac
Less: Value of Shares issued	Rs. 26.25 lac
Capital Reserve	Rs. 153.75 lac

Balance Sheet

	Rs.lacs		Rs.lacs
Paid up share capital	526.25	Cash in hand & RBI	2,900.00
Reserves & Surplus	5,500.00	Balance with other banks	2,000.00
Capital Reserve	153.75	Investment	20,100.00
Deposits	48,000.00	Advance	30,500.00
Other liabilities	3,390.00	Other assets	2,070.00
	57570		**57570**

(d) Calculation CAR & Gross NPA % of Bank 'S' after merger

CAR/CRWAR = Total Capital/Risky Weighted Assets

	Weak Bank	Strong Bank	Merged
	5%	16%	
Total Capital	Rs.180 lac	Rs.6,000 lac	Rs.6,180 lac
Risky Weighted Assets	Rs.3,600 lac	Rs.37,500 lac	Rs.41,100 lac

CAR = 6180/41100 x 100 = 15.04%

GNPA Ratio = Gross NPA/Gross Advance x 100

	Weak Bank	Strong Bank	Merged
GNPA (Given)	0.4 $0.40 = \frac{GNPA_R}{Rs.3500\ lac}$	0.05 $0.05 = \frac{GNPA_S}{Rs.27000\ lac}$	
Gross NPA	Rs.1,400 lac	Rs.1,350 lac	Rs.2,750 lac

Question 36
May 2018 (New) – Paper

Tatu Ltd. wants to takeover Mantu Ltd. and has offered a swap ratio of 1:2 (0.5 shares for every one share of Mantu Ltd.). Following information is provided

	Tatu Ltd.	Manu Ltd.
Profit after tax	Rs.24,00,000	Rs.4,80,000
Equity shares outstanding (Nos.)	8,00,000	2,40,000
EPS	Rs.3	Rs.2
PE Ratio	10 times	7 times
Market price per share	Rs.30	Rs.14

You are required to calculate:

(i) The number of equity shares to be issued by Tatu Ltd. for acquisition of Mantu Ltd.

(ii) What is the EPS of Tatu Ltd. after the acquisition?

(iii) Determine the equivalent earnings per share of Mantu Ltd.

(iv) What is the expected market price per share of Tatu Ltd. after the acquisition, assuming its PE multiple remains unchanged?

(v) Determine the market value of the merged firm.

Solution :

(i) The number of shares to be issued by Tatu Ltd:

The exchange ratio is 0.5

So, New shares = 2,40,000 × 0.5 = 1,20,000 shares.

(ii) EPS of Tatu Ltd. after acquisition:

Total Earnings	(24,00,000 + 4,80,000)	Rs.28,80,000
No. of shares	(8,00,000 + 1,20,000)	9,20,000
EPS	(28,00,000)/(9,20,000)	Rs.3.13

(iii) Equivalent EPS of Mantu Ltd:

No. of new shares	0.5
EPS	Rs.3.13
Equivalent EPS (Rs.3.13 x 0.5)	Rs.1.57

(iv) New Market Price of Tatu Ltd. (P/E remaining unchanged)

Present P/E Ratio of A Ltd.	10 times
Expected EPS after merger	Rs.3.13
Expected Market Price (Rs.3.13 x 10)	Rs.31.30

(v) Market Value of merged firm:

Total Number of Shares	9,20,000
Expected Market Price	Rs.31.30
Total value (9,20,000 x 31.30)	Rs.2,87,96,000

Question 37

Nov 2018 – RTP / Nov 2019 (Old) – RTP / Nov 2020 (New) - RTP

The following is the Balance sheet of Grape Fruit Company Ltd. as at 31st March 2011.

Liabilities	(Rs.in lakhs)	Assets	(Rs.in lakhs)
Equity shares of Rs.100 each	600	Land and Building	200
14% preference shares of	200	Plant and Machinery	300
Rs.100/- each		Furniture and Fixtures	50
13% Debentures	200	Inventory	150
Debenture interest accrued	26	Sundry debtors	70
and payable		Cash at bank	130
Loan from Bank	74	Preliminary expenses	10
Trade creditors	340	Cost of issue of debentures	5
		Profit and loss account	525
	1440		**1440**

The Company did not perform well and has suffered sizable losses during the last few years. However, it is felt that the company could be nursed back to health by proper financial restructuring. Consequently the following scheme of reconstruction has been drawn up:

(i) Equity shares are to be reduced to Rs.25/- per share, fully paid up;

(ii) Preference shares are to be reduced (with coupon rate of 10%) to equal number of shares of Rs.50 each, fully paid up.

(iii) Debenture holders have agreed to forgo the accrued interest due to them. In the future, the rate of interest on debentures is to be reduced to 9 percent.

(iv) Trade creditors will forego 25 percent of the amount due to them.

(v) The company issues 6 lakh of equity shares at Rs.25 each and the entire sum was to be paid on application. The entire amount was fully subscribed by promoters.

(vi) Land and Building was to be revalued at Rs.450 lakhs, Plant and Machinery was to be written down by Rs.120 lakhs and a provision of Rs.15 lakhs had to be made for bad and doubtful debts.

Required:

(i) Show the impact of financial restructuring on the company's activities.

(ii) Prepare the fresh balance sheet after the reconstructions is completed on the basis of the above proposals.

Solution :

Impact of Financial Restructuring

(i) Benefits to Grape Fruit Ltd.

(a) Reduction of Liabilities payable

Reduction in equity share capital (6 lakh shares × Rs.75 per share)	450
Reduction in preference share capital (2 lakh shares × Rs.50 per share)	100
Waiver of outstanding debenture Interest	26
Waiver from trade creditors (Rs.340 lakhs × 0.25)	85
Total	**661**

(b) Revaluation of Assets

Appreciation of Land and Building (Rs.450 – Rs.200 lakhs)	250
Total (A)	911

(ii) Amount of Rs.911 lakhs utilized to write off losses, fictious assets and over- valued assets.

Writing off profit and loss account	525
Cost of issue of debentures	5
Preliminary expenses	10
Provision for bad and doubtful debts	15
Revaluation of Plant and Machinery (Rs.300 lakhs – Rs.180 lakhs)	120
Total (B)	675
Capital Reserve (A) – (B)	236

(iii) Balance sheet of Grape Fruit Ltd. as at 31st March 2011 (after re- construction)

(Rs.in lakhs)

Liabilities	Amount	Assets		Amount
12 lakhs equity shares of Rs.25/- each	300	Land & Building		450
10% Preference shares of Rs.50/- each	100	Plant & Machinery		180
Capital Reserve	236	Furniture & Fixtures		50
9% debentures	200	Inventory		150
Loan from Bank	74	Sundry Debtors	70	
Trade Creditors	225	Prov. For Doubtful	15	55
		Debts		
		Cash-at-Bank (Balancing figure)		280
	1165			**1165**

*Opening Balance of Rs.130/- lakhs + Sale proceeds from issue of new equity shares Rs.150/- lakhs.

Question 38
Nov 2018 – Paper – 12 Marks

C Ltd. & D Ltd. are contemplating a merger deal in which C Ltd. will acquire D Ltd. The relevant information about the firms are given as follows:

	C Ltd.	D Ltd.
Total Earnings (E) (in millions)	Rs..96	Rs.30
Number of outstanding share (S) (in millions)	20	14
Earnings per share (EPS) (Rs.)	4.8	2.143
Price earning ratio (P/E)	8	7
Market Price per share (P) (Rs.)	38.4	15

(i) What is the maximum exchange ratio acceptable to the shareholders of C Ltd., if the P/E ratio of the combined firm is 7?

(ii) What is the minimum exchange ratio acceptable to the shareholders of D Ltd., if the P/E ratio of the combined form is 9?

Solution :

(i) Maximum exchange rate acceptable to shareholder of C Ltd., if combined PE Ratio of firm is 7.

Note : The No. of shares to be issued should be such at MPS of C Ltd. Is not diluted

Let No. of shares to be issued to D Ltd. Be x.

Total profit = 96 + 30 = 126

Total No. = 20 + x = 20 + x

EPS = = $\frac{126}{20+x}$

PE Ratio = = 7

MPS = 38.4

$\therefore \frac{126}{20+x} \times 7 = 38.4$

$\therefore x = 2.96875$

Swap Ratio = $\frac{2.96875}{14} = 0.212$

(ii) The minimum exchange ratio acceptable to the shareholders of D Ltd., if the PE Raio of the combined firm is 9.

Note : The no. of shares to be issued should be such that equivalent EPS of D Ltd. Is not diluted i.e. MPS of D = Rs.15/sh

Swap Ratio for shares to be issued. Let the D be x

Total Earning = 96 + 30 = 126

PE Ratio = = 9

Total Market Capitalisation = 126 × 9 = 1134

Total No. of shares = 20 + (14 × x) = 20 + 14x

MPS = $\frac{1134}{20+14x}$

Equivalent MPS of D Ltd. = $\left(\frac{1134}{20+14x}\right) \times x$

$\therefore x = 15 \times \left(\frac{20+14x}{1134}\right)$

$x = 15\left(\frac{20}{1134}\right) + 15\left(\frac{14x}{1134}\right)$

$x = 0.26455 + \frac{210x}{1134}$

x = 0.26455 + 0.185185x

∴ x = 32467 (Swap Ratio)

∴ No. of shares to be issued

= 14 × 0.32467 = 4.5454

Question 39
May 2019 (New) - Paper

Given is the following information :

	Day Ltd.	Night Ltd.
Net Earnings	Rs.5 crores	Rs.3.50 crores
No. of Equity Shares	10,00,000	7,00,000

The shares of Day Ltd. and Night Ltd. trade at 20 and 15 times their respective P/E ratios.

Day Ltd. considers taking over Night Ltd. by paying Rs.55 crores considering that the market price of Night Ltd. reflects its true value. It is considering both the following options :

(i) Takeover is funded entirely in cash.

(ii) Takeover is funded entirely in stock.

You are required to calculate the cost of the takeover and advise Day Ltd. on the best alternative.

Solution :

		Day Ltd.	Night Ltd.
(A)	Earning	5 Cr.	3.5 Cr.
(B)	No. of shares	10 lakh	7 lakh
(C)	EPS (A/B)	Rs.50/sh.	Rs.50/sh.
(D)	PE Ratio	20 time	15 time
(E)	MPS (C × B)	Rs.1,000/sh.	Rs.750/sh.
(F)	Market value (B × E)	100 Cr.	52.5 Cr.

(i) Cost of takeover if takeover is entirely funded by Cash

Consideration paid	55 Cr.
– Market value of Night Ltd.	52.5 Cr.
Net Cost of funding	2.5 Cr.

(ii) Cost of takeover if takeover is entirely funded by shares

Consideration paid 55 Cr.

No. of share to be issued

$= \frac{55Cr.}{1,000} = 0.55$ Cr. i.e. 5.5 lakhs

Total No. of shares = 10 + 5.5 lakh = 15.5 lakh

Proportion of capital of Night is total

$= \frac{5.5}{15.5} = 35.48\%$

EPS After Acquisition

$= \frac{5Cr. + 3.5\,Cr.}{15.5\,lakhs} =$ Rs.54.84/sh

MPS = 54.84 × 20 = Rs.1096.77/sh

Market Capitalisation = 1096.77 × 15.5 = 170 Cr.

Cost of Acquisition

= (170 × 35.48%) = 52.5%

= 7.816 Cr.

Decision : Since cost of funding is less by cash deal it should opt. for all cash deal.

Question 40

May 2019 (Old) - Paper

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 Rs.3.20 each. Other data relating to S Ltd. is as follows :

Balance Sheet of S Ltd.

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

Particulars	R Ltd. (Rs.)	S Ltd. (Rs.)	Combined Entity (Rs.)
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%	12.50%

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 S Ltd., whether it shall play any role in decision for its acquisition by R Ltd.

Solution :

(i) Minimum price per share S Ltd. Should accept from R Ltd.

(a) Market Cap. (Based on CF)

$$= \frac{CF}{Re - g} = \frac{54,87,000}{0.1305 - Nil} = 4,20,45,977.$$

$$\therefore MPS = \frac{4,20,45,977}{80,00,000} = Rs.5,255/sh$$

(b) Net Asset Value

$$= \frac{1,20,00,000 + 2,79,95,000}{80,00,000} = Rs.5/sh.$$

$\therefore$ Minimum Share Price = Rs.5/sh.

Note : Since market value is lower than even Net Asset value it shall not be considered for minimum value.

(ii) Maximum price per share R Ltd. Shall be willing to offer to S Ltd.

$$\text{Value of R} = \frac{CF}{Re - g} = \frac{90,10,000}{0.1375} = Rs.6,55,27,272$$

Value of combined Entity

$$= \frac{1,85,00,00}{0.125} = Rs.14,80,00,000$$

Value of synergy = MV of merged firm after merger – MV of merged firm before merger
= 14,80,00,000 – (4,20,45,977 + 6,55,27,273)
= 4,04,26,750

Max. Price $= \frac{\text{Standard value of S} + \text{Synergy}}{\text{No. of shares}}$

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

= Rs.10.31/sh.

(iii) Floor price per share of S Ltd. Will not play ay role in decision for its Acquisition by R Ltd.

Question 41
Nov 2019 (Old) - Paper

ABC Ltd. is a company operating in the software industry. It is considering the acquisition of XYZ Ltd. which is also into software industry. The following information are available for the companies :

Particulars	ABC Ltd.	XYZ Ltd.
Earnings after tax (Rs.)	9,00,000	2,40,000
Number of equity shares	1,50,000	60,000
P/E ratio (No. of times)	14	10

ABC Ltd. is planning to offer a premium 25% over the market price of XYZ Ltd. Required :

(i) What is the swap ratio based on current market price?

(ii) Find the number of shares to be issued by ABC Ltd. to the shareholders of XYZ Ltd.

(iii) Compute the new EPS of ABC Ltd. after merger and comment on the impact of merger.

(iv) Determine the market price of the share when P/E ratio remains unchanged.

(v) Compute the market price when P/E declines to 12 and comment on the results.

Figures are to be rounded off to 2 decimals.

Solution :

(i)

		ABC Ltd.	XYZ Ltd.
(A)	EAT	90,00,000	2,40,000
(B)	No. of shares	1,50,000	60,000
(C)	EPS (A/B)	Rs.6/sh.	Rs.4/sh.
(D)	PE Ratio	14 times	10 times
(E)	MPS (C × D)	Rs.84/sh.	Rs.40/sh.

(ii) Swap Ratio as Current Market Price

$= \frac{\text{Target Co.}}{\text{Acquiring Co.}} = \frac{40 \times 1.25}{84} = 0.5952$

(iii) No. of shares to be issued by ABC Ltd. to the shareholder of XYZ Ltd.
= 60,000 × 0.5952 = 35714.28 i.e. 35714 (Approx.)

(iv) Market price with PE remaining constant

(a) EPS = $\frac{90,00,000 + 2,40,000}{1,50,000 + 35714}$ = Rs.6.138/sh.

(b) MPS = EPS × PE

= 6.138 × 14 = Rs.85.94/sh.

(v) Market price if PE Ratio declines to 12

(a) MPS = 6.138 × 12 = Rs.73.66/sh.

(b) The market falls below the current price to ABC Ltd., making merger unfavorable to shareholder of ABC Ltd.

Question 42
Nov 2020 (New) - Paper

ICL is proposing to takeover SVL with an objective to diversify. ICL's profit after tax (PAT) has grown @ 15% per annum. Both the companies pay dividend regularly. The summarized profit and loss account of both the companies are as follows:

		Rs in Crores
Particulars	**ICL**	**SVL**
Net sales	4,545	1,500
PBIT	2,980	720
Interest	750	25
Provision for Tax	1,440	445
PAT	790	250
Dividends	235	125
Undistributed Profits	555	125

Balance sheet of both the companies along with additional information

	ICL		**SVL**	
Fixed Assets				
Land and Building (Net)	720		190	
Plant and Machinery (Net)	900		350	
Furniture and Fixtures (Net)	30	1650	10	550
Current Assets		775		580
Less current Liabilities				
Creditors	230		130	
Overdrafts	35		10	
Provision for Tax	145		50	
Provision for Dividends	60	470	50	240
Net Assets		1955		890
Paid up share capital	250		125	

Reserves and Surplus	1050	1300	660	785
Borrowings		655		105
Capital Employed		1955		890
Market Price Share (Rs)	52		75	

ICL's Land and building stated at current prices. SVL's Land and building are revalued 3 years ago. There have been increase of 30% per year in value of land and buildings.

SVL is expected to grow at the rate 18% each year after merger.

ICL's management wants to determine the premium on the share over current market price which can be paid on acquisition of SVL.

You are required to determine the premium using:

1. Net worth adjusted for current value of London building plus estimated average profit after tax for next 5 years
2. The dividend growth formula
3. ICL will push forward which method during the course of negotiation?

Period	**1**	**2**	**3**	**4**	**5**
FVIF (30%,t)	1.300	1.690	2.197	2.856	2.713
FVIF (15%,t)	1.15	2.4725	3.9938	5.7424	7.7537

Solution :

(i) Computation of Premium (Net Worth Formula): **Amount Rs.in Crores**

Total Assets (Fixed assets + Current Assets) = (550 + 580)	1130
Less: Liabilities (Current Liabilities + Borrowings) = (240 + 105)	345
Net Assets Value	785
Current Value of Land after growing for three years @ 30% = 190 x 2.197	417.43
Less: Book Value	190.00
Increase in the Value of land	227.43
Adjusted NAV (785 + 227.43)	1012.43
Current Profit after Tax (@15 % for 5 years i.e. 250 X 7.7537	1938.43
Average Profit for 1 year = 1938.43/5	387.69
Total Value of Firm (1012.43 + 387.69)	1400.12
Total Market Value = No of shares X MPS = 12.50 X 75	937.50
Premium (Total Value – Market Value)	462.62
Premium (%) = 462.62/937.50 * 100	49.35%

(ii) Computation of Premium (Dividend Growth Formula):

Existing Growth Rate	0.15
DPS= 125/12.50	10
MPS	75
Cost of Equity (D1/MP + g) = [(10 X 1.15/75) + 0.15]	0.3033
Expected growth rate after merger	0.18
Expected Market Price = 10 X [1.18 / (0.3033 - 0.18)]	95.70
Premium over current market price (95.70 - 75)/ 75 X 100	27.60%

Alternatively, if given figure of dividend is considered as D1 then Premium over Current Market Price shall be computed as follows:

Cost of Equity $\left(\frac{D_1}{P}+g\right)$	$\left[\frac{10}{75}+0.15\right]$	0.2833
Expected Growth Rate after Merger		0.18
Expected Market Price 10.00 / (0.2833 – 0.18)		96.81
Premium over Current Market Price (96.81 - 75)/ 75 x 100		29.08%

(iii) During the course of negotiations, ICL will push forward valuation based on Growth Rate Method as it will lead to least cash outflow.

Question 43
Jan 2021 (New) - Paper

The following are the financial statements of A Ltd., and B Ltd. for the financial year ended 31st March, 2020. Both the companies are working in the same industry.

Balances Sheet (Rs.)

Particulars	**A Ltd.**	**B Ltd.**
Total Current Assets	15,00,000	12,00,000
Total Net Fixed Assets	12,00,000	6,00,000
Total Assets	**27,00,000**	**18,00,000**
Equity Capital (Face Value Rs.10)	10,00,000	8,00,000
Retained Earnings	3,00,000	–
14% Long Term Debt	7,00,000	5,00,000
Total Current Liabilities	7,00,000	5,00,000
Total Liabilities	**27,00,000**	**18,00,000**

Income Statement (Rs.)

Particulars	**A Ltd.**	**B Ltd.**
Net sales	33,10,000	16,60,000
Gross Profit	6,90,000	3,40,000
Opening Expenses	2,00,000	1,00,000
Interest	98,000	70,000
EBT	3,92,000	1,70,000
Tax @ 30%	1,17,600	51,000
PAT	2,74,400	1,19,000
Additional information :		
Dividend Pay-out Ratio	40%	60%
Market Price per Share	40	15

You are required to calculate :

(i) Earnings Per share (EPS), Profit Earning ratio (PER), Return on Equity (ROE) and Book Value Per Share (BVPS) for both the firms.

(ii) Estimate future EPS growth rate for both the firms.

(iii) If on acquisition of B Ltd. by A Ltd., intrinsic value of B Ltd., will be Rs.20 per share, develop range of justifiable Exchange Ratio (ER) that can be offered by A Ltd., to shareholders of B Ltd.

(iv) Based on your analysis in (i) and (ii) whether the negotiate ratio will be closed to upper or lower range. Justify.

(v) Post-merger EPS on an ER of 0.4:1. What will be immediate accretion or dilution to EPS to the shareholders of both the firm?

(vi) Post-Merger MPS on the basis of ER of 0.4 : 1.

Solution :

Market price per share (MPS) = EPS X P/E ratio or P/E ratio = MPS/EPS

(i) Determination of EPS, P/E ratio, ROE and BVPS of A Ltd. and B Ltd.

		A Ltd.	B Ltd.
Profit After Tax	(PAT)	Rs. 2,74,400	Rs. 1,19,000
No. of Shares	(N)	100000	80000
EPS	(PAT/N)	Rs. 2.744	Rs. 1.4875
Market price per share	(MPS)	40	15
P/E Ratio	(MPS/EPS)	14.58	10.08
Equity Funds	(EF)	Rs. 13,00,000	Rs. 8,00,000
BVPS	(EF/N)	13	10
ROE	(EAT/EF) × 100	21.11%	14.88%

(ii) Estimation of growth rates in EPS for A Ltd. and B Ltd.

Retention Ratio	(1-D/P ratio)	0.6	0.4
Growth Rate	(ROE × Retention Ratio)	12.67%	5.95%

(iii) Range of Justifiable exchange ratio

(a)	Intrinsic value based		= Rs.20 / Rs.40	= 0.5:1 (upper limit)
(b)	Market price based	= MPS_{DA}/MPS_{BA}	= Rs.15 / Rs.40	= 0.375:1(lower limit)

(iv) Since, A Ltd. has a higher EPS, ROE, P/E ratio and even higher EPS growth expectations, the negotiable terms would be expected to be closer to the lower limit, based on the existing share prices.

(v) Calculation of Post merger EPS and its effects

Particulars			A Ltd.	B Ltd.	Combined
EAT	(Rs.)	(i)	2,74,400	1,19,000	3,93,400
Share outstanding		(ii)	100000	80000	132000*
EPS	(Rs.)	(i) / (ii)	2.744	1.4875	2.980

EPS Accretion (Dilution)	(Rs.)		0.236	(0.296***)	

(vi) Estimation of Post merger MPS

Particulars			A Ltd.	B Ltd.	Combined
EPS	(Rs.)	(i)	2.744	1.4875	2.98
P/E Ratio		(ii)	14.58	10.08	14.58
MPS	(Rs.)	(i) x (ii)	40	15	43.45

* Shares outstanding (combined) = 100000 shares + (.40 × 80000) = 132000 shares

** EPS claim per old share = Rs.2.98 × 0.4 Rs. 1.192

***EPS dilution = Rs.1.4875 – Rs. 1.192 Rs. 0.296

Thanks ....

CHP - 6 MUTUAL FUNDS

Question 1

Nov 2008 – RTP / Nov 2012 – RTP / May 2013 – Paper / Nov 2013 – RTP / Nov 2014 – RTP / May 2015 – Paper / Nov 2016 - Paper

Arun has invested in three Mutual Fund Schemes as per details below:

	MF X	MF Y	MF Z
Date of investment	01.12.2006	01.01.2007	01.03.2007
Amount of investment	50,000	1,00,000	50,000
Net Asset Value (NAV) at entry date	10.50	10	10
Dividend received upto 31.03.2007	950	1,500	Nil
NAV as at 31.03.2007	10.40	10.10	9.80

Required:

What is the effective yield on per annum basis in respect of each of the three schemes to Mr. Arun upto 31.03.2007?

Solution :

	MF A	MF B	MF C
Date of Investments	1/12/06	1/1/07	1/3/07
Amount of Investment	50,000	1,00,000	50,000
NAV on entry Date	10.50	10	10
Units Received	$\frac{50,000}{10.50} = 4761.9$	$\frac{1,00,000}{10} = 10,000$	$\frac{50,000}{10} = 5,000$
Dividend Received	950	1,500	Nil
Dividend Per Unit	$\frac{950}{4761.9} = 0.1995$	$\frac{1,500}{10,000} = 0.15$	Nil
NAV at 31/3/2007	10.4	10.10	9.80
Holding Period	4 months	3 months	1 month
HPY	$\frac{0.1995 - 0.1}{10.5} \times 100 =$ 0.9475%	$\frac{0.15 + 0.1}{10} \times 100$ = 2.5%	$\frac{-0.2}{10} \times 100$ = 2%
MMY	0.9475 x 3 = 2.8425%	2.5 x 4 = 10%	2 x 12 = - 24%
EAY	$(1 + 0.009475)^3 - 1$ = 2.8695%	$(1.025)^4 - 1$ = 10.38%	$(1.02)^{12} - 1$ = –26.82%

Question 2
May 2009 – RTP / Nov 2013 – Paper / Nov 2015 – Paper / May 2019 (Old) – RTP / May 2020 (New) – RTP

On 01.07.2005 Mr. A invested in 10,000 units of face value of Rs.10 per unit. On 31.03.2006 dividend was paid @ 10% and annualized yield was 140%. On 31.03.2007, 20% dividend was given. On 31.03.2008, Mr. A redeemed his all his 11,270.56 units when his annualized yield was 75.45% over the period of his holding. What are the NAVs as on 31.03.2006,31.03.2007 and 31.03.2008?

Solution :

1) From 1/7/05 to 31/3/06 (9 months)

Yield for 9 months = $140 \times \frac{9}{12}$ = 105%

Market value of investment on 31/3/08

= 1,00,000 + (1,00,000 × 105%) = 2,05,000

Divided received = 10% i.e. 10 × 10% = 1 per cent

= 10,000 × 1 = 10,000

∴NAV on 31/3/08 = $\frac{2,05,000 - 10,000}{10,000}$ = 19.5/unit

Note : Since units are increasing the divided was reinvested at closing NAV.

i.e. $\frac{10,000}{19.5}$ = 512.82 units

Total units = 10,000 + 512.82 = 10,512.82 units

(OR 2,05,000/19.50 = 10,512.82 units)

2) From 31/3/06 to 31/3/07 (1 year)

Divided received = 20%

= 10,512.82 × 10 × 20% = 21,025.64

Units received = 11,270.56 – 10,51.82 = 757.74

NAV at which amt. was reinvested = $\frac{21,025.64}{757.74}$ = 2775/unit

3) 31/3/07 to 31/3/08 (1 year)

= $\frac{1,00,000 \times (1 + 0.7545 \times 33/12}{11,270.56}$ = Rs.27.28/unit

Question 3
May 2009 Paper – 2 Marks / May 2013 – RTP

Mr. X earns 10% on his investments in equity shares. He is considering a recently floated scheme of a Mutual Fund where the initial expenses are 6% and annual recurring expensed are expected to be 2%. How much the Mutual Fund scheme should earn to provide a return of 10% to Mr. X?

Solution :

Indifference Point between direct return from the Fund

$$R_2 = \frac{R_1}{1 - \text{Initial Expense}} + Re$$

R_2 = Return from the Fund

R_1 = Direct Return

R_e = Recurring Expenses

In the above Question

R_2 = Return from the Fund

R_1 = 10%

R_e = 2%

Initial Expenses = 6%

$$R_2 = \frac{10}{1 - 0.06} + 2 = 12.64\%$$

Question 4
Nov 2009 – RTP

Consider the following information about the return on Classic Mutual Fund, the market return and the T-bill returns:

Year	Classic Mutual Fund	Market Index	T-bills
1994	17.1	10.8	5.4
1995	–14.6	–8.5	6.7
1996	1.7	3.5	6.5
1997	8.0	14.1	4.3
1998	11.5	18.7	4.1
1999	–5.8	–14.5	7.0
2000	–15.6	–26.0	7.9
2001	38.5	36.9	5.8
2002	33.2	23.6	5.0
2003	–7.0	–7.2	5.3
2004	2.9	7.4	6.2
2005	27.4	18.2	10.0
2006	23.0	31.5	11.4
2007	–0.6	–4.9	14.1
2008	21.4	20.4	10.7

The following additional information is available regarding the comparative performance of five mutual funds:

	Return (%)	Standard Deviation (%)	Beta	
Alpha	1.95	20.03	0.983	0.819
Beta	11.57	18.33	0.971	0.881

Gama	8.41	22.92	1.169	0.816
Rho	9.05	24.04	1.226	0.816
Theta	7.86	15.46	0.666	0.582

From the above information, calculate all the inputs required for determining the Sharpe's Ratio, Treynor's ratio and Jensen's ratio.

Solution :

Yr.	R_C	d_C	d^2_C	R_M	d_M	d^2_M	R_T	d_T	d^2_T	$d_C d_M$
1994	17.1	7.693	59.18	10.8	2.53	6.4	5.4	–1.96	3.8416	19.327
1995	–14.6	–24.007	576.34	–8.5	–16.77	281.23	6.7	–0.66	0.4356	402.60
1996	1.7	–7.707	59.40	3.5	–4.77	22.75	6.5	–0.86	0.7396	36.76
1997	8.0	–1.407	1.98	14.1	5.83	33.99	4.3	–3.06	9.3636	–8.203
1998	11.5	2.093	4.38	18.7	10.43	108.78	4.1	–3.26	10.6276	21.83
1999	–5.8	–15.207	231.25	–14.5	–22.77	518.47	7.0	–0.36	0.1296	346.26
2000	–15.6	–25.007	625.35	–26	–34.27	1174.43	7.9	0.54	0.2916	856.99
2201	38.5	29.093	846.40	36.9	28.63	819.68	5.8	–1.56	2.4336	832.93
2002	33.2	23.793	566.11	23.6	15.33	235	5.0	–2.36	5.5696	364.75
2003	–7.0	–16.407	269.19	–7.2	–15.47	239.32	5.3	–2.06	4.2436	253.82
2004	2.9	–6.507	42.34	7.4	–0.87	0.7569	6.2	1.16	1.3456	5.66
2005	27.4	17.993	323.75	18.2	9.93	98.60	10	2.64	6.9696	178.67
2006	23	13.593	184.77	31.5	23.23	539.63	11.4	4.04	16.3216	315.765
2007	–0.6	–10.007	100.14	–4.9	–13.17	173.45	14.1	6.74	45.4276	131.79
2008	21.4	11.993	143.83	20.4	12.13	147.14	10.7	3.34	11.1556	145.475
$\bar{x}$	141.1		4034.41	124		4399.63	110.4		118.896	3904.424
	15		σ^2 268.96	$\bar{x}$ 8.27		σ^2 293.31	$\bar{x}$ 7.36		σ^2 7.9264	260.294 COV_{CM}
	= 9.407		σ 16.4			σ 17.26			σ 2.815	

1) Sharpe Ratio = $\frac{R - Rf}{\sigma}$

Classic Mutual Fund = $\frac{9.407 - 7.36}{16.4}$ = 0.125

Market index = $\frac{8.27 - 7.36}{17.126}$ = 0.053

Classic Mutual Fund is better than market index

2) Treynor Ratio = $\frac{R - Rf}{\beta}$

$\beta_C = \frac{COV_{CM}}{\sigma^2{}_M} = \frac{260.294}{293.31}$ = 0.88

Classic Mutual Fund = $\frac{9.407 - 7.36}{0.88}$ = 2.32

Market index = $\frac{8.27 - 7.36}{1}$ = 0.91

Classic Mutual Fund is performing better than market index

3) Jenson's Alpha = Actual Return ($\bar{x}$) – Expected Return (Re – CAPM)

Rec = Rf + β(Rm – Rf)

= 7.36 + 0.88 (8.27 – 7.36)

= 8.1608

α = 9.407 – 8.1608 = 1.246

Since α is positive Mutual Fund is performing better.

Question 5

Nov 2009 – Paper – 8 Marks / May 2017 – RTP / May 2018 – RTP

A mutual fund made an issue of 10,00,000 units of Rs.10 each on January 01, 2008. No entry load was charged. It made the following investments:

	Rs.
50,000 Equity shares of Rs.100 each @ Rs.160	80,00,000
7% Government Securities	8,00,000
9% Debentures (Unlisted)	5,00,000
10% Debentures (Listed)	5,00,000
	98,00,000

During the year, dividends of Rs.12,00,000 were received on equity shares. Interest on all types of debt securities was received as and when due. At the end of the year equity shares and 10% debentures are quoted at 175% and 90% respectively. Other investments are at par.

Find out the Net Asset Value (NAV) per unit given that operating expenses paid during the year amounted to Rs.5,00,000. Also find out the NAV, if the Mutual fund had distributed a dividend of Rs.0.80 per unit during the year to the unit holders.

Solution :

1) Opening = 10,00,000 x 10 = Rs.1,00,00,000 crore

Investments 98,00,000 Cash Rs.2,00,000

2) Position of fund

50,000 Equity shares of Rs.100 each @ Rs.175	87,50,000
7% Government Securities	8,00,000
9% Debentures (Unlisted)	5,00,000
10% Debentures (Listed) (90%)	4,50,000
Total	**1,05,00,000**

3) Cash Position

Opening Balance	2,00,000
Add Dividend Received	12,00,000
Add Interest Received	
7% Government Security	56,000
9% Debentures	45,000
10% Debentures	50,000
Less Operating Expenses	(5,00,000)
Total	**10,51,000**

4) Net Asset Value (NAV) $= \frac{1,05,00,000 + 10,51,000}{10,00,000}$ = Rs.11.551

Net Asset Value (NAV) with Dividend

Dividend = 10,00,000 x 0.80 = 8,00,000

$= \frac{1,05,00,000 + 10,51,000 - 8,00,000}{10,00,000}$ = Rs.10.751

Question 6

May 2010 – RTP

Ms. Sunidhi is working with an MNC at Mumbai. She is well versant with the portfolio management techniques and wants to test one of the techniques on an equity fund she has constructed and compare the gains and losses from the technique with those from a passive buy and hold strategy. The fund consists of equities only and the ending NAVs of the fund he constructed for the last 10 months are given below:

Month	Ending NAV (Rs./unit)	Month	Ending NAV (Rs./unit)
December 2008	40.00	May 2009	37.00
January 2009	25.00	June 2009	42.00
February 2009	36.00	July 2009	43.00
March 2009	32.00	August 2009	50.00
April 2009	38.00	September 2009	52.00

Assume Sunidhi had invested a notional amount of Rs.2 lakhs equally in the equity fund and a conservative portfolio (of bonds) in the beginning of December 2008 and the total portfolio was being rebalanced each time the NAV of the fund increased or decreased by 15%.

You are **required** to determine the value of the portfolio for each level of NAV following the Constant Ratio Plan.

Solution :

Portfolio :

		Buy / Hold		Constant Ratio Plan				
Month	**NAV**	**Value of by Hold**	**Units**	**Value of Conservation**	**Value of aggressive**	**Total Value of plan**	**Revaluation Action**	**Unit of aggressive**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dec.	40	2,00,000	5,000	1,00,000	1,00,000	2,00,000	–	2,500
Jan.	25	1,25,000	5,000	1,00,000	62,500	1,62,500		2,500
				81,250	81,250	1,62,500	By 18,750	750
				81,250	81,250	1,62,500		3,250
Feb.	36	1,80,000	5,000	81,250	1,17,000	1,98,250		3,250
				94,125	99,125	1,98,250	Sell 17,875	496.53
				99,125	99,125	1,98,250		2,753.47
Mar.	32	1,60,000	5,000	99,125	88,111.04	1,87,236.04	–	2,753.47
Ap.	38	1,90,000	5,000	99,125	10,463.86	2,03,756.86		2,753.47
				1,01,878.43	1,01,878.43	2,03,756.86	Sell 2,753.43	72.46
				1,01,878.43	1,01,878.43	2,03,756.86		2,681.01
May	37	1,85,000	5,000	1,01,878.43	99,197.37	2,01,075.8		2,681.01
June	42	2,10,000	5,000	1,01,878.43	1,12,602.42	2,14,480.85		2,681.01
July	43	2,15,000	5,000	1,01,878.43	1,15,283.43	2,17,161.86		2,681.01
Aug.	50	2,50,000	5,000	1,01,878.43	1,34,050.5	2,35,928.93		2,681.01
				1,17,964.465	1,17,964.465	2,35,928.93	Sell 16,086.035	321.72
				1,17,964.465	1,17,964.465	2,35,928.93		2359.29
Sept.	52	2,60,000	5,000	1,17,964.465	1,22,683.08	2,40,647.55		2.359.29

Decision : Value of Buy hold = 260,000

Constant Ratio Plan = 2,40,647.58

∴ Value of Buy hold is better

Question 7

Nov 2010 – RTP / May 2011 – Paper / May 2014 – RTP / Nov 2017 – Paper / Nov 2018 (New) – Paper

Mr. X, an investor purchased 200 units of ABC Mutual Fund at rate of Rs.8.50 p.u., one year ago. Over the year Mr. X received Rs.0.90 as dividend and had received a capital gains distribution of Rs.0.75 per unit.

You are required to find out:

(a) Mr. X's holding period return assuming that this no load fund has a NAV of Rs.9.10 as on today.

(b) Mr. X's holding period return, assuming all the dividends and capital gains distributions are reinvested into additional units as at average price of Rs.8.75 per unit.

Solution :

(a) Return for Payout Plan :

$$\text{HPY} = \frac{\text{Div.dist.} + \text{Cap. gain dist.} + \text{Cap. Appreciation}}{\text{Purchase Price}} \times 100$$

$$= \frac{0.9 + 0.75 + 0.6}{8.5} \times 100$$

= 26.47%

(b) When all dividends and capital gains distributions are reinvested into additional units of the fund (Rs.8.75/unit):

Dividends and capital gains per unit:	Rs.0.90 + Rs. 0.75	= Rs.1.65
Total amount received from 200 units:	Rs.1.65 X 200	= Rs.330.00
Additional units added:	Rs.330/Rs.8.75	= 37.7 units
Value of 237.7 units held at end of year:	237.7 units X Rs. 9.10	= Rs.2,163
Price paid for 200 units at beginning of year	200 units X Rs. 8.50	= Rs.1,700

Thus, the Holding Period Return =

$$\frac{\text{(No of Units at the end x Ending Price) – (No of units at Beg x Initial Prices)}}{\text{No of Unis at the Beg xc Initial Price}}$$

$$= \frac{2{,}163 - 1{,}700}{1{,}700} \text{ x } 100 = 27.24\%$$

Question 8

Nov 2010 – RTP / May 2012 – RTP

Following is the historical performance information is available of the capital market and a Tomplan Mutual Fund.

Year	Tomplan Mutual Fund Beta	Tomplan Mutual Fund return %	Return on Market index%	Return on Govt. securities%

2001	0.90	–3.00	-8.50	6.50
2002	0.95	1.50	4.00	6.50
2003	0.95	18.00	14.00	6.00
2004	1.00	22.00	18.50	6.00
2005	1.00	10.00	5.70	5.75
2006	0.90	7.00	1.20	5.75
2007	0.80	18.00	16.00	6.00
2008	0.75	24.00	18.00	5.50
2009	0.75	15.00	10.00	5.50
2010	0.70	–2.00	8.00	6.00

(a) From above information you are required to calculate the following risk adjusted return measures for the measures for the Tomplan:

(i) Reward-to-variability ratio

(ii) Reward-to-volatility ratio

(b) Comment on the mutual fund's performance.

Solution :

Yr.	β	R_F	d_F	d^2_F	R_M	d_M	d^2_M	Rpf
01	0.90	–3	–14.05	197.4025	–8.5	–17.19	295.4961	6.5
02	0.95	1.5	–9.55	91.2025	4	–4.69	21.9961	6.5
03	0.95	18	6.95	48.3025	14	5.31	28.1961	6
04	1	22	10.95	119.9025	18.5	9.81	96.2361	6
05	1	10	–1.05	1.1025	5.7	–2.99	8.9401	5.75
06	0.90	7	–4.05	16.4025	1.2	–7.49	56.1001	5.75
07	0.80	18	6.95	48.3025	16	7.31	53.4361	6
08	0.75	24	12.95	167.7025	18	9.31	86.6761	5.5
09	0.75	15	3.95	15.6025	10	1.31	1.7161	5.5
10	0.70	–2	–13.05	170.3025	8	–0.69	0.4761	6
	8.7	110.5		876.225	86.9		648.269	59.5
	$\bar{x}$ 0.87	$\bar{x}$ 11.05		σ^2 87.6225	$\bar{x}$ 8.69		σ^2 64.8269	$\bar{x}$ 5.95
				σ 9.361			σ 8.052	

1) Reward to variability ratio (Sharpe Ratio)

$$= \frac{R - Rf}{\sigma}$$

Fund $= \frac{11.05 - 5.95}{9.36} = 0.545$

Market $= \frac{8.69 - 5.95}{8.052} = 0.340$

Note : Mutual fund is performing better than market

2) Reward to volatility ratio (Treynor Ratio)

$$= \frac{R - Rf}{\beta}$$

Fund $= \frac{11.05 - 5.95}{0.87} = 5.86$

Market $= \frac{8.69 - 5.95}{1} = 2.74$

Note : Mutual fund is performing better.

Question 9
Nov 2011 – RTP / May 2012 – Paper / May 2018 (New) – Paper / Nov 2019 (New) – RTP

April 2009 Fair Return Mutual Fund has the following assets and prices at 4.00st p.m.

Shares	No. of Shares	Market Price Per Share (Rs.)
A Ltd.	10000	19.70
B Ltd.	50000	482.60
C Ltd.	10000	264.40
D Ltd.	100000	674.90
E Ltd.	30000	25.90
No. of units of fund		8,00,000

Please calculate :

1. NAV of the Fund.
2. Assuming Mr. X, a HNI, send a cheque of Rs.50,00,000 to the Fund and Fund Manager purchases 18000 shares of C Ltd. and balance is held in bank. Then what will be position of fund.
3. Now suppose on 2 April 2009 at 4.00 p.m. the market price of shares is as follows :

Shares	Rs.
A Ltd.	20.30
B Ltd.	513.70
C Ltd.	290.80
D Ltd.	671.90
E Ltd.	44.20

Then what will be new NAV.

Solution :

1) NAV on 1st April 2009

Stocks		Value
A	10,000 x 19.70	1,97,000
B	50,000 x 482.60	2,41,30,000
C	10,000 x 264.40	26,44,000
D	1,00,000 x 674.90	6,74,90,000
E	30,000 x 25.90	7,77,000

	Total	**9,52,38,000**

NAV $= \frac{9,52,38,000}{8,00,000}$ = Rs.119.0475 per unit

2) Revised Fund Position

Cheque of Rs.50,00,000 from Mr. A which was invested in 18000 shares in C Ltd.

Value of shares in C Ltd. = 18000 x 264.40 = 47,59,200

Cash (50,00,000 – 47,59,200) = Rs.2,40,800

Total Fund Value = Rs.9,52,38,000 + Rs.50,00,000 = Rs.10,02,38,000

Units Issued $= \frac{50,00,000}{119.0475}$ = 42,000 units

Total Units = 8,00,000 + 42,000 = 8,42,000

NAV $= \frac{10,02,38,000}{8,42,000}$ = Rs.119.0475 per unit

3) NAV on 2nd April 2009

Stocks		Value
A	10,000 x 20.30	2,03,000
B	50,000 x 513.70	2,56,85,000
C	28,000 x 290.80	81,42,400
D	1,00,000 x 671.90	6,71,90,000
E	30,000 x 44.20	13,26,000
Cash		2,40,800
	Total	**10,27,87,200**

NAV $= \frac{10,27,87,200}{8,42,000}$ = Rs.122.08 per unit

Question 10

Nov 2011 – Paper – 5 Marks / May 2013 – RTP / May 2016 – RTP / May 2020 (Old) – RTP

Orange purchased 200 units of Oxygen Mutual Fund at Rs.45 per unit on 31st December, 2009. In 2010, he received Rs.1.00 as dividend per unit and a capital gains distribution of Rs.2 per unit. Required:

i. Calculate the return for the period of one year assuming that the NAV as on 31st December 2010 was Rs.48 per unit.

ii. Calculate the return for the period of one year assuming that the NAV as on 31st December 2010 was Rs.48 per unit and all dividends and capital gains distributions have been reinvested at an average price of Rs.46.00 per unit.

Ignore taxation.

Solution :

(i) Returns for the year

$$\text{HPY} = \frac{\text{Div. dist.} + \text{Cap. gain dist.} + \text{Cap. Appreciation}}{\text{Purchase Price}}$$

$$= \frac{1+2+3}{45} \times 100 = 13.33\%$$

(ii) When all dividends and capital gains distributions are re-invested into additional units of the fund @ (Rs.46/unit)

Dividend + Capital Gains per unit	= Rs.1.00+Rs.2.00	= Rs.3.00
Total received from 200 units	= Rs.3.00 x 200	= Rs.600
Additional Units Acquired	$= \frac{600}{46}$	=13.04 Units.
Total No. of Units	= 200 units + 13.04 units	= 213.04 units.
Value of 213.04 units held at the end of the year		
	= 213.04 units x Rs.48	= Rs.10225.92
Price Paid for 200 Units at the beginning of the year		
	= 200 units x Rs.45	= Rs.9000.00

Thus, the Holding Period Return would be:

$$= \frac{\text{(No of Units at the end x Ending Price) – (No of units at Beg x Initial Price)}}{\text{(No of Units at the Beg x Initital Price)}}$$

$$= \frac{1,225.92 - 9,000}{9,000} \text{ x } 100 = 13.62\%$$

Question 11
Nov 2012 Paper – 5 Marks

The following information is extracted from Steady Mutual Fund's Scheme:

- Asset Value at the beginning of the month - Rs.65.78
- Annualised return - 15 %
- Distributions made in the nature of Income - Rs.0.50 and Rs.0.32 & Capital gain (per unit respectively).

You are required to:

(1) Calculate the month end net asset value of the mutual fund scheme (limit your answers to two decimals).

(2) Provide a brief comment on the month end NAV.

Solution :

(1) Calculation of NAV at the end of month:

Given Annual Return = 15%

Hence Monthly Return = 1.25%

$$\text{HPY} = \frac{\text{(NAV at end – NAV at beg) – Capital Dist + Capital Gain}}{\text{Nav at Beg}}$$

$$0.0125 = \frac{(\text{NAV at End - Rs.65.78}) + 0.50 + 0.32}{65.78}$$

Nav at End = Rs.65.78

(2) There are no change in NAV

Question 12
Nov 2014 Paper – 4 Marks

Cinderella Mutual Fund has the following assets in Scheme Rudolf at the close of business on 31st March, 2014.

Company	No. of Shares	Market Price Per Share
Nairobi Ltd.	25000	Rs.20
Dakar Ltd.	35000	Rs.300
Senegal Ltd.	29000	Rs.380
Cairo Ltd.	40000	Rs.500

The total number of units of Scheme Rudolf are 10 lacs. The Scheme Rudolf has accrued expenses of Rs.2,50,000 and other liabilities of Rs.2,00,000. Calculate the NAV per unit of the Scheme Rudolf.

Solution :

Shares	No of Shares	Price	Amount (Rs.)
Nairobi Ltd.	25,000	20	5,00,000
Dakar Ltd.	35,000	300	1,05,00,000
Senegal Ltd.	29,000	380	1,10,20,000
Cairo Ltd.	40,000	500	2,00,00,000
			4,20,20,000
Less : Accrued Expenses			2,50,000
Other Liabilities			2,00,000
Total Value			4,15,70,000
No of Units			10,00,000
NAV Per unit (4,15,70,000 / 10,00,000)			41,57

Question 13
Nov 2005 – 12 Marks / May 2018 (New) – RTP / Nov 2019 (New) – Paper

Sun Moon Mutual Fund (Approved Mutual Fund) sponsored open-ended equity oriented scheme "Chanakya Opportunity Fund". There were three plans viz. 'A'- Dividend Re-investment Plan, 'B' - Bonus Plan & 'C'- Growth Plan.

At the time of Initial Public Offer on 1-4-1995, Mr. Anand, Mr. Bachhan & Mrs. Charu, three investors invested Rs. 1,00,000 each and chose 'B', 'C' & 'A' Plan respectively.

The History of the Fund is as follows :

Date	Dividend (%)	Bonus	Net Asset Value per Unit Ratio (FV Rs, 10)		
			Plan A	Plan B	Plan C
28-07-1999	20		30.70	31.40	33.42
31-03-2000	70	5:4	58.42	31.05	70.05
31-10-2003	40		42.18	25.02	56.1$
15-03-2004	25		46.45	29.10	64.28

31-03-2004		1:3	42.18	20.05	60.12
24-03-2005	40	1:4	48.10	19.95	72.40
31-07-2005			53.75	22.98	82.07

On 31st July all three investors redeemed all the balance units. Calculate annual rate of return to each of the investors.

Consider:

a. Long-term Capital Gain is exempt from Income tax.

b. Short-term Capital Gain is subject to 10% Income tax.

c. Security Transaction Tax 0.2 percent only on sale/redemption of units.

d. Ignore Education Cess.

Solution :

1) Mrs.Charu Plan and Dividend Reinvestment

Date	NAV	Div.		Units Received	Closing Units
		%	Amt.		
01.04.99	10			10,000	10,000
28.07.03	30.70	20	20,000	651.47	10651.47
31.03.04	58.42	70	74560.29	1276.28	11927.75
30.10.07	42.18	40	47.711	1131.13	13058.88
15.03.08	46.45	25	32647.20	702.85	13761.73
24.03.09	48.10	40	55046.92	1144.43	14906.16

Redemption (14906.16 × 53.75)	801206.10
Less : STT (0.2%)	1602.41
	799603.69
Less : STCGT (53.64(53.75 – 0.2%) – 48.10) 1144.43	634
	798969.69

a) Return = $\frac{798969.10 - 100000}{100000} \times \frac{12}{124} \times 100 = 67.64\%$

b) $100000(1 + r)^n = 798969.69$

$r = \left(\frac{798969.69}{100000}\right)^{12/124} - 1 = 22.28\%$

2) Mr.Anand Plan B – Bonus

Date	Bonus	Units Received	Closing Units
01.04.99	–	–	10,000
31.03.04	5 : 4	12,500	22,500
31.03.08	3 : 1	7,500	30,000
24.03.09	4 : 1	7,500	37,500

Redemption value = 37,500 × 22.98	8,61,750
Less : STT (0.2%)	1,723.50
	8,60,026.50
Less : STCGT. ([(22.98 – 0.2%) – 19.95]7,500	2,235
	8,57,791.50

$$\text{Return} = \frac{8,57,791.50 - 1,00,000}{1,00,000} \times \frac{12}{124} \times 100 = 73.33\%$$

$$r = \left(\frac{8,57,791.50}{100000}\right)^{12/124} - 1 = 23.126\%$$

3) Mr.Bachan Plan C – Growth

Redemption value (10,000 × 82.07)	8,20,700
– STT 0.2%	1641
	8,19,058
– STCGT	–
	8,19,058

$$\text{Return} = \frac{8,19,058 - 1,00,000}{1,00,000} \times \frac{12}{124} \times 100 = 69.59\%$$

$$\text{Return} = r = \left(\frac{8,19,058}{100000}\right)^{12/124} - 1 = 22.576\%$$

Question 14
Nov 2015 – Paper

Mr. X on 1.7.2012, during the initial public offer of a Mutual Fund (MF) invested Rs.1,00,000 at Face Value of Rs.10. On 31.3.2013, the MF declared a dividend of 10% when Mr. X calculated that his holding period return was 115%. On 31.3.2014, MF again declared a dividend of 20%. On 31.3.2015, Mr. X redeemed all his investment which had accumulated to 11,296.11 units when his holding period return was 202.17%.

Calculate the NAVs as on 31.03.2013, 31.03.2014 and 31.03.2015.

Solution :

1) From 1/7/12 to 31/3/13 (9 Months)

Yield for 9 months = $115 \times \frac{9}{12}$ %

∴Market value of investments on 31/3/13

= 1,00,000 + (1,00,000 × 115%) = 2,15,000

Dividend = 10% i.e. 10% 0 / 10 – Rs.1/unit

= 10,000 × 1 = 10,000

$\therefore$ NAV = $\frac{2,15,000 - 10,000}{10,000}$ = 20.5/unit

Note : Since units are increasing, the amount of dividend was reinvested at closing NAV

i.e. $\frac{10,000}{20.5}$ = 487.80 units

Total units = 10,000 + 487.80 = 10,487.80 units

2) From 31/3/13 to 31/3/14 (1 year)

Dividend = 10,487.80 × 10 × 20% = 20,975.6

Units received = 11,296.11 – 10,487.80 = 808.31

$\therefore$ NAV = $\frac{20,975.6}{808.31}$ = Rs.25.95/units

3) From 31/3/14 to 31/3/15 (1 year)

= $\frac{1,00,000 \times (1 + 2.0217)}{11,296.11}$ = Rs.26.75/unit

Question 15

Nov 2015 – Paper – 8 Marks / Nov 2018 – RTP / May 2019 (Old) – RTP / Nov 2019 (Old) – RTP

On 1st April, an open ended scheme of mutual fund had 300 lakh units outstanding with Net Assets Value (NAV) of Rs.18.75. At the end of April, it issued 6 lakh units at opening NAV plus 2% load, adjusted for dividend equalization. At the end of May, 3 Lakh units were repurchased at opening NAV less 2% exit load adjusted for dividend equalization. At the end of June, 70% of its available income was distributed.

In respect of April-June quarter, the following additional information are available:

	Rs.in lakhs
Portfolio value appreciation	425.47
Income of April	22.950
Income for May	34.425
Income for June	45.450

You are required to calculate

(i) Income available for distribution;

(ii) Issue price at the end of April;

(iii) repurchase price at the end of May; and

(iv) net asset value (NAV) as on 30th June.

Solution :

1) Income available for distributor

	Units	Income	Per Unit
Income from April	300	22.950	0.0765
Add: Dividend equalization collected on issue	6	0.4590	0.0765
Total	**306**	**23.409**	**0.0765**
Add: Income from May		34.425	
Total	**306**	**57.834**	**0.189**
Less: Dividend equalization paid on repurchase	3	(0.567)	0.189
Total	**303**	**57.267**	**0.789**
Add: Income from June		45.450	
Total	**303**	**102.717**	**0.339**
Less: Dividend Paid		(71.9019)	
Total	**303**	**30.8151**	**0.1017**

2) Issue price at end of April

Open NAV	18.75
+ 2% Entry load	0.375
	19.125
+ Dividend equalization	0.0765
	19.2015

3) Purchase price at end of May

Opening NAV	18.75
–2% Exit load	0.375
	18.375
+ Dividend Equalization	0.189
	18.564

4) NAV

Opening NA (300 × 18.75)	5625
Appreciation Portfolio	425.47
Issue of funds units (6 × (9.2015)	115.209
Income Received (22.950 + 34.425 + 45.45)	102.825
	6268.504
Less :	
Units Redeemed (3 × 18.564)	(55.692)
Income distributed	(71.9019)
Closing Net Asset	6140.9101
Units	303
∴NAV (6140.9101/303)	Rs.20.2670

Question 16

May 2014 / May 2010 – Paper / May 2016 – Paper – 6 Marks / Nov 2016 – RTP / Nov 2018 (New) – RTP

Based on the following data, estimate the Net Asset Value (NAV) on per unit basis of a Regular Income Scheme of a Mutual Fund on 31-3-2015:

	Rs. (in lakhs)
Listed Equity shares at cost (ex-dividend)	40.00
Cash in hand (As on 1-4-2014)	5.00
Bonds & debentures at cost of these, Bonds not listed	8.96
& not quoted	2.50
Other fixed interest securities at cost	9.75
Dividend accrued	1.95
Amount payable on shares	13.54
Expenditure accrued	1.76

Current realizable value of fixed income securities of face value of Rs.100 is Rs.96.50.

Number of Units (Rs.10 face value each): 275000

All the listed equity shares were purchased at a time when market portfolio index was 12,500. On NAV date, the market portfolio index is at 19,975.

There has been a diminution of 15% in unlisted bonds and debentures valuation.

Listed bonds and debentures carry a market value of Rs.7.5 lakhs, on NAV date.

Operating expenses paid during the year amounted to Rs.2.24 lakhs.

Solution :

Particulars	**Adjusted Value Rs. crores**
Equity shares	63.920
Cash in hand (5.500 – 2.240)	2.760
Bonds & Debentures not listed	2.125
Bonds & Debentures listed	7.500
Dividend accrued	1.950
Fixed income securities	9.409
Sub total assets (A)	87.664
Less: Liabilities	
Amount payable on shares	13.54
Expenditure accrued	1.76
Sub total liabilities (B)	15.30

Net assets value (A) – (B)	72.364
No. of units	2,75,000
Net assets value per unit (72.364 lakhs/2,75,000)	Rs.26.314

Question 17
Nov 2017 – Paper

A reputed financial institution of the country floated a Mutual fund having a corpus of Rs.10 crores consisting of 1 crore units of Rs.10 each. Mr. Vijay invested Rs.10,000 for 1000 units of Rs.10 each on 1st July 2014. For the financial year ended 31st March 2015, the fund declared a dividend of 10% and Mr. Vijay found that his annualized yield from the fund was 153.33%. The mutual fund during the financial year ended 31st March 2016, declared a dividend of 20%. Mr. Vijay has reinvested the entire dividend in acquiring units of this mutual fund at its appropriate NAV. On 31st march 2017 Mr. Vijay redeemed all his balances of 1129.61 units when his annualized yield was 73.52%.

You are required to find out NAV as on 31st March 2015, 31st March 2016 and 31st March 2017.

Solution :

1) From 1/7/14 to 31/3/15 (9 months)

Return for 9 months = $153.33 \times \frac{9}{12}$ = 115%

Market value of investment on 31/3/15

= 10,000 + (10,000 × 115%) = 21,500

Dividend = 10% i.e. 10% of 10 = 1

= 1,000 × 1 = 1,000

NAV = $\frac{21,500 - 1,000}{1,000}$ = Rs.20.50/unit

Note : Dividend received is reinvested at closing NAV.

i.e. $\frac{1,000}{20.5}$ = 48.78

∴Total units = 1,000 + 48.78 = 1,048.78 units

2) From 31/3/15 to 31/3/16 (1 Year)

Dividend received = 1,048.78 × 10 × 20% = 2,097.56

Units received = 1,129.61 – 1,048.78 = 80.83

∴NAV 31/3/16 = $\frac{2,097.56}{80.83}$ = Rs.25.95/unit

3) From 31/3/16 to 31/3/17 (1 year)

NAV = $\frac{10,000(1 + 0.7352 \times 33/12)}{1,129.61}$ = Rs.26.75/unit

Question 18
May 2018 – Paper – 5 Marks

The unit price of Equity Linked Savings Scheme (ELSS) of a mutual fund is Rs.10/-. The public offer price (POP) of the unit is Rs.10.204 and the redemption price is Rs.9.80.

Calculate:

(i) Front-end Load

(ii) Back end Load

Solution :

i. Front End Load

$$\frac{10.204-10}{10} \times 100 \qquad = 2.04\%$$

ii. Back End Load

$$\frac{10-9.8}{10} \times 100 \qquad = 2\%$$

Question 19
May 2018 – Paper – 8 Marks

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 (Rs.)	2,00,000	4,00,000	2,00,000
Net Assets Value (NAV) at the time of purchase (Rs.)	10.30	10.10	10
Dividend Received up to 31.03.2018 (Rs.)	6,000	0	5,000
NAV as on 31.03.2018 (Rs.)	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. Held him in finding the date of his original investment after ascertaining the following:

(i) Number of units in each scheme;

(ii) Total NPV;

(iii) Total Yield; and

(iv) Number of days investment held.

Solution :

Particulars	MF 'X'	MF 'Y'	MF 'Z'
1. No. of Units $= \frac{\text{Amount}}{\text{NAV}}$	$\frac{200000}{10.30}$ = 19,417.475	$\frac{400000}{10.10}$ = 39,603.96	$\frac{200000}{10}$ = 20,000

2. Net Asset at End = Units × Closing NAV	19,417.475 × 10.25 = 1,99,029	39,603 × 10 = 3,96,040	20,000 × 10.2 = 2,04,000
3. Dividend Per Unit	$\frac{6000}{19417.475}$ = 0.309	NIL	$\frac{5000}{20000}$ = 0.25
4. Yield $\frac{\text{Div.dist.+Capital App}}{\text{Purchase Price}}$ × 100	$\frac{(10.25-10.30)+0.309}{10.30}$ × 100 = 2.515%	$\frac{(10-10.10)}{10.10}$ × 100 = 0.99%	$\frac{(10.25-10)+0.25}{10}$ × 100 = 4.5%
5. No of days investment held	2.515 × $\frac{365}{n}$ = 9.66 N = 95 days	0.99× $\frac{365}{n}$ = 11.66 N = 31 days	4.5 × $\frac{365}{n}$ = 24.15 N = 68 days

Question 20
Nov 2018 – Paper – 5 Marks

During the year 2017 an investor invested in a mutual fund. The capital gain and dividend for the year was Rs.3.00 per unit, which were re-invested at the year end NAV of Rs.23.75. The investor had a total units of 26,750 as at the end of the year. The NAV had appreciated by 18.75% during the year and there was an entry load of Rs.0.05 at the time when the investment was made.

The investor lost his records and wants to find out the amount of investment made and the entry load in the mutual fund.

Solution :

1) NAV at year end = Rs.23.75

Appreciation in NAV = 18.75%

$\therefore$ NAV at Beginning = $\frac{23.75}{118.75\%}$ = Rs.20

2) Let the units at Beginning be X

$\therefore$ Dividend Received

= x × 3

Dividend was Reinvested = $\frac{x \times 3}{23.75}$

Units at end were 26,750

$\therefore$ x + $\frac{x \times 3}{23.75}$ = 26,750

$\therefore$ x = 23.750

3) Investment Amount

= 23,750 × (20 + 0.05) = Rs.4,76,187.50

Entry load

= 23,750 × 0.05 = Rs.1,187.50

Question 21
May 2013 – Paper / May 2018 – RTP / Nov 2018 – Paper – 8 Marks / May 2020 (Old) – RTP

A Mutual fund raised Rs.150 lakhs on April 1, 2018 by issue of 15 lakh units at Rs.10 per unit. The fund invested in several capital market instruments to build a portfolio of Rs.140 lakhs. The initial expenses amounted to Rs.8 lakhs. During the month of April, the fund sold certain instruments costing Rs.44.75 lakhs for Rs.47 lakhs and used the proceeds to purchase certain other securities for Rs.41.6 lakhs. The fund management expenses for the month amounted to Rs.6 lakhs of which Rs.50,000 was in arrears. The fund earned dividends amounting to Rs.1.5 lakhs and it distributed 80% of the realized earnings. The market value of the portfolio on 30th April, 2018 was Rs.147.84 lakhs.
An investor subscribed to 1000 units on April 1 and disposed it off at closing NAV on 30th April. Determine his annual rate of earnings.

Solution :

Issue = 15 lakhs units x 10 = 150

Portfolio	140	Cash	10
Less: Sold	(44.75)	Less: Exp	(8)
Add: Purch	41.6	Add: Sale	47
Balance	136.85	Less: Purchase	(41.6)
		Less: Exp	(5.5)
Market Value	147.85	Add: Div	1.5
		Less: Div	
		(1.5 x 80%)	(1.2)
		(2.25 x 80%)	(1.8)
		Balance	0.4

NAV at End = $\frac{(147.85+0.4)-0.5}{15}$ = 9.85

HPY = $\frac{\text{Dividend Distribution+Capital Gain Distribution+Capital Appreciation}}{\text{Purchase Price}}$ x 100

Dividend Distribution = $\frac{1.2}{15}$ = 0.08 per unit

Capital gain distribution = $\frac{1.8}{15}$ = 0.12 per unit

HPY = $\frac{0.08+0.12+(9.85-10)}{10}$ x 100 = 0.5% per month

BEY = 0.5 x $\frac{12}{1}$ = 6% P.A.

EAY $(1.005)^{12}$ – 1 = 6.17% P.A.

Question 22
May 2019 (New) – RTP / Nov 2020 (New) – RTP

There are two Mutual Funds viz. D Mutual Fund Ltd. and K Mutual Fund Ltd. Each having close ended equity schemes.
NAV as on 31-12-2014 of equity schemes of D Mutual Fund Ltd. is Rs.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 Rs.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 for particular month.

Solution :

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
NAV (31/12/14)	70.71	62.50
Equity	99%	96%
Cash	1%	4%
Equity (70.71 □ 0.99)	70	60
Cash	0.71	2.5

1) Calculation of β

Sharpe Ratio = $\frac{R - Rf}{\sigma}$

For D MF

$2 = \frac{R - Rf}{11.25}$

R – Rf = 22.50

For K MF

$3.3 = \frac{R - Rf}{5}$

R – Rf = 16.5

Treynor Ratio

For D MF

$15 = \frac{22.5}{\beta}$

$\therefore \beta = 1.5$

For K MF

$15 = \frac{16.5}{\beta}$

$\therefore \beta = 1.1$

2) Decrease in value of Equity

	DMF	KMF
Market down	5%	5%
β	1.5%	1%
Δ in Equity	7.5%	5.5%
Value	70 – 7.5%	60 – 5.5%

	= 64.75	= 56.70

3) Cash Balance

	DMF	KMF
OP	0.71	2.5
Exp.	0.25	0.25
	0.46	2.25

4) NAV at end of month

	DMF	KMF
Equity	64.75	56.70
Cash	0.46	2.25
Total	65.21	58.95

Question 23

May 2019 (New) – Paper / May 2019 (Old) – Paper

A Mutual Fund company introduces two schemes – Dividend Plan and Bonus Plan. The face value of the Unit is Rs.10 on 1-4-2014. Mr.R invested Rs.5 lakh in Dividend Plant and Rs.10 lakh in Bonus Plan. The NAV of Dividend Plan is Rs.46 and NAV of Bonus Plan is Rs.42. Both the plans matured on 31-03-2019. The particulars of Dividend and Bonus declared over the period are as follows :

Date	Dividend %	Bonus Ratio	NAV of Dividend Plan	NAV of Bonus Plan
			Rs.	Rs.
31-12.2014	12%	-	47.0	42.0
30-09.2015	-	1 : 4	48.0	43.0
31-03-2016	15%	-	49.5	41.5
30-09-2017	-	1 : 6	50.0	44.0
31-03-2018	10%	-	48.0	43.5
31-03-2019	-	-	49.0	44.0

You are required to calculate the effective yield per annum in respect of the above two plans.

Solution :

1) Dividend Reinvestment plan

Date	NAV	Div. Rate	Div. Amt.	Units Rec.	Closing
01/04/14	46	-	-	10,869.565	10,869.565
31/12/14	47	12%	13043.478	277.52	11,147.085
31/03/16	49.5	15%	16720.629	379.79	11,484.875
31/03/18	48	10%	11484.875	239.268	11,724.14

Redemption value = 11,724.14 × 49 = Rs.5,74,483

Return = $\frac{5,74,483 - 5,00,000}{5,00,000} \times 12 \times 100 = 2.979\%$

Return = 5,00,000(1 + r)^5 = 5,74,483

r = $\left(\frac{5,74,483}{5,00,000}\right)^{\frac{1}{5}} - 1 = 2.816\%$

2) Bonus plan

Date	Bonus Rate	Bonus Units	Closing
01/04/14	-	–	23,809.523
30/09/15	1 : 4	5,952.38	29,761.90
30/09/17	1 : 6	4,960.32	34,722.22

Redemption value = 34,722.22 × 44 = 15,27,777.56

Return = $\frac{15,27,777.56 - 10,00,000}{10,00,000} \times 100 \times \frac{1}{5} = 10.56\%$

Return = $\left(\frac{15,27,777.56}{10,00,000}\right)^{1/5} - 1 = 8.846\%$

Question 24

May 2019 (Old) – Paper / May 2021 (New) – RTP

The following particulars relating to S Fund Schemes:

	Particular	Value
		Rs. in Crores
1	Investments in Shares (at cost)	
	a. Pharmaceutical companies	158
	b. Construction Industries	62
	c. Service Sector Companies	112
	d. IT Companies	68
	e. Real Estate Companies	20
2	Investments in Bonds (Fixed Income)	
	a. Listed Bonds (8000, 14% Bonds of Rs.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 Rs. 520 Lakhs

Office Expenses Rs. 180 Lakhs

Advertisement Expenses Rs. 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 Rs. 2 per unit per year as cash dividend during the same period.

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

Solution :

(i) Calculation of NAV of the Fund

			(in Rs. 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	Rs. 781.209 crore
Number of Units	8.40 crore
NAV Per Unit (Rs. 781.209 crore/ 8.40 crore)	Rs. 93.00

(iii) Net Return

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

Question 25
Nov 2019 (Old) - RTP

ANP Plan, a hedge fund currently has assets of Rs. 20 crore. CA. X, the manager of fund charges fee of 0.10% of portfolio asset. In addition to it he charges incentive fee of 2%. The incentive will be linked to gross return each year in excess of the portfolio maximum value since the inception of fund. The maximum value the fund achieved so far since inception of fund about one and half year ago was Rs. 21 crores.

You are required to compute the fee payable to CA. X, if return on the fund this year turns out to be

(a) 29%, (b) 4.5%, (c) –1.8%

Solution :

(a) If return is 29%

	Rs.
Fixed fee (A) 0.10% of Rs.20 crore	2,00,000
New Fund Value (1.29 x Rs.20 crore)	25.80 crore
Excess Value of best achieved (25.8 crore – 21.0 crore)	4.80 crore
Incentive Fee (2% of 4.80 crores) (B)	9,60,000
Total Fee (A) + (B)	11,60,000

(b) If return is 4.5%

	Rs.
Fixed (A) 0.10% of Rs.20 crore	2,00,000
New Fund Value (1.045 x Rs.20 crore)	20.90 crore
Excess Value of best achieved (20.90 crore – 21.00 crore)	(Rs.0.10 crore)
Incentive Fee (as does not exceed best achieved) (B)	Nil
Total Fee (A) + (B)	2,00,000

(c) If return is (–1.8%)

No incentive only fixed fee of Rs.2,00,000 will be paid

Question 26
Nov 2019 (Old) - Paper

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 Rs.40 Lakhs. His portfolio value is Rs.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, assuming the fund's NAV will grow at 13% per annum (including dividend).

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

Solution :

1) $R = \frac{0.15}{1.006} \times 100 + 2 = 17.96\%$

2) Net financial benefit to Mr. Alex if he invest his portfolio in fund.

a) Present income to Mr. Alex

Annual Income	40
+ Income from portfolio (50 × 15%)	7.5
(If he self manage his portfolio)	47.5

∴ Additional income if Mr. Alex self manage portfolio = 7.5

b) Expected income to Mr. Alex after investing his portfolio multicap fund.

Income from portfolio – Rise in NAV – 13% = (50 × 13%)	6.5
Income from profession (40 × 10%)	4
	10.5

c) Therefore additional income to Mr. Alex = 10.5 – 7.5 = 3 lakh

Question 27
Nov 2020 (New) - Paper

M/s Corpus an AMC on 1/4/2015 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
1/4/2015			?	?
31/12/2016		1 : 4 (One unit on 4 units held)	47	40
31/3/2017	12		48	42
31/3/2018	10		50	39
31/12/2018		1 : 5 (One unit on 5 units held)	46	43
31/3/2019	15		45	42
31/3/2020	-	-	49	44

Additional Details :

Investments (Rs)	Rs 9,20,000	Rs 10,00,000
Average Profit (Rs)	Rs 27,748.60	
Average Yield (%)		6.40

You are required to calculate the issue price of both the schemes as on 1/4/2015.

Solution :

(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) = Rs. 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 28
Jan 2021 (New) - Paper

On 1st January, 2020. An open ended scheme of mutual fund had outstanding units of 300 lakhs with a NAV of Rs.20.25. At the end of January 2020, it had issued 5 lakhs at an opening NAV 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% exist load adjusted for dividend equilisation. At the end of March 2020, it had distributed 70 per cent of its available income.

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

You are require 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

Solution :

(i) Calculation of Income Available for Distribution

	Units (Lakh)	Per Unit (Rs.)	Total (Rs.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

	Rs.
Opening NAV	20.250
Add: Entry Load 2% of Rs.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

	Rs.
Opening NAV	20.250
Add: Exit Load 2% of Rs.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

		Rs. (Lakh)
Opening Net Asset Value (Rs. 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		Rs. 21.8867

Thanks ....

CHP - 7 FOREX

Question 1 :
Nov 2008 – RTP

(a) On 1st July 2008, 3 months interest rate in the US and Germany are 6.5 per cent and 4.5 per cent per annum respectively. The $/DM spot rate is 0.6560. What would be the forward rate for DM for delivery on 30th September 2008?

(b) In International Monetary Market an international forward bid on December, 15 for one Euro (€) is $ 1.2816 at the same time the price of IMM € future for delivery on December, 15 is $ 1.2806. The contract size of Euro is € 62,500. How could the dealer use arbitrage in profit from this situation and how much profit is earned?

Solution :

(a)

	USD	DM
Spot $/DM	0.6560	–
Interest rate p.a.	6.5%	4.5%
Interest for 3 Months	1.625%	1.125%

According to IRP (Interest Rate Parity)

$$\frac{F}{S} = \frac{1+iA}{1+iB}$$

$$\frac{F}{0.6560} = \frac{1.01625}{1.01125}$$

$$\text{therefore } F = \frac{0.6560 \times 1.01625}{1.01125} = 0.6592$$

(b) Buy€ 62500 × 1.2806 = $ 80037.50

Sell€ 62500 × 1.2816 = $ 80100.00

Profit $ 62.50

Alternatively if the market comes back together before December 15, the dealer could unwind his position (by simultaneously buying € 62,500 forward and selling a futures contract. Both for delivery on December 15) and earn the same profit of $ 62.50.

Question 2 :
Nov 2008 – RTP

In March, 2008, the Zed Pro Industries makes the following assessment of dollar rates per British pound to prevail as on 1.9.2008:

$/Pound	Probability
1.6	0.15
1.7	0.2

1.8	0.25
1.9	0.2
2	0.2

(i) What is the expected spot rate for 1.9.2008?

(ii) If, as of March, 2008, the 6-month forward rate is $ 1.80, should the firm sell forward its pound receivables due in September, 2008?

Solution :

(i) Calculation of expected spot rate for September, 2008:

$ for £	Probability	Expected$/£
1.60	0.15	0.24
1.70	0.20	0.34
1.80	0.25	0.45
1.90	0.20	0.38
2.00	0.20	0.4
	1	EV = 1.81

Therefore, the expected spot value of $ for £ for September, 2008 would be $ 1.81.

(ii) If the six-months forward rate is $ 1.80, the expected profits of the firm can be maximised by retaining its pounds receivable.

Question 3 :
Nov 2008 – RTP / May 2009 – RTP / Nov 2011 – Paper / Nov 2018 (New) – RTP / Nov 2019 (Old) – RTP

On July 28, 2008 Unicon (an importer) requested a bank to remit Singapore Dollar (SGD) 2,50,000 under an irrevocable LC. However, due to bank strikes, the bank could effect the remittance only on August 4, 2008. The interbank market rates were as follows:

	July, 28	August 4
Bombay US$1	= Rs.45.85/45.90	45.91/45.97
London Pound 1	= US$ 1.7840/1.7850	1.7765/1.7775
Pound 1	= SGD 3.1575/3.1590	3.1380/3.1390

The bank wishes to retain an exchange margin of 0.125%. How much does the customer stand to gain or lose due to the delay?

Solution :

An importer customer requested to remit SGD 2,50,000.

On July 28, 2008 the rates are		On August 4, 2008 the rates are	
US $	= Rs.45.90	US $	= Rs.45.97
Pound 1	= US$ 1.7850	Pound 1	= US$ 1.7775
Pound 1	= SGD 3.1575	Pound 1	= SGD 3.1380

Therefore, SGD 1 = $\frac{Rs.45.90 \times \$1.7850}{SGD\ 3.1575}$	Therefore, SGD 1 = $\frac{Rs.45.97 \times \$1.7775}{SGD\ 3.1380}$
SGD 1 = Rs.25.9482	SGD 1 = Rs.26.0394
Add: Exchange margin (0.125%) Rs.0.0324	Add: Exchange margin (0.125%) Rs. 0.0325
Rs.25.9806	Rs.26.0719

Hence, loss to the importer

= SGD 2,50,000 (Rs.26.0719 – Rs.25.9806)

= Rs.22,825

Question 4 :

Nov 2008 Paper – 6 Marks / May 2019 (New) – RTP

An exporter is a UK based company. Invoice amount is $3,50,000. Credit period is three months. Exchange rates in London are :

Spot Rate ($/£)	1.5865 – 1.5905
3-month Forward Rate ($/£)	1.6100 – 1.6140

Rates of interest in Money Market :

	Deposit	Loan
$	7%	9%
£	5%	8%

Compute and show how a money market hedge can be put in place. Compare and contrast the outcome with a forward contract.

Solution :

UK firm (£)

- Exporter
- $3,50,000 receivable after 3 months

UK firm has to alternatives,

Alt 1 : Forward cover

Alt 2 : Money market cover

Alt 1 : Forward cover

FC receivable → Sell FC

3mf rate $/£ 1.6100 / 1.6140

S B

i.e. sell = Buy £ & ∴ $\frac{3,50,000}{1.6140}$ = £ 216852.54 Receivable after 3 months

Alt 2 : Money market cover

FC Receivable ⇒ Borrow → Sell → Invest

Step 1 : Borrow $ to pay $ 3,50,000 @ 9% p.a. i.e. 2.25% for 3 months

$$\frac{3,50,000}{1.0225} = \$3,42,298,.28$$

Step 2 : Sell $342298.28 @ spot

Spot $/£ 1.5865 / 1.5905

S B

i.e. $\frac{342298.28}{1.5905}$ = £ 215214.265

Step 3 : Invest £215214.265 @ 55 p.a. i.e. 1.25% for 3 months

215214.265 × 1.0225 = £217904.44 receivable after 3 months

Decision : UK firm should go ahead with money market over.

Question 5 :
Nov 2008 Paper – 6 Marks

An Indian exporting firm, Rohit and Bros., would be cover itself against a likely depreciation of pound sterling. The following data is given :

Receivables of Rohit and Bros	: £500,000
Spot rate	: Rs.56,00/£
Payment date	: 3-months
3 months interest rate	: India : 12 per cent per annum
	: UK : 5 per cent per annum

What should the exporter do?

Solution :

- Indian exporter (Rs.)
- £ 5,00,000 receivable after 3 months

According to money market cover

FC receivable ⇒ Borrow – Sell – Invest

(1) Borrow ⇒ £ 5,00,000 @ 5% p.a. i.e. 1.25% (3m)

$$\frac{5,00,000}{1.0125} = £4,93,827.16.$$

(2) Sell £493827.16 @ spot ⇒ Rs./ £ = 56

i.e. 493827.16 × 56 = Rs.2,76,54,320.96

(3) Invest Rs.276549320.96 @ 12% p.a. i.e. 3% (3 m)

27654320.96 × 1.03 = Rs.2,84,83,950.59 receivable after 3 months

Question 6 :
Nov 2008 Paper – 4 Marks / Nov 2008 – Paper / May 2010 – Paper / May 2013 – RTP / Nov 2017 – Paper

The rate of inflation in USA is likely to be 3% per annum and in India it is likely to be 6.5%. The current spot rate of US $ in India is Rs.42.40. Find the expected rate of US $ in India after one year and 3 years from now using purchasing power parity theory.

Solution :

According to Purchasing Power Parity theory

$$\frac{F}{S} = \frac{1 + iA}{1 + iB}$$

Where F = Forward Rate
S = Spot Rate
iA = Rs.inflation Rate and
iB = $ Inflation Rate

After 1 Year

$$\frac{F}{42.40} = \frac{1 + 0.065}{1 + 0.03} \text{ therefore } F = \text{Rs.}43.8408$$

After 3 Years

$$F = 42.40 \times \frac{1.065}{1.03} \times \frac{1.065}{1.03} \times \frac{1.065}{1.03} = \text{Rs.}46.8709$$

Question 7 :
May 2009 – RTP

An MNC company in USA has surplus funds to the tune of $ 10 million for six months. The Finance Director of the company is interested in investing in € for higher returns. There is a Double Tax Avoidance Agreement (DTAA) in force between USA and Germany. The company received the following information from London:

€/$ Spot	0.4040/41
6 months forward	67/65
Rate of interest for 6 months (p.a.)	5.95%– 6.15%
Withholding tax applicable for interest income	22%
Tax as per DTAA	10%

If the company invests in £, what is the gain for the company?

Solution :

$ 10 million converted @ € 0.4040/$ = $10,000,000 × 0.4040	= €4,040,000
and invested @ 5.95% for6 months in Luxemburg will fetch :	
€ 4,040,000 (1+ 0.0595/2)	= € 4,160,190
Interest earned =€(4,160,190 – 4,040,000)	= € 120,190
Withholding Tax @ 10% (in view of DTAA)	= € 12,019

Net interest eligible for repatriation	= € 108,171
Amount repatriated after 6 months= € 108,171 + € 4,040,000	= € 4,148,171
Amount received at the forward rate of € 0.3976/$ = €4,148,171/0.3976	= 10,433,026
Additional amount fetched =$10,433,026 – $10,000,000	= $ 433,026.

Question 8 :
May 2009 – RTP / Nov 2018 – Paper

Spot rate 1 US $ = Rs.47.7123
180 days Forward rate for 1 US $ = Rs.48.6690
Interest rate in India = 12% p.a
Interest rate in USA = 8% p.a
An arbitrageur takes loan of Rs. 40,00,000 from Indian Bank for 6 months and goes for arbitrage. What is his gain or loss? (Take 1 year = 360 days)

Solution :

Step 1 : Borrow Rs.40,00,000 @ 12% PA i.e. 6% for 6 months
Amount payable = 40,00,000 × 1.06 = Rs.42,40,000

Step 2 : Convert Rs.40,00,000 into $ spot
i.e. $\frac{40,00,000}{47.7123}$ = $83,835.82

Step 3 : Invest $83,835.82 @ 8% PA i.e. 4% for 6 months
Amount received = 83,835.82 × 1.04 = 87,189.26$

Step 4 : Convert $ 87,189.26 into Rs. 6 months forward
i.e. 87,189.26 × 48.6690 = Rs.42,43,414
Profit = Rs.3,414

Question 9 :
May 2009 Paper – 6 Marks / Nov 2014 – RTP

Your forex dealer had entered into a cross currency deal and had sold US $ 10,00,000 against EURO at US $ 1 = EUR 1.4400 for spot delivery.
However, later during the day, the market became volatile and the dealer in compliance with his management's guidelines had to square – up the position when the quotations were:

Spot US $ 1	INR	31.4300/4500
1 month margin		25/20
2 months margin		45/35
Spot US $ 1	EURO	1.4400/4450
1 month forward		1.4425/4490
2 months forward		1.4460/4530

What will be the gain or loss in the transaction?

Solution :

1. The amount of EUR bought by selling
   USD 10,00,000 × 1.4400 = EUR 14,40,000
2. The amount of EUR sold for buying
   USD 10,00,000 × 1.4450 = EUR 14,45,000
3. Net Loss in the Transaction = EUR 5,000
   To acquire EUR 5,000 from the market @
   (a) USD 1 = EUR 1.4400 &
   (b) USD1 = INR 31.4500
   Cross Currency buying rate of Rs./ € is
   Rs.31.4500 / 1.440 i.e. Rs.21.8403
   Loss in the Transaction Rs.21.8403 * 5000 = Rs.1,09,201.50

Question 10 :
May 2009 Paper

You have following quotes from Bank A and Bank B:

	Bank A	Bank B
SPOT	CHF/USD 1.4650/55	CHF/USD 1.4653/60
3 Months	5/10	
6 Months	10/15	
SPOT	USD/GBP 1.7645/60	USD/GBP 1.7640/50
3 Months	25/20	
6 Months	35/25	

Calculate :

(i) How much minimum CHF amount you have to pay for 1 Million GBP spot?

(ii) Considering the quotes from Bank A only, for CHF/ GBP what are the Implied Swap points for Spot over 3 months?

Solution :

1) Minimum CHF amount for 10,00,000 £

Alt 1 : Bank A CHF/$ 1.4655 i.e. CHF/Rs. 1.4655
$/£ 1.7660 × 1.7660
2.5881

i.e. 10,00,000 × 2.5881 = CHF 25,88,100

Alt 2 : Bank B = 1.4660 × 1.7650 = 2.58749
i.e. 10,00,000 × 2.58749 = CHF 25,87,490

Alt 3 : Bank A CHF/$ 1.4655
Bank B $/£ 1.7650
i.e. 1.4655 × 1.7650 = 2.5866
i.e. 10,00,000 × 2.5866 = CHF 25,86,600

Alt 4 : Bank B CHF/$ 1.4660

Bank A $/£ 1.7660

i.e. 1.4660 × 1.7660 = 2.588956

i.e. 10,00,000 × 2.588956 = CHF 25,88,956

Alt 2 is the Best

2) Swap points for spot over 3 months for Bank a

Spot Bank A CHF/£	1.4650	1.4655
	× 1.7645	× 1.7660
	2.5850	2.5881
Swap	.28	.12
3 months CHF/£	2.5822	2.5869

Working Note :

Spot CHF/$	1.4650 / 1.4655
Swap	5 / 10
3 months CHF/$	1.4655 / 1.4665
Spot CHF $/£	1.7645 / 1.7660
Swap	25 / 20
3 months $/£	1.7620 / 1.7640

∴3 months CHF/£	1.4655 /	1.4665
	× 1.7620 /	× 1.7640
	2.5822	2.5869

Question 11 :

Nov 2009 – RTP

If the interest rate for the next 6 months for the US$ is 1.5% (annual compounding). The interest rate for the € is 2% (annual compounding). The spot price of the € is US $ 1.665. The forward price is expected to be US$ 1.664. Please determine correct forward price and recommend an arbitrage strategy.

Solution :

1) According to Interest Rate Parity

$$\frac{F}{S} = \frac{1+iA}{1+iB}$$

$$\therefore \frac{F}{1.665} = \frac{1.0075}{1.01}$$

$\therefore F = \frac{1.665 \times 1.0075}{1.01} = 1.6609$

Since Actual F $/€ 1.664 does not match with F as per IRP $/€ 1.6609 there is arbitrage possible.

2) Arbitrage

(i) Borrow $10000 @1.5 PA i.e. 0.75% for 6 months

Amount payable = 10,000 × 1.0075 = $10075

(ii) Covert $10,000 into € spot

@ $/€ 1.665

i.e. $\frac{10,000}{1.665}$ = € 6,006.006

(iii) Invest € 6,006.006 @ 2% PA i.e. for 6 months

Amount Received = 6,006.006 × 1.01 = € 6,066.066

(iv) Convert € 6,0066.066 into $ 6 months

@ $/€ 1.664

i.e. 6,066.066 × 1.664 = $ 10,093.93

Profit = 10,0973.93 = 10,075 = $ 18.33

Question 12 :
Nov 2009 – Paper

M/s Omega Electronics Ltd. Exports air conditioners to Germany by importing all the components from Singapore. The company is exporting 2,400 units at a price of Euro 500 per units. The cost of imported components is S$ 800 per unit. The fixed cost and other variables cost per unit are Rs.1,000 and

Rs.1,500 respectively. The cash flow in foreign currencies are due in six months. The current exchange rates are as follows :-

Rs./Euro 51.50/55

Rs./$ 27.20/25

After 6 months the exchange rates turn out as follows :

Rs./Euro 52.00/05

Rs./$ 27.70/75

1) You are required to calculate loss/gain due to transaction exposure.

2) Based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of air conditioners is Rs.25,000 :

a) The current exchange rate changes to :

Rs./Euro 51.75/80

Rs./$ 27.10/15

b) Price elasticity of demand is estimated to be 1.5

c) Payments and Receipts are to be settled at the end of six months.

Solution :

(a) Calculation of Gain / Loss due to transaction exposure

Opening Positions :		**Rs.**
Sales (2,400 units × 500 × 51.5)		6,18,00,000
Less : Cost		
Import (2,400 × 800 × 27.25)	5,23,20,00	
FC (1,000 × 2,400)	24,00,000	
VC (1,500 × 2,400)	36,00,000	(5,83,20,000)
Subject to : € Exposure and $ Exposure	Profit	34,80,000

After 6 months

€ Profit = (52 – 51.5) 2,400 × 500 = Rs.6,00,000 (Profit)

$ Loss = (27.75 – 27.25) 2,400 × 800 = Rs.9,60,000 (Loss)

Rs.3,60,000 (Loss)

2) Calculating of Gain / Loss due to transaction and operating exposure contracted price to be 25,000

Opening position :		**Rs.**
(i) Sales (2,400 × 500 × 51.75)		6,21,00,000
Less : Cost :		
Import (2,400 × 800 × 27.15)	5,21,28,000	
FC	24,00,000	
VC	36,00,000	(5,81,28,000)
Subject to : € Exposure and S $ Exposure	Profit	39,72,000

(ii) To cut € transaction exposure, we shall sell product not at € 500 but at Rs.25,000.

Original price = €500

Now price (in Euro market)

$= \frac{Rs.25,000}{51.75}$ €483.09

↓ in price $\left(\frac{500-483.09}{500}\right) \times 100$ = 3.38%

(X) Price elasticity = 1.5

∴↑ in Quantity = (3.38 × 1.5) = 5.073 %

∴New Quantity = 2,400 + 5.073% = 2522 units (Approx.)

New Positions :

Sales (2522 × 25,000)		6,30,50,000
Less : Cost :		
Import (2,522 × 800 × 27.15)	5,47,77,840	

VC (2,522 × 1,500)	37,83,000	
FC	24,00,000	(6,09,60,840)
Subject to S $ Exposure	Profit	20,89,160

Loss on S $ = (27.75 – 27.15) × 2,522 × 800 = Rs.12,10,560

Question 13 :
May 2010 – RTP

On 30th June 2009 when a forward contract matured for execution you are asked by an importer customer to extend the validity of the forward sale contract for US$ 10,000 for a further period of three months.

Contracted Rate US$1 = Rs.41.87

The US Dollar quoted on 30.6.2009

Spot	Rs. 40.4800/Rs. 40.4900
Premium July	0.1100/0.1300
Premium August	0.2300/0.2500
Premium September	0.3500/0.3750

Calculate the cost for your customer in respect of the extension of the forward contract. Rupee values to be rounded off to the nearest Rupee.

Margin 0.080% for Buying Rate

Margin 0.25% for Selling Rate

Solution :

This extension of forward Contract involves following steps

1. Cancel the contract at TT buying rate.
2. Rebook the contract for three months at the current rate of exchange.

Accordingly

Step 1: Cancel the contract at TT buying rate (sell for customer) on 30.6.2009

	Rs.
Spot US$ 1	40.4800
Less: Margin 0.080%	0.0324
	40.4476
Hence TT buying rate	Rs. 40.45 (Rounded off)
US$ 10,000 @ Rs. 40.45	Rs. 4,04,500/-
US$ 10,000@ Rs. 41.87	Rs. 4,18,700/-
Difference in favour of the bank	Rs. 14,200/-.

Step 2: New contract to be booked at the appropriate forward rate.

Three months forward rate is as under:

US$ 1 Spot Selling	Rs.40.4900
Add : September Premium	Rs. 0.3750

	Rs. 40.8650
Add: Margin (0.25%)	Rs. 0.1022
	Rs. 40.9672

Forward rate to be quoted to the customer is US$ 1 = Rs.40.97

Question 14 :
May 2010 – RTP

Wenden Co is a Dutch-based company which has the following expected transactions.

One month: Expected receipt of	£2,40,000
One month: Expected payment of	£1,40,000
Three months: Expected receipts of	£3,00,000

The finance manager has collected the following information:

Spot rate (£ per €):	1.7820 ± 0.0002
One month forward rate (£ per €):	1.7829 ± 0.0003
Three months forward rate (£ per €):	1.7846 ± 0.0004

Money market rates for Wenden Co:

	Borrowing	**Deposit**
One year Euro interest rate:	4.9%	4.6
One year Sterling interest rate:	5.4%	5.1

Assume that it is now 1 April.

Required:

(a) Calculate the expected Euro receipts in one month and in three months using the forward market.

(b) Calculate the expected Euro receipts in three months using a money-market hedge and recommend whether a forward market hedge or a money market hedge should be used.

Solution :

Wenden Co. is a Dutch based company

FC receivable after 1 month - £ 1,00,000 (2,40,000 – 1,40,000)
after 3 months - £ 3,00,000

(a) Forward cover

1 month – Receipts of £ 1,00,000

1 month rate £/€ (1.7829 – 0.0003) / (1.7829 + 0.0003

i.e. £/€ 1.7826 / 1.7832
S B

i.e. $\frac{1,00,000}{1.7832}$ = €56,078.96

3 month – Receipt of £ 3,00,000

3 month rate £/€ (1.7846 – 0.0004) / (1.7846 + 0.0004)

£/€ 1.7842 / 1.7850
S B

Sell £ = Buy € = 1.7850

i.e. $\frac{3,00,00}{1.7850}$ = € 1,68,067.23

(b) Money Market Hedge

FC receivable ⇒ Borrow → Sell → Invest

Step 1 : Borrow £ to received 3,00,000 @ 5.4% p.a. i.e. 1.35% (3 m)

$\frac{3,00,00}{1.0.35}$ = £ 2,96,003.946

Step 2 : Sell £ 2,96,003.946 @ spot

£/€ (1.7820 – 0.0002) / (1.7820 + 0.0002)

£/€ 1.7818 / 1.7822

S B

Sell £ = Buy € = 1.7822

i.e. $\frac{2,96,003.946}{1.7822}$ = €1,66,089.073

Step 3 : Invest € 1,66,089.073 @ 4.6% p.a. i.e. 1.15 (3m)

1,66,089.073 × 1.0115 = €1,67,999.097 Receivable after 3 m

Decision : Forward cover for 3 months should be used.

Question 15 :
May 2010 – RTP / May 2021 (New) – RTP

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 alternative 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.

Solution :

(a) (i) Receipt under three proposals

(a) Proposal of Mr. Grand

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

(b) Proposal of Mr. John

Forward Rate = €1.1990 - 0.0055 = 1.1935

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

(c) Proposal of Ms. Royce

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

= $\frac{€5.5\text{millio n}}{1.1943}$ = £ 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 16 :
Nov 2010 – RTP

Somu Electronics imported goods from Japan on July 1st 2009, of JP ¥ 1 million, to be paid on 31st, December 2009. The treasury manager collected the following exchange rates on July 01, 2009 from the bank.

Delhi Rs./US$ Spot	45.86 /88
6 months forward	46.00/03
Tokyo JP ¥/ US$ Spot	108/108.50
6 months forward	110/110.60

In spite of fact that the forward quotation for JP ¥ was available through cross currency rates, Mr. X, the treasury manager purchased spot US$ and converted US$ into JP ¥ in Tokyo using 6 months forward rate.

However, on 31st December, 2009 Rs./US$ spot rate turned out to be 46.24 /26.

You are required to calculate the loss or gain in the strategy adopted by Mr. X by comparing the notional cash flow involved in the forward cover for Yen with the actual cash flow of the transaction.

Solution :

- Somu Electronics (1/7/2009)
- Indian Importer
- Pay ¥ 10,00,000
- After 6 months (31/12/2009)

<u>Forward Cover (Notional Cash Flow)</u>

6mf Rs. / $ 46.00 / 46.03

6mf ¥ / $ 110.00 / 110.6

i.e. 6mf Rs. / ¥ $\frac{46.00}{110.60} \Big/ \frac{46.03}{110}$ i.e. 10,00,000 × 0.4185

Rs. / ¥ $\frac{0.4159}{S} \Big/ \frac{0.4185}{B}$ = Rs.4,18,500 pay after 6 months

Rs. / $ 46.24 / 46.26 (spot / 31/12)

6mf ¥ / $ 110.00 / 110.60

Rs. / ¥ $\frac{46.24}{110.6} \Big/ \frac{46.26}{110}$

Rs. / ¥ $\frac{0.4181}{S} \Big/ \frac{0.4205}{B}$

i.e. 10,00,000 × 0.4205 = Rs.420500 pay after 6 months.

The loss of Rs.2,000 (420500 – 418500)

Question 17 :
Nov 2010 – RTP

An automobile company in Gujarat exports its goods to Singapore at a price of SG$ 500 per unit. The company also imports components from Italy and the cost of components for each unit is € 200. The company's CEO executed an agreement for the supply of 20000 units on January 01, 2010 and on the same date paid for the imported components. The company's variable cost of producing per unit is Rs. 1,250 and the allocable fixed costs of the company are Rs. 1,00,00,000.

The exchange rates as on 1 January 2010 were as follows-

Spot	Rs./SG$	33.00/33.04
	Rs./€	56.49/56.56

Mr. A, the treasury manager of company is observing the movements of exchange rates on a day to day basis and has expected that the rupee would appreciate against SG$ and would depreciate against €.

As per his estimates the following are expected rates for 30th June 2010.

Spot	Rs./SG$	32.15/32.21
	Rs./€	57.27/57.32

You are required to find out:

(a) The change in profitability due to transaction exposure for the contract entered into.

(b) How many units should the company increases its sales in order to maintain the current profit level for the proposed contract in the end of June 2010.

Solution :

(a) Let us first calculate the Company's existing profits

	Rs.	Rs.
Sales – 20000 x SG$500 x Rs.33		330,000,000
Variable Cost		
Imported Raw Material-20000 x €200 x Rs.56.56	226,240,000	
Manufacturing Cost- 20000 x Rs.1,250	25,000,000	
Fixed Cost	10,000,000	261,240,000
Profit		68,760,000

After the Rupee appreciation against SG$ and depreciation against €, the company's profitability will be

	Rs.	Rs.
Sales – 20000 x SG$500 x Rs.32.15		321,500,000
Variable Cost		
Imported Raw Material-20000 x €200 x Rs.57.32	229,280,000	
Manufacturing Cost- 20000 x Rs. 1,250	25,000,000	
Fixed Cost	10,000,000	264,280,000
Profit		57,220,000

Thus profit will decrease by Rs. 11,540,000 (Rs. 68,760,000 – Rs. 57,220,000)

(b) Let the number of units that need to be sold for keeping the profits at pre appreciation level be X.

Then

Rs.68,760,000 = [500 × Rs. 32.15 × X] – [(1250 × X) + (200 × 57.32X) + 10,000,000] 68,760,000 = [16075X – (1250X + 11464X + 10,000,000)]

68,760,000 + 10,000,000= 16075X – 12714X

78,760,000 = 3361X

X = 23433.50 or, 23434 units.

Thus, the company should increase its existing supply from 20000 to 23434 to maintain the current profit level of Rs. 68,760,000.

Question 18 :
Nov 2010 – Paper / May 2016 – Paper / May 2018 (New) – Paper

Given the following information :

Exchange rate - Canadian Dollar 0.665 per DM (Spot)
Canadian Dollar 0.670 per DM (3 months)

Interest rates - DM 7% p.a.
Canadian Dollar 9% p.a.

What operations would be carried out to earn the possible arbitrage gains?

Solution :

spot	$ / DM	0.665
3mf	$ / DM	0.670
i$		9%pa
iDM		7%pa

Step 1 : Borrow 10,000 CD for 3 months

Amt : payable = 10,000 x 1.0225 CD = 10225 CD

Step 2 : Convert CD 10,000 in DM spot

Amount Received = $\frac{10,000}{0.665}$ = 15,037.59 DM

Step 3 : Invest 15,037.59 DM for 3 months

Amount Receivable = 15,037.59 x 1.0175 = 15,300.7478

Step 4 : Sell 15,300.7478 DM 3 mf

Amount Receivable = 15,300.7478 x 0.670 = 10,251.50

Profit = 10,251.50 – 10,225 = 26.5 $

Question 19 :
May 2011 – RTP

Arnie operating a garment store in US has imported garments from Indian exporter of invoice amount of Rs.1,38,00,000 (equivalent to US$ 3,00,000). The amount is payable in 3 months. It is expected that the exchange rate will decline by 5% over 3 months period. Arnie is interested to take appropriate action in foreign exchange market. The three month forward rate is quoted at Rs.44.50.

You are required to calculate expected loss which Arnie would suffer due to this decline if risk is not hedged. If there is loss, then how he can hedge this risk.

Solution :

1) Arnie us imports fc Rs.1,38,00,000 payable after 3 months

Spot Rs. / $ $\frac{1,38,00,000}{3,00,000} = 46$

Expected 3 months spot Rs. / $ 43.7

3 mf rate Rs. / $ 44.5

2) No Hedging

3m spot Rs. / $ 43.7

$\frac{1,38,00,000}{43.7} = 3,15,789.4737$ $

: Loss = 1,57,789.4737

3) Hedging

3mf Buy

3mf Rs. / $ 44.5

Amt payable $= \frac{1,38,00,000}{44.5} = 310112.3596$ $

: Saving in loss 315789.4737

310112.3596

5677.1141 $

Question 20 :
May 2011 – RTP / Nov 2015 – RTP

AMK Ltd. an Indian based company has subsidiaries in U.S. and U.K.

Forecasts of surplus funds for the next 30 days from two subsidiaries are as below:

U.S. $12.5 million

U.K. £ 6 million

Following exchange rate informations are obtained:

	$/Rs.	£/Rs.
Spot	0.0215	0.0149
30 days forward	0.0217	0.0150

Annual borrowing/deposit rates (Simple) are available.

Rs. 6.4%/6.2%

$ 1.6%/1.5%

£ 3.9%/3.7%

The Indian operation is forecasting a cash deficit of Rs. 500 million.

It is assumed that interest rates are based on a year of 360 days.

(i) Calculate the cash balance at the end of 30 days period in Rs. for each company under each of the following scenarios ignoring transaction costs and taxes:

(a) Each company invests/finances its own cash balances/deficits in local currency independently.

(b) Cash balances are pooled immediately in India and the net balances are invested/borrowed for the 30 days period.

(ii) Which method do you think is preferable from the parent company's point of view?

Solution :

(i) (a) Independent Investment / Borrow

(1) India = 500 × 1.00533(6.4/12 × 1) = Rs.502.67 million payable

(2) US = $\frac{\$12.5 \times 1.00125(1.5/12 \times 1)}{0.0217}$ = Rs.576.757 million receivable

(3) UK = $\frac{Rs.6 \times 1.003083(3.7/12 \times 1)}{0.015}$ = Rs.401.233 million receivable

Rs.475.32 million receivable

(b) Pool Cash Flow to India and Investment / Borrow (Net)

(1) US = $\frac{\$12.5}{0.0215}$ = Rs.581.395 million receivable

(2) UK = $\frac{£6}{0.0149}$ = Rs.402.685 million receivable

(3) India = Rs.500 million payable

Net = Rs.484.08 million receivable

Investment in India of Rs.484.04 million

Rs.484.08 × 1.005167 (6.2/12 × 1) = Rs.486.581 million Receivable

(ii) Independent Investment / Borrow

Question 21 :

Nov 2011 – Paper / Nov 2019 (New) – RTP

An Indian importer has to settle an import bill for $ 1,30,000. The exporter has given the Indian exporter two options:

(i) Pay immediately without any interest charges.

(ii) Pay after three months with interest at 5 percent per annum.

The importer's bank charges 15 percent per annum on overdrafts. The exchange rates in the market are as follows:

Spot rate (Rs./$) : 48.35 /48.36

3-Months forward rate (Rs./$) : 48.81 /48.83

The importer seeks your advice. Give your advice.

Solution :

1) If importer pays now, he will have to buy US$ in Spot Market by availing overdraft facility. Accordingly, the outflow under this option will be

	Rs.
Amount required to purchase $130000[$130000 X Rs.48.36]	62,86,800
Add: Overdraft Interest for 3 months @15% p.a.	2,35,755
	65,22,555

2) If importer makes payment after 3 months then, he will have to pay interest for 3 months @ 5% p.a. for 3 month along with the sum of import bill. Accordingly, he will have to buy $ in forward market. The outflow under this option will be as follows:

	$
Amount of Bill	1,30,000
Add: Interest for 3 months @5% p.a.	1,625
	1,31,625
Amount required to purchase 1,31,625 3 mf	
(US$ 131625 X Rs. 48.83)	Rs. 6427249

Since outflow of cash is least in (ii) option, it should be opted for.

Question 22 :
May 2012 – RTP

True Blue Cosmetics Ltd. is an old line producer of cosmetics products made up of herbals. Their products are popular in India and all over the world but are more popular in Europe.

The company invoice in Indian Rupee when it exports to guard itself against the fluctuation in exchange rate. As the company is enjoying monopoly position, the buyer normally never objected to such invoices. However, recently, an order has been received from a whole-saler of France for FFr 80,00,000. The other conditions of the order are as follows:

(a) The delivery shall be made within 3 months.

(b) The invoice should be FFr.

Since, company is not interested in losing this contract only because of practice of invoicing in Indian Rupee. The Export Manger Mr. E approached the banker of Company seeking their guidance and further course of action.

The banker provided following information to Mr. E.

(a) Spot rate 1 FFr = Rs. 6.60

(b) Forward rate (90 days) of 1 FFr = Rs. 6.50

(c) Interest rate in India is 9% and in France is 12%.

Mr. E entered in forward contract with banker for 90 days to sell FFr at above mentioned rate. When the matter come for consideration before Mr. A, Accounts Manager of company, he approaches you.

You as a Forex consultant is required to comment on:

(i) Whether there is an arbitrage opportunity exists or not.

(ii) Whether the action taken by Mr. E is correct and if bank agrees for negotiation of rate, then at what forward rate company should sell FFr to bank.

Solution :

- True Blue Cosmetics Ltd.
- FFr 80,00,000 receivable
- After 90 days
- i Rs. = 9% P.A. i.e. 2.25 for 90 days
- Spot Rs. / FFr = 6.60
- 90 days forward Rs./FFr 6.50
- i FFr = 12% P.a. i.e. 3% for 90 days

1) As per IRP

$$\frac{F}{S} = \frac{1+iA}{1+iB}$$

$$\frac{F}{6.6} = \frac{1.0225}{1.03}$$

i.e. Rs./FFr = 6.55

Since actual F i.e. Rs./FFr 6.5 does not match with F as per IRP i.e. Rs./FFr = 6.55 arbitrage opportunity exists.

2) The decision taken by Mr.E is not correct because as per IRP the forward rate should be Rs./FFr 6.55. Mr.E. should enter into many market hedge.

If bank is ready to negotiate forward rate then we should ask for Rs./FFr 6.55.

Question 23 :
May 2012 – Paper / May 2018 – RTP

NP and Co. has imported goods for US $ 7,00,000. The amount is payable after three months. The company has also exported goods for US $ 4,50,000 and this amount is receivable in two months. For receivable amount a forward contract is already taken at € 48.40.

The market rates for € and $ are as under.

Spot € 48.50 / 70

Two months 25 / 30 points

Three months 40 / 45 points

The Company wants to cover the risk and it has two options as under :

a) To cover payables in the forward market and

b) To lag the receivables by one month and cover the risk only for the net amount. No interest for delaying the receivables is earned. Evaluate both the options if the cost of Rupee Funds is 12%. Which option is preferable?

Solution :

- NP and co. (Indian Co)
- Payable $ 7,00,000 (Buy) After 3 months
- Receivable 4,50,000 (Sell) After 2 months (Forward cover @ 48.9)

Alt 1 : To cover the payable in forward market

Spot Rs. / $	48.50 / 48.7
3m swap	40 / 45
3mf Rs./$	48.9 / 49.5
	S B

Cash Flow Receivable

(i) After 2 months = 4,50,000 × 48.9 = Rs.2,20,05,000 Receivable

After 3 months = 2,20,05,000 × 1.01 (12/12 × 1) = Rs.2,22,25,050 Receivable

Payable = 7,00,000 × 49.15 = Rs.3,44,05,000 Payable

After 3 months = Rs.1,21,79,950 payable

Alt 2 : (A) Cancel old Receivable

FC sell - $ 48.9

2 mf Buy : Spot Rs. / $ = 48.5 / 48.7

2m swap 25 / 30

2mf Rs. / $ 48.75 / 49

S B

After 2 months : Loss = (49 – 48.9) × 4,50,000 + 100 = 45,100

(B) Receivable – 3 months – 4,50,000
Payable – 3 months – 7,00,000 } Net payable = 2,50,000

Forward cover 3 mf Rs./$ 48.9 / 49.15

S B

(C) Cash Flow

(i) After 2 months = Payable = Rs.45,100 payable

(ii) After 3 m nths = 45,100 × 1.01 (12/12 × 1) = Rs.45,551 payable

(+) $ 2,50,000 × 49.15 = Rs.1,22,87,500 payable

After 3 months Rs.1,23,33,051 payable

Question 24 :
Nov 2012 – RTP

A company is considering hedging its foreign exchange risk. It has made a purchase on 1st. January, 2008 for which it has to make a payment of US $ 50,000 on September 30,2008. The present exchange rate is 1 US $ = Rs.40. It can purchase forward 1 US $ at Rs. 39. The company will have to make a upfront premium of 2% of the forward amount purchased. The cost of funds to the company is 10% per annum and the rate of corporate tax is 50%. Ignore taxation. Consider the following situations and compute the Profit/Loss the company will make if it hedges its foreign exchange risk:

(i) If the exchange rate on September 30, 2008 is Rs.42 per US $.

(ii) If the exchange rate on September 30, 2008 is Rs.38 per US $.

Solution :

- Indian Co.
- $ 50,000 payable
- After 9 months (1/1 to 30/9)

Amount payable if hedged		Amt.	Amt.
(a)	$ 50,000 × 39	–	19,50,000
(b)	Premium ($ 50,000 × 39 × 2%)	39,000	–
	+ Interest @ 10% for 9 months	2,925	41,925
	Total payable		19,91,925

(1) If Exchange Rate on 30/9 is Rs./$ 42

Amount payable = $ 50,000 × 42 = rs.21,00,000

Net gain = 21,00,000 – 19,91,925 = Rs.1,08,075

(2) If exchange rate on 30/9 is Rs./$ 38

Amount payable = $50,000 × 38 = Rs.19,00,000

Net loss = 19,91,925 – 19,00,000 = Rs.91,925

Question 25 :
Nov 2012 – RTP

An Indian exporting firm, Rohit and Bros., would be cover itself against a likely depreciation of pound sterling. The following data is given:

Receivables of Rohit and Bros	: £500,000	
Spot rate	: Rs.56.00/£	
Payment date	: 3-months	
3 months interest rate	: India	: 12 per cent per annum
	: UK	: 5 per cent per annum

What should the exporter do?

Solution :

Rohit and Bros can cover the risk in the money market.

The following steps are required to be taken:

Step 1 : Borrow pound sterling for 3- months @ 5% p.a. i.e. 1.25% for 3 months

The borrowing has to be such that at the end of three months, the amount becomes £ 500,000.

The amount borrowed is = $\frac{5,00,000}{1.0125}$ = £493,827.16

Step 2 : Convert the borrowed sum into rupees at the spot rate.

This gives: £493,827 × Rs.56 = Rs.2,76,54,320

Step 3 : Sell The sum thus obtained is placed in the money market at 12 % p.a. i.e. 3% for 3 months

Amount Receivable = 2,76,54,320 x 1.03 = Rs.2,84,83,951.

Question 26 :

Nov 2012 – Paper / Nov 2017 – Paper / Nov 2019 (Old) – Paper

The US dollar is selling in India at Rs.55.50. If the interest rate for a 6 months borrowing in India is 10% per annum and the corresponding rate in USA is 4%.

(i) Do you expect that US dollar will be at a premium or at discount in the Indian Forex Market?

(ii) What will be the expected 6-months forward rate for US dollar in India? and

(iii) What will be the rate of forward premium or discount?

Solution :

(1) Under the given circumstances, the USD is expected to quote at a premium in India as the interest rate is higher in India

(2) According to IRP

$$\frac{F}{S} = \frac{1 + iA}{1 + iB}$$

After 6 months,

$\frac{F}{55.5} = \frac{1.05}{1.02}$, therefore F = Rs. 57.13

(3) Forward Premium on $ $= \frac{F-S}{S} \times 100 \times \frac{12}{n}$

$= \frac{57.13 - 55.5}{55.5} \times 100 \times \frac{12}{6} = 5.88\%$

Question 27 :
May 2013 – Paper / May 2014 – Paper / Nov 2014 – Paper

A Bank sold Hong Kong Dollars 40,00,000 value spot to its customer at Rs.7.15 and covered itself in London Market on the same day, when the exchange rates were:

US$ = HK$ 7.9250 7.9290

Local interbank market rates for US$ were

Spot US$ 1 = Rs.55.00 / 55.20

You are required to calculate rate and ascertain the gain or loss in the transaction. Ignore brokerage. You have to show the calculations for exchange rate up to four decimal points.

Solution :

Customer Bank Cover bank

Buy ← Sale/Buy ←

Rs. / HK $ 7.15

1) To cover sale of HK $ 40,00,000 Bank will have to buy it from Cover Bank

Rs. / $ 55/55.20

HK $ / $ 7.9250 / 7.9290

Rs./HK $ $\frac{55}{79290} \Big/ \frac{55.20}{7.9250}$

i.e. 6.93656 / 6.96530

Rate applicable 6.96530

2) Amount of profit = (7.15 – 6.96530) × 40,00,000 = Rs.7,38,800

Question 28 :
Nov 2013 – RTP / May 2015 – RTP

Columbus Surgicals Inc. is based in US, has recently imported surgical raw materials from the UK and has been invoiced for £ 480,000, payable in 3 months. It has also exported surgical goods to India and France.

The Indian customer has been invoiced for £ 138,000, payable in 3 months, and the French customer has been invoiced for € 590,000, payable in 4 months.

Current spot and forward rates are as follows:

	£ / US$
Spot:	0.9830 – 0.9850
Three months forward:	0.9520 – 0.9545
	US$ / €
Spot:	1.8890 – 1.8920
Four months forward :	1.9510 – 1.9540

Current money market rates are as follows:

UK : 10.0% – 12.0% p.a.
France : 14.0% – 16.0% p.a.
US A: 11.5% – 13.0% p.a.

You as Treasury Manager are required to show how the company can hedge its foreign exchange exposure using Forward markets and Money markets hedge and suggest which the best hedging technique is.

Solution :

Columbus Surgicals Inc. (US Based)
Imports from UK £ 4,80,000 payable 3 months
Exports to India £ 1,38,000 payable after 3 months
Net payable £ 3,42,000 payable after 3 months
Exports to France € 5,90,000 receivable after 4 months

(A) 3 months

(i) FC (Forward Cover) = FC Pay → Buy FC Forward

3mf £ / $ 0.9520 / 0.9545
S B

Buy £ = sell $ = 0.9520

i.e. $\frac{3,42,000}{0.9520}$ = $ 3,59,243.70 payable after 3 months

(ii) Money Market Cover

FC pay → Invest / Buy / Borrow

Step 1 : $\frac{3,42,000}{1.025}$ = £ 3,33,658.54

Step 2 : $\frac{£3,33,658}{0.98300}$ = $ 3,39,428.83 Spt rates = £/$ = $\frac{0.9830}{S} \Big/ \frac{0.9850}{B}$

Step 3 : 3,39,428.3 × 1.0325 (13 × 3/12) = $ 3,50,460.26 Payable after 3 months

Decision : Company should go ahead with money market cover for Net (Export-Import) for 3 months.

(B) 4 months → € 5,90,000 Receivable

(i) Forward Cover

FC Receivable = sell FC

4mf $/€ = 1.9510 / 1.9540
S B

i.e. 5,90,000 × 1.9510 = $ 11,51,090 Receivable after 3 months

(ii) Money Market Cover

FC Receivable ⇒ Borrow → Sell → Invest

Step 1 : Borrow = $\frac{€5,90,000}{1.053}$ = €5,60,126.58

Step 2 : Spot rate $ / € 1.8890 / 1.8920
S B

i.e. 5,60,126.58 × 1.890 = $ 10,58,079.11

Sep 3 : $ 10,58,079.11 × 1.0383 = $ 10,98,638.81 Receivable after 3 months

Decision : US co. should go ahead with Forward Cover.

Question 29 :
Nov 2013 – Paper / May 2020 (Old) – RTP

You, a foreign exchange dealer of your bank, are informed that your bank has sold a T.T. on Copenhagen for Danish Kroner 10,00,000 at the rate of Danish Kroner 1 = Rs. 6.5150.

You are required to cover the transaction either in London or New York market. The rates on that date are as under:

Mumbai-London	Rs.74.3000	Rs.74.3200
London-New York	Rs.49.2500	Rs.49.2625
London-Copenhagen	DKK 11.4200	DKK 11.4350
New York-Copenhagen	DKK 07.5670	DKK 07.5840

In which market will you cover the transaction, London or New York, and what will be the exchange profit or loss on the transaction? Ignore brokerages.

Solution :

Customer Bank Cover bank
Buy ← Sale/Buy ←
Rs. / DKr 6.5150

Alt 1 : Cover in London

1) To cover sale of DKr 10,00,000 bank will have to buy it from Cover Bank

Rs. / £ 74.30 / 74.32

DKr / £ 11.42 / 11.4350

∴ Rs. / DKr $\frac{74.30}{11.4350} / \frac{74.32}{11.42}$

= 6.4976 / 6.5079
S B

Rate Application = 6.5079

2) Profit = (6.5150 – 6.5079) × 10,00,000 = Rs.7,100

Alt 2 : Cover In New York

1) Rs. / $ 49.25 / 49.2625

DKr / $ 7.5670 / 7.5840

Rs. / DKr $\frac{49.25}{7.5840} / \frac{49.2625}{7.5670}$

i.e. 6.4939 / 6.5102

2) Profit = (6.5150 – 6.5102) × 10,00,000 = Rs.4,800

Note : The entity should cover in London Market.

Question 30 :
Nov 2013 – Paper / Nov 2017 –RTP / May 2018 (New) – RTP / May 2019 (Old) – Paper

Your bank's London office has surplus funds to the extent of USD 5,00,000/- for a period of 3 months. The cost of the funds to the bank is 4% p.a. It proposes to invest these funds in London, New York or Frankfurt 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 at for a period of 3 months.

London	5 % p.a.
New York	8% p.a.
Frankfurt	3% p.a.

The market rates in London for US dollars and Euro are as under:

London on New York	
Spot	1.5350/90
1 month	15/18
2 month	30/35
3 months	80/85
London on Frankfurt	
Spot	1.8260/90
1 month	60/55
2 month	95/90
3 month	145/140

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

Solution :

(i) If investment is made at London

Convert US$ 5,00,000 at Spot Rate (5,00,000/1.5390)		= £ 3,24,886
Add: £ Interest for 3 months on £ 324,886 @ 5%		= £ 4,061
		= £ 3,28,947
Less: Amount Invested	$ 5,00,000	
Interest accrued thereon	$ 5,000	
=	$ 5,05,000	
Equivalent amount of £ required to pay the above sum ($ 5,05,000/1.5430)		= £ 3,27,285
Arbitrage Profit		= £ 1,662

(ii) If investment is made at New York

	Gain $ 5,00,000 (8% - 4%) x 3/12	=	$5,000
	Equivalent amount in £ 3 months ($ 5,000/ 1.5475)		£ 3,231
(iii)	If investment is made at Frankfurt		
	Convert US$ 500,000 at Spot Rate (Cross Rate) 1.8260/1.5390	=	€ 1.1865
	Euro equivalent US$ 500,000	=	€ 5,93,250
	Add: Interest for 3 months @ 3%	=	€ 4,449
		=	€ 5,97,699
	3 month Forward Rate of selling € (1/1.8150)	=	£ 0.5510
	Sell € in Forward Market € 5,97,699 x £ 0.5510	=	£ 3,29,332
	Less: Amounted invested and interest thereon	=	£ 3,27,285
	Arbitrage Profit	=	£ 2,047

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

Question 31 :
May 2014 – RTP / Nov 2015 – RTP / Nov 2019 (New) – Paper

Following information relates to AKC Ltd. which manufactures some parts of an electronics device which are exported to USA, Japan and Europe on 90 days credit terms.

Cost and Sales information :

	Japan	USA	Europe
Variable cost per unit	Rs.225	Rs.395	Rs.510
Export sale price per unit/Receipts from sale	Yen 650	US$10.23	Euro 11.99
due in 90 days	Yen 78,00,000	US$1,02,300	Euro 95,920

Foreign exchange rate information :

	Yen/Rs.	US$/Rs.	Euro/Rs.
Spot market	2,417-2.437	0.0214-0.0217	0.0177-0.0180
3 months forward	2.397-2.427	0.0213-0.0216	0.0176-0.0178
3 months spot	2.423-2.459	0.02144-0.02156	0.0177-0.0179

Advice AKC Ltd. by calculating average contribution to sales ratio whether it should hedge its foreign currency risk or not.

Solution :

1)	**Calculation of units**	**Japan**	**USA**	**Europe**
	Amount	¥ 78,00,000	$ 1,02,300	€ 95,920
	SP	¥ 650	$ 10.23	€ 11.90
	Units	12,000	10,000	8,000

2) Calculation of variable cost

Japan = 12,000 × 225 = 27,00,000

USA	= 10,000 × 395	=	39,50,000
Europe	= 8,000 × 510	=	40,80,000
			1,07,30,000

3) Calculation of contribution if hedged

Japan	= 78,00,000 / 2.427	=	32,13,844
USA	= 1,02,300 / 0.0.216	=	47,36,111
Europe	= 95,920 / 0.0178	=	53,88,764
			1,33,38,719
		– VC	1,07,30,000
		Contribution	26,08,719

Calculation of contribution if not hedged

Japan	= 78,00,000 / 2.459	=	31,72,021
USA	= 1,02,300 / 0.02156	=	47,44,898
Europe	= 95,920 / 0.0179	=	53,58,659
			1,32,75,579
		– VC	1,07,30,000
			25,45,578

4) Contribution to Sales Ratio

Hedged	Not Hedged
$= \frac{26,08,719}{1,33,38,719} \times 100$	$= \frac{25,45,578}{1,32,75,578} \times 100$
= 19.56%	= 19.17%

Decision : AKC Ltd. should ahead with hedging.

Question 32 :
May 2014 – Paper / Nov 2018 – RTP

JKL Ltd., an Indian company has an export exposure of JPY 10,00,000 on August 31, 2014. Japanese Yen (JPY) is not directly quoted against Indian Rupee.

The current spot rates are:

INR/US $ = Rs.62.22

JPY/US$ = JPY 102.34

It is estimated that Japanese Yen will depreciate to 124 level and Indian Rupee to depreciate against US $ to Rs.65.

Forward rates for August 2014 are

INR/US $ = Rs.66.50

JPY/US$ = JPY 110.35

Required:

(i) Calculate the expected loss, if the hedging is not done. How the position will change, if the firm takes forward cover?

(ii) If the spot rates on August 31, 2014 are:

INR/US $ = Rs.66.25

JPY/US$ = JPY 110.85

Is the decision to take forward cover justified?

Solution :

- JKL ltd. Indian co.
- ¥ 10,00,000 Receivable
- On 31/8/2014

1) Spot Rate Rs. / $ 62.22 $\therefore$ Rs. / ¥ = $\frac{62.22}{102.34}$ = 0.06080

Amount receivable = 10,00,000 × 0.6080 = Rs.6,08,000

2) Expected Rate if hedging is not done

Rs. / ¥ = 65/124 = 05242

Amount receivable = 10,00,000 × 0.5242 = Rs.5,24,200

Expected Loss = 6,08,000 – 5,24,200 = Rs.83,800

3) If hedged

Rate = 66.5 / 110.35 = 0.6026

Amount receivable = 10,00,000 × 0.6026 = Rs.6,02,600

Loss = 6,08,000 – 6,02,60 = Rs.5,400

Saving = 83,800 – 5,400 = Rs.78,400

4) If actual spot on 31/8/2014

Rs. / ¥ 66.25 / 110.85 = 0.5977

Amount receivable = 10,00,000 × 0.5977 = Rs.5,97,700

Loss = 6,08,000 – 5,97,700 = Rs.10,300

Savings due to hedge = 83,800 – 10,300 = Rs.73,500

Decision : The decision to take forward cover is justified.

Question 33 :
Nov 2014 – Paper

Gibralater Limited has imported 5000 bottles of shampoo at landed cost in Mumbai, of US $ 20 each. The company has the choice for paying for the goods immediately or in 3 months time. It has a clean overdraft limited where 14% p.a. rate of interest is charged.

Calculate which of the following method would be cheaper to Gibralter Limited.

(i) Pay in 3 months time with interest @ 10% and cover risk forward for 3 months.

(ii) Settle now at a current spot rate and pay interest of the overdraft for 3 months.

The rates are as follow :
Mumbai Rs. /$ spot : 60.25-60.55
3 months swap : 35/25

Solution :

Option - I

$20 x 5000	= $ 1,00,000
Repayment in 3 months time = $1,00,000 x (1 + 0.10/4)	= $ 1,02,500
3-months outright forward rate	= Rs.59.90/Rs. 60.30
Repayment obligation in Rs. ($1,02,500 X Rs. 60.30)	= Rs. 61,80,750

Option -II

Overdraft ($1,00,000 x Rs. 60.55)	Rs. 60,55,000
Interest on Overdraft (Rs. 60,55,000 x 0.14/4)	Rs. 2,11,925
	Rs. 62,66,925

Option I should be preferred as it has lower outflow.

Question 34 :
May 2015 – RTP / Nov 2019 (Old) – RTP

Sun Ltd. is planning to import equipment from Japan at a cost of 3,400 lakh yen. The company may avail loans at 18 percent per annum with which it can import the equipment. The company has also an offer from Osaka branch of an India based bank extending credit of 180 days at 2 percent per annum against opening of an irrecoverable letter of credit.

Additional information:

Present exchange rate Rs.100 = 340 yen
180 day's forward rate Rs.100 = 345 yen
Commission charges for letter of credit at 2 per cent per 12 months.
Advice the company whether the offer from the foreign branch should be accepted.

Solution :

1) Option I (To finance the purchases by availing loan at 18% per annum):

Cost of equipment	Rs.in lakhs
3400 lakh yen at Rs. 100 = 340 yen	1,000.00
Add: Interest at 18% (on Rs. 1000 lakhs) for 6 months	90.00
Total outflow in Rupees	1,090.00

2) Option II (To accept the offer from foreign branch):

Cost of letter of credit	Rs. in lakhs
At 1 % on 3400 lakhs yen at Rs. 100 = 340 yen	10.00
Add: Interest	0.90
(A)	10.90
Payment at the end of 180 days:	
Cost	3400.00 lakhs yen

Interest at 2% p.a. [3400 × 2/100 × 180/365]	33.53 lakhs yen
	3433.53 lakhs yen
Conversion at Rs. 100	
= 345 yen [3433.53 / 345 × 100] (B)	= Rs. 995.23 lakhs
Total Cost: (A) + (B)	= 1006.13 lakhs

Advise : Option 2 is cheaper by (1090.00 – 1006.13) lakh or 83.87 lakh. Hence, the offer may be accepted.

Question 35 :
Nov 2012 – Paper / May 2015 – Paper

DEF Ltd. has imported goods to the extent of US $ 1 crore. The payment terms are 60 days interest free credit. For additional credit of 30 days, interest at the rate of 7.75% p.a will be charged.

The banker of DEF Ltd. has offered a 30 days loan at the rate of 9.5% p.a. Their quote for the foreign exchange is as follows.

Spot rate INR / US $	62.50
60 days forward rate INR/US $	63.15
90 days forward rate INR/US $	63.45

Which one of the following options would be better?

1) Pay the supplier on 60th day and avail bank loan for 30 days
2) Avail the supplier's offer of 90 days credit.

Solution :

(i) **Pay the supplier in 60 days**

If the payment is made to supplier in 60 days the applicable forward rate would be for 1 USD	Rs. 63.15
Payment Due	USD 1,00,00,000
Outflow in Rupees (1,00,00,000 x 63.15)	Rs. 63.15 Crores
Add : Interest on loan for 30 days @ 9.5% p.a	Rs. 0.50 Crores
Total Outflow	Rs. 63.65 Crores

(ii) **Availing supplier's offer of 90 days credit**

Amount Payable	USD 1 Crore
Add : Interest on the credit period for 30 days @ 7.75% p.a	USD 0.00646
Total Outflow	USD 1.00646
Applicable forward Rate	Rs. 63.45
Total Outflow (1.00646 x 63.45)	Rs. 63.86 Crores

Decision : DEF Ltd should pay the supplier in 60 days

Question 36 :
Nov 2015 – Paper

The Bank enters into a forward purchase TT covering an export bill for Swiss Franc 1,00,000 at Rs. 32.4000 due on 25th April and covered itself for same delivery in the local inter bank market at Rs. 32.4200. However on 25th March, exporter sought for cancellation of the contract as the tenor of the bill is changed.

In Singapore Market, Swiss Francs were quoted against US Dollars as under :

Spot	USD 1 = Sws Fcs.	1.5076 / 1.5120
One month Forward		1.5150 / 1.5160
Two month Forward		1.5250 / 1.5270
Three Month Forward		1.5415 / 1.5445

And the interbank market US dollar are quoted as under

Spot	USD 1 = Rs.	49.4302 / .4455
One month Forward Swap		.4100 / .4200
Two month Forward Swap		.4300 / .4400
Three Month Forward Swap		.4500 / .4600

Calculate the cancelation charges, payable by the customer if exchange margin required by the bank is 0.10% on buying and selling

Solution :

	Customer		Bank		Cover bank
	Sell	→	Buy/sell	→	
25/4	Rs./SF 32.40				Rs./SF 32.42
25/3			Sell / Buy	←	

1) To cancel forward purchase TT bank will have cancel the covered contract with cover bank. The same rate shall be applicable to cancel contract

Spot	Rs./$	49.4302 / 49.4455
	1mf swap	.4100 / .4200
	Rs. / $	49.8402 / 49.8655
	1mf SF/$	1.5150 / 1.5160

$\therefore$ Rs./SF $= \frac{49.8402}{1.5160} \Big/ \frac{49.8655}{1.5150}$

i.e. 32.8761 / 32.9145

Rate Applicable =	32.9145
–0.10% Margin	0.0329
	32.8816

2) Exchange difference payable by customer

= (32.8816 – 32.40) × 1,00,000 = Rs.48,160

Question 37 :
May 2016 – RTP

Following are the rates quoted at Mumbai and British Pound (£):

Spot (£/Rs.)	52.60/70	Interest Rates	India	London
3 m Forward	20/70	3 months	8%	5%
6 m Forward	50/75	6 months	10%	8%

Verify whether there is any scope for covered interest arbitrage, if you can borrow in rupees.

Solution :

Particulars	Option I (3 months)	Option II (6 months)
Amount Borrowed	1,00,000	1,00,000
Pounds (£) obtained by converting at spot rate	1,00,000/52.70 = 1897.53	1,00,000/52.70 = 1897.53
Invest pound for the period	1.25%	4%
Amount of pound received at the end of the period	1897.53 × 1.0125 = 1,921.25	1897.53 × 1.04 = 1,973.43
Convert pounds to Rs. At forward rate	1,921.25 × 52.80 = 1,01,442	1,973.43 × 53.10 = 1,04,789
Amount of Re. loan to be repaid	1,00,000 × 1.02 = 1,02,000	1,00,000 × 1.05 = 1,05,000

Since the amount of Indian Rupees to be Received is less than the amount repaid in both cases there is no scope for covered interest arbitrage by borrowing in Indian Rupees.

Question 38 :
May 2016 – Paper

ABC Ltd. of UK has exported goods worth Can $ 5,00,000 receivable in 6 months. The exporter wants to hedge the receipt in the forward market. The following information is available:

Spot Exchange Rate Can $ 2.5/£
Interest Rate in UK 12%
Interest Rate In Canada 15%

The forward rates truly reflect the interest rates differential. Find out the gain/loss to UK exporter if Can $ spot rates (i) declines 2%, (ii) gains 4% or (iii) remains unchanged over next 6 months.

Solution :

Forward Rate = $\frac{2.50\ (1+0.075)}{(1+0.060)}$ = Can$2.535/£

(i) If spot rate decline by 2%

Spot rate = Can$2.50 x 1.02 = Can$2.55/£

	£

£ receipt as per Forward Rate (Can$ 5,00,000/Can$2.535)	1,97,239
£ receipt as per Spot Rate (Can$ 5,00,000/Can$2.55)	1,96,078
Gain due to forward contract	1,161

(ii) If Spot rate gains by 4%

Spot Rate = Can$2.50 x 0.96 = Can$2.40/£

	£
£ receipt as per Forward Rate (Can$ 5,00,000/Can$2.535)	1,97,239
£ receipt as per Spot Rate (Can$ 5,00,000/Can$2.40)	2,08,333
Loss due to forward contract	11,094

(iii) Is spot rate remains unchanged

	£
£ receipt as per Forward Rate (Can$ 5,00,000/Can$2.535)	1,97,239
£ receipt as per Spot Rate (Can$ 5,00,000/Can$2.50)	2,00,000
Loss due to forward contract	2,761

Question 39 :
Nov 2016 – Paper

On April 3, 2016, a Bank quotes the following:

Spot exchange Rate (US $ 1)	INR 66.2525	INR 67.5945
2 months' swap points	70	90
3 months' swap points	160	186

In a spot transaction, delivery is made after two days.

Assume spot date as April 5, 2016.

Assume 1 swap point = 0.0001,

You are required to:

(i) Ascertain swap points for 2 months and 15 days. (For June 20, 2016),

(ii) Determine foreign exchange rate for June 20, 2016, and

(iii) Compute the annual rate of premium/discount of US$ on INR, on an average rate.

Solution :

(i) Swap Points for 2 months and 15 days

	Bid	Ask
Swap Points for 2 Months (a) Swap Points for 3 Months (b)	70 160	90 186
Swap Points for 30 days (c) = (b) – (a)	90	96
Swap Points for 15 days (d) = (c)/2	45	48
Swap Points for 2 Months & 15 days (e) = (a)+(d)	115	138

(ii) Foreign Exchange rates for 20th June 2016

	Bid	Ask
Spot Rate (a) Swap Points for 2 months & 15 days (b)	66.2525 0.0115	67.5945 0.0138
	66.2640	67.6083

(iii) Annual Rate of Premium

	Bid	Ask
Spot Rate (a) Foreign Exchange Rates for 20th June 2016 (b) Premium (c)	66.2525 66.2640 0.0115	67.5945 67.6083 0.0138
Total (d) = (a) + (b)	132.5165	135.2028
Average (d)/2	66.2583	67.6014
Premium	$\frac{0.0115}{66.2583} \times \frac{12}{2.5} \times 100$ = 0.0833%	$\frac{0.0138}{67.6014} \times \frac{12}{2.5} \times 100$ =0.0980%

Question 40 :
Nov 2016 – Paper

On 10th July, an importer entered into a forward contract with bank for US $ 50,000 due on 10th September at an exchange rate of Rs.66.8400. The bank covered its position in the interbank market at Rs.66.6800.

How the bank would react if the customer requests on 20th September:

(i) to cancel the contract?

(ii) to execute the contract?

(iii) to extend the contract with due date to fall on 10th November?

The exchange rates for US$ in the interbank market were as below:

	10th September	20th September
Spot US$1 =	66.1500/1700	65.9600/9900
Spot/September	66.2800/3200	66.1200/1800
Spot/October	66.4100/4300	66.2500/3300
Spot/November	66.5600/6100	66.4000/4900

Exchange margin was 0.1% on buying and selling.

Interest on outlay of funds was 12% p.a.

You are required to show the calculations to:

(i) cancel the Contract,

(ii) execute the Contract, and

(iii) extend the Contract as above.

Solution :

Execute / Cancel / Extend the contract after due date.

If the customer asks for cancellation of contract after the due date, FEDAI rules for automatic cancellation shall apply and customer is required to pay

(i) Exchange difference

(ii) Swap Loss

(iii) Interest on funds outlay.

(A) Cancellation of Contract :

(i) Exchange difference :

Buy Rate	66.84
Sell Rate	65.8940 (65.96 – 0.1%)
	0.946
(×) Amount	$ 50,000
Difference in Amount	Rs.47,300 → Loss

(ii) Swap Loss

(66.32 – 66.15) × 50,000 = Rs.8,500 → Loss

(iii) Interest on funds outlay

Funds outlay (66.68 – 66.15) × 50,000 = Rs.26,500

Int. on funds outlay $= 26{,}500 \times 12\% \times \frac{10 days}{365}$ = Rs.87

Total Amount Payable = Rs.55,887

(i) + (ii) + (iii) [47,300 + 8,500 + 87]

(B) Execute the contract :

(i) Changes for cancellation Rs.55,887

(ii) Spot Buy Rs./$ 65.99 + 0.1% = 66.0560 → Buy Rate

(×) Amount 50,000

Rs.33,02,800

(C) Extend the contract :

(i) Cancellation of charges Rs.55,887 → pay on 20th Sept.

(ii) New forward contract rate

Spot / November (Rs./$) 66.4000 / 66.49

S B

Forward Buy Rate = 66.49 + 0.1% = 66.556 (Rs./$)

Question 41 :
Nov 2016 – Paper

A company is considering hedging its foreign exchange risk. It has made a purchase on 1st July, 2016 for which it has to make a payment of US$ 60,000 on December 31, 2016. The present exchange rate is 1 US $ = Rs.65. It can purchase forward 1 $ at Rs.64. The company will have to make an upfront premium @ 2% of the forward amount purchased. The cost of funds to the company is 12% per annum.

In the following situations, compute the profit/loss the company will make if it hedges its foreign exchange risk with the exchange rate on 31st December, 2016 as

(i) Rs.68 per US $.
(ii) Rs.62 per US $.
(iii) Rs.70 per US $.
(iv) Rs.65 per US $.

Solution :

India co.

- $ 60,000 payable
- After 6 months (1/7 to 31/12)

To hedge its payable total amount payable would be

A)	$ 60,000 × 64		38,40,000
B)	Upfront Premium		
	$ 60,000 × 64 × 2% =	76,800	
	Int. @ 12% an above	4,680	81,480
			39,21,408

1) If Actual Rate on 318/12 is Rs./$ 68
   Amount payable = $ 60,000 × 68 Rs.40,80,000
   Profit from hedge = Rs.1,58,595
2) If Actual Rate is 31/12 is Rs./$ 62
   Amount payable = $ 60,000 × 62 Rs.37,20,000
   Loss from hedge = Rs.2,01,408
3) If Actual Rate is 31/12 is Rs./$ 70
   Amount payable = $60,000 × 70 Rs.42,00,000
   Profit from hedge = Rs.2,78,592
4) If Actual rate Rs./$ 65
   Amount payable = $ 60,000 × 65 Rs.39,00,000
   Loss if hedge = Rs.21,408

Question 42 :
May 2017 – Paper

An importer requested his bank to extend for Forward contract of US $ 25,000 which is due for maturity on 31-10-2015 for a further periods of six month. The other details are as under:
Contract rate US $ 1 = Rs.61.00
The US $ quoted on 31-10-2015
Spot: Rs.60.3200/60.6300
Six month premium: 0.86 %/0.98%
Margin money for buying and selling rate are 0.086% and 0.15% respectively
Compute
(1) Cost to importer in respect to extension of forward contract.
(2) New Forward contract rate.

Solution :

(i) The contract is to be cancelled on 31-10-2015 at the spot buying rate of

US$	= Rs.60.3200
Less: Margin Money 0.086%	= Rs.0.0519
	= Rs.60.2681
Rounded off Rs.60.2700	
US$ 25,000 @ Rs.60.2700	= Rs.15,06,750
US$ 25,000 @ Rs.61.0000	= Rs.15,25,000

The difference in favour of the Bank/Cost to the importer **Rs.18,250**

(ii) The Rate of New Forward Contract

Spot Selling Rate US$ 1	= Rs.60.6300
Add: Premium @ 0.98%	= Rs.0.5942
	= Rs.61.2242
Add: Margin Money 0.15%	= Rs.0.0918
	= Rs.61.3160 or Rs.61.3175

Question 43 :
May 2018 – Paper / May 2020 (Old) – RTP

An importer customer of your bank wishes to book a forward contract with your bank on 3rd September for sale to him of SGD 5,00,000 to be delivered on 30th October.
The spot rates on 3rd September are USD 49.3700/3800 and USD/SGD 1.7058/68. The swap points are:

USD/Rs.		USD/SGD	
Spot/September	0300/0400	1st month forward	48/49
Spot/October	1100/1300	2nd month forward	96/97
Spot/November	1900/2200	3rd month forward	138/140
Spot/December	2700/3100		

Spot/January	3500/4000		

Calculate the rate to be quoted to the importer by assuming an exchange margin of paisa.

Solution :

Indian Customer

- SGD 5,00,000
- After 2 months (3rd Sept. to 30/10)

1) Spot Rs./$ 49.3700 / 493800
   2mf Swap 1100 / 1300
   2mf Rs./$ 49.48 / 49.51

2) Spot SGD / $ 1.7058 / 1.7068
   2mf Swap 96 / 97
   2mf SGD/$ 1.7154 / 1.7165

3) 2mf Rs./SGD $\frac{49.48}{1.7165} \Big/ \frac{49.51}{1.7154}$
   = 28.8261 / 28.8621
   i.e. Rate Applicable = 28.8621
   + Exchange margin $\frac{0.01}{28.8721}$

$\therefore$ Total payable = 5,00,000 $\times$ 28.8721
= Rs.1,44,36,050

Question 44 :
May 2018 (New) – RTP / May – 2015 – Paper / May 2018 – Paper

An importer booked a forward contract with his bank on 10th April for USD 2,00,000 due on 10th June @ Rs.64.4000. The bank covered its position in the market at Rs.64.2800.

The exchange rates for dollar in the interbank market on 10th June and 20th June were:

	10th June	20th June
Spot USD 1 =	Rs.63.8000/8200	Rs.63.6800/7200
Spot/June	Rs.63.9200/9500	Rs.63.8000/8500
July	Rs.64.0500/0900	Rs.63.9300/9900
August	Rs.64.3000/3500	Rs.64.1800/2500
September	Rs.64.6000/6600	Rs.64.4800/5600

Exchange Margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 20th June for extension of contract with due date on 10th August.

Rates rounded to 4 decimal in multiples of 0.0025.

On 10th June, Bank Swaps by selling spot and buying one month forward.

CALCULATE:

(i) Cancellation rate

(ii) Amount payable on $ 2,00,000

(iii) Swap loss

(iv) Interest on outlay of funds, if any

(v) New contract rate

(vi) Total Cost

Solution :

(i) Cancellation rate

The forward sale contract shall be cancelled at Spot TT Purchase for $ prevailing on the date of cancellation as follows:

$/Rs. Market Buying Rate	Rs.63.6800
Less: Exchange Margin @ 0.10%	Rs.0.0636
	Rs.63.6163

Rounded off to Rs.63.6175

(ii) Amount payable on $ 2,00,000

Bank Sells $2,00,000 @ Rs.64.4000	Rs.1,28,80,000
Bank Buys $2,00,000 @ Rs.63.6163	Rs.1,27,23,260
Amount payable by customer	Rs.1,56,740

(iii) Swap Loss

On 10th June the bank does a swap sale of $ at market buying rate of Rs.63.8300 and forward purchase for June at market selling rate of Rs.63.9500.

Bank buys at	Rs.63.9500
Bank sells at	Rs.63.8000
Amount payable by customer	Rs.0.1500

Swap Loss for $ 2,00,000 in Rs. = Rs.30,000

(iv) Interest on Outlay of Funds

On 10th April, the bank receives delivery under cover contract at Rs.64.2800 and sell spot at Rs.63.8000

Bank buys at	Rs.64.2800
Bank sells at	Rs.63.8000
Amount payable by customer	Rs.0.4800

Outlay for $ 2,00,000 in Rs.96,000

Interest on Rs.96,000 @ 12% for 10 days Rs.320

(v) New Contract Rate

The contract will be extended at current rate

$/Rs. Market forward selling rate for August	Rs.64.2500
Add: Exchange Margin @ 0.10%	Rs.0.0643
	Rs.64.3143

Rounded off to Rs.64.3150

(vi) Total Cost

Cancellation Charges	Rs.1,56,740
Swap Loss	Rs.30,000
Interest	Rs.320
	Rs.1,87,060

Question 45 :
Nov 2018 – RTP

Suppose you are a treasurer of XYZ plc in the UK. XYZ have two overseas subsidiaries, one based in Amsterdam and one in Switzerland. The Dutch subsidiary has surplus Euros in the amount of 725,000 which it does not need for the next three months but which will be needed at the end of that period (91 days). The Swiss subsidiary has a surplus of Swiss Francs in the amount of 998,077 that, again, it will need on day 91. The XYZ plc in UK has a net balance of £75,000 that is not needed for the foreseeable future.

Given the rates below, what is the advantage of swapping Euros and Swiss Francs into Sterling?

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

Interest rates for the Deposits

Amount of Currency	91 day Interest Rate % p.a.		
	£	€	CHF
0 – 1,00,000	1	¼	0
1,00,001 – 5,00,000	2	1 ½	¼
5,00,001 – 10,00,000	4	2	½
Over 10,00,000	5.375	3	1

Note: Assume 360 days a year.

Solution :

	Interest	Amount after 91 days	Conversion in £
Holland			£5,02,414.71

€ 7,25,000 × 0.02 × 91/360 =	€ 3,665.28	€ 7,28,665.28	(728665.28 × 0.06895)
Switzerland CHF 9,98,077 × 0.005 × 91/360 =	CHF 1,261.46	CHF 9,99,338.46	£4,32,651.51 (999338.46/2.3098)
UK £ 75,000 × 0.01 × 91/360 =	£189.58	£75,189.58	£75,189.58
		Total GBP at 91 days	£10,10,255.80

Swap to Sterling

Sell € 7,25,000 (Spot at 0.6858) buy £ Sell CHF 9,98,077 (Spot at 2.3326) buy £ Independent GBP amount	£ 4,97,205.00 £ 4,27,881.76 £ 75,000.00
	£10,00,086.76
Interest (£ 10,00,086.76 × 0.05375 × 91/360)	£13,587.98
Total GBP at 91 days Less: Total GBP at 91 days as per individual basis	£10,13,674.74 £10,10,255.80
Net Gain	£3,418.94

Question 46 :
Nov 2018 – Paper / Nov 2019 (New) – RTP

Digital Exporters are holding an Export bill in United States Dollar (USD) 5,00,000 due after 60 days. They are worried about the falling USD value, which is currently at Rs.75.60 per USD. The concerned Export Consignment has been priced on an Exchange rate of Rs.75.50 per USD. The Firm's Bankers have quoted a 60-day forward rate of Rs.75.20. calculate:

(i) Rate of discount quoted by the Bank, assuming 365 days in a year.

(ii) The probable loss of operating profit if the forward sale is agreed to.

Solution :

Digital Exporters

- $5,00,000Receivables
- due after 60 days

Spot	₹/$	75.60
Priced	₹/$	75.50
60 day forward =	₹/$	75.20

1. Forward discount on $ = $\frac{F-S}{S} \times 100 \times \frac{365}{n}$

   $= \frac{75.20 - 75.60}{75.60} \times 100 \times \frac{365}{60}$

   = -3.22%

2. Loss of operating profit

   = (75.50 – 75.20) 500000

   = ₹ 1,50,000

Question 47 :
Nov 2018 – Paper

The Treasury desk of a global bank incorporated in UK wants to invest GBP 200 million on 1st January, 2019 for a period of 6 months and has the following options:

(1) The Equity Trading desk in Japan wants to invest the entire GBP 200 million in high dividend yielding Japanese securities that would earn a dividend income of JPY 1,182 million. The dividends are declared and paid on 29th June. Post dividend, the securities are expected to quote at a 2% discount. The desk also plans to earn JPY 10 million on a stock borrow lending activity because of this investment. The securities are to be sold on June 29 with a T + 1 settlement and the amount remitted back to the Treasury in London.

(2) The Fixed Income desk of US proposed to invest the amount in 6 month G-Secs that provides a return of 5% p.a.

The exchange rates are as follows:

Currency Pair	1st Jan 2019 (Spot)	30th June 2019 (Forward)
GBP – JPY	148.0002	150.0000
GBP – USD	1.28000	1.30331

As a treasurer, advise the bank on the best investment option.
What would be your decision from a risk perspective?
You may ignore taxation.

Solution :

Bank of UK
- Invest £ 200 million
- For 6 Months

Alt 1 = Invest in Japan
Alt 2 = Invest in US

Alternative 1

Invest in Japan

Spot ¥/£	148.0002
i.e 200 x 148.0002	= 29600.04 invested
Receivable after 6 months	
From investments (29600.04 x 0.98)	= 29008.0392
+ Dividend	1182.0000
+ Borrowings/Liability	10.0000
	30,200.0392
6mf ¥/£ 150 i.e. $\frac{30200.0392}{150}$	= £ 201.334

Alternative 2

Invest in $

Spot $/£	1.28
i.e 200 x 1.28	= 256 $
+ Interest	6.4
	262.4 $
6mf $/£	1.30331
i.e. $\frac{262.4}{1.30331}$	= £ 201.334

Decision : Both alternatives provides similar return. However Alt 2 is better since its risk free.

Question 48 :
Nov 2018 (New) – RTP

Place the following strategies by different persons in the Exposure Management Strategies Matrix.

Strategy 1: Kuljeet a wholesaler of imported items imports toys from China to sell them in the domestic market to retailers. Being a sole trader, he is always so much involved in the promotion of his trade in domestic market and negotiation with foreign supplier that he never pays attention to hedge his payable in foreign currency and leaves his position unhedged.

Strategy 2: Moni, is in the business of exporting and importing brasswares to USA and European countries. In order to capture the market he invoices the customers in their home currency. Lavi enters into forward contracts to sell the foreign exchange only if he expects some profit out of it other-wise he leaves his position open.

Strategy 3: TSC Ltd. is in the business of software development. The company has both receivables and payables in foreign currency. The Treasury Manager of TSC Ltd. not only enters into forward contracts to hedge the exposure but carries out cancellation and extension of forward contracts on regular basis to earn profit out of the same. As a result management has started looking Treasury Department as Profit Centre.

Strategy 4: DNB Publishers Ltd. in addition to publishing books are also in the business of importing and exporting of books. As a matter of policy the movement company invoices the customer or receives invoice from the supplier immediately covers its position in the Forward or Future markets and hence never leave the exposure open even for a single day.

Solution :

Strategy 1: This strategy is covered by High Risk: Low Reward category and worst as it leaves all exposures unhedged. Although this strategy does not involve any time and effort, it carries high risk.

Strategy 2: This strategy covers Low Risk: Reasonable reward category as the exposure is covered wherever there is anticipated profit otherwise it is left.

Strategy 3: This strategy is covered by High Risk: High Reward category as to earn profit, cancellations and extensions are carried out. Although this strategy leads to high gains but it is also accompanied by high risk.

Strategy 4: This strategy is covered by Low Risk: Low Reward category as company plays a very safe game.

Diagrammatically all these strategies can be depicted as follows:

High Risk

Low Reward	Strategy 1	Strategy 3	High Reward
	Strategy 4	Strategy 2	

Low Risk

Question 49 :
Nov 2018 (New) – Paper – 8 Marks

You as a dealer in foreign exchange have the following position in Swiss Francs on 31st Jan, 2018:

	Swiss Francs
Balance in the Nostro A/c Credit	1,00,000
Opening Position Overbought	50,000
Purchased a bill on Zurich	70,000
Sold forward TT	49,000
Forward purchase contract cancelled	41,000
Remitted by TT	75,000
Draft on Zurich cancelled	40,000

What steps would you take, if you are required to maintain a credit Balance of Swiss Francs 30,000 in the Nostro A/c and keep as overbought position on Swiss Francs 10,000?

Solution :

Exchange Position / Currency Position

Particulars	Purchase Sw. Fcs	Sale Sw. Fcs
Opening Balance Overbought	50,000	-
Bill on Zurich	70,000	-
Forward Sales – TT	-	49,000
Cancellation of Forward Contract TT Sales	-	41,000
Draft on Zurich cancelled	-	75,000
	40,000	
Closing Balance Oversold	1,60,000	1,65,000
	5,000	-
	1,65,000	1,65,000

Cash Position (Nastro Account)

	Credit	Debit
Opening Balance Credit	1,00,000	-
TT Sales	-	75,000
	1,00,000	75,000
Closing Balance (Credit)	-	25,000
	1,00,000	1,00,000

The Bank has to buy spot TT Sw. Fcs. 5,000 to increase the balance in Nostro account to Sw. Fcs. 30,000.

This would bring down the oversold position on Sw. Fcs. as Nil.

Since the bank requires an overbought position of Sw. Fcs. 10,000, it has to buy forward Sw. Fcs. 10,000.

Question 50 :

Nov 2018 (New) – Paper

An Indian Company obtains the following quotes (Rs/$)

Spot	35.90/36.10
3 month forward rate	36.00/36.25
6 month forward rate	36.10/36.40

The company needs dollar funds for 6 months. Determine whether the company should borrow in $ or Rs. Interest rates are

3 month interest rate	Rs 12%, $ 6%
6 month interest rate	Rs 11.5%, $ 5.5%

Also determine what should be the rate of interest after 3 months to make the company indifferent between 3 months borrowing and 6 month borrowing in the case of

i) Rupee borrowing

ii) Dollar borrowing

Note : For the purpose of calculation you can take the units of $ and Rs. as 100 each.

Solution :

Indian Co.

- Needs $ funds for 6 months

1) If company borrows $ funds

Borrow $ 100	$ 100
Interest 5.5% P.A.	$ 2.75 for 6 months
	$ 102.75
6mf Rs./$	36.40
Amount payable	Rs.3,740.1

2) If company borrows Rs. funds

Spot Rate Rs./$	36.10
Amount Borrowed ($100 × 36.10)	Rs.3,610
+ Interest 11.5% PA i.e. 5.75%	207.575
Amount payable	Rs.3,818

3) Rate of interest after 3 months to make the company indifferent between 3 months borrowing and 6 months borrowing

f36 = $\left(\frac{1.0275}{1.015}\right) - 1$ = 1.23% for 3 months i.e. 4.93% for 6 months

Question 51 :
Nov 2018 – New – Paper

On 19th January, Bank A entered into forward contract with a customer for a forward sale of US $ 7,000, delivery 20th March at Rs.46.67. on the same day, it covered its position by buying forward from the market due 19th March, at the rate of Rs.46.655. on 19th February, the customer approaches the bank and requests for early delivery of US $.

Rates prevailing in the interbank markets on that date are as under

Spot (Rs./$) 46.5725/5800

March 46.3550/3650

Interest on outflow of funds is 16% and on inflow of funds is 12%. Flat charges for early delivery are Rs.100.

What is the amount that would be recovered from the customer on the transaction?

Note: Calculation should be made on month's basis than on day's basis.

Solution :

1. Swap loss : (46.5800 - 46.3550) × 7000 = 1575
2. Net inflow on 19th Feb.

   (46.67 - 46.58) × 7000 = 630.

   Bank will pay interest for 1 month @ 12% to the client

   = 630 × 12% × $\frac{1}{12}$

   = 6.30

   Amount to be recovered from customer on transaction

7000 × 46.67	326690
Swap loss	1575
- Interest on cash difference	(6.30)
+ Early delivery charge	100
Total	**328358.70**

Question 52 :
May 2019 (Old) – RTP

XYZ Bank, Amsterdam, wants to purchase Rs.25 million against £ for funding their Nostro account and they have credited LORO account with Bank of London, London.

Calculate the amount of £'s credited. Ongoing inter-bank rates are per $, Rs.61.3625/3700 & per £, $ 1.5260/70.

Solution :

To purchase Rupee, XYZ Bank shall first sell £ and purchase $ and then sell $ to purchase Rupee. Accordingly, following rate shall be used:

(£/Rs.)ask

The available rates are as follows:

$(\$/£)_{bid}$ = $1.5260

$(\$/£)_{ask}$ = $1.5270

$(Rs./\$)_{bid}$ = Rs.61.3625

$(Rs./\$)_{ask}$ = Rs.61.3700

From above available rates we can compute required rate as follows:

$(£/Rs.)_{ask}$ = $(£/\$)_{ask} \times (\$/Rs.)_{ask}$

= (1/1.5260) × (1/61.3625)

= £ 0.01068 or £ 0.0107

Thus amount of £ to be credited

= Rs.25,000,000 × £ 0.0107

= £ 267,500

Question 53 :
May 2019 (Old) – RTP

The following 2-way quotes appear in the foreign exchange market:

	Spot	2-months forward
Rs./US $	Rs.46.00/Rs.46.25	Rs.47.00/Rs.47.50

Required:

(i) How many US dollars should a firm sell to get Rs.25 lakhs after 2 months?

(ii) How many Rupees is the firm required to pay to obtain US $ 2,00,000 in the spot market?

(iii) Assume the firm has US $ 69,000 in current account earning no interest. ROI on Rupee investment is 10% p.a. Should the firm encash the US $ now or 2 months later?

Solution :

(i) US $ required to get Rs.25 lakhs after 2 months at the Rate of Rs.47/$

$$\therefore \frac{\text{Rs.}25,000}{\text{Rs.}47} = \text{US \$ } 53191.489$$

(ii) Rs. required to get US$ 2,00,000 now at the rate of Rs.46.25/$

∴ US $ 200,000 × Rs.46.25 = Rs.92,50,000

(iii) Encashing US $ 69000 Now Vs 2 month later

Proceed if we can encash in open mkt ($ 69000 × Rs.46) Rs.31,74,000

Opportunity gain

$= 31,74,000 \times \frac{10}{100} \times \frac{2}{12}$ Rs.52,900

Likely sum at end of 2 months Rs.32,26,900

Proceeds if we can encash by forward rate :

$ 69000 × Rs.47.00 Rs.32,43,000

It is better to encash the proceeds after 2 months and get opportunity gain.

Question 54 :
May 2019 (New) – Paper

On 1st January 2019 Global Ltd., an exporter entered into a forward contract with BBC Bank to sell US$ 2,00,000 on 31stMarch 2019 at Rs.71.50/$. However, due to the request of the importer, Global Ltd. received the amount on 28 February 2019. Global Ltd. requested the Bank to take delivery of the remittance on 2ndMarch 2019. The Inter-banking rates on 28thFebruary were as follows:

Spot Rate	Rs.71.20 / 71.25
One month premium	5/10

If Bank agrees to take early delivery then what will be the net inflow to Global Ltd. assuming that the prevailing prime lending rate is 15%. Assume 365 days in a year.

Solution :

On 28th February 2019 bank would purchase form the exporter US$ 200000 at the agreed rate i.e. Rs.71.50/$. However, bank will charge for this early delivery consisting of Swap Difference and Interest on outlay of funds.

(i) Swap Difference

Bank sells at	Rs.71.20
It buys at	Rs.71.35
Swap loss per US$	Rs. 0.15

Swap loss for $ 200000 is Rs. 30,000

(ii) Interest on Outlay of funds

On February Bank sell $ in Market	Rs. 71.20
Bank buys from customer	Rs. 71.50
Outlay per US $	Rs. 0.30
Outlay of funds for US$ 200000	Rs.60,000

Interest of outlay of funds on Rs.60,000 for 31 days (1st March 2019 to 31st March 2019) at 15% p.a. i.e. Rs.764

(iii) Charges for early delivery

Swap Loss	Rs.30,000
Interest on Outlay of Funds	Rs. 764
	Rs.30,764

(iv) Net Inflow to Global Ltd.

Proceed of US $ 200000 @ Rs.71.50	Rs.1,43,00,000
Less: Charges for early delivery	Rs. 30,764
Net Inflow	Rs.1,42,69,236

Question 55 :
May 2019 (New) – Paper

K Ltd. currently operates from 4 different buildings and wants to consolidate its operations into one building which is expected to cost Rs.90 crores. The Board of K Ltd. had approved the above plan and to fund the above cost, agreed to avail an External Commercial Borrowing (ECB) of GBP 10 m from G Bank Ltd. on the following conditions:

- The Loan will be availed on 1st April, 2019 with interest payable on half yearly rest.
- Average Loan Maturity life will be 3.4 years with an overall tenure of 5 years.
- Upfront Fee of 1.20%.
- Interest Cost is GBP 6 months LIBOR + Margin of 2.50%.
- The 6 month LIBOR is expected to be 1.05%.

K Ltd. also entered into a GBP-INR hedge at 1 GBP = INR 90 to cover the exposure on account of the above ECB Loan and the cost of the hedge is coming to 4.00% p.a.

As a Finance Manager, given the above information and taking the 1 GBP = INR 90:

(i) Calculate the overall cost both in percentage and rupee terms on an annual basis.

(ii) What is the cost of hedging in rupee terms?

(iii) If K Ltd. wants to pursue an aggressive approach, what would be the net gain/loss for K Ltd. if the INR depreciates/appreciates against GBP by 10% at the end of the 5 years assuming that the loan is repaid in GBP at the end of 5 years?

Ignore time value and taxes and calculate to two decimals.

Solution :

(i) Calculation of Overall Cost

Upfront Fee (GBP 10 M @ 1.20%)	Rs. 1,20,000
Interest Payment (GBP 10 M x 3.55% x 3.4)	Rs.12,07,000
Hedging Cost (GBP 10 M x 4% x 3.4)	Rs.13,60,000
Total	Rs.26,87,000

Or Rs.2.687 million

Overall cost in % terms on Annual Basis $= \frac{2.687 \text{ million}}{(1,00,00,000 - 1,20,000)} \times \frac{1}{3.4}$

$= \frac{2.687}{9.88} \times \frac{1}{3.4} \times 100 = 8\%$

Overall Cost in Rupee terms@ GBP 1 = Rs.90 $\times \frac{2.687}{3.4} \times 100$ = Rs.711.26 lakhs

OR

Overall cost in % terms on Annual Basis $= \frac{2.687 \text{ million}}{(1,00,00,000)} \times \frac{1}{3.4}$

$= \frac{2.687}{3.4} \times \frac{1}{3.4} \times 100 = 7.9\%$

Overall Cost in Rupee terms@ GBP 1 = 10,000,000 × 7.90% × 90

= Rs.71,100,000

OR

Calculation of overall cost

Interest & Margin (A)	=	3.55%
Hedging cost (B)	=	4%
		7.55%
Onetime fee	=	1.20%
Average loan maturity	=	3.4 years
Per annum cost 1.2/3.4 (C)	=	0.35%
Annual overall cost in % terms (A+B+C)	=	7.9%
Overall Cost in Rupee terms@ GBP 1	=	10,000,000 × 7.90% × 90
	=	Rs.71,100,000

(ii) Cost of Hedging in terms of Rupees

Rs.13,60,000 × 90 = Rs.12,24,00,000 = Rs.12.24 crores in Total

OR

GBP10,000,000 × 90 × 4% = Rs.3,60,00,000 on Annual Basis

(iii) If K Ltd. pursues an aggressive approach then Gain/Loss in INR Depreciation/ Appreciation shall be computed as follows:

(a) If INR depreciates by 10%

Re. loss per GBP = 90 × 10%	= Rs.9
Total Losses GBP10M	= Rs.90 Million
Less: Cost of Hedging	= Rs.36 Million
Net Loss	= Rs.54 million

(b) If INR appreciates by 10%

Rs. Gains per GBP = Rs.90 x 10%	= Rs.9
Total Gain on Repayment of loan	= 90 Million
Add: Saving in Cost of Hedging	= 36 Million
Net Gain	= 126 Million

Question 56 :
Nov 2019 (Old) – RTP

Following are the details of cash inflows and outflows in foreign currency denominations of MNP Co. an Indian export firm, which have no foreign subsidiaries :

Currency	Inflow	Outflow	Spot rate	Forward rate
US $	4,00,00,000	2,00,00,000	48.01	48.82
French Franc (FFr)	2,00,00,000	80,00,000	7.45	8.12
U.K. £	3,00,00,000	2,00,00,000	75.57	75.98
Japanese Yen	1,50,00,000	2,50,00,000	3.20	2.40

(i) Determine the net exposure of each foreign currency in terms of Rupees.

(ii) Are any of the exposure positions offsetting to some extent?

Solution :

(i) Net exposure of each foreign currency in Rupees

	Inflow	Outflow	Net Inflow	Spread	Net Exposure
	(Millions)	(Millions)	(Millions)		Millions)
US$	40	20	20	0.81	16.20
FFr	20	8	12	0.67	8.04
UK£	30	20	10	0.41	4.10
Japan Yen	15	25	-10	-0.80	8.00

(ii) The exposure of Japanese yen position is being offset by a better forward rate

Question 57 :
Nov 2019 (Old) – Paper

H Ltd. is an Indian firm exporting handicrafts to North America. All the exports are invoiced in US$. The firm is considering the use of money market or forward market to cover the receivable of $50,000 expected to be realized in 3 months time and has the following information from its banker :

	Exchange Rates
Spot	Rs./$ 72.65/73
3-m forward	Rs./$ 72.95/73.40

The borrowing rates in US and India are 6% and 12% p.a. and the deposit rates are 4% and 9% p.a. respectively.

(i) Which option is better for H Ltd.?

(ii) Assume that H Ltd. anticipates the spot exchange rate in 3-months time to be equal to the current 3 months forward rate. After 3-months the spot exchange rate turned out to be Rs./$: 73/73.42. What foreign exchange exposure and risk of H Ltd.?

Solution :

Indian Co.

- $ 50,000 Receivable
- After 3 months

1) Alt 1 : Forward Cover

3 mf Rs./$ 72.95 / 73.40

Rate applicable Rs./$ 72.95

i.e. Amount receivable = 50,000 × 72.95
= Rs.36,47,500 Receivable after 3mf

2) Alt 2 : Money Market Cover

FC Receivable → Borrow / Sell / Invest

Step 1 : Borrow $ to pay $ 50,000 @ 6% p.a.

i.e. 1.5% for 3 months

Amount Borrowed = $\frac{50,000}{1.015}$ = $ 49,261.08

Step 2: Sell $ 49,26,.08 Spot @ Rs./$ 72.65

Amount received = 49,261.08 × 72.65 = Rs.35,78,817.

Step 3 : Invest Rs.35,78,817 @ 12% p.a. i.e. 3% for 3 months

= Rs.35,78,817 × 1.03 = Rs.36,86,182 Receivable after 3 months

Decision : India Co, should opt for money market cover

If H anticipated $ Spot rate after 3 months = 3mf = Rs./$ 72.95 / 73.40 and actual rate throw out to be Rs./$ 73/73.42.

H is faced with transaction exposure and if he does not hedge the risk his profit = (73 – 72.95) × 50,000 = Rs.2,500.

Question 58 :
Nov 2019 (Old) – Paper

A German subsidiary of an US based MNC has to mobilize 1,00,000 Euro's working capital for the next 12 months. It has the following options :

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

Bank 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 the market determined, examine which loan is the most attractive using interest rate differential.

Solution :

Net Cost under each of the option is as follows :

1) Loan from German Bank

Cost = 5 + 0.25 = 5.25%

2) Loan from Us Parent Bank

Effective Rate $\left(\frac{4}{1-0.08}\right)$ = 4.35%

+ Premium of US $ $\left(\frac{1.05}{1.04}\right) - 1$ = 0.96%

Net Cost 5.31%

3) Loan from Swiss Bank

Effective Rate of Interest $\left(\frac{3}{1-0.08}\right)$ = 3.26%

Premium on US $ $\left(\frac{1.05}{1.03}\right)-1$ = 1.94%

Net Cost **5.20%**

Question 59 :
May 2020 (New) – RTP

Followings are the spot exchange rates quoted at three different forex markets:

USD/INR	48.30 in Mumbai
GBP/INR	77.52 in London
GBP/USD	1.6231 in New York

The arbitrageur has USD 1,00,00,000. Assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates.

Solution :

The arbitrageur can proceed as stated below to realize arbitrage gains.

(i) Buy Rs. from USD 10,000,000 at Mumbai 48.30 × 10,000,000 = Rs.483,000,000

(ii) Convert these Rs. to GBP at London $\left(\frac{\text{Rs.}483,000,000}{\text{Rs.}77.52}\right)$ = GBP 6,230,650.155

(iii) Convert GBP to USD at New York GBP 6,230,650.155 × 1.6231 USD 10,112,968.26

There is net gain of USD 10,112968.26 less USD 10,000,000 i.e. USD 112,968.26

Question 60 :
Nov 2020 (New) – RTP

Citi Bank quotes JPY/ USD 105.00 -106.50 and Honk Kong Bank quotes USD/JPY 0.0090- 0.0093.

(a) Are these quotes identical if not then how they are different?

(b) Is there a possibility of arbitrage?

(c) If there is an arbitrage opportunity, then show how would you make profit from the given quotation in both cases if you are having JPY 1,00,000 or US$ 1,000.

Solution :

(a) The quotes are different

Citi Bank Quotes are direct for JPY

Honk Kong Bank Quotes are indirect for JPY

(b) Citi Quote JPY / USD 105 / 106.50

∴ USD/JPY $\frac{1}{106.50} / \frac{1}{105}$

0.0094 / 0.0095

Since this rates are higher than Honk Kong rate $/¥ 0.0090 / 0.0093 arbitrage is possible.

(c) (i) Arbitrage using ¥ 100000

Sell ¥ 100000 to Citi Bank $\frac{100000}{106.50}$ = $ 938.967

Sell $ 938.967 to Hong Kong Bank @ 0.0093

i.e. $\frac{938.967}{0.0093}$ = $ 100964.21

Profit = 964.21 ¥

(ii) Arbitrage using $1000

Sell $ 1000 at Hong Kong Bank $/¥ 0.0090 / $\frac{0.0090}{B}$

i.e. $\frac{1000}{0.0093}$ = ¥ 107526.88

Sell ¥ 107526.88 at Citi Bank ¥/$ 105 / $\frac{106.5}{B}$

i.e. $\frac{107526.88}{106.50}$ = $ 1009.64

i.e. $9.64 profit

Question 61 :
Nov 2020 (New) – RTP

(a) Given:

US$ 1 = ¥ 107.31

£ 1 = US$ 1.26

A$ 1 = US$ 0.70

(i) Calculate the cross rate for Pound in Yen terms

(ii) Calculate the cross rate for Australian Dollar in Yen terms

(iii) Calculate the cross rate for Pounds in Australian Dollar terms

(b) The current spot exchange rate is $1.35/£ and the three-month forward rate is $1.30/£. According to your analysis of the exchange rate, you are quite confident that the spot exchange rate will be $1.32/£ after 3 months.

(i) Suppose you want to speculate in the forward market then what course of action would be required and what is the expected dollar Profit (Loss) from this speculation?

(ii) What would be your Profit (Loss) in Dollar terms on the position taken as per your speculation if the spot exchange rate turns out to be $1.26/£.

Assume that you would like to buy or sell £1,000,000.

Solution :

(a) (i) ¥ if = ?

¥ / $	107.31	¥ / £	107.31 × 1.26 = 135.2106
$ / £	1.26		

(ii) ¥ / AS $

¥ / $	107.31	¥/A$	107.31 × 0.70 = 75.117
$ / A$	0.70		

(iii) A$ / £

$ / A$ 0.70 A$ / £ = $\frac{1.26}{0.70}$ = 1.8

(b)

Spot	$ / £	1.35	3m Expected spot	
3mf	$ / £	1.30	$ / £	1.32

(i) To speculate in forward market the speculation should by 3m $/£ @ 1.30.

Expected profit = (1.32 – 1.30) i.e. 0.002 $ / £

(ii) If 3m spot turns out to be $/£ 1.26 loss to speculator would be

(1.30 – 1.26) × 1000000 = $ 40000

Question 62 :
Nov 2020 (New) – RTP

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.

Solution :

XYZ – UK – Sub → Amsterdam € 1,450,000

↓ → Switzerland CHF 1,996,154

£150,000

You will enter into swaps if you receive higher interest than that available on individual basis

Interest on individual basis

(i) Amsterdam € 1,450,000 × 2% × 91/360 = €7330.56

Total amount € 1457,330.56

Convert € in £ 91 day forward

Spot £ / € 0.6858 / 0.6869

91 days Pts 0.0037 / 0.0040

3mf £ / € $\frac{0.6895}{S} / \frac{0.6909}{B}$

i.e. 1457.330.56 × 0.6895 = £10,04,829.42

(ii) Switzerland = 19,96,154 × 0.5% × 91/360 = 2522.9

Total Amt = CHF 1998676.92

Converting CHF in £ 91 day forward

Spot CHF / £ 2.3295 / 2.3326

91 day Swap 0.0242 / 0.0228

3mf CHF / £ 2.3053 / $\frac{2.3098}{B}$

i.e. $\frac{19,98,676.92}{2.3098}$ = £8,65,303.02

(iii) UK = £1,50,000 × 1% × 91/360 = 379.17

Total Amt = £1,50,000 + 379.17 = £1,50,379.17

Total Amt receivable = £20,20,511.61

at end of 3mfs

Now we would swap if we receive the above Amt.

Swap

1)	UK	£ 1,50,000
2)	Sell € spot = 14,50,000 × 0.6858	£ 9,94,410
3)	Sell CHF spot = 1996154 / 2.3326	£ 8,55,763.53
		£ 20,00,173.53
	Receivable	20,20,511.61
	Interest	£ 20,338.08

$$\text{Rate} = \frac{20,338.08}{20,00,173.61} \times 100 \times = \frac{360}{91} = 4.023\%$$

Question 63 :
Nov 2020 (New) – Paper

ZX limited has made purchase worth USD 80,000 on 1st may 2020 for which it has to make a payment on 1st November 2020. The present exchange rate is INR/USD 75. The company can purchase forward dollars at INR/USD 74. The company will have to make up front premium @ 1% off forward amount purchase. The cost of funds to ZX limited is 10% per annum.

The company can hedge its position with the following expected rate of USD in foreign exchange market on 1st may 2020.

	Exchange Rate	Probability
I.	INR / USD 77	0.15
II.	INR / USD 71	0.25
III.	INR / USD 79	0.20
IV.	INR / USD 74	0.40

You are required to advise the company for suitable cover for risk.

Solution :

(i) If ZX Ltd. does not take forward (Unhedged Position):

Expected Rate = Rs. 77 × 0.15 + Rs. 71 × 0.25 + Rs. 79 × 0.20 + Rs. 74 × 0.40

= Rs. 11.55 + Rs. 17.75 + Rs. 15.80 + Rs. 29.60 = Rs. 74.70

Expected Amount Payable = USD 80,000 × Rs. 74.70 = Rs. 59,76,000

(ii) If the ZX Ltd. hedge its position in the forward market:

Particulars	Amount (Rs.)
If company purchases US$ 80,000 forward premium is (80000 × 74 × 1%)	59,200
Interest on Rs. 59,200 for 6 months at 10%	2,960
Total hedging cost (a)	62,160

Amount to be paid for US$ 80,000 @ Rs. 74.00 (b)	59,20,000
Total Cost (a) + (b)	59,82,160

Advise : Since cashflow is less in case of unhedged position company should opt for the same.

Question 64 :
Nov 2020 (New) – Paper

USD 10,000 is lying idle in your bank account. You are able to get the following quotes from the dealers.

Dealer	**Quote**
A	EUR/USD 1.1539
B	EUR/GBP 0.9094
C	GBP/USD 1.2752

Is there an opportunity of gain from these quotes?

Solution :

The arbitrageur can proceed as stated below to realize arbitrage gains.

(i)	Buy € from US$ 10,000 from Dealer A (10,000/ 1.1539)	€ 8,666.26
(ii)	Convert these € to £ by selling to Dealer B (€ 8,666.26 × 0.9094)	£ 7,881.09
(iii)	Convert £ to US$ by selling to Dealer C (£ 7,881.09 × 1.2752)	US$ 10,049.97

There is net gain of US$ 10,049.97 less US$ 10,000 i.e. US$ 49.97 or US$ 50.00.

Question 65 :
Nov 2020 (New) – Paper

ICL an Indian MNC is executing a plant in Sri Lanka. It has raised Rs 400 billion. Half of the amount will be required after 6 months time. ICL is looking at opportunity to invest this amount on 1st April 2020 for the period of 6 months. It is considering to underlying proposals.

Market	**Japan**	**US**
Nature of investments	Index fund (JPY)	Treasury Bills (USD)
Dividend (in billions)	25	-
Income from stock lending (in billions)	11.9276	-
Discount on initial investment at the end	2%	-
Interest	-	5 % PA
Exchange rate (1/4/2020)	JPY/INR 1.58	USD/INR 0.014
Exchange rate (30th Sept 2020)	JPY/INR 1.57	USD/INR 0.013

You are an investment manager, is required to suggest the best course of option.

Solution :

Investment in JPY			(in billions)
Particulars	Currency INR	ER	Currency JPY
Available amount	200	1.58	316
Dividend Income			25
Stock Lending Income			11.9276
Investment value at the end after discount @ 2%			309.68
Amount available at the end			346.6076
Conversion as on 30-09-2020		1.57	Rs. 220.7692
Gain			Rs. 20.7692

Investment in USD			(in billions)
Particulars	Currency INR	ER	Currency USD
Available amount	200	0.014	2.80
Interest for 6 months @ 5% p.a.			0.07
Amount available at the end			2.87
Conversion as on 30-09-2020		0.013	Rs. 220.7692
Gain			Rs. 20.7692

The equivalent amount is same in both the options so ICL is indifferent.

However, USD is more stable, and Treasury Bills are risk free, so investment in Treasury Bills (USD) is suggested.

Question 66 :
Jan 2021 (New) – Paper

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 Rs/USD and USD/EUR in inter-bank market are quoted as follows :

	Rs/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.

Solution :

(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

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

(ii) Cash Inflow Rs. 1,83,69,825

(iii) Interest for 80 days @ 8% Rs. 3,22,101

Question 67 :
Jan 2021 (New) – Paper

XYZ has taken a six-month loan from its foreign collaborator for USD 2 millions. Interest is payable on maturity @ LIBOR plus 1%. The following information is available :

Spot rate	INR/USD	68.5275
6 months Forward rate	INR/USD	68.4575
6 months LIBOR for USD	2%	
6 months LIBOR for INR	6%	

You are required to :

(i) Calculate Rupee requirements if forward cover is taken.

(ii) Advise the company on the forward cover.

Solution :

(i) Rupee requirement if forward cover is taken:

6 Month Forward rate	68.4575
Interest amount $\left(20,00,000 \times 3\% \times \frac{6}{12}\right)$	US$ 30,000
Principal amount	US$ 20,00,000
	US$ 20,30,000

Rupee Requirement = INR 68.4575 X US$ 20,30,000 = INR 13,89,68,725

* LIBOR + 1%

(ii) Forward Rate as per Interest Rate Parity after 6 months is expected to be:

$$= 68.5275 \times \frac{(1.03)}{(1.01)} = 69.8845/US\$$$

The company should take forward cover because as per Interest Rate Parity, the rate after 6 months is expected to be higher than forward rate.

However, if spot rate is 68.4275, the expected rate as per Interest Rate Parity shall be:

$$= 68.4275 \times \frac{(1.03)}{(1.01)} = 69.7825/US\$$$

Thus, still the company should take forward cover.

Thanks ....

CHP - 8 INTERNATIONAL FINANCIAL MANAGEMENT

Question 1 :
Nov 2008 – RTP

XYZ Ltd. is considering a project in Luxemburg, which will involve an initial investment of € 1,30,00,000. The project will have 5 years of life. Current spot exchange rate is Rs.58 per €. The risk free rate in Germany is 8% and the same in India is 12%. Cash inflow from the project are as follows:

Year	Cash inflow
1	€ 30,00,000
2	€ 25,00,000
3	€ 35,00,000
4	€ 40,00,000
5	€ 60,00,000

Calculate the NPV of the project using foreign currency approach. Required rate of return on this project is 14%.

Solution :

Step 1 : Calculation of foreign currency discount rate

$$= \left(\frac{1.14}{1.12} \times 1.08\right) - 1 = 9.93\%$$

Step 2 : Calculation of NPV

Year	Cash Flow €	PV @ 9.93%
1	30,00,000	27,29,009
2	25,00,000	20,68,748
3	35,00,000	26,34,628
4	40,00,000	27,39,019
5	60,00,000	37,37,405
		1,39,08,809
	Less : Investment	1,30,00,000
	NPV	9,08,809 €

Note : Since NPV is positive we should go ahead with project.

Question 2 :
Nov 2008 – RTP

An Indian company is planning to set up a subsidiary in US. The initial project cost is estimated to be US $40 million; Working Capital required is estimated to be $4 million.

The finance manager of company estimated the data as follows:

Variable Cost of Production (Per Unit Sold)	$2.50
Fixed cost per annum	$ 3 Million
Selling Price	$ 10
Production capacity	5 million units
Expected life of Plant	5 years
Method of Depreciation	Straight Line Method (SLM)
Salvage Value at the end of	5 years NIL

The subsidiary of the Indian company is subject to 40% corporate tax rate in the US and the required rate of return of such types of project is 12%. The current exchange rate is Rs.48/US$ and the rupee is expected to depreciate by 3% per annum for next five years.

The subsidiary company shall be allowed to repatriate 70% of the CFAT every year along with the accumulated arrears of blocked funds at the end of 5 years, the withholding taxes are 10%. The blocked fund will be invested in the USA money market by the subsidiary, earning 4% (free of taxes) per year.

Determine the feasibility of having a subsidiary company in the USA, assuming no tax liability in India on earnings received by the parent company from the US subsidiary.

Solution :

This question is solved by home-currency approach because information about forward rates is given to us and the interest rates relating to 2 countries are not given to us.

- Indian Company
- Project in US

Calculating of NPV **(Rs. In million)**

PV of Inflow			
• Recurring Inflow			4060.36
• Salvage			
• Working Capital			
(–) PV of Outflow			
• Cost of asset	(i)	1920	
• Working capital	(ii)	192	(2112)
			1948.36

Calculation of PV of Outflow

(i) Cost of asset = 40 Million $

= 40 × 48 = Rs.1,920 million

(ii) Working Capital = 4 million $

= 4 × 48 = Rs.192 million

Calculation of PV of Inflow

(iii) Calculate forward rates ⇐ Step 1

Spot Rate Rs / $ = 48

Rs. Depreciation by 3%

$F_1 = \frac{48}{0.97} = 49.48$

$F_2 = 49.48 \div 0.97 = 51.01$

$F_3 = 51.01 \div 0.97 = 52.59$

$F_4 = 52.59 \div 0.97 = 54.22$

$F_5 = 54.22 \div 0.97 – 55.90$

For Step 2 : To Convert cash inflows from $ to Rs. And than PV. Fist calculate cash inflows.

(iv) (A) Calculation of cash inflows

Units	5
(x) SP	10
Sales	50 (5 × 10)
(–) VC	(12.5) (5 × 2.5)
Contribution	37.5
(–) FC	(3)
NPBT	34.5
(–) Depreciation	(8) [(40 –Nil)15]
PBT	26.5
(–) Tax @ 40%	10.6
PAT	15.9
(+) Depreciation	8
	23.9

70%	30%
16.73	7.17
(–) 10% with holding tax	↓
15.057	Re-invest @ 40%
↓	
For 1/2/3/4 years	

(B) Cash Flow for 5th year

0	7.17	7.17	7.17	7.17	23.9
				1.04	7.4568
				$(1.04)^2$	7.7551
				$(1.04)^3$	8.0653
				$(1.04)^4$	8.3879
		(+) Scrap			Nil

(+)	Working Capital	4
		59.5651
	Withholding tax	(–) 10%
	Cash Inflow for 5th year	53.6086

(v) Convert the currency and apply PV

Year	$ CF	Rs./ $ Exchange Rate	Rs. CF	PV @ 12%
1.	15.057	49.48	745.02	665.20
2.	15.057	51.01	768.06	612.29
3.	15.057	52.59	791.85	563.62
4.	15.057	54.22	816.39	518.83
5.	53.6086	55.90	2996.72	1700.42
				Rs.4060.36 million

Summary :

1. Calculation of forward Rates
2. Re-investment of 30% blocked funds
3. Withholding tax

Question 3 :
May 2010 – RTP

OJ Ltd. Is a supplier of leather goods to retailers in the UK and other Western European countries. The company is considering entering into a joint venture with a manufacturer in South America. The two companies will each own 50 per cent of the limited liability company JV(SA) and will share profits equally . £ 450,000 of the initial capital is being provided by OJ Ltd. and the equivalent in South American dollars (SA$) is being provided by the foreign partner. The managers of the joint venture expect the following net operating cash flows, which are in nominal terms:

SA$ 000	Forward	Rates of exchange to the £ Sterling
Year 1	4,250	10
Year 2	6,500	15
Year 3	8,350	21

For tax reasons JV(SV) the company to be formed specifically for the joint venture, will be registered in South America.

Ignore taxation in your calculations.

Assuming you are financial adviser retained by OJ Limited to advise on the proposed joint venture.

(i) Calculate the NPV of the project under the two assumptions explained below. Use a discount rate of 18 per cent for both assumptions.

Assumption 1: The South American country has exchange controls which prohibit the payment of dividends above 50 per cent of the annual cash flows for the first three years of the project. The accumulated balance can be repatriated at the end of the third year.

Assumption 2: The government of the South American country is considering removing exchange controls and restriction on repatriation of profits. If this happens all cash flows will be distributed as dividends to the partner companies at the end of each year.

(ii) Comment briefly on whether or not the joint venture should proceed based solely on these calculations.

Solution :

Since only one discounting rate in given and interest rates are absent we have to follow Home currency approach..

Assumption 1: Exchange Control exists.

Yr	CF SA $	OJ's Sh	Withdrawal	Exc. Rate	CF (Rs.)	DF (18%)	DCF
1	42,50,000	21,50,000	10,62,500	10	1,06,250	0.847	89,994
2	65,00,000	32,50,000	16,25,000	15	1,08,333	0.718	77,783
3	83,50,000	41,75,000	68,62,500	21	3,26,785	0.609	1,99,012
					PV Inflows		3,66,789
					- PV Outflows		4,50,000
					NPV		(83,211)

Decision : Project is not desirable if the exchange control exists

Assumption 2 : No exchange control

Yr	CF SA $	OJ's Sh	Exc. Rate	CF (Rs.)	DF (18%)	DCF
1	42,50,000	21,50,000	10	2,15,000	0.847	1,82,105
2	65,00,000	32,50,000	15	2,16,667	0.718	1,55,567
3	83,50,000	41,75,000	21	1,98,810	0.609	1,21,075
				PV Inflows		4,58,747
				- PV Outflows		4,50,000
				NPV		8,747

Decision : The project can be picked up is the exchange controls are removed

Question 4 :
Nov 2012 – RTP

A USA based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by the US parent at a transfer price of US $10 millions. The unit will remain in existence in India for one year; the software is expected to get developed within this time frame.

The US based company will be subject to corporate tax of 30 per cent and a withholding tax of 10 per cent in India and will not be eligible for tax credit in the US. The software developed will be sold in the US market for US $ 12.0 millions. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India Rs.15,00,000

Man power cost (80 software professional will be working for

10 hours each day) Rs.400 per man hour

Administrative and other costs Rs.12,00,000

Advise the US Company on the financial viability of the project. The rupee-dollar rate is Rs. 48/$.

Solution :

Proforma profit and loss account of the Indian software development unit

Particulars	Rs.	
Revenue		48,00,00,000
Less: costs		
Rent	15,00,000	
Manpower(400x80x10x365)	11,68,00,000	
Administrative and other cost	12,00,000	11,95,00,000
Earning before tax		36,05,00,000
Less: Tax		10,81,50,000
Earning after Tax		25,23,50,000
Less: withholding TDS		2,52,35,000
Repatriation amount in Rs.		22,71,15,000
Repatriation amount in dollars		$4.7 million

Note: Students may assume the year of 360 days instead of 365 days as has been done in the answer provided above. In such a case where a year is assumed to be of 360 days, manpower cost is Rs.11,52,00,000 and repatriated amount Rs.22,81,23,000.

Advise: The cost of development software in India for the US based company is $5.268 million. As the USA based Company is expected to sell the software in the US at $12.0 million, it is advised to develop the software in India.

Question 5 :

May 2013 – Paper – 10 Marks

XY Limited is engaged in large retail business in India. It is contemplating for expansion into a country of Africa by acquiring a group of stores having the same line of operation as that of India.

The exchange rate for the currency of the proposed African country is extremely volatile. Rate of inflation is presently 40% a year. Inflation in India is currently 10% a year.

Management of XY Limited expects these rates likely to continue for the foreseeable future. Estimated projected cash flows, in real terms, in India as well as African country for the first three years of the project are as follows:

	Year – 0	Year – 1	Year – 2	Year – 3
Cash Flows in Indian Rs. (000)	-50,000	-1,500	-2,000	-2,500
Cash flows in African Rands (000)	-2,00,000	+50,000	+70,000	+90,000

XY Ltd. assumes the year 3 nominal cash flows will continue to be earned each year indefinitely. It evaluates all investments using nominal cash flows and a nominal discounting rate. The present exchange rate is African Rand 6 to Rs.1.

You are required to calculate the net present value of the proposed investment considering the following:

(i) African Rand cash flows are converted into rupees and discounted at a risk adjusted rate.

(ii) All cash flows for these projects will be discounted at a rate of 20% to reflect it's high risk.

(iii) Ignore taxation.

	Year – 1	Year – 2	Year – 3
PVIF @ 20%	833	694	579

Solution :

Calculation of NPV

Year	0	1	2	3
Inflation factor in India	1.00	1.10	1.21	1.33
Inflation factor in Africa	1.00	1.40	1.96	2.74
Exchange Rate (as per IRP)	6.00	7.6364	9.719	12.3696
Cash Flows in Rs. '000				
Real	-50000	-1500	-2000	-2500
Nominal (1)	-50000	-1650	-2420	-3327.50
Cash Flows in African Rand '000				
Real	-200000	50000	70000	90000
Nominal	-200000	70000	137200	246960
In Indian Rs. '000 (2)	-33333	9167	14117	19965
Net Cash Flow in Rs. '000 (1)+(2)	-83333	7517	11697	16637
PVF@20%	1	0.833	0.694	0.579
PV	-83333	6262	8118	9633

NPV of 3 years= -59320 (Rs. '000)

NPV of Terminal Value = $\frac{16,637}{0.20}$ x 0.579 = 48,164 (Rs. '000)

Total NPV of the Project = -59320 (Rs. '000) + 48164 (Rs. '000) = -11156 (Rs. '000)

Question 6 :

May 2014 – Paper / Nov 2019 (Old) – RTP / Nov 2019 (New) – Paper

A multinational company is planning to set up a subsidiary company in India (where hitherto it was exporting) in view of growing demand for its product and competition from other MNCs. The initial project cost (consisting of Plant and Machinery including installation) is estimated to be US$ 500 million. The net working capital requirements are estimated at US$ 50 million. The company follows straight line method of depreciation. Presently, the company is exporting two million units every year at a unit price of US$ 80, its variable cost per unit being US$ 40.

The Chief Financial Officer has estimated the following operating cost and other data in respect of proposed project:

(i) Variable operating cost will be US $ 20 per unit of production;

(ii) Additional cash fixed cost will be US $ 30 million p.a. and project's share of allocated fixed cost will be US $ 3 million p.a. based on principle of ability to share;

(iii) Production capacity of the proposed project in India will be 5 million units;

(iv) Expected useful life of the proposed plant is five years with no salvage value;

(v) Existing working capital investment for production & sale of two million units through exports was US $ 15 million;

(vi) Export of the product in the coming year will decrease to 1.5 million units in case the company does not open subsidiary company in India, in view of the presence of competing MNCs that are in the process of setting up their subsidiaries in India;

(vii) Applicable Corporate Income Tax rate is 35%, and

(viii) Required rate of return for such project is 12%.

Assuming that there will be no variation in the exchange rate of two currencies and all profits will be repatriated, as there will be no withholding tax, estimate Net Present Value (NPV) of the proposed project in India.

Present Value Interest Factors (PVIF) @ 12% for five years are as below:

Year	**1**	**2**	**3**	**4**	**5**
PVIF	0.8929	0.7972	0.7118	0.6355	0.5674

Solution :

Financial Analysis whether to set up the manufacturing units in India or not may be carried using NPV technique as follows:

I. Incremental Cash Outflows

	$ Million
Cost of Plant and Machinery	500.00
Working Capital	50.00
Release of existing Working Capital	(15.00)
	535.00

II. Incremental Cash Inflow after Tax (CFAT)

(a) Generated by investment in India for 5 years

	$ Million
Sales Revenue (5 Million x $80)	400.00
Less: Costs	
Variable Cost (5 Million x $20)	100.00
Fixed Cost	30.00
Depreciation ($500 Million/5)	100.00
EBIT	170.00
Taxes@35%	59.50
EAT	110.50
Add: Depreciation	100.00
CFAT (1-5 years)	210.50
Cash flow at the end of the 5 years (Release of Working Capital)	35.00

(b) Cash generation by exports (Opportunity Cost)

	$ Million
Sales Revenue (1.5 Million x $80)	120.00
Less: Variable Cost (1.5 Million x $40)	60.00
Contribution before tax	60.00
Tax@35%	21.00
CFAT (1-5 years)	39.00

(c) Additional CFAT attributable to Foreign Investment

	$ Million
Through setting up subsidiary in India	210.50
Through Exports in India	39.00
CFAT (1-5 years)	171.50

III. Determination of NPV

Year	CFAT ($ Million)	PVF@12%	PV($ Million)
1 – 5	171.50	3.6048	618.2232
5	35	0.5674	19.8590
			638.0822
Less: Initial Outflow			535.0000
			103.0822

Since NPV is positive the proposal should be accepted.

Question 7 :

May 2016 – RTP

Opus Technologies Ltd., an Indian IT company is planning to make an investment through a wholly owned subsidiary in a software project in China with a shelf life of two years. The inflation in China is estimated as 8 percent. Operating cash flows are received at the year end.

For the project an initial investment of Chinese Yuan (CN¥) 30,00,000 will be in a piece of land. The land will be sold after the completion of project at estimated value of CN¥ 35,00,000. The project also requires an office complex at cost of CN¥ 15,00,000 payable at the beginning of project. The complex will be depreciated on straight-line basis over two years to a zero salvage value. This complex is expected to fetch CN¥ 5,00,000 at the end of project.

The company is planning to raise the required funds through GDR issue in Mauritius. Each GDR will have 5 common equity shares of the company as underlying security which are currently trading at Rs.200 per share (Face Value = Rs.10) in the domestic market. The company has currently paid a dividend of 25% which is expected to grow at 10% p.a. The total issue cost is estimated to be 1 percent of issue size.

The annual sales is expected to be 10,000 units at the rate of CN¥ 500 per unit. The price of unit is expected to rise at the rate of inflation. Variable operating costs are 40 percent of sales. Current Fixed Operating costs is CN¥ 22,00,000 per year which is expected to rise at the rate of inflation.

The tax rate applicable in China for business income and capital gain is 25 percent and as per GOI Policy no further tax shall be payable in India. The current spot rate of CN¥ 1 is Rs.9.50. The nominal interest rate in India and China is 12% and 10% respectively and the international parity conditions hold.

You are required to

(a) Identify expected future cash flows in China and determine NPV of the project in CN¥.

(b) Determine whether Opus Technologies should go for the project or not, assuming that there neither there is any restriction nor any charges/taxes payable on the transfer of funds from China to India.

Solution :

Working Notes:

1. Calculations of Cost of Capital (GDR)

Current Dividend (D_0)	2.50
Expected Dividend (D_1)	2.75
Net Proceeds (200-1% of 200)	198.00
Growth Rate	10.00%

Ke = 2.75/198 + 0.10 = 0.1139 i.e. 11.39%

2. Calculation of Expected Exchange Rate as per Interest Rate Parity.

Year	Expected Rate
1	$= 9.50 \times \frac{(1+0.12)}{(1+0.10)} = 9.67$
2	$= 9.50 \times \frac{(1+0.12)^2}{(1+0.10)^2} = 9.85$

3. Realization on the disposal of Land net of Tax

	CN¥
Sale value at the end of Project	35,00,000
Cost of Land	30,00,000
Capital Gain	5,00,000
Tax paid	1,25,000
Amount Realized net of tax	33,75,000

4. Realization on the disposal of Office Complex

	CN¥
Sale value at the end of Project	5,00,000

WDV	0
Capital Gain	5,00,000
Tax paid	1,25,000
Amount Realized net of tax (A)	3,75,000

5. Computation of Annual Cash Inflows

Year	**1**	**2**
Annual Units	10,000	10,000
Price per bottle (CN¥)	540	583.20
Annual Revenue (CN¥)	54,00,000	58,32,000
Less: Expenses		
Variable operating cost (CN¥)	21,60,000	23,32,800
Depreciation (CN¥)	7,50,000	7,50,000
Fixed Cost per annum (CN¥)	23,76,000	25,66,080
PBT (CN¥)	1,14,000	1,83,120
Tax on profit (CN¥)	28,500	45,780
Net Profit (CN¥)	85,500	1,37,340
Add: Depreciation (CN¥)	7,50,000	7,50,000
Cash Flow	8,35,500	8,87,340

(a) Computation of NPV of the project in (CN¥)

Year	**0**	**1**	**2**
Initial Investment	-45,00,000		
Annual Cash Inflows		8,35,500	8,87,340
Realization on the disposal of Land net of Tax			33,75,000
Realization on the disposal of Office Complex			3,75,000
Total	-45,00,000	8,35,500	46,37,340
PVF @ 11.39%	1.000	0.898	0.806
PV of Cash Flows	-45,00,000	7,50,279	37,37,696
		NPV	-12,025

(b) Evaluation of Project from Opus Point of View

(i) Assuming that inflow funds are transferred in the year in which same are generated i.e. first year and second year.

Year	**0**	**1**	**2**
Cash Flows (CN¥)	-45,00,000	8,35,500	46,37,340
Exchange Rate (Rs./CN¥)	9.50	9.67	9.85
Cash Flows (Rs.)	-4,27,50,000	80,79,285	4,56,77,799

PVF @ 12%	1.00	0.893	0.797
	-4,27,50,000	72,14,802	3,64,05,206
NPV			8,70,008

(ii) Assuming that inflow funds are transferred at the end of the project i.e. second year.

Year	**0**	**2**
Cash Flows (CN¥)	-45,00,000	54,72,840
Exchange Rate (Rs./CN¥)	9.50	9.85
Cash Flows (Rs.)	-4,27,50,000	5,39,07,474
PVF	1.00	0.797
	-4,27,50,000	4,29,64,257
NPV		

Though in terms of (CN¥) the NPV of the project is negative but in Rs. it has positive NPV due to weakening of Rs. in comparison of (CN¥). Thus Opus can accept the project.

Question 8 :
Nov 2016 – RTP / May 2021 (New) – RTP

Odessa Limited has proposed to expand its operations for which it requires funds of $ 15 million, net of issue expenses which amount to 2% of the issue size. It proposed to raise the funds though a GDR issue. It considers the following factors in pricing the issue:

(i) The expected domestic market price of the share is Rs.300
(ii) 3 shares underly each GDR
(iii) Underlying shares are priced at 10% discount to the market price
(iv) Expected exchange rate is Rs.60/$

You are required to compute the number of GDR's to be issued and cost of GDR to Odessa Limited, if 20% dividend is expected to be paid with a growth rate of 20%.

Solution :

Net Issue Size = $15 million

Gross Issue = $\frac{\$15 \text{ million}}{0.98}$ = $15.306 million

Issue Price per GDR in Rs. (300 x 3 x 90%) Rs.810

Issue Price per GDR in $ 810/60) $13.50

Dividend Per GDR (D1) = Rs.2* x 3 = Rs.6

* Assumed to be on based on Face Value of Rs.10 each share.

Net Proceeds Per GDR = Rs.810 x 0.98 = Rs.793.80

(a) Number of GDR to be issued

$\frac{\$15.306 \text{ million}}{\$13.50}$ = 1.1338 million

(b) Cost of GDR to Odessa Ltd.

$K_e = \frac{6.00}{793.80} + 0.20 =$ 20.76%

Question 9 :
May 2017 – Paper

A USA based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by the US parent at a transfer price of US $200 Lakhs. The unit will remain in existence in India for one year; the software is expected to get developed within this time frame.

The US based company will be subject to corporate tax of 30% and a withholding tax of 10% in India and will not be eligible for tax credit in the US. The software developed will be sold in the US market for US $ 240 lakhs. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India	Rs.20,00,000
Man power cost (160 software professional will be working for 10 hours each day)	Rs.600 per man hour
Administrative and other costs	Rs.24,00,000

Advise the US Company on the financial viability of the project. The rupee-dollar rate is Rs.67/$. Assume 1 year = 360 days.

Solution :

Proforma profit and loss account of the Indian software development unit

	Rs.	Rs.
Revenue		1,34,00,00,000
Less: Costs:		
Rent	20,00,000	
Manpower (Rs.600 x 160 x 10 x 360)	34,56,00,000	
Administrative and other costs	24,00,000	35,00,00,000
Earnings before tax		99,00,00,000
Less: Tax		29,70,00,000
Earnings after tax		69,30,00,000
Less: Withholding tax(TDS)		6,93,00,000
Repatriation amount (in rupees)		62,37,00,000
Repatriation amount (in dollars)		$93.09 lakhs

Advice:

The cost of development software in India for the US based company is $106.86 lakhs or $ 10.686 million. As the USA based Company is expected to sell the software in the US at $240 lakhs, it is advised to develop the software in India.

Question 10 :
May 2018 (New) – RTP

A foreign based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by the foreign parent company at a transfer price of US $10 millions. The unit will remain in existence in India for one year; the software is expected to get developed within this time frame.

The foreign based company will be subject to corporate tax of 30 per cent and a withholding tax of 10 per cent in India and will not be eligible for tax credit in the US. The software developed will be sold in the US market for US $ 12.0 millions. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India - Rs.20,00,000

Man power cost (80 software professional will be working for 10 hours each day)

= Rs.540 per man hour

Administrative and other costs - Rs.16,20,000

Advise the Foreign Company on the financial viability of the project. The rupee-dollar rate is Rs.65/$.

Assume: 365 days in a year

Solution :

Proforma profit and loss account of the Indian software development unit

Particulars	Rs.	
Revenue		65,00,00,000
Less: costs		
Rent	20,00,000	
Manpower(Rs.500×80×10×365)	15,76,80,000	
Administrative and other cost	16,20,000	16,13,00,000
Earning before tax		48,87,00,000
Less: Tax		14,66,10,000
Earning after Tax		34,20,90,000
Less: withholding TDS		3,42,09,000
Repatriation amount in Rs.		30,78,81,000
Repatriation amount in dollars		$4.7366 million

Advise : The cost of development software in India for the US based company is $5.3 million. As the foreign based Company is expected to sell the software in the US at $12.0 million, it is advised to develop the software in India.

Question 11 :
May 2018 (New) – Paper / May 2020 (Old)

Omega Ltd. is interested in expanding its operation and planning to install manufacturing plant at US. For the proposed project, it requires a fund of $10 million (net of issue expenses or floatation cost). The estimated floatation cost is 2%. To finance this project, it proposes to issue GDRs.

As a financial consultant, you are requested to compute the number of GDRs to be issued and cost of the GDR with the help of following additional information:

(i) Expected market price of share at the time of issue of GDR is Rs.250 (Face Value being Rs.100)

(ii) 2 shares shall underlay each GDR and shall be priced at 4% discount to market price.

(iii) Expected exchange rate Rs.64/$

(iv) Dividend expected to be paid is 15% with growth rate 12%.

Solution :

Net Issue = $10 Million

Gross Issue = $\frac{10}{0.98}$ = $10.204 Million

Issue Price per GDR in Rs.

= 250 × 2 × 96%

= Rs.480

Issue Price per GDR in $

= $\frac{480}{64}$ = $7.5

Dividend per GDR

= 15 × 2 = Rs.30

Net Proceeds per GDR

= 480 × 0.98

= Rs.470.4

1. No. of GDR = $\frac{10.204}{7.5}$ = 1.3605 Million

2. Cost of GDR = $\frac{30}{470.4}$ + 0.12 = 18.38%

Question 12 :
May 2019 (New) – RTP / May 2019 (Old) – RTP

The directors of Implant Inc. wishes to make an equity issue to finance a $10 m (million) expansion scheme which has an excepted Net Present Value of $2.2m and to re-finance an existing $6 m 15% Bonds due for maturity in 5 years time. For early redemption of these bonds there is a $3,50,000 penalty charges. The Co. has also obtained approval to suspend these pre-emptive rights and make a $15 m placement of shares which will be at a price of $0.5 per share. The floatation cost of issue

will be 4% of Gross proceeds. Any surplus funds from issue will be invested in IDRs which is currently yielding 10% per year.

The Present capital structure of Co. is as under:

	'000
Ordinary Share ($1 per share)	7,000
Share Premium	10,500
Free Reserves	25,500
	43,000
15% Term Bonds	6,000
11% Debenture (2012-2020)	8,000
	57,000

Current share price is $2 per share and debenture price is $ 103 per debenture. Cost of capital of Co. is 10%. It may be further presumed that stock market is semi-strong form efficient and no information about the proposed use of funds from the issue has been made available to the public. You are required to calculate expected share price of company once full details of the placement and to which the finance is to be put, are announced.

Solution :

In semi-strong form of stock market, the share price should accurately reflect new relevant information when it is made publicly available including Implant Inc. expansion scheme and redemption of the term loan.

The existing Market Value $ 2 x 7,000,000		$ 14,000,000
The new investment has an expected NPV		$ 2,200,000
Proceeds of New Issue		$ 15,000,000
Issue Cost of		($ 600,000)
PV of Benefit of early redemption		
Interest of $ 900,000 ($,6,000,000 x 15 %)x 3.791	3,411,900	
PV of Repayment in 5 years $ 6,000,000 x 0.621	3,726,000	
	7,137,900	
Redemption Cost Now	(6,000,000)	
Penalty charges		787,900
Expected Total Market value		31,387,900
New No. of shares (30 Million + 7 Million)		37,00,000
Expected Share Price of Company		$ 0.848

Question 13 :
May 2020 (New) – RTP

XYZ Ltd., a company based in India, manufactures very high quality modem furniture and sells to a small number of retail outlets in India and Nepal. It is facing tough competition. Recent studies on marketability of products have clearly indicated that the customer is now more interested in variety and choice rather than exclusivity and exceptional quality. Since the cost of quality wood in India is very high, the company is reviewing the proposal for import of woods in bulk from Nepalese supplier.

The estimate of net Indian (Rs.) and Nepalese Currency (NC) cash flows in Nominal terms for this proposal is shown below:

Net Cash Flow (in millions)

Year	0	1	2	3
NC	–25.000	2.600	3.800	4.100
Indian (Rs.)	0	2.869	4.200	4.600

The following information is relevant:

(i) XYZ Ltd. evaluates all investments by using a discount rate of 9% p.a. All Nepalese customers are invoiced in NC. NC cash flows are converted to Indian (Rs.) at the forward rate and discounted at the Indian rate.

(ii) Inflation rates in Nepal and India are expected to be 9% and 8% p.a. respectively. The current exchange rate is Rs.1= NC 1.6

Assuming that you are the finance manager of XYZ Ltd., calculate the net present value (NPV) and modified internal rate of return (MIRR) of the proposal.

You may use following values with respect to discount factor for Rs.1 @ 9%.

	Present Value	Future Value
Year 1	0.917	1.188
Year 2	0.842	1.090
Year 3	0.772	1

Solution :

(i) Computation of Forward Rates

End of year	NC	NC/Rs.
1	NC1.60 x $\left(\frac{(1+0.09)}{1+0.08}\right)$	1.615
2	NC1.615 x $\left(\frac{(1+0.09)}{1+0.08}\right)$	1.630
3	NC1.630 x $\left(\frac{(1+0.09)}{1+0.08}\right)$	1.645

(ii) NC Cash Flows converted in Indian Rupees

Year	NC (Million)	Conversion Rate	Rs. (Million)
0	-25.00	1.600	–15.625
1	2.60	1.615	1.61
2	3.80	1.630	2.33
3	4.10	1.645	2.49

Net Present

Year	Cash Flow in India	Cash Flow in Nepal	Total	PVF @90%	PV
0	–	–15.625	–15.625	1.000	–15.625
1	2.869	1.61	4.479	0.917	4.107
2	4.200	2.33	6.53	0.842	5.498

3	4.600	2.49	7.09	0.772	5.473
					–0.547

Modified Internal Rate of Return

	Year			
	0	**1**	**2**	**3**
Cash Flow (Rs. Million)	–15.63	4.479	6.53	7.09
Year 1 Cash Flow reinvested for 2 years (1.188 x 4.479)				5.32
Year 2 Cash Flow reinvested for 1 years (1.090 x 6.53)				7.12
				19.53

$$\text{MIRR} = \sqrt[n]{\frac{\text{Terminal Cash Flow}}{\text{Initial Outlay}}} - 1 = \sqrt[3]{\frac{19.53}{15.625}} - 1 = 0.0772 \text{ say } 7.72\%$$

Question 14 :
Nov 2020 (New) – Paper

The management of multinational company TL limited is engaged in construction of infrastructure project. A proposal to construct a Toll Road in Nepal is under consideration of the management.

The following information is available:

The initial investment will be in purchase of equipment costing USD 250 lakhs. The economic life of the equipment is 10 years. The depreciation on the equipment will be charged on straight line method. EBITDA to be collected from toll road project is projected to be USD lakh per annum for the period of 20 years.

To encourage investment Nepalese government is offering 15% on loan of USD 150 lakhs for an interest rate of 6% for annum. The interest is to be paid annually. The loan will be repaid at the end of 15 year in one tranche.

The required rate of return for the project under all equity financing is 12% per annum.

Post tax cost of debt is 5.6% PA .

Tax rate is 30%.

All cash flows will be in USD.

Ignore inflation.

You are required to advise the management on the viability of the project by using adjusted present value method.

Solution :

(i) Net Present Value (All Equity Financed) – Base NPV

Particulars	Period	USD Lakhs	PVF @ 12%	PV (USD Lakhs)
Initial Investment	0	(250.00)	1.000	(250.00)
EBIDTA	1 to 20	33.00	7.469	246.477
Tax	1 to 20	(9.90)	7.469	(73.943)

Depreciation	1 to 10	(25.00)		
Tax Saving on Dep	1 to 10	7.50	5.650	42.375
NPV				(35.091)

(ii) Present Value of Impact of Financing by Debt

Particulars	Period	USD Lakhs	PVF @ 12%	PV (USD Lakhs)
Loan	0	150.00	1.000	150.000
Interest	1 to 15	(9.00)	8.559	(77.031)
Tax Saving on Interest	1 to 15	2.70	8559	23.109
Repayment of Principal	15	(150.00)	0.315	(47.250)
NPV				48.828

Adjusted Present Value of the Project
= Base NPV + PV of Impact of Financing
= - US$ 35.091 + US $ 48.828 lakh
= US$ 13.737 lakh

Advise: Since APV is positive, TL Ltd. should accept the project.

Alternatively, if instead of PV of overall impact of Financing the PV of impact of tax shield on Interest is considered then APV shall be computed as follows:
= Base NPV + PV of Tax Shield on Interest
= - US$ 35.091 + US $ 23.109 lakh
= - US$ 11.982 lakh

Advise: Since APV is negative, TL Ltd. should not accept the project.

Question 15 :
Jan 2021 (New) – Paper

A proposed foreign investment involves creation of a plant with an annual output of 1 million units. The entire production will be exported at a selling price of USD 10 per unit. At the current rate of exchange dollar cost of local production equal to USD 6 per unit. Dollar is expected to decline by 10% or 15%. The change in local cost of production and probability from the expected current level will be as follows :

Decline in value of USD (%)	Reduction in local cost of production (USD/unit)	Probability
0	–	0.4
10	0.30	0.4
15	0.15 Additional reduction	0.2

The plant at the current rate of exchange will have a depreciation of USD 1 million annually. Assume local Tax rate as 30%.

You are required to find out :

(i) Annual Cash Flow after Tax (CFAT) under all the different scenarios of exchange rate.

(ii) Expected value of CFAT assuming no repatriation of profits.

(iii) Viability of the investment proposal assuming an initial investment of USD 25 million on plant and working capital with a required rate of return of 11% on investment and on the basis of CFAT arrived under option (ii). The CFAT will grow @3% per annum in perpetuity.

Solution :

(i) Calculation of Annual CFAT

	Scenario 1	Scenario 2	Scenario 3
Annual Sales (in units) (A)	10,00,000	10,00,000	10,00,000
	US $	US $	US $
Selling price p.u.	10.00	10.00	10.00
Cost p.u.	6.00	5.70	5.55
Profit p.u. (B)	4.00	4.30	4.45
Total Profit (A x B)	40,00,000	43,00,000	44,50,000
Less: Depreciation	10,00,000	9,00,000	8,50,000
PBT	30,00,000	34,00,000	36,00,000
Less: Tax @30%	9,00,000	10,20,000	10,80,000
PAT	21,00,000	23,80,000	25,20,000
Add: Depreciation	10,00,000	9,00,000	8,50,000
Expected CFAT (US$)	31,00,000	32,80,000	33,70,000

(ii) Expected Value of CFAT

= US$ 31,00,000 x 0.4 + US$ 32,80,000 x 0.4 + US$ 33,70,000 x 0.2

= US$ 32,26,000

(iii) Viability of proposal:

Expected CFAT = US $ 32,26,000

Expected Growth Rate = 3%

Expected Value of inflow in perpetuity $= \frac{\text{US \$ } 32,26,000(1.03)}{0.11 - 0.03}$

$= \frac{33,22,780}{0.08}$ = US $ 4,15,34,750

	US $
Value of Inflows	4,15,34,750
Less: Initial Outlay	2,50,00,000
NPV of project	1,65,34,750

Since NPV is positive, project is viable.

Question 16 :
Jan 2021 (New) – Paper

X Ltd., an Indian company, is considering a proposal to make an investment of USD 1,65,00,000 in Latin America. The project will have a life of 5 years. The current spot exchange rate is INR/USD 72. All investments and revenues will occur in USD. The USD and INR risk free rates are 8% and 12% respectively. The following cash flow is expected form the project.

Year	Cash inflow (USD)
1	30,00,000
2	37,50,000
3	45,00,000

4	60,00,000
5	75,00,000

Assume required rate of return on the project as 14%.

You are required to calculate :

(i) The viability of project using foreign currency approach.

(ii) What will be the impact if there is a withholding tax of 10% applicable on the project.

Solution :

(i) Viability of the Project

(1 + 0.12) (1 + Risk Premium) = (1 + 0.14)

Or, 1 + Risk Premium = 1.14/1.12 = 1.0179

Therefore, Risk adjusted dollar rate is = 1.0179 x 1.08 = 1.099 – 1 = 0.099

Calculation of NPV

Year	Cash flow (Million) US$	PV Factor at 9.9%	P.V.
1	3.00	0.910	2.730
2	3.75	0.828	3.105
3	4.50	0.753	3.389
4	6.00	0.686	4.116
5	7.50	0.624	4.680
			18.02
		Less: Investment	16.50
		NPV	1.52

Therefore, Rupee NPV of the project is = Rs. 72 x US$ 1.52 Million

= Rs. 109.44 Million

Project is viable as the NPV is positive.

(ii) If there is a withholding tax of 10%

Total PV of Cash Inflows	US$ 18.02 Million
Less: Withholding Tax @ 10%	US$ 1.802 Million
PV of Cash Inflow after Withholding Tax	US$ 16.218 Million
Less: Initial Investment	US$ 16.50 Million
NPV	(US$ 0.282 Million)

Therefore, Rupee NPV of the project is = Rs. 72 x (US$ 0.282 Million)

= - Rs. 20.304 Million

Thus, if there is a withholding tax of 10% then the project will not be viable.

Thanks ....

CHP - 9 INTEREST RATE RISK

Question 1 :
May 2010 Paper / May 2017 – RTP / Nov 2017 – RTP / May 2018 (New) – RTP

The following market data is available:

Spot USD/JPY 116.00

Deposit rates p.a.	**USD**	**JPY**
3 months	4.50%	0.25%
6 months	5.00%	0.25%

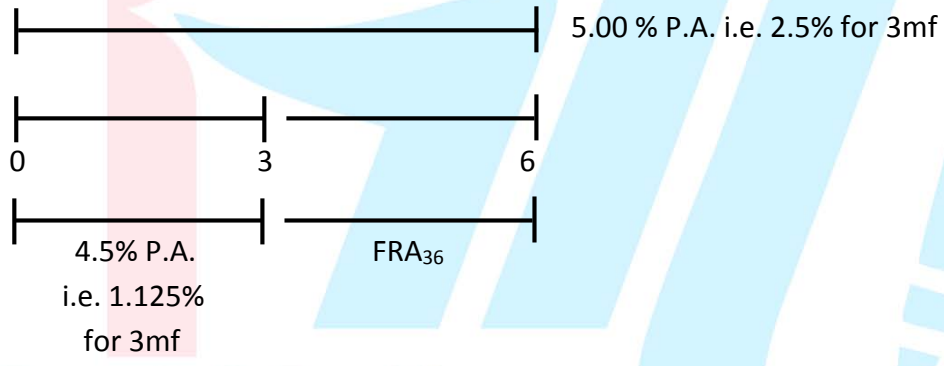
Forward Rate Agreement (FRA) for Yen is Nil.

1. What should be 3 months FRA rate at 3 months forward?
2. The 6 & 12 months LIBORS are 5% & 6.5% respectively. A bank is quoting 6/12 USD FRA at 6.50 – 6.75%. Is any arbitrage opportunity available?

Calculate profit in such case.

Solution :

1) 3 months FRA at 3 month forward = FRA_{36}



2) $\therefore FRA_{36} = \left(\frac{1.025}{1.0/125}\right) - 1 = 1.36\%$ for 3mfs i.e. 5.44% P.A.

Since FRA as quoted by Bank 6.5/6.75 does not match theoretical FRA, Arbitrage opportunity is available.

Path 1 : Borrow : $ 1000 Invest $ 1000

Amount payable = $ 1000 × 1.065 = 1065 $

Amount receivable = $ 1000 × 1.025 × 1.0325 (6.5/2) = 1.58.3125 $

Loss $ 6.6875

Path 2 : Invest / Borrow $ 1000

Invest amount receivable = 1000 × 1.065 = $ 1065

Amount pay = 1000 × 1.025 × 10.3375 (6.75/2) = $1059.59

Profit $ 5.41

Question 2 :
Nov 2010 – RTP

TMC Corporation entered into €3.5 million notional principal interest rate swap agreement. As per the agreement TMC is to pay a fixed rate and to receive a floating rate of LIBOR.

The Payment will be made at the interval of 90 days for one year and it will be based on the adjustment factor 90/360. The term structure of LIBOR on the date of agreement is as follows:

Days	Rate (%)
90	7.00
180	7.25
270	7.45
360	7.55

You are required to calculate fixed rate on the swap and first net payment on the swap.

Solution :

(i)

Term	Rate P.A.	Periodic Rate	PV of Rs.100
90	7.00	1.75	98.28
180	7.25	3.625	96.50
270	7.45	5.5875	94.71
360	7.55	7.55	92.98
			382.47

(ii) Fixed Rate (Using IRR)

Period	CF	PV @ 1.75% i.e. 7.00% P.A.	PV @ 1.875% i.e. 7.55% P.A.
90	100	98.28	98.15
180	100	96.59	96.33
270	100	94.93	94.54
360	100	93.30	92.79
		383.1	381.81
		– 382.47	– 382.47
		0.63	– 0.66

IRR $= \text{LR} + \dfrac{NPV}{\sum NPV} \times \text{Diff. of Rate}$

$= 1.75 + \dfrac{0.63}{1.29} \times 0.1375 = 1.817$ for 3 months i.e. 7.27% P.A.

(iii) First Net Payment

Fixed Rate payment = € 35,00,000 × 7.27% × 90/360

= 63,613

Floating Rate Payment = € 35,00,000 × 75 × 90/360

= 61,250

∴ Fixed Rate Payment shall pay

= 63,613 – 61,250 = Rs.2,363/-

Question 3 :
Nov 2012 – RTP

TM Fincorp has bought a 6X9 Rs.100 crore Forward Rate Agreement (FRA) at 5.25%. On fixing date reference rate i.e. MIBOR turns out be as follows:

Period	Rate (%)
3 months	5.50
6 months	5.70
9 months	5.85

You are required to determine:

(a) Profit/Loss to TM Fincorp. in terms of basis points.

(b) The settlement amount.

(Assume 360 days in a year)

Solution :

(a) TM will make a profit of 25 basis points since a 6X9 FRA is a contract on 3-month interest rate in 6 months, which turns out to be 5.50% (higher than FRA price).

(b) The settlement amount After 3 months = 100 × 0.25% × 3/12 = 0.0625 Cr. i.e. 6,25,000

Question 4 :
May 2013 – Paper / Nov 2014 – RTP / Nov 2018 (New) – RTP / Nov 2019 (New) – Paper

M/s. Parker & Co. is contemplating to borrow an amount of Rs.60 crores for a period of 3 months in the coming 6 month's time from now. The current rate of interest is 9% p.a., but it may go up in 6 month's time. The company wants to hedge itself against the likely increase in interest rate.

The Company's Bankers quoted an FRA (Forward Rate Agreement) at 9.30% p.a. What will be the effect of FRA and actual rate of interest cost to the company, if the actual rate of interest after 6 months happens to be (i) 9.60% p.a. and (ii) 8.80% p.a.?

Solution :

If M/s. Parker & Co. enters into FRA his effective rate shall be rate at which FRA is entered i.e. 9.3%.

Actual Rate	**9.6%**	**8.8%**
Interest Payable		
60 × 9.6% × 3/12	1.44	–
60 × 8.8% × 3/12	–	1.32
FRA Exercised		
Amount Receivable		
60 × 0.3% × 3/12	(0.045)	–
Amount Payable		

60 × 0.5% × 3/12	–	0.075
Net Payable	**1.395**	**1.395**

Effective Rate = $\frac{1.395}{60} \times 100 \times \frac{12}{3}$ = 9.3%.

Question 5 :
Nov 2020 (New) – RTP

Two companies ABC Ltd. and XYZ Ltd. approach the DEF Bank for FRA (Forward Rate Agreement). They want to borrow a sum of Rs.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%

Solution :

(i) FRA 2 × 3 (Rate After 2 years for 1 year)

$$= \frac{\text{Larger Period}}{\text{Smaller Period}}$$

For XYZ = $\left[\frac{(1.0448)^3}{(1.042)^2}\right]^{1/1} - 1 = 5.04\%$

For ABC = $\left[\frac{(1.0578)^3}{(1.0548)^2}\right]^{1/1} - 1 = 6.38\%$

(ii)

	4.5%	5.5%
Interest Payable	= 100 × 4.5% × 12/12	100 × 5.5% ×12/12
	= 4.5 Cr. Payable	5.5 Cr. Payable
FRA	= 100 × (5.04 – 4.5%) × 12/12	= 100 × (5.5 – 5.04%) × 12/12
	= 0.54 Cr. Payable	= 0.46 Rec

Premium	= 100 × 0.1% = 0.1 Payable	= 100 × 0.11 = 0.1 Payable
Total payable	5.14% ↓ i.e. $\frac{5.14}{100} \times 100 = 5.14\%$	= 5.14% ↓ i.e. $\frac{5.14}{100} \times 100 = 5.14\%$

Question 6 :
May 2021 (New) – RTP

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.

Solution :

(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.

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

$= \frac{£25,000,000}{£50,000} \times \frac{6}{3} = 1000$ 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)	95.50 (100 - 6.5)

Loss/ (Gain) Cash Payment (Receipt) for Future Settlement Interest for 6 months on £50 million at actual rates	1.35% £ 50,000×1000× 1.35%×3/12 = £1,68,750 £ 25 million × 4.5% × ½ = £ 5,62,500	-0.65% £ 50,000×1000×0.65%×3/12 = (£81,250) £ 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%.

Thanks ....

CHP - 10 DERIVATIVES - FUTURE

Question 1 :
Nov 2008 – RTP

The 6-months forward price of a security is Rs.200. The borrowing rate is 8% per annum payable with monthly rests. What should be the spot price?

Solution :

According to COC Model

F = S + NCC	- NCC Includes
200 = S + Interest	- Interest
Interest = 8% p.a. payable	- Storage cost
On monthly rest	- Monetary benefit
i.e. 8/12 = 0.67 % p.m.	- Conveyance yield

$$\therefore S = \frac{200}{(1.0067)^6}$$

$\therefore$ S = Rs.192.18

Question 2 :
May 2009 - Paper – 4 Marks / Nov 2017 – RTP

The share of X Ltd. is currently selling for Rs.300. Risk free interest rate is 0.8% per month. A three months futures contract is selling for Rs.312. Develop an arbitrage strategy and show what your riskless profit will be 3 month hence assuming that X Ltd. will not pay any dividend in the next three months.

Solution :

Step 1 : F = S + NCC
= 300 × $(1.008)^3$ = 307.26

Step 2 : Since Actual F(312) > theoretical F(307.26) the strategy should be cash and carry i.e. (S^+, F^- and borrow)

Step 3 : Profit will be difference between actual F and theoretical F
i.e. 312 – 307.26 = Rs.4.74 per future

Step 4 : Assuming at 7(After 3months) S = F = 200 or 400

		S = F = 200	S = F = 400
1)	S^+ @ 300	(100) Loss	100
		(300 – 200)	(400 – 300)
2)	F^- @ 312	112 profit	(88)
		(312 – 200)	(400 – 312)
3)	Interest	(7.26)	7.26

		$[300 \times (1008)^3] - 300$	
	Profit	4.74	4.74

Question 3 :
May 2011 – RTP

The following information is available about standard gold.

Spot Price (SP)	Rs.15,600 per 10 gms.
Future Price (FP)	Rs.17,100 for one year future contract
Risk free interest Rate (Rf)	8.5%
Present Value of Storage Cost	Rs.900 per year

From the above information you are requested to calculate the Present Value of Convenience yield (PVC) of the standard gold.

Solution :

According to Cost of Carry model

PV of F = S + PV of Storage Cost – PV of Convenience Yield

$$\frac{17100}{(1.0085)^1} = 15{,}600 + 900 - \text{PV of Convenience Yield}$$

PV of Convenience Yield = Rs.740

Question 4 :
May 2011 – RTP

ABC Technologic is expecting to receive a sum of US$400000 after 3 months. The company decided to go for future contract to hedge against the risk. The standard size of future contract available in the market is $1000. As on date spot and futures $ contract are quoting at Rs.44.00 & Rs.45.00 respectively. Suppose after 3 months the company closes out its position futures are quoting at Rs.44.50 and spot rate is also quoting at Rs.44.50. You are required to calculate effective realization for the company while selling the receivable. Also calculate how company has been benefitted by using the future option.

Solution :

Step 1 : FC Receivable

Strategy = Sell FC i.e. F– @ 45

Step 2 : No. of lots

$$= \frac{4{,}00{,}000\$}{1{,}000\$} = 40 \text{ lots}$$

Step 3 : Final Settlement

1) Settle futures = gain = (45 – 44.5) = 0.5 Rs./$

2) Settle exposure = spot Rs./$ 44.5

3) Net receivable = 44.5 + 0.5 = Rs./$ 45

Amount Receivable

= 4,00,000 × 45 = Rs.1,80,00,000

Question 5 :
May 2011 – Paper / Nov 2013 – RTP

A Mutual Fund is holding the following assets in Rs.Crores :

Investments in diversified equity shares	90.00
Cash and Bank Balances	10.00
	100.00

The Beta of the portfolio is 1.1. The index future is selling at 4300 level. The Fund Manager apprehends that the index will fall at the most by 10%. How many index futures he should short for perfect hedging ? One index future consists of 50 units. Substantiate your answer assuming the Fund Manager's apprehension will materialize.

Solution :

No. of lots = $\frac{V_p \times (\beta_t - \beta_p)}{F \times M \times \beta f}$

V_P = Value of portfolio

βt = target Beta

βp = Beta of portfolio

F = Future selling price

M = Contract size

βf = Beta of futures

= $\frac{90,00,00,000 \times (1.1 - Nil)}{4300 \times 50 \times 1}$ = 4,605 lots

Justification – f market falls by 10%

1) Loss in equity

90,00,00,000 × 10% = 9 Cr.

2) Gain in equity

= 4,300 × 10% × 50 × 4,605 = 9 Cr.

∴ Portfolio is perfectly hedge.

Question 6 :
Nov 2011 – RTP / May 2020 (Old) – RTP

Zaz plc, a UK Company is in the process of negotiating an order amounting €2.8 million with a large German retailer on 6 month's credit. If successful, this will be first time for Zaz has exported goods into the highly competitive German Market. The Zaz is considering following 3 alternatives for managing the transaction risk before the order is finalized.

(a) Mr. Peter the Marketing head has suggested that in order to remove transaction risk completely Zaz should invoice the German firm in Sterling using the current €/£ spot rate to calculate the invoice amount.

(b) Mr. Wilson, CE is doubtful about Mr. Peter's proposal and suggested an alternative of invoicing the German firm in € and using a forward exchange contract to hedge the transaction risk.

(c) Ms. Karen, CFO is agreed with the proposal of Mr. Wilson to invoice the German first in €, but she is of opinion that Zaz should use sufficient 6 month sterling further contracts (to the nearest whole number) to hedge the transaction risk.

Following data is available

Sport Rate	€ 1.1960 - €1.1970/£
6 months forward swap	0.60 - 0.55 Euro Cents.
6 month further contract is currently trading at	€ 1.1943/£
6 month future contract size is	£62,500
Spot rate and 6 month future rate	€ 1.1873/£

You are required to

(i) Calculate (to the nearest £) the £ receipt for Zaz plc, under each of 3 above proposals.

(ii) In your opinion which alternative you consider to be most appropriate.

Solution :

(i) Receipt under three proposals

(a) Proposal of Mr. Peter

Invoicing in £ will produce = $\frac{€\ 2.8}{1.1970}$ = £2.339 million

(b) Proposal of Mr. Wilson

Forward Rate = €1.1970-0.0055 = 1.1915

Using Forward Hedge = $\frac{€\ 2.8}{1.1915}$ = £2.35 million

(c) Proposal of Ms. Karen

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

= $\frac{€\ 2.8}{1.1943}$ = £2,344,470 million

Number of Contracts = $\frac{2,344,470}{62,500}$ = 37 Contracts (Approximately)

Thus, € amount hedged by future contract will be

= 37 Rs.£62,500 = £23,12,500

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

Total loss on Future Contracts = 37 Rs.£62,500 Rs.€0.0070 = €16,188

After 6 months

Amount Received	€ 28,00,000
Less: Loss on Future Contracts	€ 16,188
	€ 27,83,812

Sterling Receipts

On sale of € at spot = $\frac{€\ 27,83,312}{1,1873}$ = £ 2.3446 million

(ii) Zaz plc should go ahead with option 2, as suggested by Mr Wilson

Question 7 :
Nov 2011 – Paper / Nov 2015 – RTP / May 2020 (New) – RTP

Nitrogen Ltd, a UK company is in the process of negotiating an order amounting to €4 million with a large German retailer on 6 months credit. If successful, this will be the first time that Nitrogen Ltd has exported goods into the highly competitive German market. The following three alternatives are being considered for managing the transaction risk before the order is finalized.

(i) Invoice the German firm in Sterling using the current exchange rate to calculate the invoice amount.

(ii) Alternative of invoicing the German firm in € and using a forward foreign exchange contract to hedge the transaction risk.

(iii) Invoice the German first in € and use sufficient 6 months sterling future contracts (to the nearly whole number) to hedge the transaction risk.

Following data is available:

Spot Rate	€ 1.1750 - €1.1770/£
6 months forward swap	0.60 - 0.55 Euro Cents
6 months further contract is currently trading at	€1.1760/£
6 months future contract size is	£62500
Spot rate and 6 months future rate	€1.1785/£

Required:

(a) Calculate to the nearest £ the receipt for Nitrogen Ltd, under each of the three proposals.

(b) In your opinion, which alternative would you consider to be the most appropriate and the reason thereof.

Solution :

(i) Receipt under three proposals

(a) Invoicing in Sterling Invoicing in £ will produce

$= \frac{€\ 4\ \text{million}}{1.1770}$ = £3398471

(b) Use of Forward Contract

Forward Rate = €1.1770 – 0.0055 = 1.1715

Using Forward Market hedge Sterling receipt would be

$= \frac{€4\text{million}}{1.1715}$ = £ 3414426

(c) Use of Future Contract

The equivalent sterling of the order placed based on future price (€1.1760)

$= \frac{€\ 4\ \text{million}}{1.1760}$ £ 3401360

Number of Contracts = $\frac{£\ 3401360}{62,500}$ = 54 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 54·£62,500 = £3375000

Buy Future at	€1.1760
Sell Future at	€1.1785
	€0.0025

Total profit on Future Contracts = 54 x £ 62,500 x €0.0025 = €8438

After 6 months

Amount Received	€ 4000000
Add: Profit on Future Contracts	€ 8438
	€ 4008438

Sterling Receipts

On sale of € at spot = $\frac{4008438}{1.1785}$ = €3401305

(ii) Proposal of option (c) is preferable because the option (a) & (b) produces least receipts.

Question 8 :
May 2012 – RTP / May 2012 – Paper / Nov 2014 – RTP

On 31-7-2011, the value of stock index is Rs.2,600. The risk free rate of return is 9% p.a.
The dividend yield on this stock index is as follows:

Month	Dividend Paid
January	2%
February	5%
March	2%
April	2%
May	5%
June	2%
July	2%
August	5%
September	2%
October	2%
November	5%
December	2%

Assuming that interest is continuously compounded daily, then what will be future price of contract deliverable on 31-12-2011.
Given = e0.02417 = 1.02446.

Solution :

The duration of future contract is 5 months. The average yield during this period will be :

$\frac{5\% + 2\% + 2\% + 5\% + 2\%}{5}$ = 3.2%

As per Cost to Carry model the future price will be

F = Se (rf - D)t

Where S = Spot Price

rf = Risk Free interest

D = Dividend Yield

t = Time Period

Accordingly, future price will be

Rs.2,600 e(0.09- 0.032)×5 /12

= Rs.2,600 e0.02417

= Rs.2,600 x 1.02446

= Rs.2663.60

Question 9 :

May 2012 Paper / May 2013 – RTP / Nov 2013 – RTP / May 2017 – RTP

A company is long on 10 MT of copper @ Rs.474 per kg (spot) and intends to remain so for the ensuing quarter. The standard deviation of changes of its spot and future prices are 4% and 6% respectively, having correlation coefficient of 0.75. What is its hedge ratio? What is the amount of the copper future it should short to achieve a perfect hedge?

Solution :

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

$$H = r \times \frac{\sigma S}{\sigma F}$$

Where

σS = Standard deviation of ΔS

σF =Standard deviation of ΔF

ρ = coefficient of correlation between ΔS and ΔF

H = Hedge Ratio

ΔS = change in Spot price.

ΔF = change in Future price.

Accordingly

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

No. of contract to be short = 10 x 0.5 = 5

Amount = 5000 x Rs.474 = Rs.23,70,000

Question 10 :

Nov 2012 – RTP

Suppose that there is a future contract on a share presently trading at Rs.1000. The life of future contract is 90 days and during this time the company will pay dividends of Rs.7.50 in 30 days, Rs.8.50 in 60 days and Rs.9.00 in 90 days.

Assuming that the Compounded Continuously Risk free Rate of Interest (CCRRI) is 12% p.a.

you are required to find out:

(a) Fair Value of the contract if no arbitrage opportunity exists.

(b) Value of Cost to Carry.
[Given e-0.01 = 0.9905, e-0.02 = 0.9802, e-0.03 = 0.97045 and e0.03 = 1.03045]

Solution :

(a) First of all we shall calculate the Dividend Proceed which is as follows:
= Rs.7.50e-0.12X30/360 + Rs.8.50e-0.12X60/360+Rs.9.00e-0.12X90/360
= Rs.7.50e-0.01 + Rs.8.50e-0.02+ Rs.9.00e-0.03
= Rs.7.50×0.9905+ Rs.8.50×0.9802+ Rs.9.00X0.97045
= Rs.7.43+ Rs.8.33+ Rs.8.73
= Rs.24.49
Fair Value of Future Contract = Rs.1000 e0.12X90/360 – Dividend Proceeds
= Rs.1000 × 1.03045 – Rs.24.49 = Rs.1005.96

(b) Since Value of Future Contract = Spot Price + Cost to Carry
Rs.1005.96 = Rs.1000 +Cost to Carry
Cost to Carry = Rs.5.96

Question 11 :
May 2013 - RTP

A wheat trader has planned to sell 440000 kgs of wheat after 6 months from now. The spot price of wheat is Rs.19 per kg and 6 months future on same is trading at Rs.18.50 per kg (Contract Size= 2000 kg). The price is expected to fall to as low as Rs.17.00 per kg 6 month hence. What trader can do to mitigate its risk of reduced profit? If he decides to make use of future market what would be effective realized price for its sale when after 6 months is spot price is Rs.17.50 per kg and future contract price for 6 months is Rs.17.55.

Solution :

In order to hedge its position trader would go short on future at current future price of Rs.18.50 per kg. This will help the trader to realize sure Rs.18.50 after 6 months.

Quantity of wheat to be hedged	440000 kgs
Contract Size	2000 kgs
No. of Contracts to be sold	220
Future Price	Rs.18.50
Exposure in Future Market (Rs.18.50×220×2000)	Rs.81,40,000

After 6 months the trader would cancel its position in future market by buying a future contract of same quantity and will sell wheat in spot market and position shall be as follows.

Price of Future Contract	Rs.17.55
Amount bought	Rs.77,22,000
Gain/Loss on Future position	Rs.4,18,000
Spot Price	Rs.17.50
Amount realized by selling in spot market	Rs.77,00,000
Effective Selling Amount	Rs.81,18,000

Effective Selling Price (Per Kg) Rs.18.45

Question 12 :
Nov 2013 – RTP / Nov 2014 – RTP / Nov 2015 – RTP / May 2016 – RTP / May 2019 (Old) – RTP

BSE	5000
Value of portfolio	Rs.10,10,000
Risk free interest rate	9% p.a.
Dividend yield on Index	6% p.a.
Beta of portfolio	1.5

We assume that a future contract on the BSE index with four months maturity is used to hedge the value of portfolio over next three months. One future contract is for delivery of 50 times the index. Based on the above information calculate:

(i) Price of future contract.

(ii) The gain on short futures position if index turns out to be 4,500 in three months.

(iii) Value of Portfolio using CAPM

Solution :

(i) BSE = 5,000

Rf = 9% P.A. i.e. 3% for 4 months

Dy = 6% P.A. i.e. 2% for 4 months

F = (S + Interest – Dividend yield) × lot size

= [5,000 × 1.01 (3 – 2%)] × 50

= Rs.2.52.500

(ii) Hedge Ratio = $\frac{10,10,000}{2,52,500}$ x 1.5 = 6 contracts

Index after three months turns out to be 4500

Future price will be = 4500 + 4500 (0.09 – 0.06) x $\frac{1}{12}$

= 4,511.25

Therefore, Gain from the short futures position is = 6 x (5050 – 4511.25) x 50

= Rs.1,61,625

(iii) To use CAPM we require risk-free rate of return, beta of portfolio and Market Return. Since risk-free rate of return and beta of portfolio is given first we shall calculate market return as follows:

Change in Index Value = 4500-5000 = -500

Return from Index = $\frac{-500}{5000}$ x 100 = -10% for 3 months

Dividend yield on index p.a. = 6% and for 3 months shall be 1.5%.

Thus return to investor for investment in index for three months= -10%+1.5% = -8.5%

Now we can use CAPM to compute expected return for 3 months:

Expected Return = Rf +β (Rm – Rf)

= 2.25% + 1.50(- 8.5 - 2.25%)

= 2.25% + 1.50 (-10.75%)

= – 13.875%

The expected value of portfolio (without hedging) after 3 months will be:

Rs.10,10,000 [1+(-0.13875)]

= Rs.8,69,862.25

The expected value of portfolio with hedging after 3 months will be:

= Expected Value of portfolio (without hedging) + Gain from the future Index

= Rs.8,69,862.25 + Rs.1,61,625 = Rs.10,31,487.25

Question 13 :
Nov 2013 – Paper / Nov 2018 (New) – RTP

Ram buys 10,000 shares of X Ltd. at a price of Rs.22 per share whose beta value is 1.5 and sells 5,000 shares of A Ltd. at a price of Rs.40 per share having a beta value of 2. He obtains a complete hedge by Nifty futures at Rs.1,000 each. He closes out his position at the closing price of the next day when the share of X Ltd. dropped by 2%, share of A Ltd. appreciated by 3% and Nifty futures dropped by 1.5%. What is the overall profit/loss to Ram?

Solution :

1) Opening Position

Long as X	= 10,000 × 22 × 1.5	= 3,30,000
Long as A	= 5,000 × 40 × 2	= 4,00,000
Net Short		70,000

To hedge Ram should go long or futures

No. of lots = $\frac{70,000}{1,000}$ = 70 lots

2) Gain/Loss

On X = Loss of 10,000 × (22 × 2%)	=	4,400
On Y = Loss of 5,000 × (40 × 3%)	=	6,000
On Nifty = Loss of 70 × (1,000 × 1.5%)	=	1,050
Total Loss		11,450

Question 14 :
May 2014 – RTP / May 2018 (New) – TP / Nov 2019 (Old) – RTP

Electraspace 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 €50 million for the entire period of slack season in about 3 months.

A Bank has given the following quotations:

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 (5.85%).

You are required to determine:

(a) How a FRA, shall be useful if the actual interest rate after 6 months turnout to be:

(i) 4.5% (ii) 6.5%

(b) How 3 moths Future contract shall be useful for company if interest rate turns out as mentioned in part (a) above.

Solution :

(a) By entering into an FRA firm shall effectively lock interest rate. Electraspace wants to borrow for 6 months in 3 months time. Therefore he must entry $FRA_{3\times9}$ 5.64/5.94. The borrowing rate shall be 5.94%.

	Actual Rate	**4.5%**	**6.5%**
(1)	Interest paid		
	50 × 4.5% × 6/12	1.125	–
	50 × 6.5% × 6/12	–	1.625
(2)	FRA		
	Payable (5.94 – 4.5%) × 50 × 6/12	0.36	–
	Receivable (6.5 – 5.94) × 50 × 6/12	–	0.14
	Net Payable	**1.485**	**1.485**

Effective rate = $\frac{1.485}{50} \times 100 \times \frac{12}{6}$ = 5.94%

(b) If the given entity is the borrower it will have to offset interest cost by profit on future contract.

If interest rate rise it will lead to greater outflow so to offset entity will sell futures.

No. of lots $= \frac{€5,00,00,000}{50,000} \times \frac{6\,(\text{Duration of loan})}{3\,(\text{Future Duration})}$

= 2,000 contracts

Actual Rate	**4.5%**	**6.5%**
Future	i.e. (100 – 4.5 = 95.5)	i.e. (100 – 6.5 = 93.50)
Sell	94.15	94.15
Buy	95.5	93.5
Gain (Loss)	(1.35)	0.65
Interest Payment		

50 × 4.5 × 6/12	1.125	–
50 × 6.5 × 6/12	–	1.625
Future		
Outflow 50,000 × 2,000 × 1.35% × 3/12	0.3375	–
Inflow 50,000 × 2,000 × 0.65 × 3/12	–	0.1625
Net	**1.4625**	**1.4625**

Question 15 :
May 2014 – RTP / May 2015 – Paper / May 2019 (New) – RTP / May 2019 (Old) – Paper

XYZ Ltd. is an export oriented business house based in Mumbai. The Company invoices in customers' currency. Its receipt of US $ 1,00,000 is due on September 1, 2009.

Market information as at June 1, 2009 is:

Exchange Rates	**Currency Futures**	
US $/ Rs.	**US $/**Rs.	Contract size Rs4,72,000
Spot 0.02140	June 0.02126	
1 Month Forward 0.02136	September 0.02118	
3 Months Forward 0.02127		

	Initial Margin	**Interest Rates in India**
June	Rs.10,000	7.50%
September	Rs.15,000	8.00%

On September 1, 2009 the spot rate US $/ Rs.is 0.02133 and currency future rate is 0.02134. Comment which of the following methods would be most advantageous for XYZ Ltd.

(a) Using forward contract

(b) Using currency futures

(c) Not hedging currency risks.

It may be assumed that variation in margin would be settled on the maturity of the futures contract.

Solution :

XYZ Ltd has $ 1,00,000 receivables due on Sept 1, has 3 Alternatives

Alternative 1 : Using Forward Cover

Alternative 2 : Using Future Cover

Alternative 3 : No cover

A) Alternative 1 : Forward Cover – Sell FC Forward

Forward Rate : 0.02127

Amount Receivable = $\frac{1,00,000}{0.02127}$ = Rs.47,01,457

B) Alternative 2 : Future Contract

Step 1 :

Currency Exposure = $ 1,00,000 (Sell $ Futures or Buy Rs.Future)

Since Rs.Future is Available = The firm should buy Rs.Futures

Step 2 :

No of Contracts needed $= \frac{1,00,000/0.02118}{4,72,000}$ = 10 Contracts

Step 3 :

Initial margin payable is 10 x Rs.15,000 = Rs.1,50,000

Step 4 :

Final Settlement

A.	Settlement of Future contract	
	[(0.02134 – 0.02118) x 10 x 472000/-]/0.02133	35,406
B.	Settlement of Exposure	
	= US$1,00,000/0.02133	46,88,233
C.	Interest on Initial Margin	
	= 1,50,000 x 0.08 x 3/12	(3,000)
	Net Inflow	47,20,639

C) Alternative 3 : No cover

Settlement of Exposure

= US$1,00,000/0.02133 46,88,233

Decision : The most advantageous option would have been to hedge with futures.

Question 16 :

May 2015 – RTP

Mr. Careless was employed with ABC Portfolio Consultants. The work profile of Mr. Careless involves advising the clients about taking position in Future Market to obtain hedge in the position they are holding. Mr. ZZZ, their regular client purchased 100,000 shares of X Inc. at a price of $22 and sold 50,000 shares of A plc for $40 each having beta 2. Mr. Careless advised Mr. ZZZ to take short position in Index Future trading at $1,000 each contract.

Though Mr. Careless noted the name of A plc along with its beta value during discussion with Mr. ZZZ but forgot to record the beta value of X Inc.

On next day Mr. ZZZ closed out his position when:

- Share price of X Inc. dropped by 2%
- Share price of A plc appreciated by 3%
- Index Future dropped by 1.5%

Mr. ZZZ, informed Mr. Careless that he has made a loss of $114,500 due to the position taken. Since record of Mr. Careless was incomplete he approached you to help him to find the number of contract of Future contract he advised Mr. ZZZ to be short to obtain a complete hedge and beta value of X Inc. You are required to find these values.

Solution :

1) Opening Position

Long on X = 1,00,000 × 22 × x = 22,00,000 x

Shot on Y = 50,000 × 40 × 2 = 40,00,000

Net 22,00,000 x – 40,00,000

No. of lots = $\frac{22,00,000x - 40,00,000}{1,000}$

2) Closing position : loss of $ 1,14,500

On X = Loss of 1,00,000 × (22 × 2%)	=	44,000
On Y = Loss of 50,000 × (40 × 3%)	=	60,000
On future = Loss of x × (1,000 × 1.5%) (Balancing Figure)	=	10,500
		1,14,500

∴No. of lots =

x × (1,000 × 1.5%) = 10,500

∴x = 700 (short)

∴β of x = $\frac{22,00,000x - 40,00,000}{1,000}$ = –700

∴x = 1.5

Question 17 :
May 2015 – RTP

Mr. X, is a Senior Portfolio Manager at ABC Asset Management Company. He expects to purchase a portfolio of shares in 90 days. However he is worried about the expected price increase in shares in coming day and to hedge against this potential price increase he decides to take a position on a 90-day forward contract on the Index. The index is currently trading at 2290. Assuming that the continuously compounded dividend yield is 1.75% and risk free rate of interest is 4.16%, you are required to determine:

(a) Calculate the justified forward price on this contract.

(b) Suppose after 28 days of the purchase of the contract the index value stands at 2450 then determine gain/ loss on the above long position.

(c) If at expiration of 90 days the Index Value is 2470 then what will be gain on long position.

Note: Take 365 days in a year and value of e0.005942 = 1.005960, e0.001849 = 1.001851.

Solution :

(a) The Forward Price shall be = S0en(r – y)

Where

S 0 = Spot price

n = period

r = risk free rate of interest

y = dividend yield

Accordingly, Forward Price = 2290 e90/365(0.0416 – 0.0175)

= 2290 e0.005942

= 2290(1.005960)

= 2303.65

(b) Gain/loss on Long Position after 28 days

= 2450 – 2290 e28/365(0.0416 – 0.0175)

= 2450 – 2290 e0.001849

= 2450 – 2290(1.001851)

= 2450 – 2294.24

= 155.76

(c) Gain/loss on Long Position at maturity

= Sn – S0en(r – y)

= 2470.00 – 2303.65

= 166.35

Question 18 :

May 2015 – RTP / Nov 2019 – RTP / New 2019 (New) – RTP

Sensex futures are traded at a multiple of 50. Consider the following quotations of Sensex futures in the 10 trading days during February, 2014:

Day	High	Low	Closing
4-2-14	3306.4	3290.00	3296.50
5-2-14	3298.00	3262.50	3294.40
6-2-14	3256.20	3227.00	3230.40
7-2-14	3233.00	3201.50	3212.30
10-2-14	3281.50	3256.00	3267.50
11-2-14	3283.50	3260.00	3263.80
12-2-14	3315.00	3286.30	3292.00
14-2-14	3315.00	3257.10	3309.30
17-2-14	3278.00	3249.50	3257.80
18-2-14	3118.00	3091.40	3102.60

Abshishek bought one sensex futures contract on February, 04. The average daily absolute change in the value of contract is Rs.10,000 and standard deviation of these changes is Rs.2,000. The maintenance margin is 75% of initial margin.

You are required to determine the daily balances in the margin account and payment on margin calls, if any.

Solution :

Initial Margin = μ + 3σ

Where μ = Daily Absolute Change

σ = Standard Deviation

Accordingly

Initial Margin = Rs.10,000 + Rs.6,000

= Rs.16,000

Maintenance margin = Rs.16,000 x 0.75

= Rs.12,000

Statement of Movement of Future Rates

Date	Workings	Balance
4/2/14	Initial Deposit	16,000
5/2/14	50 x (3294.40 - 3296.50)= -105	- 105
		15,895
6/2/14	50 x (3230.40 - 3294.40)= -3200	-3200
		12,695
7/2/14	50 x (3212.30 - 3230.40)= -905	- 905
		11,790
	Add : Margin Call	4,120
		16,000
10/2/14	50x(3267.50 - 3212.30)= 2760	2,760
		18,760
11/2/14	50x(3263.80 - 3267.50)= -185	-185
		18,575
12/2/14	50x(3292 - 3263.80) =1410	1,410
		19,985
14/2/14	50x(3309.30 - 3292)=865	865
		20,850
17/2/14	50x(3257.80 - 3309.30)=-2575	-2,575
		18,275
18/2/14	50x(3102.60 - 3257.80)=-7760	-7760
		10,515
	Square off	-10,515
		Nil

Profit / Loss = 16000 + 4,120 – 10515 = 9,605 ---- Loss

Question 19 :
Nov 2015 – Paper

On April 1, 2015, an investor has a portfolio consisting of eight securities as shown below :

Security	Market Price	No of Shares	β Value
A	29.40	400	0.59
B	318.70	800	1.32
C	660.20	150	0.87
D	5.20	300	0.35
E	281.90	400	1.16
F	275.40	750	1.24
G	514.60	300	1.05
H	170.50	900	0.76

The cost of Capital is 20% P.A continuously compounded. The investor fears a fall in prices of the shares in the near future. Accordingly, he approaches you for the advice to protect the interest of his portfolio.

You can make use of the following information:

(i) The current Nifty Value is 8500

(ii) NIFTY Futures can be traded in units of 25 only.

(iii) Futures for May are currently quoted at 8700 and Futures for June are being quoted at 8550

You are required to calculate

(i) The Beta of his portfolio

(ii) The theoretical Value of the Futures contract for contracts expiring in May and June
Given ($e^{0.03}$ = 1.03045, $e^{0.04}$ = 1.04081, $e^{0.05}$ = 1.05127)

(iii) The number of NIFTY Contracts that he would have to sell if he desires to hedge until June in each of the following cases :
(a) His total Portfolio (b) 50% of his Portfolio (c) 120% of his Portfolio

Solution :

(i) Beta of the Portfolio

a	Market Price	No of Shares	Value	β Value	Value x β
A	29.40	400	11760	0.59	6938.40
B	318.70	800	254960	1.32	336547.20
C	660.20	150	99030	0.87	86156.10
D	5.20	300	1560	0.35	546.00
E	281.90	400	112760	1.16	130801.60
F	275.40	750	206550	1.24	256122.00
G	514.60	300	154380	1.05	162099.00
H	170.50	900	153450	0.76	116622.00
Total			994450		1095832.30

$$\text{Portfolio Beta} = \frac{1095832.30}{994450} = 1.102$$

(ii) Theoretical Value of Future Contract Expiring in May and June

F = Sert

FMay= 8500 x e0.20 x (2/12) = 8500 x e0.0333

e0.0333 shall be computed using Interpolation Formula as follows:

e0.03 = 1.03045

e0.04 = 1.04081

e0.01 = 0.01036

e0.0033 = 0.00342

e0.0067 = 0.00694

e0.0333 = 1.03045 + 0.00342 = 1.03387 or 1.04081 – 0.00694 = 1.03387

According the price of the May Contract

8500 X 1.03387 = Rs.8788

Price of the June Contract

FMay= 8500 x e0.20 x (3/12) = 8500 x e0.05= 8500 x 1.05127 = 8935.80

(iii) No. of NIFTY Contracts required to sell to hedge until June

$= \frac{\text{Value of Position to be Hedged}}{\text{Value of Future Contract}} \times \beta$

(A) Total portfolio = $\frac{994450}{8500 \times 25}$ x 1.102 = 5.157 say 6 contracts

(B) 50% of Portfolio = $\frac{994450 \times 0.5}{8500 \times 25}$ x 1.102 = 2.58 say 3 contracts

(C) 120% of Portfolio = $\frac{994450 \times 1.2}{8500 \times 25}$ x 1.102 = 6.19 say 7 contracts

Question 20 :

Nov 2016 – RTP / Nov 2017 – RTP / May 2020 (Old) – RTP

A trader is having in its portfolio shares worth Rs.85 lakhs at current price and cash Rs.15 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%.

Determine:

(i) Current portfolio beta

(ii) Portfolio beta after 3 months if the trader on current date goes for long position on Rs.100 lakhs Nifty futures.

Solution :

1) $\beta p = \frac{85}{100} \times 1.6 + \frac{15}{100} \times \text{Nil} = 1.36$

2) βp after 3 months

a) $\beta s = \frac{\text{Change in portfolio of Share}}{\text{Change in Market}}$

$1.6 = \frac{3.2}{\text{Change in Market}}$

$\therefore$ Change in market = $\frac{3.2}{1.6}$ = 2

b) After 3 months

i) Stock falls by 3.2% = 85 – 3.2% = 82.28

ii) Cash = 15 – loss on future

Loss on future = (100 × 2%) = 2

$\therefore$ Cash = 15 – 2 = 13

95.28

iii) Total loss = 100 – 95.28 = 4.72%

iv) $\beta p = \frac{4.72}{2} = 2.36$

Question 21 :
Nov 2016 – Paper / May 2021 (New) – RTP

Details about portfolio of shares of an investor is as below:

Shares	No. of shares (lakh)	Price per share	Beta
A Ltd.	3.00	Rs.500	1.40
B Ltd.	4.00	Rs.750	1.20
C Ltd.	2.00	Rs.250	1.60

The investor thinks that the risk of portfolio is very high and wants to reduce the portfolio beta to 0.91. He is considering two below mentioned alternative strategies:

(i) Dispose off a part of his existing portfolio to acquire risk free securities, or

(ii) Take appropriate position on Nifty Futures which are currently traded at Rs.8125 and each Nifty points is worth Rs.200.

You are required to determine:

(1) portfolio beta,

(2) the value of risk free securities to be acquired,

(3) the number of shares of each company to be disposed off,

(4) the number of Nifty contracts to be bought/sold; and

(5) the value of portfolio beta for 2% rise in Nifty.

Solution :

1) Portfolio Beta

Shares	No.	Price	Amount	β	Amount β
A	3	500	1,500	1.4	2,100
B	4	750	3,000	1.2	3,600
C	2	250	500	1.6	800
			5,000		6,500

$\beta p = \frac{6,500}{5,000} = 1.3$

2) The value of Rf to be acquired to reduce beta to 0.91.

Let the portion to be sold and Rf to be brought be x

$$\therefore \frac{6{,}500-(x\times 1.3)+(x\times 0)}{5{,}000+x-x} = 0.91$$

$\therefore$ x =1,500

i.e. Rf to be purchased and portion to be sold = 1,500

3) No. of shares to be disposed.

Note : Portfolio should be disposed off in same ratio as it was held.

Details	Portfolio	Sold	SP	Not to be sold
A	1,500	450	500	0.90
B	3,000	900	750	1.2
C	500	150	250	0.60
	5,000	1,500		

4) No. of lots to be brought / sold = $\frac{Vp\times(\beta t-\beta p)}{F\times M\times \beta f}$

$$= \frac{50{,}00{,}00{,}000\times(0.91-1.3)}{8{,}125\times 200\times 1} = 120 \text{ contracts}$$

5) Portfolio β for 2% rise Nifty

	Rs. lakh
Portfolio rises by 2 × 1.3 = 2.6%	
Current value of Portfolio	5,000
Value after rise (5,000 + 2.6%)	5,130
Loss on futures (8,125 × 2% × 200 × 120)	39
Value of portfolio after Nifty	5,091

$\therefore$ Rise in portfolio = $\frac{5{,}091-5{,}000\times 100}{5{,}000}$ = 1.82%

$\therefore$ βp = 1.82/2 = 0.91

Question 22 :
Nov 2016 – Paper / Nov 2017 – Paper / May 2021 (New) – RTP

LMN Ltd. is an export oriented business house based in Mumbai. The Company invoices in customer's currency. The receipt of US $ 6,00,000 is due on 1st September, 2016.

Market information as at 1st June 2016 is

Exchange Rates	US$/Rs.	Exchange Rates US$/Rs.		Contract Size
Spot	0.01471	Currency Futures		
1 Month Forward	0.01464	June	0.01456	Rs.30,00,000
3 Months Forward	0.01458	September	0.01449	
	Initial Margin (Rs.)	Interest Rates in India %		
June	12,000	8.00 p.a.		

September	16,000	8.50 p.a.

On 1st September, 2016, the spot rate US $/Rs.is 0.01461 and currency futures rate is US $/ Rs.0.01462.

It may be assumed that variation in Margin would be settled on the maturity of the futures contract. Which of the following methods would be most advantageous for LMN Ltd.:

(i) using Forward Contract,

(ii) using Currency Futures; and

(iii) not hedging Currency Risks

Show the calculations and comment.

Solution :

LMN Ltd. an Indian firm

- $ 6,00,000 Receivable
- After 3 months

Alt 1 : <u>Forward Cover</u>

3 months $ / Rs. 0.01458

Amount Receivable = $\frac{6,00,000}{0.01458}$ = Rs.4,11,52,26

Alt 2 : <u>Future Cover</u>

Step 1 : FC Receivable

Sell FC or Buy HC

Note : Since futures are available for Rs. i.e. Home currency we should Buy future

Step 2 : No. of lots = $\frac{6,00,000/0.01449}{30,00,000}$ = 13.80 i.e. 14 lots

Step 3 : Settlement

1) Settle the futures

Profit = 10.01462 – 0.01449) × 14 × 30,00,000

= $ 5,460

Convert $ 5,460 in Rs. spot on 30/9

i.e. $\frac{5,460}{0.01461}$ = rs.3,73,717

2) Settle the Exposure

= $\frac{\$6,00,000}{0.01461}$ = Rs.4,10,67,761 Receivable 3 months

3) Interest on margin

= 14 × 16,000 × 8.5% × 3/12 Rs.4,760

Net amount receivables of 1, 2, and 3

= Rs.4,14,36,718 Receivable after 3 months

Alt 3 : No hedge

Amount receivable = Rs.4,10,67,761 after 3 months

Decision : India co. should opt. for Future Cover.

Question 23 :
May 2017 – RTP

Miss K holds 10,000 shares of IBS Bank @ 2,738.70 when 1 month Index Future was trading @ 6,086 The share has a Beta (β) of 1.2. How many Index Futures should she short to perfectly hedge his position. A single Index Future is a lot of 50 indices.

Justify your result in the following cases:

(i) when the Index zooms by 1%

(ii) when the Index plummets by 2%.

Solution :

Value of Portfolio of Miss. K (Rs.2,738.70 x 10,000) Rs.2,73,87,000

Number of index future to be sold by Miss. K is: $\frac{1.2 \text{ x } 2738.70 \text{ x } 10000}{6.086 \text{ x } 50}$

= 108 contract

(i) Justification of the answer if index is zoomed by 1%:

Gain in the value of the portfolio Rs.2,73,87,000×1%×1.2

= Rs.3,28,644

Loss by short covering of index future is 0.01×6,086×50×108

= Rs.3,28,644

This justifies the result.

(ii) Justification of the answer if index is plummets by 2%:

Loss in the value of the portfolio Rs.2,73,87,000×2%×1.2

= Rs.6,57,288

Gain by short covering of index future is 0.02×6,086×50×108

= Rs.6,57,288

This justifies the result.

Question 24 :
May 2018 – RTP / Nov 2019 (Old) – RTP

Calculate the price of 3 months PQR futures, if PQR (FV Rs.10) quotes Rs.220 on NSE and the three months future price quotes at Rs.230 and the one month borrowing rate is given as 15 percent and the expected annual dividend yield is 25 percent per annum payable before expiry. Also examine arbitrage opportunities.

Solution :

1) According to Cos of carry Model

F = S + NCC

= S + Interest – Dividend Yield

= 220 + (220 × 15% × 3/12) – (220 × 25% × 3/12)

= 220 + 8.25 – 13.75

= 214.5

2) Arbitrage

Step 1 : Since Actual F(230) is greater than theoretical F(214.5) we should enter into cash and carry arbitrage.

i.e. S^+ @ 220, F^- @ 230 and borrow

Step 2 : Profit irrespective of price at maturity profit will difference of mis pricing

i.e. 230 – 214.5 = Rs.15.5

Step 3 : Assuming S = F = 200 or 400

		S = F = 200	S = F = 400
(1)	S^+ @ 220	(20)	180
(2)	F^- @ 230	30	(170)
(3)	Interest		
	(220 × 15% × 3/12)	(8.25)	(8.25)
(4)	Dividend		
	(220 × 25% × 3/12)	13.75	13.75
	Profit	15.5	15.5

Question 25 :
Nov 2018 – RTP / May 2021 - RTP

The following data relate to R Ltd.'s share price:

Current price per share Rs. 1,900

6 months future's price/share Rs. 2,050

Assuming it is possible to borrow money in the market for transactions in securities at 10% per annum,

(i) advise the justified theoretical price of a 6-months forward purchase; and

(ii) evaluate any arbitrage opportunity, if available.

Solution :

(i) The justified theoretical price of a 6 months forward contract as per cost to carry model is as follows:

Theoretical minimum price = Rs. 1,900 + (Rs. 1,900 x 10/100 x 6/12) = Rs. 1,995

(ii) Arbitrage Opportunity - Since current future price is Rs.2050, yes there is an opportunity for carrying arbitrage profit. The arbitrageur can borrow money @ 10 % for 6 months and buy the shares at Rs. 1,900. At the same time he can sell the shares in the futures market at Rs.

2,050. On the expiry date 6 months later, he could deliver the share and collect Rs. 2,050 pay off Rs. 1,995 and record a risk –less profit of Rs. 55 (Rs. 2,050 – Rs. 1,995).

Question 26 :
May 2019 (New) – Paper

A Rice Trader has planned to sell 22000 kg of Rice after 3 months from now. The spot price of the Rice is Rs.60 per kg and 3 months future on the same is trading at Rs.59 per kg. Size of the contract is 1000 kg. The price is expected to fall as low as Rs.56 per kg, 3 months hence. What the trader can do to mitigate its risk of reduced profit? If he decides to make use of future market, what would be the effective realized price for its sale when after 3 months, spot price is Rs.57 per kg and future contract price for 3 months is Rs.58 per kg?

Solution :

1) To hedge its position trader would go short in future market @ 59/kg i.e. F⁻ 59.
   (a) Quantity to be hedge 22,000 kg
   (b) Contract size 1,000 kg
   (c) No. of contract = 22,000/1,000 22 lots
2) After 3 months S = 57 / F = 58.

Note : After 3 months actually S = F. However as question provides above numbers. We shall solve it accordingly.

(a)	Price of future	Rs.58 kg.
(b)	Profit of future (59 – 58) = 1 × 1,000 × 22	Rs.22,000
(c)	Spot price	Rs.57 kg.
(d)	Amount received on sale (57 × 22,000)	Rs.12,54,000
(e)	Total amount received (b + d)	Rs.12,76,000
(f)	Effective selling price (12,76,000 / 22,000)	Rs.58 kg.

Question 27 :
May 2019 (Old) – Paper

On April 1, 2019, Kasi has a portfolio consisting of four securities as shown below:

Security	A	K	S	P
Market Price	Rs.48.5	Rs.332.68	Rs.13.99	Rs.292.82
No. of Shares	673	480	721	358
β Value	0.74	1.28	0.54	0.46

Cost of Capital is 16% p.a. compounded continuously. Kasi fears a fall in prices of shares in future. Accordingly, he approaches you for the advice to protect the interest of his Portfolio.

You can make use of the following information:

(i) The current NIFTY Value is 9380.

(ii) NIFTY Futures can be traded in units of 25 only.

(iii) Futures for September are currently quoted at 9540 and Futures for October are being quoted at 9820.

You are required to calculate:

The Beta of his Portfolio.

Theoretical Value of Futures for contracts expiring in September & October.

Given ($e^{0.067}$ = 1.0693, $e^{0.08}$ = 1.0833, $e^{0.093}$ = 1.0975)

The number of NIFTY Contract that he would have to sell, if he desires to hedge 150% of the Portfolio until October.

Solution :

(1) Beta of the Portfolio

Security	Market Price	No. of Shares	Value	β	Value × β
A	48.50	673	32,640.50	0.74	24,153.97
K	332.68	480	1,59,686.40	1.28	2,04,398.59
S	13.99	721	10,086.79	0.54	5,446.87
P	292.82	358	1,04,829.56	0.46	48,221.60
			3,07,243.25		2,82,221.03

Portfolio = $\frac{\text{Rs.2,82,221.03}}{\text{Rs.3,07,243.25}}$ = 0.9186 say 0.92

(2) Theoretical Value of Future Contract Expiring in September and October

$F = Se^{rt}$

$F_{Sep} = 9380 \times e^{0.16 \times (6/12)} = 9380 \times e^{0.08}$

According the price of the September Contract

9380 x 1.0833 = Rs.10,161.35

Price of the October Contract

$F_{Oct} = 9380 \times e^{0.16 \times (7/12)} = 9380 \times e^{0.093}$

= 9380 x 1.0975 = rs.10,294.55

(3) No. of Nifty Contract to be sold to hedge 150% of Portfolio

Value of Portfolio = Rs.3,07,243.25

150% of Portfolio = Rs.3,07,243.25 x 1.50 = Rs.4,60,864.88

No. of Contracts to Hedge = $\frac{\text{Rs.4,60,864.88}}{9820 \times 25} \times 0.92$ = 1.73 contracts say 2 contracts

Question 28 :
Nov 2019 (New) – Paper

A future contract is available on R Ltd. that pays an annual dividend of Rs.4 and whose stock is currently priced at Rs.125. Each future contract calls for deliver of 1,000 shares to stock in one year, daily marking to market. The corporate treasury bill rate is 8%.

Require :

(i) Given the above information, what should the price of one future contract be?

(ii) If the company stock price decreases by 6%, what will be the price of one futures contact?

(iii) As a result of the company stock price decrease, will an investor that has a long position in one futures contract of R Ltd. realizes a gain or loss? What will be the amount of his gain or loss?

(Ignore margin and taxation, if any)

Solution :

1) As per cost carry model

F = S + Interest – Dividend Yield

= 125 × 1.08 – 4 = Rs.131

2) If stock price decreases by 6% the future price will be

S = 125 – 6% = 117.5

F = 117.50 × 1.08 – 4 = Rs.122.90

3) The trader is holding long position and future price falls, therefore he will makes loss.

Loss = (131 – 122.90) × 1000 = Rs.8100.

Question 29 :
Nov 2019 (Old) – Paper

The NSE-50 Index futures are traded with rupee value being Rs.100 per index point. On 15th September, the index close at 1195 and December futures (last trading day December 15) were trading at 1225. The historical dividend yield on the index has been 3% per annum and the borrowing rate was 9.5% per annum.

(i) Determine whether on September 15, the December futures were underpriced or overpriced?

(ii) What arbitrage transaction is possible to gain out this mispricing?

(iii) Calculate the gains and losses if the index on 15th December close at (a) 1260 (b) 1175.

Assume 365 days in a year for your calculations.

Solution :

1) As per cost of carry model

F = S + Interest – Divided yield

= 1195 + 1195 (0.095 – 0.03) 91/365

= 1214.366

The Future is trading in market @ 1225 > 1214.366, which indicates it is overpriced.

2) Since actual F > theoretical F, we should go for cash and carry Arbitrage i.e.

S^+ @ 1195

F^- @ 1225

and borrow 1195 × 100

Note : Profit at expiry irrespective of price will be always = Mispricing of F

i.e. (1225 – 1214.366) × 100 = Rs.1063.4

3)

		F = S = 1260	F = S = 1175
A	S^+ @ 1195	Profit = (1260 – 1195)100	Loss = (1195 – 1175) × 100 = 2000
B	F^- @ 1225	Loss = (1260 – 1225)100	Profit = (1225 – 1175) × 100 = 5000
C	Dividend Earn	(1195 × 100) × 3% × 91/365 = 893.79	893.79
D	Interest Paid	(1195 × 100) × 9.5% × 91/365 = 2830.35	2830.35
	Profit	Rs.1063.44	Rs.1063.44

Question 30 :
May 2020 (New) – RTP

On January 1, 2018 an investor has a portfolio of 5 shares as given below:

Security	Price	No. of Shares	Beta
A	349.30	5,000	1.15
B	480.50	7,000	0.40
C	593.52	8,000	0.90
D	734.70	10,000	0.95
E	824.85	2,000	0.85

The cost of capital to the investor is 10.5% per annum.

You are required to calculate:

(i) The beta of his portfolio.

(ii) The theoretical value of the NIFTY futures for February 2018.

(iii) The number of contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio if the current value of NIFTY is 5900 and NIFTY futures have a minimum trade lot requirement of 200 units. Assume that the futures are trading at their fair value.

(iv) The number of future contracts the investor should trade if he desires to reduce the beta of his portfolios to 0.6.

No. of days in a year be treated as 365.

Given: In (1.105) = 0.0998 and $e^{(0.015858)}$ = 1.01598

Solution :

(i) Calculation of Portfolio Beta

Security	Price of the Stock	No. of shares	Value	Weightage	Beta	Weighted Beta
A	349.30	5,000	17,46,500	wi	Bi	0.107
B	480.50	7,000	33,63,500	0.093	1.15	0.071
C	593.52	8,000	47,48,160	0.178	0.40	0.227

D	734.70	10,000	73,47,000	0.252	0.90	0.370
E	824.85	2,000	16,49,700	0.39	0.95	0.074
			1,88,54,860	0.087	0.85	0.849

Portfolio Beta = 0.849

(ii) Calculation of Theoretical Value of Future Contract

Cost of Capital = 10.5% p.a. Accordingly, the Continuously Compounded Rate of Interest in (1.105) = 0.0998

For February 2013 contract, t= 58/365= 0.1589

Further F= Se^{rt}

F= Rs.5,900$e^{(0.0998)(0.1589)}$

F= Rs.5,900$e^{0.015858}$

F= Rs.5,900 x 1.01598 = Rs.5,994.28

Alternatively, it can also be taken as follows:

= Rs.5900 $e^{0.105\times58/365}$

= Rs.5900 $e^{0.01668}$

= Rs.5900 x 1.01682 = Rs.5,999.24

(iii) When total portfolio is to be hedged:

$$= \frac{\text{Value of Spot Position requiring hedging}}{\text{Value of Future Contract}} \text{ x Portfolio Beta}$$

$$= \frac{1,88,54,860}{5994.28\times200} \times 0.849 = 13.35 \text{ contracts say 13 or 14 contracts}$$

(iv) When total portfolio beta is to be reduced to 0.6 :

$$\text{Number of Contracts to be sold} = \frac{P(\beta_P - \beta_P^{'})}{F}$$

$$= \frac{1,88,54,860(0.849-0.600)}{5994.28\times200} = 3.92 \text{ contracts say 4 contract}$$

Question 31 :
Nov 2020 (New) – RTP

Mr. SG sold five 4-Month Nifty Futures on 1st February 2020 for Rs.9,00,000. At the time of closing of trading on the last Thursday of May 2020 (expiry), Index turned out to be 2100. The contract multiplier is 75.

Based on the above information calculate:

(i) The price of one Future Contract on 1st February 2020.

(ii) Approximate Nifty Sensex on 1st February 2020 if the Price of Future Contract on same date was theoretically correct. On the same day Risk Free Rate of Interest and Dividend Yield on Index was 9% and 6% p.a. respectively.

(iii) The maximum Contango/ Backwardation.

(iv) The pay-off of the transaction.

Note: Carry out calculation on month basis.

Solution :

1) Price of are future = $\frac{900000}{5}$ = 180000

2) Approx. Nifty index on 1st Feb.2020

Nifty future price = $\frac{180000}{75}$ = 2400

F = S + Interest – Dividend

2400 = S × 1.03 – (5 × 0.02)

2400 = 1.015

∴S = 2376.24

3) Maximum Contango/ Backwardation

To determine if market is under Contango/ Backwardation we first should calculate

Basis = Spot price – Future price

If Basis is Negative = Contango

Positive = Backwardation

Saying F = 2400 and S = 2376.24

Basis is negative therefore market is in Contango.

Maximum Contango = 2400 – 2376.24 = 23.76

4) Pay off = (2400 – 2100) × 75 × 5 = 112500

Since Mr.SG had gone short its profit for Mr.SG.

Question 32 :
Nov 2020 (New) – RTP

A Rice Trader has planned to sell 22000 kg of Rice after 3 months from now. The spot price of the Rice is Rs.60 per kg and 3 months Future on the same is trading at Rs.59 per kg. Size of the contract is 1000 kg. The price is expected to fall as low as Rs.56 per kg, 3 months hence.

Required:

(i) to interpret the position of trader in the Cash Market.

(ii) to advise the trader the trader should take in Future Market to mitigate its risk of reduced profit.

(iii) to demonstrate effective realized price for its sale if he decides to make use of future market and after 3 months, spot price is Rs.57 per kg and future contract price for closing the contract is Rs.58 per kg.

Solution :

Sell 22000 kg after 3 months

Spot = Rs.60/kg

3m future = Rs.59/kg

Contract size = 1000 kg

Expected fall = Rs.56 kg 3 months hence

1) Position in cash market
In future he is going short (sell today)
$\therefore$ In cash market he is in long position

2) To mitigate his position, he should sell future (Rice is expected to fall $\rightarrow$ sell future)

3) Effective realised price if he eaters into future market
After 3 months spot price = Rs.57/kg
Future contract = Rs.58/kg
a) Reverse from sale = 22000 $\times$ 57 = 1254000
b) Reverse into future = (59 – 58) 22000 = 22000
$\therefore$ Total collection = 1254000 + 22000 = 1276000
i.e. $\frac{1276000}{22000}$ = Rs.58/kg

Question 33 :
Jan 2021 (New) – Paper

The price of march Nifty Futures Contact on a particular day was 9170. The minimum trading lot on Nifty Futures is 50. The initial margin is 8% and the maintenance margin is 6%. The index closed at the following levels on next five days :

Day	1	2	3	4	5
Settlement Price (Rs.)	9380	9520	9100	8960	9140

You are required to calculate :
(i) Mark to market cash flows and daily closing balances on account of
(a) An investor who has taken a long position at 9170
(b) An investor who has taken a shot position at 9170
(ii) Net profit/loss on each of the contacts

Solution :
(i) Contract Size (Rs. 9,170 x 50) = Rs. 4,58,500
Initial Margin (8% of 4,58,500) = Rs. 36,680
Maintenance Margin (6% of 4,58,500) = Rs. 27,510
(1) For investor taken Long position:

Day	Change in Future value (Rs.)	Margin A/c (Rs.)	Call Money (Rs.)
0	-	36,680	
1	(Rs. 9,380 - Rs. 9,170) x 50 = 10,500	47,180	
2	(Rs. 9,520 - Rs. 9,380) x 50 = 7,000	54,180	
3	(Rs. 9,100 - Rs. 9,520) x 50 = - 21,000	33,180	
4	(Rs. 8,960 - Rs. 9,100) x 50 = - 7,000	36,680	10,500
5	(Rs. 9,140 - Rs. 8,960) x 50 = 9,000	45,680	

(2) For investor taken Short position:

Day	Change in Future value (Rs.)	Margin A/c (Rs.)	Call Money (Rs.)
0		36,680	
1	(Rs. 9,170 - Rs. 9,380) x 50 = -10,500	36,680	10,500
2	(Rs. 9,380 - Rs. 9,520) x 50 = -7,000	29,680	
3	(Rs. 9,520 - Rs. 9,100) x 50 = 21,000	50,680	
4	(Rs. 9,100 - Rs. 8,960) x 50 = 7,000	57,680	
5	(Rs. 8,960 - Rs. 9,140) x 50 = -9,000	48,680	

(ii) Calculation of Net Profit/Loss

(1) Long Position

	(Rs.)
Ending margin	45,680
Less: Initial Margin	36,680
Profit	9,000
Less: Margin Call	10,500
Net Loss	1,500

OR, Loss = (9,140 – 9,170) x 50 = (Rs. 1,500)

(2) Short Position

	(Rs.)
Ending margin	48,680
Less: Initial Margin	36,680
Profit	12,000
Less: Margin Call	10,500
Net Profit	**1,500**

OR, Profit = (9,170 – 7,040) x 50 = Rs. 1,500

Question 34 :
Jan 2021 (New) – Paper

Shyam buys 10,000 share of X Ltd., @Rs.25 per share and obtains a complete hedge of shorting 400 Nifty at Rs.1,100 each. He close out his position at the closing price of the next day when the share of X Ltd., has fallen by 4% and Nifty Future has dropped by 2.5%.

What is the overall profits or loss from this set of transaction?

Solution :

Cash Outlay

= 10000 x Rs. 25 – 400 x Rs. 1,100

= Rs. 2,50,000 – Rs. 4,40,000 = - Rs. 1,90,000

Cash Inflow at Close Out

= 10000 x Rs. 25 x 0.96 - 400 x Rs. 1,100 x 0.975

= Rs. 2,40,000 – Rs. 4,29,000 = - Rs. 1,89,000

Gain/ Loss

= Rs. 1,90,000 – Rs. 1,89,000 = Rs. 1,000 (Gain)

Thanks ....

CHP - 10 DERIVATIVES - OPTION

Question 1 :
Nov 2008 – RTP

The market received rumour about XYZ Company's tie-up with a multinational company. This has induced the market price to move up. If the rumour is false, the XYZ Company stock price will probably fall dramatically. To protect from this an investor has bought the call and put options.
He purchased one 3 months call with a striking price of Rs.52 for Rs.2 premium, and paid Re.1 per share premium for a 3 months put with a striking price of Rs.50.

(i) Determine the Investor's position if the tie up offer bids the price of stock up to Rs.53 in 3 months.

(ii) Determine the Investor's ending position, if the tie up programme fails and the price of the stocks falls to Rs.46 in 3 months.

Solution :

C+ 52 @ 2
P+ 50 @ 1
Total 3 Premium out flow

Profit Profile

EP	C(E/L)	PO	P(E/L)	PO	Pre	Net
53	E	1	L	-	(3)	(2)
46	L	0	E	4	(3)	1

1) At 53, call will be exercised, but put will lapse giving trader loss of Rs.2
2) At 46, call will lapse, but put will be exercised, giving trader profit of Rs.1

Question 2 :
Nov 2008 – Paper / Nov 2009 – RTP / Nov 2011 – RTP

Following information is available for X Company's shares and Call option:

Current share price	Rs.185
Option exercise price	Rs.170
Risk free interest rate	7%
Time of the expiry of option	3 years
Standard deviation	0.18

Calculate the value of option using Black-Scholes formula.

Solution :

Applying the Black Scholes Formula,
Value of the Call option now:
The Formula

C = SN (d_1) – $K_e^{(-rt)}$ N (d_2)

d_1 = In (S/K) + $(r + \sigma^2/2)t$

d_2 = $d_1 - \sigma\sqrt{t}$

Where,

C = Theoretical call premium

S = Current stock price = 80

t = time until option expiration = 0.5

K = option striking price = 75

r = risk-free interest rate = 12%

N = Cumulative standard normal distribution

e = exponential term

σ = Standard deviation of continuously compounded annual return.

In = natural logarithim

d_1 = $\frac{0.34315}{0.31177}$ = 1.1006

d^2 = 1.1006– 0.31177 = 0.7888

Nd1 = 0.8770

Nd2 = N(0.2989) = 0.7823 + 0.88 × (7852 – 7823) = 0.7848

Value of call option

= 162.245– 108.151

= Rs.54.094

Question 3 :

Nov 2008 – Paper / Nov 2009 – RTP / Nov 2011 – Paper / May 2018 – RTP / May 2019 (New) – Paper

Mr. X established the following spread on the Delta Corporation's stock :

(i) Purchased one 3-month call option with a premium of Rs.30 and an exercise price of Rs.550.

(ii) Purchased one 3-month put option with a premium of Rs.5 and an exercise price of Rs.450.

Delta Corporation's stock is currently selling at Rs.500. Determine profit or loss, if the price of Delta Corporation's :

(i) remains at Rs.500 after 3 months.

(ii) Falls at Rs.350 after 3 months.

(iii) Rises to Rs.600.

Assume the size option is 100 shares of Delta Corporation.

Solution :

Profit Profile for Delta Limited

Expiry Price	Call (Exercise/ Lapse)	Pay off	Put (Exercise/ Lapse)	Pay off	Premium	Profit / Loss (x 100)
500	Lapse	Nil	Lapse	Nil	(35)	(3500)
350	Lapse	Nil	Exercise	100	(35)	6500
600	Exercise	50	Lapse	Nil	(35)	1500

Explanation

Total premium paid on purchasing a call and put option

= (Rs.30 per share × 100) + (Rs.5 per share × 100). = 3,000 + 500 = Rs.3,500

1) In case if price remains at 500,

X exercises neither the call option nor the put option as both will result in a loss for him.

Ending value = – Rs.3,500 + zero gain

= –Rs.3,500

i.e. Net loss = Rs.3,500

2) Incase if Price Falls to 350

Since the price of the stock is below the exercise price of the call, the call will not be exercised. Only put is valuable and is exercised.

Total premium paid = Rs.3,500

Ending value = –Rs.3,500 + Rs.[(450– 350) × 100]

= –Rs.3,500 + Rs.10,000 = Rs.6,500

i.e. Net gain = Rs.6,500

3) Incase if price rises to 600

In this situation, the put is worthless, since the price of the stock exceeds the put's exercise price. Only call option is valuable and is exercised.

Total premium paid = Rs.3,500

Ending value = –3,500 + [(600– 550) × 100]

Net Gain = –3,500 + 5,000 = Rs.1,500

Question 4 :

May 2009 – RTP / May 2020 (Old) – RTP / May 2020 (New) – RTP

From the following data for certain stock, find the value of a call option:

Price of stock now = Rs.80

Exercise price = Rs.75

Standard deviation of continuously compounded annual return = 0.40

Maturity period = 6 months

Annual interest rate = 12%

Number of S.D. from Mean,	**(z) Area of the left or right (one tail)**
0.25	0.4013
0.30	0.3821
0.55	0.2912
0.60	0.2578

e 0.12 x 0.05= 1.0060

In 1.0667 = 0.0645

Solution :

Applying the Black Scholes Formula,

Value of the Call option now:

The Formula

$C = SN(d_1) - K_e^{(-rt)} N(d_2)$

$d_1 = \text{In}(S/K) + (r + \sigma^2/2)t$

$d_2 = d_1 - \sigma\sqrt{t}$

Where,

C = Theoretical call premium

S = Current stock price = 80

t = time until option expiration = 0.5

K = option striking price = 75

r = risk-free interest rate = 12%

N = Cumulative standard normal distribution

e = exponential term

σ = Standard deviation of continuously compounded annual return.

In = natural logarithim

$$d_1 = \frac{\text{In}(1.0667) + (12\% + (0.08))^{0.5}}{0.40\sqrt{0.5}}$$

$$= \frac{0.0645 + (0.02)^{0.5}}{0.40 \times 0.701}$$

$$= \frac{0.1645}{0.2828} = 0.5817$$

$d^2 = 0.5817 - 0.2828 = 0.2989$

Nd1 = N (0.5817) = 0.7190 + 0.000578 = 0.7195

Nd2 = N(0.2989) = 0.6141 + 0.003382 = 0.6175

Value of call option= 80 x 0.7195– (75 / 1.0060) x 0.6175

= 57.56– 74.55 x 0.6175

= 57.56 – 46.04 = Rs.11.52

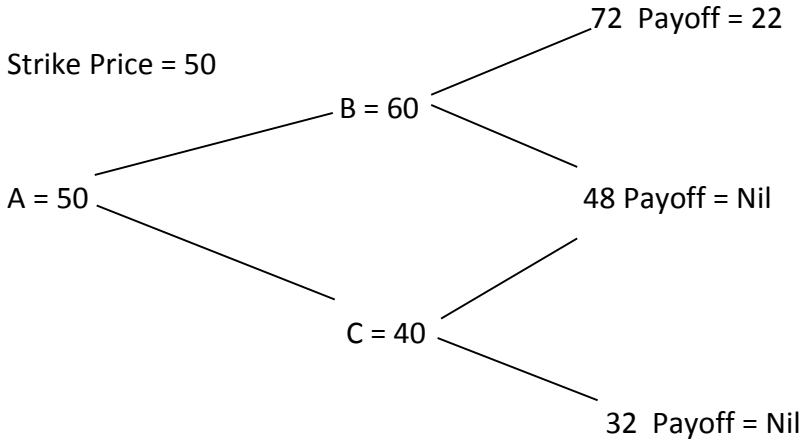
Question 5 :

May 2009 – Paper

Consider a two year American call option with a strike price of Rs.50 on a stock the current price of which is also Rs.50. Assume that there are two time periods of one year and in each year the stock price can move up or own by equal percentage of 20%. The risk free interest rate is 6%. Using binominal option model, calculate the probability of price moving up and down. Also draw a two step binomial tree showing prices and payoffs at each node.

Solution :

(a) Stock prices in the two step Binominal tree



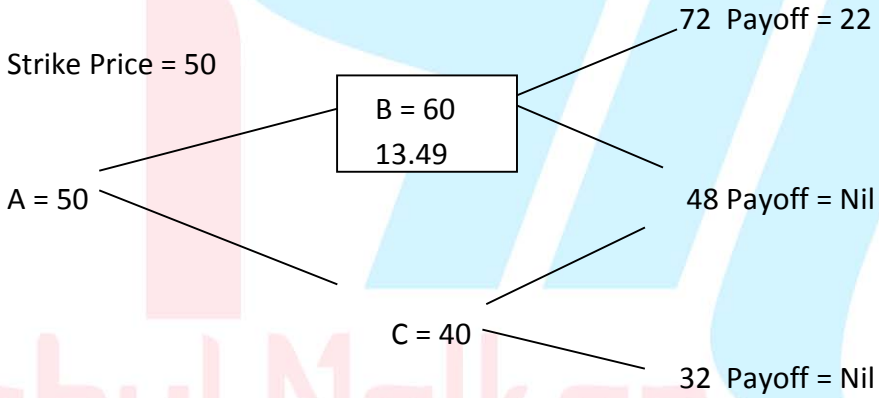
Using the single period model, the probability of price increase is

$$P = \frac{R - d}{U - d} = \frac{1.06 - 0.8}{1.2 - 0.8} = 0.65$$

therefore the p of price decrease = 1-0.65 =0.35

Using the single period binomial model the value of call option at node B is

$$\text{Value} = \frac{Cup + Cd\ (1 - p)}{R} = \frac{22 \times 0.65 + Nil \times 0.35}{1.06} = 13.49$$



Using the single period binomial model the value of call option at node c will be Nil – because the payoff in both the, up move and down move is Zero

The value of option at node 'A' is = $\frac{13.49 \times 0.65 + Nil \times 0.35}{1.06} = 8.272$

Question 6 :
May 2009 – Paper

On 19th April following are the spot rates

Spot EUR/USD 1.20000 USD/INR 44.8000

Following are the quotes of European Options:

Currency Pair	Call/Put	Strike Price	Premium	Expiry date
EUR / USD	Call	1.2000	$0.035	July 19
EUR/USD	Put	1.2000	$0.04	July 19

USD/INR	Call	44.8000	Rs.0.12	Sep 19
USD/INR	Put	44.8000	Rs.0.04	Sep 19

(i) A trader sells an at-the-money spot straddle expiring at three months (July 19). Calculate gain or loss if three months later the spot rate is EUR/USD 1.2900.

(ii) Which strategy gives a profit to the dealer if five months later (Sep. 19) expected spot rate is USD/INR 45.00. Also calculate profit for a transaction USD 1.5 million.

Solution :

(i) Straddle is a portfolio of a CALL & a PUT option with identical Strike Price. A trader sells Straddle of At the Money Straddle will be selling a Call option & a put option with Strike Price of USD per EUR.

He will receive premium of $ 0.035 + $ 0.040 = $ 0.075

At the expiry of three months Spot rate is 1.2900 i.e. higher than Strike Price Hence, Buyer of the Call option will exercise the option, but buyer of Put option will allow the option to lapse.

Profit or Loss to a trader is

Premium received $0.075

Loss on call option exercised1.2900 – 1.2000 $0.090

Net Loss of $ 0.015 per EUR

(ii) BUY Strategy i.e. either Call or Put

Price is expected to go up then call option is beneficial.

On 19th April to pay Premium 15,00,000 @ Rs.0.12 i.e.	INR 1,80,000
On 19th September exercise call option to gain 15,00,000 @ Rs.0.20	INR 3,00,000
Net Gain or Profit	INR 1,20,000

Question 7 :
Nov 2009 - Paper

Equity share of PQR Ltd. is presently quoted at Rs.320. The Market Price of the share after 6 months has the following probability distribution:

Market Price	Rs.180	260	280	320	400
Probability	0.1	0.2	0.5	0.1	0.1

A put option with a strike price of Rs.300 can be written.

You are required to find out expected value of option at maturity (i.e. 6 months)

Solution :

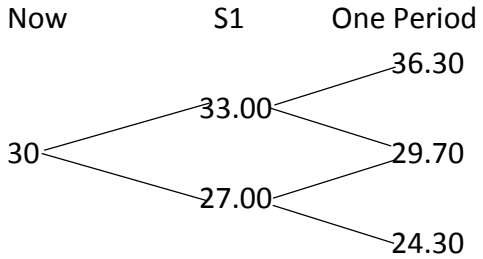
1) Expected pay off at maturity for put option strike price = 300

MP	P(E/L)	PO	Probability	PO P
180	E	120	0.1	12
260	E	40	0.2	8
280	E	20	0.5	10
320	L	-	-	-
400	L	-	-	-
				30

2) Expected value of option = Expected pay off = Rs.30

Question 8 :
May 2010 - RTP

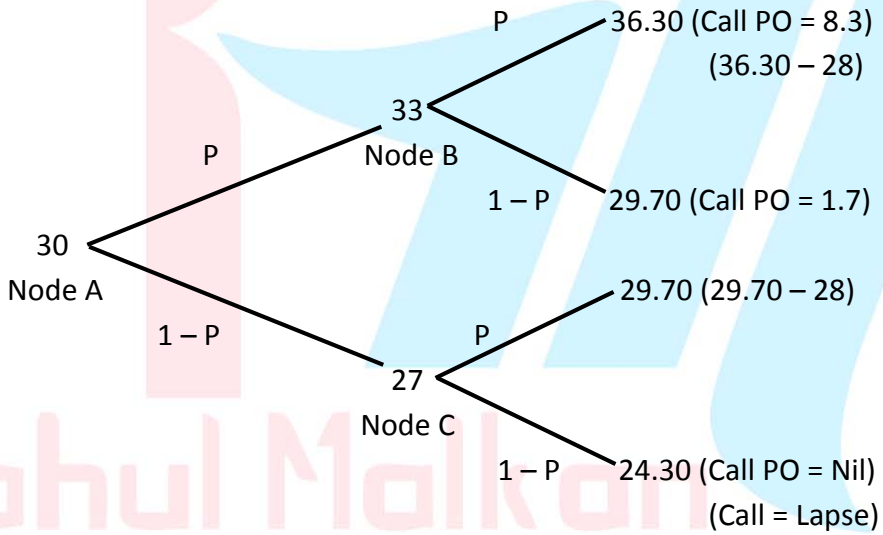
Following is a two-period tree for a share of stock in CAB Ltd.:



Using the Binomial model, calculate the current fair value of a regular call option on CAB Stock with the following characteristics : X = Rs.28, Risk Free Rate = 5 percent (per sub period). You should also indicate the composition of the implied riskless hedge portfolio at the valuation date.

Solution :

X = 28



	Node A	Node B	Node C
Current Price	30	33	27
US	33	36.30	29.70
U	1.1(33/30)	1.1	1.1
dS	27	29.70	24.30
d	0.9 (27/30)	0.9	0.9
R	5%	5%	5%

$$P = \frac{R-d}{U-d} = \frac{1.05-0.9}{1.1-0.9} = \frac{0.15}{0.2} = 0.75$$

1 – P = 1 – 0.75 = 0.25

Node B $= \frac{8.3 \times 0.75 + 1.7 \times 0.25}{1.05} = 6.33$

Node C $= \frac{1.7 \times 0.75 + Nil \times 0.25}{1.05} = 1.214$

Node A $= \frac{6.33 \times 0.75 + 1.214 \times 0.25}{1.05} = 4.81$

Question 9 : 3
May 2010 - RTP

You are trying to value a long term call option on the Standard and Poor's 500, expiring in 2 months, with a strike price of $900. The index is currently at $930, and the annualized standard deviation in stock prices is 20% per annum. The average dividend yield on the index is 0.3% per month, and is expected to remain unchanged over the next month. The treasury bond rate is 8%.

a. Estimate the value of the long term call option.

b. Estimate the value of a put option, with the same parameters.

c. What are the implicit assumptions you are making when you use the Black-Scholes model to value this option?

Which of these assumptions are likely to be violated? What are the consequences for your valuation?

Solution :

Applying the Black Scholes Formula,

Value of the Call option now:

The Formula

$C = SN(d_1) - K_e^{(-rt)} N(d_2)$

$d_1 = \ln(S/K) + (r + \sigma^2/2)t$

$d_2 = d_1 - \sigma\sqrt{t}$

Where,

C = Theoretical call premium

S = Current stock price = 930

t = time until option expiration = 0.5

K = option striking price = 900

r = risk-free interest rate = 8%

N = Cumulative standard normal distribution

e = exponential term

σ = Standard deviation of continuously compounded annual return.

In = natural logarithm

$d_1 = \frac{\ln(930/300) + (5\% + (0.02))^{0.5}}{0.2\sqrt{2/12}}$

= 0.544

d^2 = 0.4628

N(d1) = 0.7069

N(d2) = 0.6782

C = $930 X 0.7069 X e-0.03X2/12– $900 X 0.6782 X e-0.08X2/12
C = $930 X 0.7069 X 0.9950– $900 X 0.6782 X 0.9867
C = $654.13– $602.26
C = $51.87

Question 10 :
May 2010 – Paper

Mr. A purchased a 3 month call option for 100 shares in XYZ Ltd. at a premium of Rs.30 per share, with an exercise price of Rs.550. He also purchased a 3 month put option for 100 shares of the same company at a premium of Rs.5 per share with an exercise price of Rs.450. The market price of the share on the date of Mr. A's purchase of options, is Rs.500. Calculate the profit or loss that Mr. A would make assuming that the market price falls to Rs.350 at the end of 3 months.

Solution :

Since the market price at the end of 3 months falls to Rs.350 which is below the exercise price under the call option, the call option will not be exercised. Only put option becomes viable.

The gain will be:	**Rs.**
Gain per share (Rs.450 – Rs.350)	100
Total gain per 100 shares	10,000
Cost or premium paid (Rs.30 x 100) + (Rs.5 x 100)	3,500
Net gain	6,500

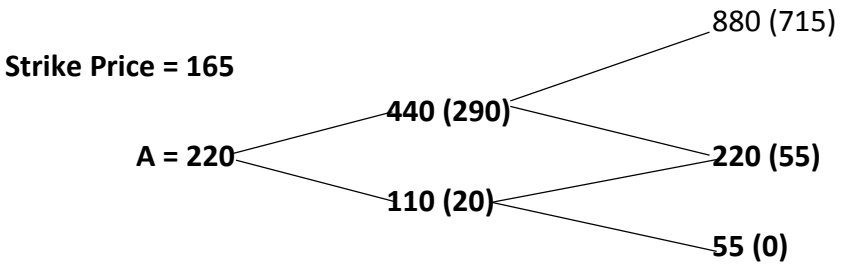
Question 11 :
Nov 2010 – RTP

X Ltd.'s share is currently trading at Rs.220. It is expected that in six months some if could double or halved (equivalent to a Rs.=98%). One year call option on X Ltd.'s share has an exercise price of Rs.165. Assuming risk free rate of interest to be 20%, calculate.

(a) Value of call option on X Ltd's share.
(b) Option Delta for the second six month, in case stock price rises to Rs.440 or falls to Rs.110.
(c) Now suppose in 6 months the share price is Rs.110. How at this point we can replicate portfolio of call options and risk-free lending.

Solution :

The possible prices of X Ltd.'s share and the associated call option values shown below:



a)

	Node A	Node B	Node C
CP	220	440	110
SP	165	165	165
US	440	880	220
U	2(440/220)	2	2
dS	110	220	55
d	0.5(110/220)	0.5	0.5
Rf	20% P.A.	20% P.A.	20% P.A.
	10% 6 m	10% 6 m	10% 6m
R	1.1	1.1	1.1

P = $\frac{R-d}{U-d}$ = $\frac{1.1-0.5}{2-0.5}$ = 0.4 $\therefore$ 1 – P = 0.6

Node B = $\frac{715\times 0.4+55\times 0.6}{1.1}$ = 290

Node C = $\frac{55\times 0.4+Nil\times 0.6}{1.1}$ = 20

Node A = $\frac{290\times 0.4+20\times 0.6}{1.1}$ = 116.36

b) (i) If the price rises to Rs.440:

Delta = $\frac{\text{`715 - `55}}{\text{`880 - `220}}$ = 1.0

(ii) If the price rises to Rs.110:

Delta = $\frac{\text{`55 - `0}}{\text{`220 - `55}}$ = 0.33

c) If the stock price is Rs.110 at 6 months, the option delta is 0.33. Therefore, in order to replicate the stock, we buy three calls and lend, as follows:

	Initial Outlay	Stock Price = 55	Stock Price = 220
Buy 3 calls	-60	0	165
Lend PV(55	-50	55	+55
	-110	+55	+220
This strategy is equivalent to:			
Buy stock	-110	+55	+220

Question 12 :
May 2011 - RTP

The following table provides the prices of options on equity shares of X Ltd. and Y Ltd. The risk free interest is 9%. You as a financial planner are required to spot any mispricing in the quotations of option premium and stock prices? Suppose, if you find any such mispricing then how you can take advantage of this pricing position.

Share	Time to Exercise	Exercise Price (Rs.)	Share Price (Rs.)	Call Price (Rs.)	Put Price (Rs.)
X Ltd	6 months	100	160	56	4
Y Ltd	3 months	80	100	26	2

Solution :

In order to find out any mispricing we shall use Put Call Parity theorem.

Accordingly,

Value of Call + PV (exercise price) = Value of Put + Share Price

Thus,

For share of X Ltd.

56+ 100 e-0.045 = 4 + 160

56 + 95.60 = 164

Thus there is price mismatch. The strategy to be adopted to take advantage of situation will be to buy call and sell put and share. The strategy will lead to cash flow position as follows:

	Inflow (Rs.)	Outflow (Rs.)
Buying the Call	-	56
Selling the Put	4	-
Short Selling the share	160	-
Total	164	56
Net inflow	-	108
	164	164

Invest Rs.108 for 6 months and get Rs.108 x e 0.045 (Rs.108 x1.046)	Rs.112.97
After 6 months: Inflow from investment	Rs.112.97
Out flow due to exercise of option	Rs.100.00
Net Gain	Rs. 12.97

Similarly for Share of Y Ltd.

26 + 80 e-0.045 = 2 + 100

26 + 76.48 = 102

102.48 =102

Thus, there is a mismatch The strategy to be adopted sell call and buy put and share. The position of cash flows on the strategy adopted will be as follows:

	Inflow (Rs.)	Outflow (rs.)
Buy the share	-	100
Buy the Put	-	2

Sell the call	26	-
Total Net inflow	26 76	102
	102	102

This amount shall be borrowed for 3 months. After the 3 months the position will be as follows:

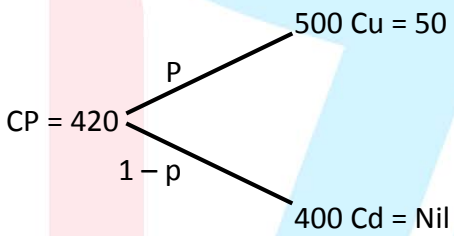
Repayment of borrowings (76 x e0.045)	Rs.79.50
Inflow due to exercise of option	Rs.80.00
Net Gain	Rs. 0.50

Question 13 :
May 2011 - Paper

The current market price of an equity share of Penchant Ltd is Rs.420. Within a period of 3 months, the maximum and minimum price of it is expected to be Rs.500 and Rs.400 respectively. If the risk free rate of interest be 8% p.a., what should be the value of a 3 months Call option under the "Risk Neutral" method at the strike rate of Rs.450 ? Given e0.02 = 1.0202

Solution :

SP = 450



CP = 420

SP = 450

VS = 500

V = 500/420 = 1.19

dS = 400

d = 400/420 = 0.9523

Rf = 8%

R = 1.0202

P $= \frac{R-d}{V-d}$

$= \frac{1.0202-0.9523}{1.19-0.9523}$

= 0.2856

1 – P = 0.7146

Vc = $\frac{50 \times 0.2856 + Nil \times 0.7143}{1.0202}$ = Rs.14.

Question 14 :

May 2012 - RTP

The current spot price of share of ABC Ltd. is Rs.121.00 with strike price Rs.125.00 and Rs.130.00 are trading at a premium of Rs.3.30 and Rs.1.80 respectively. Mr. X, a speculator is bullish about the share price over next six months. However, he is also of belief that share price could also go down. He approaches to you for advice, you are required to:

(a) Suggest a strategy that Mr. X can adopt which puts limit on his gain and loss.

(b) How much is maximum possible profit.

(c) Draw out a rough diagram of the strategy adopted.

(d) What will be break-even price of the share?

[Assume – No brokerage fees and interest cost/gains].

Solution :

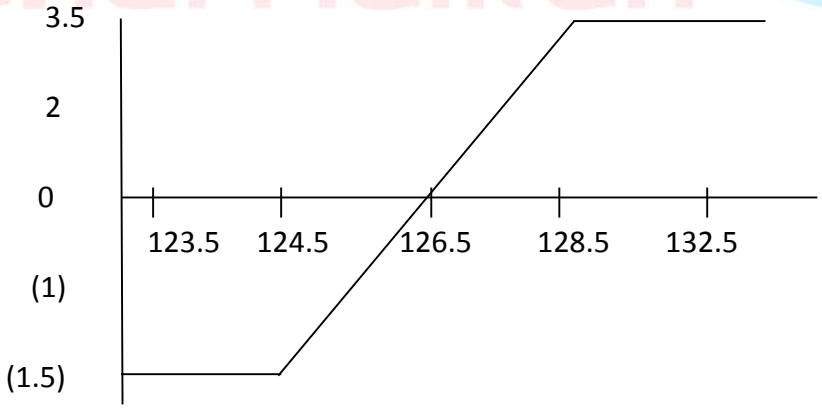
(a) The best strategy for Mr. X would be Long Call Spread. It involves buying of one call option at price of Rs.125 and selling call option at Rs.130.

(b) The pay-off position can be computed as follows.

Price on date of	Pay-off of Buying option	Pay-off of selling option	Net	Premium spread	Net Pay-off
123.50	-	-	-	(1.50)	(1.50)
124.50	-	-	-	(1.50)	(1.50)
125.50	0.50	-	0.50	(1.50)	(1.00)
126.50	1.50	-	1.50	(1.50)	-
127.50	2.50	-	2.50	(1.50)	1.00
128.50	3.50	-	3.50	(1.50)	2.00
129.50	4.50	-	4.50	(1.50)	3.00
130.50	5.50	(0.50)	5.00	(1.50)	3.50
131.50	6.50	(1.50)	5.00	(1.50)	3.50
132.50	7.50	(2.50)	5.00	(1.50)	3.50

Maximum Profit = Rs.3.5

(c)



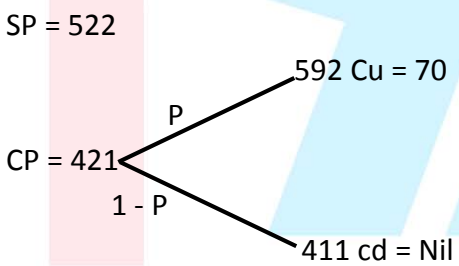
(d) Breakeven price = Rs.126.5

Question 15 :
May 2012 - Paper – 8 Marks / May 2013 – RTP / Nov 2017 – RTP

Sumana wanted to buy shares of EIL which has a range of Rs.411 to Rs.592 a month later. The present price per share is Rs.421. Her broker informs her that the price of this share can sore up to Rs.522 within a month or so, so that she should buy a one month CALL of EIL. In order to be prudent in buying the call, the share price should be more than or at least Rs.522 the assurance of which could not be given by her broker. Though she understands the uncertainty of the market, she wants to know the probability of attaining the share price Rs.592 so that buying of a one month CALL of EIL at the execution price of Rs.522 is justified. Advice her. Take the risk free interest to be 3.60% and e0.036 = 1.037.

Solution :

CP = 421
SP = 522
us = 592
u = 592/421 = 1.406
ds = 411
d = 411/421 = 0.976
Rf = 3.6%
R = 1.037



$$P = \frac{R-d}{u-d} = \frac{1.037-0.976}{1.406-0.976} = 0.1418$$

1 – P = 0.8582

$$uc = \frac{70 \times 0.1418 + Nil \times 0.976}{1.037} = \text{Rs.}9.57$$

Advice : She should buy Call only if it available at less than Rs.9.57.

Question 16 :
Nov 2012 – RTP

A call and put exist on the same stock each of which is exercisable at Rs.60. They now trade for:

Market price of Stock or stock index Rs.55
Market price of call Rs.9
Market price of put Rs.1

Calculate the expiration date cash flow, investment value, and net profit from:

(i) Buy 1.0 call
(ii) Write 1.0 call
(iii) Buy 1.0 put
(iv) Write 1.0 put
for expiration date stock prices of Rs.50, Rs.55, Rs.60, Rs.65, Rs.70.

Solution :

1) Buy Call : C^+ 60 @ 9

EP	C(E/L)	Po	Premium	Net
50	L	–	(9)	(9)
55	L	–	(9)	(9)
60	L	–	(9)	(9)
65	E	5	(9)	(4)
70	E	10	(9)	1

2) Write Call : C^- 60 @ 9

EP	C(E/L)	Po	Premium	Net
50	L	–	9	9
55	L	–	9	9
60	L	–	9	9
65	E	(5)	9	4
70	E	(10)	9	(1)

3) Buy Put : P^+ 60 @ 1

EP	P(E/L)	Po	Premium	Net
50	E	10	(1)	9
55	E	5	(1)	4
60	L	–	(1)	(1)
65	L	–	(1)	(1)
70	L	–	(1)	(1)

4) Write Put : P^- 60@ 1

EP	P(E/L)	Po	Premium	Net
50	E	(10)	1	(9)
55	E	(5)	1	(4)
60	L	–	1	1
65	L	–	1	1
70	L	–	1	1

Question 17 :
Nov 2012 – Paper / Nov 2018 – Paper

You as an investor had purchased a 4 month call option on the equity shares of X Ltd. of Rs.10, of which the current market price is Rs.132 and the exercise price Rs.150. You expect the price to range between Rs.120 to Rs.190. The expected share price of X Ltd. and related probability is given below:

Expected Price	120	140	160	180	190
Probability	.05	.20	.50	.10	.15

Compute the following:

(1) Expected Share price at the end of 4 months.

(2) Value of Call Option at the end of 4 months, if the exercise price prevails.

(3) In case the option is held to its maturity, what will be the expected value of the call option?

Solution :

(1) Expected share price at the end of 4 months

120 x 0.05 + 140 x 0.20 + 160 x 0.50 + 180 x 0.10 + 190 x 0.15

= Rs.160.50

(2) Value of Call option if the exercise price prevails

= Rs.150 – Rs.150 = Nil

(3) Value of Call option if the call held till maturity

Expected Price	Call (Exercise / Lapse)	Pay off	Probability	Pay off x Prob
120	Lapse	Nil	0.05	Nil
140	Lapse	Nil	0.20	Nil
160	Exercise	10	0.50	5
180	Exercise	30	0.10	3
190	Exercise	40	0.15	6
			Total	14

Question 18 :
Nov 2013 – Paper

An American firm is under obligation to pay interests of Can$ 1010000 and Can$ 705000 on 31st July and 30th September respectively. The Firm is risk averse and its policy is to hedge the risks involved in all foreign currency transactions. The Finance Manager of the firm is thinking of hedging the risk considering two methods i.e. fixed forward or option contracts.

It is now June 30. Following quotations regarding rates of exchange, US$ per Can$, from the firm's bank were obtained:

Spot	1 Month Forward	3 Month Forward
0.9284-0.9288	0.9301	0.9356

Price for a Can$ /US$ option on a U.S. stock exchange (cents per Can$, payable on purchase of the option, contract size Can$ 50000) are as follows:

Strike Price	Calls		Put	
(US$/Can$)	July	Sept	July	Sept
0.93	1.56	2.56	0.88	1.75
0.94	1.02	NA	NA	NA
0.95	0.65	1.64	1.92	2.34

According to the suggestion of finance manager if options are to be used, one month option should be bought at a strike price of 94 cents and three month option at a strike price of 95 cents and for the remainder uncovered by the options the firm would bear the risk itself. For this, it would use forward rate as the best estimate of spot. Trans action costs are ignored.

Recommend, which of the above two methods would be appropriate for the American firm to hedge its foreign exchange risk on the two interest payments.

Solution :

Alt 1 : Forward Market Cover

Hedge the risk by buying Can$ in 1 and 3 months time will be:

July - 1010000 X 0.9301 = US $ 939401

Sept.- 705000 X 0.9356 = US $ 659598

Alt 2 : Option Contracts

July Payment = 1010000/ 50,000 = 20.20

September Payment = 705000/ 50,000 = 14.10

Company would like to take out 20 contracts for July and 14 contracts for September respectively. Therefore costs, if the options were exercised, will be:-

	July		Sept.	
	Can $	US $	Can $	US $
Covered by Contracts	1000000	940000	700000	665000
Balance bought at spot rate	10000	9301	5000	4678
Option Costs:				
Can $ 50000 x 20 x 0.0102		10200		
Can $ 50000 x 14 x 0.0164	---			11480
Total cost in US $ of using Option Contract		959501		681158

Decision : As the firm is stated as risk averse and the money due to be paid is certain, a fixed forward contract, being the cheapest alternative in the both the cases, would be recommended.

Question 19 :

Nov 2015 – Paper

Mr Dayal is interested in purchasing equity shares of ABC Ltd. Which is currently selling at Rs.600 each. He expects the price of the share to go upto Rs.780 or May go Down to Rs.480 in three months. The chances of occurrence of such variations are 60% and 40% respectively. A call option on the share of ABC Ltd. can be exercised at the end of 3 months with the strike price of Rs.630.

What combination of share and option should Mr Dayal select if he wants a perfect hedge?

What should be the value of option today (the risk free rate is 10% P.A)
What is expected rate of return on the option?

Solution :

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

$$\Delta = \frac{C_1 - C_2}{S_1 - S_2} = \frac{150 - 0}{780 - 480} = 0.5$$

(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 20 :
Nov 2015 – Paper / May 2019 (New) – Paper

ABC, a US firm, will need £ 5,00,000 in 180 days. In this connection, the following information is available.

Spot Rate 1 £ = $ 2.00

180 day forward rate for 1 £ = $ 1.96 as on today.

Interest rate is as follows	**US**	**UK**
180 day deposit rate	5.0%	4.5%
180 day borrowing rate	5.5%	5.0%

A call option on £ that expires in 180 days has an exercise price of $ 1.97 and a premium of $ 0.04.

ABC Ltd. has forecasted the spot rates for 180 days as below :

Future Rate	**Probability**
$ 1.91	30%
$ 1.95	50%
$ 2.05	20%

Which of the following strategies will be cheaper for ABC Ltd.?

(i) Forward Contract

(ii) A Money Market Hedge

(iii) A Call option Contract and

(iv) No Hedging option

Solution :

ABC, a US firm needs £ 5,00,000 in 180 days and is evaluating 4 alternative options

(i) Forward Contract

(ii) A Money Market Hedge

(iii) A Call option Contract and

(iv) No Hedging option

Alternative 1 : Forward Cover – Buy FC Forward

= £5,00,000 × $1.96 = $9,80,000/-

Alternative 2 : Money Market Cover (Invest – Buy – Borrow)

Step 1 : Invest

Amount in £ to be invested = 5,00,000/1.045 = £4,78,469

Step 2 : Buy

Amount of $ needed to convert into £ = £4,78,469 x $2 = $9,56,938

Step 3 : Borrow

Interest and principal on $ loan after 180 days = $9,56,938 x 1.055 = $10,09,570

Alternative 3 : Call Option

Step 1 : Buy Call at $ 1.97 and a premium of $ 0.04.

Premium Outflow = $ 0.04

Step 2 : Expected Rate of FC = = 1.91 x 0.3 + 1.95 x 0.5 + 2.05 x 0.2 = 1.958

Step 3 : Expected Pay off

Expected Spot Rate in 180 days	Lapse / Exercise	Pay off	Probability	Pay off x Prob
1.91	Lapse	Nil	0.30	Nil
1.95	Lapse	Nil	0.50	Nil
2.05	Exercise	0.08	0.20	0.016

Settlement Price = 1.958 + 0.04 – 0.016 = 1.982

Settlement = 5,00,000 x 1.982 = 9,91,000

Add Interest = $ 20,000 x 5.5% = 1,100

Total Payable = 9,92,100

Alternative 4 : No Hedge

Expected Price = 1.91 x 0.3 + 1.95 x 0.5 + 2.05 x 0.2 = 1.958

Settlement = 5,00,000 x 1.958 = 9,79,000

Decision : The company should go ahead with no hedge

Question 21 :
Nov 2015 – Paper

XYZ, an Indian firm, will need to pay Japanese Yen 5,00,000 on 30th June. In order to hedge the risk involved in foreign currency transaction, the firm is considering twp alternative methods i.e forward contract cover and currency option contract.

On 1st April, following quotations (JPY/INR) are made available :

Spot3 month forward

1.9516/1.97111.9726/1.9923

The prices for forex currency option on purchase are as follows :

Strike Price	JY 2.125
Call Option (June)	JY 0.047
Put Option (June)	JY 0.098

For excess or balance of JY Covered, the firm would use forward rate as future spot rate.

You are required to recommend cheaper hedging alternative for XYZ.

Solution :

XYZ, an indian firm, will need to pay Japanese Yen 5,00,000 on 30th June .

To hedge the transaction he has 2 alternative

Alternative 1 : Forward Cover

Alternative 2 : Option Cover

Alternative 1 : Forward Cover

3 month Forward Rate : JPY/INR 1.9726/1.9923

Amount Payable = $\frac{5,00,000}{1.9726}$ = Rs.2,53,500

Alternative 2 : Option Cover

To purchase JY 5,00,000, XYZ shall enter into a Put Option @ JY 2.125/INR

Accordingly, outflow of INR = $\frac{\text{JPY } 5,00,000}{2.125}$ = Rs.2,35,294

Add : Premium = $\frac{2,35,294 \times 0.098}{1.9516}$ = Rs.11,815

Total = Rs.2,47,109

Since outflow of cash is least in case of Option same should be opted for. Further if price of INR goes above JY 2.125/INR the outflow shall further be reduced.

Question 22 :
May 2016 – Paper

Fresh Bakery Ltd.' s share price has suddenly started moving both upward and downward on a rumour that the company is going to have a collaboration agreement with a multinational company in bakery business. If the rumour turns to be true, then the stock price will go up but if the rumour turns to be false, then the market price of the share will crash. To protect from this an investor has purchased the following call and put option:

(i) One 3 months call with a striking price of Rs.52 for Rs.2 premium per share.

(ii) One 3 months put with a striking price of Rs.50 for Rs.1 premium per share.

Assuming a lot size of 50 shares, determine the followings:

(1) The investor's position, if the collaboration agreement push the share price to Rs.53 in 3 months.

(2) The investor's ending position, if the collaboration agreement fails and the price crashes to Rs.46 in 3 months' time.

Solution :

1) Opening Position

50 C+ 52 @ 2 = 50 × 2 = 100 outflow

50 P+ 50 @ 1 = 50 × 1 = 50 outflow

150 outflow

2) Profit Profile

EP	C(E/L)	Po	P(E/L)	Po	Pre.	Net
53	E	1 × 50 = 50	L	–	(150)	(100)
46	L	–	E	4 × 50 = 200	(150)	50

Explanation :

1) At 53 – Call will be exercised

– Pay off (53 – 52) × 50 = 50

– Put will lapse –

– Premium (150)

Net Loss 100

2) At 46 – Put will be exercised

– Pay off (50 – 46) × 50 200

– Call will lapse –

– Premium (150)

Net gain 50

Question 23 :
Nov 2016 – RTP

A Ltd. of U.K. has imported some chemical worth of USD 3,64,897 from one of the U.S. suppliers. The amount is payable in six months' time. The relevant spot and forward rates are:

Spot rate USD 1.5617-1.5673

6 months forward rate USD 1.5455-1.5609

The borrowing rates in U.K. and U.S. are 7% and 6% respectively and the deposit rates are 5.5% and 4.5% respectively.

Currency options are available under which one option contract is for US$ 21250. The option premium for US$ at a strike price of GBP 0.58825/USD is GBP 0.036 (call option) and GBP 0.056 (put option) for 6 months period.

The company has 3 choices:

(i) Forward cover

(ii) Money market cover, and

(iii) Currency option

Which of the alternatives is preferable by the company?

Solution :

A Ltd., UK Co.

- $ 3,64,897 payable
- After 6 months

Alt 1 : Forward cover

6 mf $/¥ 1.5455 \ 1.5609

Rate Application 1.5455

Amount Payable = $\frac{3,64,897}{1.5455}$ = £ 2,36,102.88 Pay after 6 months

Alt 2 : Money Market Cover

FC payable = Invest / Buy / Borrow

Step 1 : Invest $ to receive $ 3,64,897 @ 4.5%

P.A . i.e. 2.25% for 6 months

Amount to be invested = $\frac{3,64,897}{1.0225}$ = $ 3,56,867.48

Step 2 : Buy $ 3,56,867.48 Spot $/£ 1.5617 / 1.5673

i.e. $\frac{3,56,867.48}{1.5617}$ = £ 2,28,512.19

Sep 3 : Borrow £ 2,28,512.19 @ 7% i.e. 3.5% for 6 months

Amount payable = 2,28,512.19 × 1.035

= $ 2,36,510.11 After 6 months

Alt 3 : Option Cover

Amount payable = $ 3,64,897

Lot size = $ 21,250

No. of lots (3,64,897 / 21,250) = 17.17 lots

Note : We shall trade in 17 lots and any excess shall be covered trough forward cover

1) Option cover (17 × 21,250) $ 3,61,250

2) Forward cover (3,64,897 – 3,61,250) $ 3,647

Call Option :

1) Amount payable to buy $ 3,61,250

= 17 × 21,250 × 0.58825 $ 2,12,505.31

2) Premium payable

= 17 × 21,250 × 0.036 13,005

+ Interest on £ 13,005 for 6 months @ 3.5% for 6 months	455.175	$ 13,460.175
Forward Cover = $\frac{3,647}{1.5455}$		$ 2,359.75
	Total Payable	$ 2,28,325.235

The company should opt. for Option Cover.

Question 24 :
May 2017 – Paper

Ram Chemical is in production Line of Chemicals and considering a proposal of building new plant to produce pesticides. The Present Value (PV) of new proposal is Rs.150 crores (After considering scrap value at the end of life of project). Since this is a new product market, survey indicates following variation in Present Value (PV):

Condition Favorable in first year	PV will increase 30% from original estimate
Condition sluggish in first year	PV will decrease by 40% from original figures.

In addition Rama Chemical has a option to abandon the project at the end of Year and dispose it at Rs.100 crores. If risk free rate of interest is 8%, what will be present value of put option?

Solution :

Decision tree showing pay off

Year 0	Year 1	Pay off
	195	0
150		
	90	100-90 = 10

First of all we shall calculate probability of high demand (P) using risk neutral method as follows:

8% = p x 30% + (1-p) x (-40%)

0.08 = 0.30 p - 0.40 + 0.40p

p = $\frac{0.48}{0.70}$ = 0.6857 say 0.686

The value of abandonment option will be as follows:

Expected Payoff at Year 1

= p × 0 + [(1-p) × 10]

= 0.686 × 0 + [0.314 × 10]

= Rs.3.14 crore

Since expected pay off at year 1 is 3.14 crore, present value of expected pay off will be:

$\frac{3.14}{1.08}$ = 2.907 crore.

This is the value of abandonment option (Put Option).

Question 25 :
Nov 2017 – Paper

A call option on gold with exercise price Rs.26,000 per ten gram and three months to expire is being traded at a premium of Rs.1,010 per ten gram. It is expected that in three months time the spot price might change to Rs.27,300 or 24,700 per ten gram. At present this option is at-the-money and the rate of interest with simple compounding is 12% per annum. Is the current premium for the option justified? Evaluate the option and comments.

Solution :

To determine whether premium is justified we shall compute the value of option by using any of the following models:

By use of Binomial Model :

Decision Tree showing pay off

Year 0	3 Months	Pay off
	27300	1300
26000		
	24700	0

The Delta (△) Ratio

$\triangle = \frac{1300-0}{27300-24700} = 0.50$

Replicating portfolio Buy 5 gram of gold and sell one call option.

The pay off if price goes up = 0.50 x Rs.27300 - Rs.1,300
= Rs. 12,350

The pay off if price goes down = 0.50 x Rs.24,700
= Rs.12,350

Present Value of Pay-off = $\frac{\text{Rs.12,350}}{1.03}$ = Rs.11,990

Current Investment = Rs.26,000 x 0.50 = Rs.13,000

Value of Option = Rs.13,000 – Rs.11,990 = Rs.1,010

Thus the price of option is justified.

Alternatively, by using Risk Neutral Model:

First of all we shall calculate probability of high demand (P) using risk neutral method as follows:

3% = p x 5% + (1-p) x (-5%)

0.03 = 0.05 p - 0.05 + 0.05p

p = $\frac{0.08}{0.10}$ = 0.80

The value of Call Option = $\frac{1300 \text{ x } 0.8+0 \text{ x } 0.2}{1.03}$ = Rs.1,009.71 say Rs.1,010

Thus, the price of option is justified.

Question 26 :
May 2018 (New) – Paper

Mr. KK purchased a 3 month call option for 100 shares in PQR Ltd. at a premium of Rs.40 per share, with an exercise price of Rs.560. He also purchased a 3 month put option for 100 shares of the same company at a premium of Rs.10 per share with an exercise price of Rs.460. The market price of the share on the date of Mr. KK's purchase of options, is Rs.500. Calculate the profit or loss that Mr. KK would make assuming that the market price falls to Rs.360 at the end of 3 months.

Solution :

Since the market price at the end of 3 months falls to Rs.360 which is below the exercise price under the call option, the call option will not be exercised. Only put option becomes viable.

The gain will be:	**Rs.**
Gain per share (Rs.450 – Rs.350)	100
Total gain per 100 shares	10,000
Cost or premium paid (Rs.40 x 100) + (Rs.10 x 100)	5,000
Net gain	5,000

Question 27 :
Nov 2018 – RTP / May 2019 (New) – RTP

The market received rumour about ABC Corporation's tie-up with a multinational company. This has induced the market price to move up. If the rumour is false, the ABC Corporation's stock price will probably fall dramatically. To protect from this an investor has bought the call and put options.

He purchased one 3 months call with a striking price of Rs.42 for Rs.2 premium, and paid Re.1 per share premium for a 3 months put with a striking price of Rs.40.

(i) Determine the Investor's position if the tie up offer bids the price ABC Corporation's stock up to Rs.43 in 3 months.

(ii) Determine the Investor's ending position, if the tie up programme fails and the price of the stocks falls to Rs.36 in 3 months.

Solution :

1) Opening position

C^+ 42 @ 2 i.e. 100 × 2 = 200 outflow

P^+ 40 @ 1 i.e. 100 × 1 = 100 outflow

300

Note : We have assumed 100 shares

2) Profit Profile

EP	C(E/L)	Po	P(E/L)	Po	Pre.	Net
43	E	1 × 100 = 100	–	–	(300)	(200)
36	L	Nil	E	100 × 4 = 400	(300)	100

Explanation :

1) At price 43.

Call is exercised = (43 – 42) = 100	100
Put will Lapse	–
Premium	(300)
Net Loss	(200)

2) At price 36.

Call will Lapse	–
Put will be exercised (40 – 36) 100	400
Premium	(300)
Net Gain	100

Question 28 :
Nov 2018 (New) – RTP / Nov 2019 (Old) – RTP

Ram holding shares of Reliance Industries Ltd. which is currently selling at Rs.1000. He is expecting that this price will further fall due to lower than expected level of profits to be announced after one month. As on following option contract are available in Reliance Share.

Strike Price (Rs.)	Option	Premium (Rs.)
1030	Call	40
1010	Call	35
1000	Call	30
990	Put	35
970	Put	20
950	Put	8
930	Put	5

Ram is interested in selling his stock holding as he cannot afford to lose more than 5% of its value. RECOMMEND a hedging strategy with option and show how his position will be protected.

Solution :

Instead of selling the stock of Reliance Ltd., Ram must cover his Risk by buying or long position in Put Option with appropriate strike price. Since Ram's risk appetite is 5%, the most suitable strike price in Put Option shall be Rs.950 (Rs.1000 – 5% of Rs.1000). If Ram does so, the overall position will be as follows:

Spot Price after 1 month	Stock Value	Put Payoff	Initial Cash Flow	Total
S < 950	S	950 – S	-8	942–S
S > 950	S	-	-8	S-8

Thus, from the above, it can be seen that the value of holding of Ram shall never be less than Rs.942 as Put Option will compensate for loss below spot price of Rs.950. However, this strategy will involve a cost of Rs.8.

Question 29 :
Nov 2018 (New) – Paper / Nov 2019 (Old) – RTP

The equity share of SSC Ltd. is quoted at Rs.310. A three month call option is available at a premium of Rs.8 per share and a three month put option is available at a premium of Rs.7 per share.
Ascertain the net payoffs to the option holder of a call option and a put option, considering that:

i. the strike price in both cases is Rs.320; and

ii. the share price on the exercise day is Rs.300, 310, 320, 330 and 340.

Also indicate the price range at which the call and the put options may be gainfully exercised.

Solution :

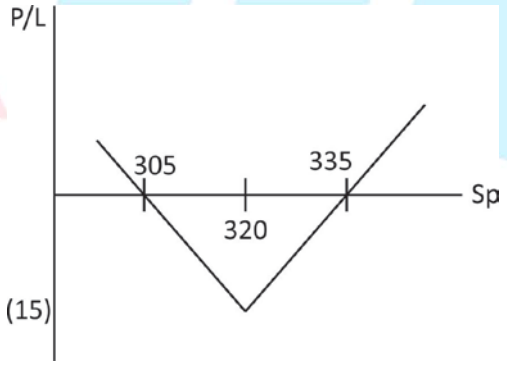
1) Opening Position

C^+ 320 @	8
P+ 320 @	7
Total outflow	15

2) Profit Profile

EP	C(E/L)	Po	Put (E/L)	Po	Premium	Net
300	L	–	E	20	(15)	5
310	L	–	E	10	(15)	(5)
320	L	–	L	–	(15)	(15)
330	E	10	L	–	(15)	(5)
340	E	20	L	–	(15)	(5)

3) Diagram



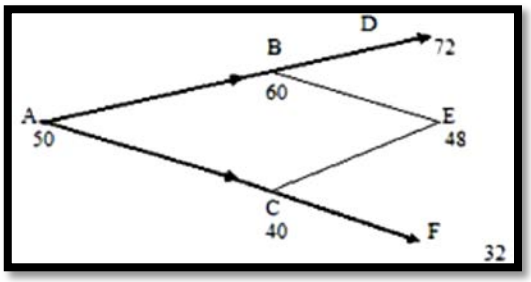
Question 30 :
Nov 2019 (New) – RTP

Consider a two-year call option with a strike price of Rs.50 on a stock the current price of which is also Rs.50. Assume that there are two-time periods of one year and in each year the stock price can move up or down by equal percentage of 20%. The risk-free interest rate is 6%. Using binominal

option model, calculate the probability of price moving up and down. Also draw a two-step binomial tree showing prices and payoffs at each node.

Solution :

Stock prices in the two step Binominal tree

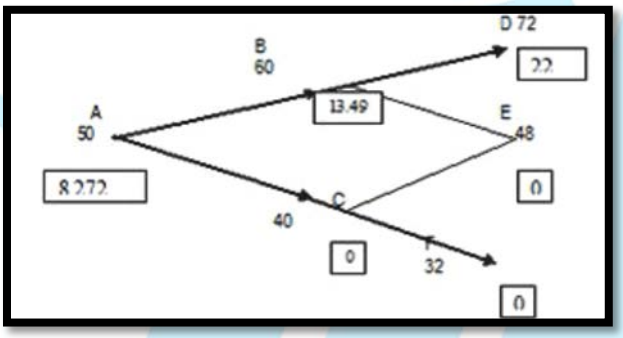


Using the single period model, the probability of price increase is

P = $\frac{R-d}{u-d} = \frac{1.06-0.80}{1.20-0.80} = \frac{0.26}{0.40}$ = 0.65

Therefore the p of price decrease = 1-0.65 = 0.35

The two step Binominal tree showing price and pay off



The value of an American call option at nodes D, E and F will be equal to the value of European option at these nodes and accordingly the call values at nodes D, E and F will be 22, 0 and 0 using the single period binomial model the value of call option at node B is

C = $\frac{Cup + Cd(1-p)}{R} = \frac{22 \times 0.65 + 0 \times 0.35}{1.06}$ = 13.49

The value of option at node 'A' is

$\frac{13.49 \times 0.65 + 0 \times 0.35}{1.06}$ = 8.272.

Question 31 :
Nov 2019 (New) – Paper

AB Ltd.'s equity shares are presently selling at a price of Rs.500 each. An investor is interested in purchasing AB Ltd.'s shares. The investor expects that there is a 70% chance that the price will go up to Rs.650 or a 30% chance that it will go down to Rs.450, three months from now. There is a call

option on the shares of the firm that can be exercised only at the end of three months at an exercise price of Rs.550.

Calculate the following :

(i) If the investor wants a perfect hedge, what combination of the share and option should he select?

(ii) Explain how the investor will be able to maintain identical position regardless of the share price.

(iii) If the risk-free rate of return is 5% for the three months period, what is the value of the option at the beginning of the period?

(iv) What is the expected return on the option?

Solution :

i) If investor wants perfect hedge he should

Buy 1 share @ 500

Write 2 option @ 35.71/sh.

ii) Explanation to (i) above

(a) If share price rises to 650

Profit on share (650 – 500)	150
– Notional Interest (500 × 0.05)	(25)
– Loss on call (650 – 550) × 2	(200)
+ Call Premium (35.71 × 2 × 1.05)	75
	Nil

(b) If share price falls 450

Loss on share (500 – 450)	(50)
– Notional Interest (500 × 0.05)	(25)
– Po on Call	Nil
+ Call Premium (35.71 × 2 × 1.05)	75
	Nil

iii) Value of option as per portfolio Replication Model

Step 1 : Spread between 2 possible prices

= 650 – 450 = 200

Step 2 : Spread between 2 possible pay off

1) Price rises to 650 = 650 – 500 = 100

2) Price falls to 450 = Call will lapse

Spread = 100 – Nil = 100

Step 3 : No. of option = $\frac{200}{100}$ = 2

Step 4 : Value of Call

SO = N × C + Pv of lower of EP/LP

500 = 2 × C + Pv of 450 (@ 5%)

500 = 2C + 428.57

$\therefore C = \frac{500 - 428.57}{2}$ = Rs.35.71/sh

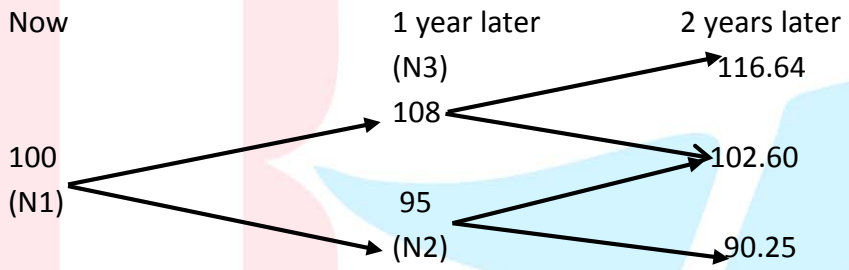
iv) Expected return on option

= 100 × 70% + Nil × 30% = Rs.70

$= \frac{70 - 35.71}{35.71} \times 100 = 96.02\%$

Question 32 :
Nov 2020 (New) – Paper

A two year tree for a share of stock in ABC limited, is as follows



Consider a 2 year American call option on the stock of ABC limited with the strike price of Rs 98. The current price of the stock is Rs100. Risk return is 5% per annum with continuous compounding and $e^{0.05}$ = 1.05127.

Assume 2 time period of one year each.

Using binomial model, calculate :

1. The probability of price moving up and down
2. Expected pay off at each node N1, N2 and N3 (round off upto 2 decimal points).

Solution :

(i) Using the single period model, the probability of price moving up is

$$P = \frac{R - d}{u - d} = \frac{1.05127 - \frac{95}{100}}{\frac{108}{100} - \frac{95}{100}} = \frac{0.10127}{0.13} = 0.779 \text{ say } 0.78 \text{ i.e. } 78\%$$

Therefore, the probability of price moving down = 1 – 0.78 = 0.22 i.e. 22%

(ii) Expected pay-off at

Node N2

$$\frac{0.78 \times 18.64 + 0.22 \times 4.60}{1.05127} = \frac{15.55}{1.05127} = \text{Rs.}14.79$$

Node N3

$$\frac{0.78 \times 4.60 + 0.22 \times 0}{1.05127} = \frac{3.588}{1.05127} = \text{Rs.}3.41$$

Node N1

$$\frac{0.78 \times 14.79 + 0.22 \times 3.41}{1.05127} = \frac{12.286}{1.05127} = \text{Rs.}11.69$$

Thanks ....

CHP - 10 DERIVATIVES - SWAPS

Question 1 :
Nov 2008 – Paper / Nov 2009 – RTP / Nov 2011 – Paper / Nov 2016 – RTP

Suppose a dealer quotes 'All-in-cost' for a generic swap at 8% against six month libor flat. If the notional principal amount of swap is Rs.5,00,000,

(i) Calculate semi-annual fixed payment.

(ii) Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding libor was 6% on the effective date of swap.

In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?

Generic swap is based on 30/360 days basis.

Solution :

(i) Semi-annual fixed payment

$$= 5,00,000 \times 8\% \times \frac{180}{360}$$

= Rs.20,000/-

(ii) Floating Rate Payment

$$= 5,00,000 \times 6\% \times \frac{181}{360}$$

= Rs.15083

(iii) Net Amount

= Rs.20,000– 15,083 = 4,917

Question 2 :
Nov 2010 – Paper / May 2012 – RTP / May 2013 – RTP / May 2014 – RTP / May 2017 – RTP / Nov 2017 – RTP / Nov 2017 – Paper

Derivative Bank entered into a plain vanilla swap through on OIS (Overnight Index Swap) on a principal of Rs.10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 2nd August, 2010 and was to commence on 3rd August, 2010 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

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

If Derivative Bank received Rs.317 net on settlement, calculate Fixed rate and interest under both legs.

Notes:

I. Sunday is Holiday.

II. Work in rounded rupees and avoid decimal working.

Solution :

Day	Principal (Rs.)	MIBOR (%)	Interest (Rs.)	Total
Tuesday	10,00,00,000	7.75	21,233	10,00,21,233
Wednesday	10,00,21,233	8.15	22,334	10,00,43,567
Thursday	10,00,43,567	8.12	22,256	10,00,65,823
Friday	10,00,65,823	7.95	21,795	10,00,87,618
Saturday & Sunday (*)	10,00,87,618	7.98	43,764	10,01,31,382
Monday	10,01,31,382	8.15	22,358	10,01,53,740
Total Interest @ Floating	(10,01,53,740 – 10,00,000)		1,53,740	
Less: Net Received			317	
Expected Interest @ fixed			1,53,423	
Thus Fixed Rate of Interest	$\left(\frac{1,53,423}{10,00,00,000}\times 100\times\frac{365}{7}\right)$		0.07999914%	
Approx.			8%	

(*) i.e. interest for two days.

Note: Alternatively, answer can also be calculated on the basis of 360days in a year.

Question 3 :
May 2011 - RTP

The following details are related to the borrowing requirements of two companies ABC Ltd. and DEF Ltd.

Company	Requirement	Fixed Rates Offered	Floating Rates Offered
ABC Ltd.	Fixed Rupee Rate	4.5%	PLR + 2%
DEF Ltd.	Floating Rupee Rate	5.0%	PLR + 3%

Both Companies are in need of Rs.2,50,00,000 for a period of 5 years. The interest rates on the floating rate loans are reset annually. The current PLR for various period maturities are as follows:

Maturity (Years)	PLR (%)
1	2.75
2	3.00
3	3.20
4	3.30
5	3.375

DEF Ltd. has bought an interest rate Cap at 5.625% at an upfront premium payment of 0.25%.

(a) You are required to exhibit how these two companies can reduce their borrowing cost by adopting swap assuming that gains resulting from swap shall be share equity among them.

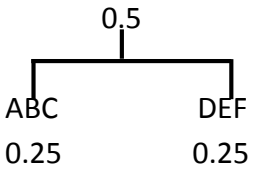
(b) Further calculate cost of funding to these two companies assuming that expectation theory holds good for the 4 years.

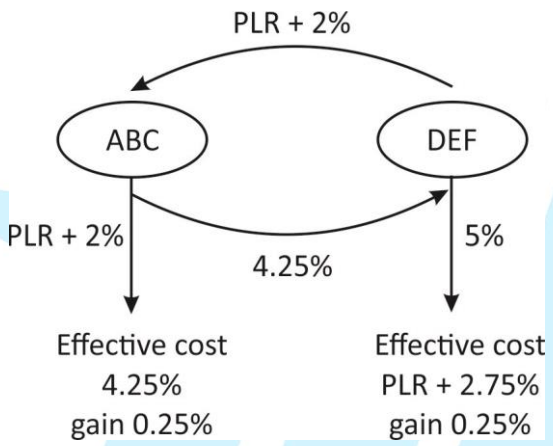
Solution :

1) Swap Assuming equal gain to both the parties

Gain = 4.5 + PLR + 3% = PLR + 7.5%

5 + PLR + 2% = PLR + 7%





Explanation :

a) ABC will borrowed @ PLR + 2% from bank and then receive the same from DEF giving DEF 4.25% thus getting a cheaper rate of 4.25% net saving 0.25.

b) DEF will borrow @5% fixed swap to get 4.25% from ABC in return of providing PLR + 2% to ABC. Finally effective cost to DEF will be PLR + 2.75% getting a gain of 0.25%.

2) Effective cost to both parties will be

a) To ABC – Fixed rate of 4.25%

b) To DEF

Year	Effective PLR	Load	Effective Rate	Cap	Effective under Cap
1	2.75	2.75	5.5	5.625	5.5
2	$\frac{(1.03)^2}{(1.0275)} - 1 = 3.25$	2.75	6	5.625	5.625
3	$\frac{(1.032)^3}{(1.03)^2} - 1 = 3.6\%$	2.75	6.35	5.625	5.625

4	$\frac{(1.033)^4}{(1.032)^3} - 1 = 3.6\%$	2.75	6.35	5.625	5.625

Question 4 :
May 2011 – RTP

XYZ plc borrows £ 20 million of 6 months LIBOR + 0.25% for a period of two years. Mr.Toby, Treasury Manager of XYZ anticipates a rise in LIBOR, hence proposed to buy a Cap option from a ABC Bank at strike rate of 7%. The lump sum premium is 1% for the whole of the three resets period and the fixed rate of interest is 6% p.a. The actual position of LIBOR during the forth coming reset period is as follows:

Reset Period	LIBOR
1	8.00%
2	8.50%
3	9.00%

You are required to show how far interest-rate risk is hedged through Cap option.

Solution :

First of all we shall calculate premium payable to bank as follows:

$$\frac{0.01}{\left(\frac{1}{0.03}\right) - \frac{1}{0.03 \times 1.03}} \times £\ 2,00,00,000 = £\ 53,908$$

Now we see the net payment received from bank

Reset Period	Additional interest due to rise in interest rate	Amount Received from Bank	Premium paid to Bank	Net Amount Received from Bank
1	£ 100,000	£ 100,000	£ 53,908	£46,092
2	£ 150,000	£ 150,000	£ 53,908	£96,092
3	£ 200,000	£ 200,000	£ 53,908	£146,092
Total	£ 450,000	£ 450,000	£161,724	£ 288,276

Thus, from above it can be seen that interest rate risk amount of £ 450,000 reduced to £ 288,276 by using of Cap option.

Question 5 :
May 2011 – Paper / Nov 2013 – RTP / May 2020 (Old) – RTP / May 2020 (New) – RTP

A Inc. and B Inc. intend to borrow $200,000 and $200,000 in ¥ respectively for a time horizon of one year. The prevalent interest rates are as follows :

Company	¥ Loan	$ Loan
A Inc	5%	9%
B Inc	8%	10%

The prevalent exchange rate is $1 = ¥120.

They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ¥ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

Solution :

Opportunity gain of A Inc under currency swap	Receipts	Payments	Net
Interest to be remitted to B. Inc in $ 2,00,000 x 9%=$18,000		¥21,60,000	
Converted into ($18,000x¥120)			
Interest to be received from B. Inc in $ converted into Y (6%x$2,00,000 x ¥120)	¥14,40,000		
Interest payable on Y loan		¥12,00,000	
	¥14,40,000	¥33,60,000	
Net Payment -	¥19,20,000		
	¥33,60,000	¥33,60,000	
$ equivalent paid ¥19,20,000 x(1/¥120)			$16,000
Interest payable without swap in $			$18,000
Opportunity gain in $			$2,000

Opportunity gain of B inc under currency swap	Receipts	Payments	Net
Interest to be remitted to A. Inc in ($ 2,00,000 x 6%)		$ 12,000	
Interest to be received from A. Inc in Y converted into $ =¥21,60,000/¥120	$ 18,000		
Interest payable on $ loan@10%		$ 20,000	
	$ 18,000	$ 32,000	
Net Payment -	$ 14,000		
	$ 32,000	$ 32,000	
Y equivalent paid $14,000 X ¥120			¥16,80,000
Interest payable without swap in ¥ ($2,00,000X¥120X8%)			¥19,20,000
Opportunity gain in Y			¥2,40,000

Alternative Solution

Cash Flows of A Inc

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings	$2,00,000 x ¥120	+ ¥240,00,000
Swap		- ¥240,00,000
Swap		+$2,00,000
Net Amount		+$2,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	¥240,00,000 x 5%	¥12,00,000
Interest Receipt from B Inc.	¥2,00,000 x 120 x 6%	¥14,40,000
Net Saving (in $)	¥2,40,000/¥120	$2,000
Interest to B Inc.	$2,00,000 x 9%	–$18,000
Net Interest Cost		–$16,000

A Inc. used $2,00,000 at the net cost of borrowing of $16,000 i.e. 8%. If it had not opted for swap agreement the borrowing cost would have been 9%. Thus there is saving of 1%.

Cash Flows of B Inc

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings		+ $2,00,000
Swap		– $2,00,000
Swap	$2,00,000 x ¥120	+¥240,00,000
Net Amount		+¥240,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	$2,00,000 x 10%	– $20,000
Interest Receipt from B Inc.		+ $ 18,000
Net Saving (in ¥)	– $2,000 x ¥120	– ¥2,40,000
Interest to A Inc.	$2,00,000 x 6% x ¥120	– ¥14,40,000
Net Interest Cost		– ¥16,80,000

B Inc. used ¥240,00,000 at the net cost of borrowing of ¥16,80,000 i.e. 7%. If it had not opted for swap agreement the borrowing cost would have been 8%. Thus there is saving of 1%.

Question 6 :
Nov 2011 - RTP

Euroloan Bank has a differential advantage in issuing variable-rate loans, but wishes to avoid the income risk associated with such loan. Currently bank has a portfolio €25,000,000 loans with PLR + 150bp, reset monthly PLR is currently 4%.

IB an investment bank has arranged for Euroloan to swap into a fixed interest payment of 6.5% on notional amount of loan for its variable interest income. If Euroloan agrees to this, what amount of interest is received and given in the first month? Further, assume that PLR increased by 200 bp.

Solution :

Euroloan Earns = € 25,000,000 x $\frac{0.055}{12}$ = € 114,583.33

This amount will be swapped in exchange of € 25,000,000 x $\frac{0.065}{12}$

= € 135,416.67

If PLR jumps by 200 basis point Euroloan Earns € 25,000,000 x $\frac{0.075}{12}$

= € 156,250

This amount will be returned to IB Bank and will get € 135,416.67

Thus with increase in PLR, Bank will Loose

Question 7 :

Nov 2011 – RTP

A Ltd. is considering a Rs.50 crores 3 year interest rate swap. The company is interested in borrowing at floating rate however, due to its good credit rating, it has a comparative over lower rated companies in fixed rate market. It can borrow at fixed rate of 6.25% or floating rate MIBOR+0.75%. Presently, MIBOR is 5.25% but is expected to change in 6 months due to political situation in the country. X Ltd. an intermediary bank agreed to arrange a swap. The bank will offset the swap risk with a counter party (B. Ltd.) a comparative lower credit rated company, which could borrow at a fixed rate of 7.25% and floating rate of MIBOR + 1.25%. X Ltd. would charge Rs.12,00,000 per year as its fee from each party. Mr. Fin the CFO, of A Ltd. desires that A Ltd. should receive 60% of any arbitrage saving (before payment of fees) from the swap as A Ltd. enjoying high credit rating.

Any fees paid to the bank are tax allowable. The applicable tax rate is 30%. You are required to:

(a) Evaluate whether the proposal is beneficial for both parties or not.

(b) Assuming that MIBOR was to increase to 5.75% immediately after political crisis over and shall remain constant for the period of swap. Evaluate the present value of savings from the swap for A Ltd., assuming that interest payment are made semi- annually in arrears.

Solution :

1)

Swap	Fixed Rate	Floating	Preference
A Ltd.	6.25%	M + 0.75%	Floating
B Ltd.	7.25%	M + 1.25%	Fixed

Total gain M + 1.25% + 6.25 = M + 7.5%

M + 0.75% + 7.25 = M + 8%

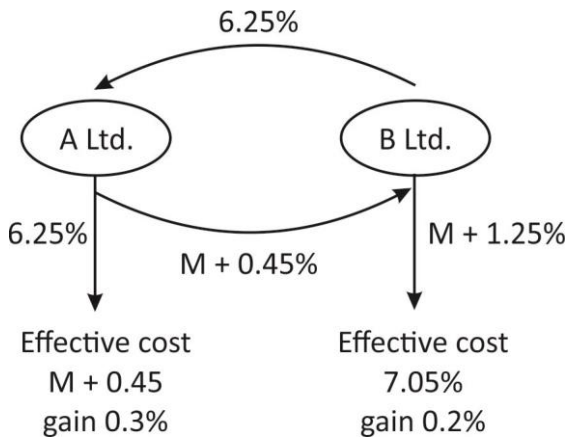
0.5%

A – 60% B – 40%

0.3% 0.2%

X Ltd. who arranges the swap shall charge Rs.12,00,000 per year from each party.

2) Swap design



3) Evaluation of swap

(a) A point of view

Saving in Interest is 0.3%

i.e. 50 Cr. × 0.3%	15,00,000
– Cost to Bank (12,00,000 × 0.7)	8,40,000
Savings	6,60,000

(b) B Point of view

Saving in Interest is 0.2%

i.e. 50 Cr. × 0..2%	10,00,000
– Cost to Bank (12,00,000 × 0.7)	8,40,000
Savings	1,60,000

4) PV of savings from Swap far A Ltd.

Period	Saving	Cost	Net	PV @ 6.2% (5.75 + 0.45%)
1	7,50,000	–	7,50,000	7,06,215
2	7,50,000	8,40,000	(90,000)	(79,798)
3	7,50,000	–	7,50,000	6,26,163
4	7,50,000	8,40,000	(90,000)	(70,753)
5	7,50,000	–	7,50,000	5,55,186
6	7,50,000	8,40,000	(90,000)	(62,733)
	PV of Savings			16,74,280

Question 8 :
Nov 2012 – RTP

Drilldip Inc. a US based company has a won a contract in India for drilling oil field. The project will require an initial investment of Rs.500 crore. The oil field along with equipments will be sold to Indian Government for Rs.740 crore in one year time. Since the Indian Government will pay for the amount in Indian Rupee (Rs.) the company is worried about exposure due exchange rate volatility.

You are required to:

(a) Construct a swap that will help the Drilldip to reduce the exchange rate risk.

(b) Assuming that Indian Government offers a swap at spot rate which is 1US$ = Rs.50 in one year, then should the company should opt for this option or should it just do nothing. The spot rate after one year is expected to be 1US$ = Rs.54. Further you may also assume that the Drilldip can also take a US$ loan at 8% p.a.

Solution :

(a) The following swap arrangements can be entered by Drilldip.

(i) Swap a US$ loan today at an agreed rate with any party to obtain Indian Rupees (`) to make initial investment.

(ii) After one year swap back the Indian Rupees with US$ at the agreed rate. In such case the company is exposed only on the profit earned from the project.

(b) With the swap

	Year 0 (Million US$)	Year 1 (Million US$)
Buy Rs.500 crore at spot rate of 1US$ = Rs.50	(100.00)	–
Swap Rs.500 crore back at agreed rate of Rs.50	–	100.00
Sell Rs.240 crore at 1US$ = Rs.54	–	44.44
Interest on US$ loan @8% for one year	–	(8.00)
	(100.00)	136.44

Net result is a net receipt of US$ 36.44 million.

Without the swap

	Year 0 (Million US$)	Year 1 (Million US$)
Buy Rs.500 crore at spot rate of 1US$ = Rs.0	(100.00)	–
Sell Rs.740 crore at 1US$ = Rs.54	–	137.04
Interest on US$ loan @8% for one year	–	(8.00)
	(100.00)	129.04

Net result is a net receipt of US$ 29.04 million.

Decision: Since the net receipt is higher in swap option the company should opt for the same.

Question 9 :
Nov 2012 – RTP

Suppose that a 1-year cap has a cap rate of 8% and a notional amount of Rs.100 crore. The frequency of settlement is quarterly and the reference rate is 3-month MIBOR. Assume that 3-month MIBOR for the next four quarters is as shown below.

Quarters 3-months	MIBOR (%)
1	8.70
2	8.00

3	7.80
4	8.20

You are required to compute payoff for each quarter.

Solution :

There is no payoff to the cap if the cap rate exceeds 3-month MIBOR. For Periods 2 and 3, there is no payoff because 3-month MIBOR is below the cap rate. For Periods 1 and 4, there is a payoff and the payoff is determined by:

Rs.100 crore × (3-month MIBOR – Cap Rate)/4

The payoffs are summarized below:

Quarters	3-months MIBOR (%)	Pay-off (Rs.)
1	8.70	17,50,000
2	8.00	Nil
3	7.80	Nil
4	8.20	5,00,000

Question 10 :
Nov 2012 – RTP

Suppose that a 1-year floor has a floor rate of 4% and a notional amount of Rs.200 crore. The frequency of settlement is quarterly and the reference rate is 3-month MIBOR. Assume that 3-month MIBOR for the next four quarters is as shown below.

Quarters 3-months	MIBOR (%)
1	4.70
2	4.40
3	3.80
4	3.40

You are required to compute payoff for each quarter.

Solution :

There is a payoff to the floor if 3-month MIBOR is less than the floor rate. For Periods 1 and 2, there is no payoff because 3-month MIBOR is greater than the floor rate. For Periods 3 and 4, there is a payoff and the payoff is determined by:

Rs.200 crore × (Floor Rate – 3-month MIBOR)/4

The payoffs are summarized below:

Quarters	3-months MIBOR (%)	Pay-off (Rs.)
1	4.70	Nil
2	4.40	Nil
3	3.80	10,00,000
4	3.40	30,00,000

Question 11 :
May 2013 – Paper / Nov 2016 – RTP

XYZ Limited borrows £ 15 Million of six months LIBOR + 10.00% for a period of 24 months. The company anticipates a rise in LIBOR, hence it proposes to buy a Cap Option from its Bankers at the strike rate of 8.00%. The lump sum premium is 1.00% for the entire reset periods and the fixed rate of interest is 7.00% per annum. The actual position of LIBOR during the forthcoming reset period is as under:

Reset Period	LIBOR
1	9.00%
2	9.50%
3	10.00%

You are required to show how far interest rate risk is hedged through Cap Option. For calculation, work out figures at each stage up to four decimal points and amount nearest to £. It should be part of working notes.

Solution :

First of all we shall calculate premium payable to bank as follows:

$$P = \frac{rp}{\left[\left(\frac{1}{i}\right) - \frac{1}{i \times (1+i)^{t}}\right]} \times A$$

Where

P = Premium
A = Principal Amount
rp = Rate of Premium
i = Fixed Rate of Interest
t = Time

$$P = \frac{0.01}{\left[\left(\frac{1}{0.035}\right) - \frac{1}{i0.035 \times (1+0.035)^{4}}\right]} \times 15,00,000$$

$$= \frac{0.01}{28.5714 - \frac{1}{0.04016}} \times 15,00,000$$

= 40,861 £

Now we see the net payment received from bank

Reset Period	Additional interest due to rise in interest rate	Amount received from Bank	Premium paid to Bank	Net Amount received from Bank
1	£ 75,000	£ 75,000	£ 40,861	£34,139
2	£ 1,12,500	£ 1,12,500	£ 40,861	£71,639
3	£ 1,50,000	£ 1,50,000	£ 40,861	£109,139

Total	£ 337,500	£ 337,500	£122,583	£ 214,917

Thus, from above it can be seen that interest rate risk amount of £ 337,500 reduced by £ 214,917 by using of Cap option.

Question 12 :

May 2014 – RTP / May 2019 (New) – RTP

XYZ Inc. issues a £ 10 million floating rate loan on July 1, 2013 with resetting of coupon rate every 6 months equal to LIBOR + 50 bp. XYZ is interested in a collar strategy by selling a Floor and buying a Cap. XYZ buys the 3 years Cap and sell 3 years Floor as per the following details on July 1, 2013:

Notional Principal Amount	$ 10 million
Reference Rate	6 months LIBOR
Strike Rate	4% for Floor and 7% for Cap
Premium	0*

*Since Premium paid for Cap = Premium received for Floor

Using the following data you are required to determine:

(i) Effective interest paid out at each reset date,

(ii) The average overall effective rate of interest p.a.

Reset Date	LIBOR (%)
31-12-2013	6.00
30-06-2014	7.00
31-12-2014	5.00
30-06-2015	3.75
31-12-2015	3.25
30-06-2016	4.25

Solution :

(A) The pay-off of each leg shall be computed as follows:

Cap Receipt

Max {0, [Notional principal x (LIBOR on Reset date – Cap Strike Rate)

$$\times \frac{\text{Number of days in the settlement period}}{365}$$

Floor Pay-off

Max {0, [Notional principal x (Floor Strike Rate – LIBOR on Reset date)

$$\times \frac{\text{Number of days in the settlement period}}{365}$$

Statement showing effective interest on each re-set date

Reset Date	LIBOR (%)	Days	Interest Payment ($) LIBOR + 0.5%	Cap Receipts ($)	Floor Payoff ($)	Effective Interest
31-12-2013	6.00	184	3,27,671	0	0	3,27,671
30-06-2014	7.00	181	3,71,918	24,795	0	3,47,123
31-12-2014	5.00	184	2,77,260	0	0	2,77,260
30-06-2015	3.75	181	2,10,753	0	0	2,10,753
31-12-2015	3.25	184	1,89,041	0	12,603	2,01,644
30-06-2016	4.25	181	2,35,548	0	0	2,35,548
Total		1095				15,99,999

(B) Average Annual Effective Interest Rate shall be computed as follows:

$$\frac{15,99,999}{1,00,00,000} \times \frac{365}{1095} \times 100 = 5.33\%$$

Question 13 :
Nov 2014 – RTP / May 2019 (Old) – RTP / Nov 2019 (New) – RTP / Nov 2020 (New) – RTP

Two companies ABC Ltd. and XYZ Ltd. approach the DEF Bank for FRA (Forward Rate Agreement). They want to borrow a sum of Rs.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 in 2 years turns out to be

(a) 4.50% (b) 5.50%

Solution :

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

<u>XYZ Ltd.</u>

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

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

$r = 5.04\%$

Bank will quote 5.04% for a 2V3 FRA.

<u>ABC Ltd.</u>

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

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

r = 6.38%

Bank will quote 6.38% for a 2V3 FRA.

(ii)

		4.50%- Allow to Lapse	5.50%- Exercise
Interest	Rs.100 crores X 4.50%	Rs.4.50 crores	-
	Rs.100 crores X 5.04%	-	Rs.5.04 crores
Premium (Cost of Option)	Rs.100 crores X 0.1%	Rs.0.10 crores	Rs.0.10 crores
		Rs.4.50 Crores	Rs.5.14 Crores

Question 14 :

Nov 2015 – RTP

NoBank offers a variety of services to both individuals as well as corporate customers. NoBank generates funds for lending by accepting deposits from customers who are paid interest at PLR which keeps on changing.

NoBank is also in the business of acting as intermediary for interest rate swaps. Since it is difficult to identify matching client, NoBank acts counterparty to any party of swap.

Sleepless approaches NoBank who have already have Rs.50 crore outstanding and paying interest @PLR+80bp p.a. The duration of loan left is 4 years. Since Sleepless is expecting increase in PLR in coming year, he asked NoBank for arrangement of interest of interest rate swap that will give a fixed rate of interest.

As per the terms of agreement of swap NoBank will borrow Rs.50 crore from Sleepless at PLR+80bp per annuam and will lend Rs.50 crore to Sleepless at fixed rate of 10% p.a. The settlement shall be made at the net amount due from each other. For this services NoBank will charge commission @0.2% p.a. if the loan amount. The present PLR is 8.2%.

You as a financial consultant of NoBank have been asked to carry out scenario analysis of this arrangement.

Three possible scenarios of interest rates expected to remain in coming 4 years are as follows:

	Year 1	Year 2	Year 3	Year 4
Scenario 1	10.25	10.50	10.75	11.00
Scenario 2	8.75	8.85	8.85	8.85
Scenario 3	7.20	7.40	7.60	7.70

Assuming that cost of capital is 10%, whether this arrangement should be accepted or not.

Solution :

Interest and Commission due from Sleepless = Rs.50 crore (0.10+0.002)

= Rs.5.10 crore

Net Sum Due to Sleepless in each of Scenarios

Scenario 1

Year	PLR	Sum due to Sleepless	Net Sum Due (Rs.Crore)	PVF	(Rs.Crores)
1	10.25	50 (10.25 + 0.8)%= 5.525	5.10 –5.525 = - 0.425	0.909	-0.38633
2	10.50	50 (10.50 + 0.8)%= 5.650	5.10 –5.650 = - 0.550	0.826	-0.4543
3	10.75	50 (10.75 + 0.8)%= 5.775	5.10–5.775 = - 0.675	0.751	-0.50693
4	11.00	50 (11.00 + 0.8)%= 5.900	5.10 –5.900 = - 0.800	0.683	-0.5464
					-1.89395

Scenario 2

Year	PLR	Sum due to Sleepless	Net Sum Due (Rs.Crore)	PVF	(Rs.Crores)
1	8.75	50 (8.75 + 0.8)%= 4.775	5.10 –4.775 = 0.325	0.909	0.295425
2	8.85	50 (8.85+ 0.8)%= 4.825	5.10 –4.825 = 0.275	0.826	0.22715
3	8.85	50 (8.85+ 0.8)%= 4.825	5.10–4.825 = 0.275	0.751	0.206525
4	8.85	50 (8.85+ 0.8)%= 4.825	5.10 –4.825 = 0.275	0.683	0.187825
					0.916925

Scenario 3

Year	PLR	Sum due to Sleepless	Net Sum Due (Rs.Crore)	PVF	(Rs.Crores)
1	7.20	50 (7.20 + 0.8)%= 4.00	5.10 – 4.00 = 1.10	0.909	0.9999
2	7.40	50 (7.40 + 0.8)%= 4.10	5.10 – 4.10 = 1.00	0.826	0.826
3	7.60	50 (7.60 + 0.8)%= 4.20	5.10– 4.20 = 0.90	0.751	0.6759
4	7.70	50 (7.70 + 0.8)%= 4.25	5.10 – 4.25 = 0.85	0.683	0.58055
					3.08235

Decision: Since the NPV of the proposal is positive in Scenario 2 (Best Case) and Scenario 3 (Most likely Case) the proposal of swap can be accepted. However, if management of NoBank is of strong opinion that PLR are likely to be more than 10% in the years to come then it can reconsider its decision.

Question 15 :
Nov 2017 – Paper

A textile manufacturer has taken floating interest rate loan of Rs.40,00,000 on 1st April, 2012. The rate of interest at the inception of loan is 8.5% p.a. interest is to be paid every year on 31st March, and the duration of loan is four years. In the month of October 2012, the Central bank of the country releases following projections about the interest rates likely to prevail in future.

(i) On 31st March, 2013, at 8.75%; on 31st March, 2014 at 10% on 31st March, 2015 at 10.5% and on 31st March, 2016 at 7.75%. Show how this borrowing can hedge the risk arising out of expected rise in the rate of interest when he wants to peg his interest cost at 8.50% p.a.

(ii) Assume that the premium negotiated by both the parties is 0.75% to be paid on 1st October, 2012 and the actual rate of interest on the respective due dates happens to be as:

on 31st March, 2013 at 10.2%; on 31st March, 2014 at 11.5%; on 31st March, 2015 at 9.25%; on 31st March, 2016 at 8.25%. Show how the settlement will be executed on the perspective interest due dates.

Solution :

1) As borrower does not want to pay more than 8.5% P.A on this loan, he should enter into Cap Agreement.

Cap Agreement is available from bank, at a payment of premium which can negotiated by party and bank.

2) Borrower will have to pay premium of 0.75% on 1/10/12

i.e. 40,00,000 × 0.75% = 30,000

Settlement on various dates

Date	Actual Rate	Cap. Rate	Difference	Amount Receivable
31/3/13	10.2	8.5	1.7	40,00,000 × 17% = 68,000
31/3/14	11.5	8.5	3.3	40,00,000 × 3.3% = 1,20,000
31/3/15	9.25	8.5	0.75	40,00,000 × 075% = 30,000
31/3/16	8.25	8.5	Nil	Actual rate does not exceed Cap.

Question 16 :

May 2018 – RTP / May 2018 (New) – RTP

TMC Holding Ltd. has a portfolio of shares of diversified companies valued at Rs.400 crore enters into a swap arrangement with None Bank on the terms that it will get 1.15% quarterly on notional principal of Rs.80 crore in exchange of return on portfolio which is exactly tracking the Sensex which is presently 21600.

You are required to determine the net payment to be received/ paid at the end of each quarter if Sensex turns out to be 21,860, 21,780, 22,080 and 21,960.

Solution :

Qtrs. (1)	Sensex (2)	Sensex Return (%) (3)	Amount Payable (Rs.crore) (4)	Fixed Return (Receivables) (Rs.Crore) (5)	Net (Rs.Crore) (5) – (4)
0	21,600	-	-	-	-
1	21,860	1.2037	4.8148	4.6000	-0.2148
2	21,780	-0.3660	-1.4640	4.6000	6.0640
3	22,080	1.3774	5.5096	4.6000	-0.9096
4	21,960	-0.5435	-2.1740	4.6000	6.7740

Question 17 :
May 2018 (New) – Paper – 8 Marks

Punjab Bank entered into a plain vanilla swap through on OIS (Overnight Index Swap) on a principal of Rs.2 crore and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 25th July, 2017 and was to commence on 25th July, 2017 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

8.70%, 9.10%, 9.12%, 8.95%, 8.98% and 9.10%.

If Punjab Bank received Rs.507 net on settlement, calculate fixed rate and interest under both legs.

Notes:

(i) Sunday is Holiday.

(ii) Work in rounded rupees and avoid decimal working.

(iii) Consider 365 days in a year

Solution :

Day	Principal (Rs.)	MIBOR (%)	Interest (Rs.)
Tuesday	2,00,00,000	8.70	4,767
Wednesday	2,00,04,767	9.10	4,987
Thursday	2,00,09,754	9.12	5,000
Friday	2,00,14,754	8.95	4,454
Saturday & Sunday (*)	2,00,19,662	8.98	9,851
Monday	2,00,29,513	9.10	4,994
Total Interest @ Floating			34,507
Less: Net Received			507
Expected Interest @ fixed			34,000
Thus Fixed Rate of Interest			0.0886428
Approx.			8.86%

(*) i.e. interest for two days.

Question 18 :
Nov 2018 (New) – Paper

A dealer quotes 'All-in-cost' for a generic swap at 6% against six month LIBOR flat. If the notional principal amount of swap is Rs.9,00,000:

(i) Calculate semi-annual fixed payment.

(ii) Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 5% on the effective date of swap.

(iii) In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer? Generic swap is based on 30/360 days basis.

Solution :

1) Semi Annual fixed payment
   = 9,00,000 × 6% × 6/12 = 27,000
2) Floating Rate Payment
   = 9,00,000 × 5% × 181/360 = 22,625
3) Net Payment
   = 27,000 – 22,625 = Rs.4,375

Question 19 :
May 2019 (Old) – Paper

IM is an American firm having its subsidiary in Japan and JI is a Japanese firm having its subsidiary in USA: They face the following interest rates

	IM	JI
USD Floating rate	LIBOR + 0.5%	LIBOR + 2.5%
JPY Fixed rate	4%	4.25%

IM wishes to borrow USD at floating rate and JI JY at fixed rate. The amount required by both the companies is same at the current Exchange Rate. A financial institution requires 75 basis points as commission for arranging Swap. The companies agree to share the benefit/ loss equally.

You are required to find out

(i) Whether a beneficial swap can be arranged ?

(ii) What rate of interest for both IM and JI ?

Solution :

(i) IM has overall strong position and hence is in a comparative advantageous position in both rates. However, it has a comparative advantage in floating-rate market.
The differential between the U.S. dollar floating rates is 2.00% per annum, and the differential between the JPY fixed rates is 0.25% per annum. The difference between the differentials is 1.75% per annum. The total potential gain to all parties from the swap is therefore 1.75% per annum, or 175 basis points. If the financial intermediary requires 75 basis points, each of IM and JI can be made 50 basis points better off.

(ii) Since the Net Benefit of 100 Basis Points to be shared equally among IM and JI interest rate for them shall be as follows:

IM

Borrowing from Market	LIBOR + 0.5%
Less: Benefit from Swap	0.5%
Net Interest	LIBOR

JI

Borrowing from Market	4.25%
Less: Benefit from Swap	0.5%
Net Interest	3.75%

Question 20 :
Nov 2020 (New) – Paper

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

Company	IB	Zaki
INR Floating Rate	BPLR + 0.50%	BPLR + 2.5%
JPY Fixed Rate	2%	2.25%

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

You are required to find out:

Whether a swap can be arranged which can be beneficial for both the firms?

What rate of interest will the firms end up paying up?

Solution :

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.

Thanks ....

CHP - 11 PORTFOLIO MANAGEMENT

Question 1 :

Nov 2008 – Paper / Nov 2009 – RTP / Nov 2010 – Paper / May 2018 – Paper / Nov 2019 (New) – RTP / May 2020 (Old) – RTP

Consider the following information on two stocks, A and B:

Year	Return on A (%)	Return on B (%)
2006	10	12
2007	16	18

You are required to determine:

(i) The expected return on a portfolio containing A and B 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) Correlation coefficient between the returns of the two stocks.

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

Solution :

Yr	R_A	d_A	d^2_A	R_B	d_B	d^2_B	$d_A d_B$
06	10	–3	9	12	–3	9	9
07	16	3	9	18	3	9	9
	26		18	30		18	18
	$\bar{x}\ \frac{26}{2}$		$\sigma^2\ \frac{18}{2}$	$\bar{x}$ 15		$\sigma^2\ \frac{18}{2}$	$COV_AB = \frac{18}{2}$
	= 13		= 9			= 9	= 9
			$\sigma = \sqrt{9}$			$\sigma = \sqrt{9}$	
			3			3	

1) $R_P = 13 \times 40\% + 15 \times 60\% = 14.2$

2) $\sigma_A = 3\ \sigma_B = 3$

3) $COV_{AB} = 9$

4) $COR_{AB} = \frac{COV_{AB}}{\sigma A \sigma B} = \frac{9}{3 \times 3} = 1$

5) $\sigma_P = 3 \times 40\% + 3 \times 60\% = 3$

Question 2 :
May 2009 - RTP

Following information is available on Return (%) of shares of two companies A andB :

Probabilities	Return of A	Return of B
0.05	6	8
0.20	12	18
0.50	20	28
0.20	24	34
0.05	30	44

(i) Compute expected return from the portfolio

(ii) If the investment in A and B is in the ratio of 70:30 what is the risk of the portfolio ?

Solution :

1.

Prob.	R_A	$R_A.P$	d_A	$d2_A.P$	R_B	$R_B.P$	dB	$d^2_B.P$	$d_Ad_B.P$
0.05	6	0.3	–13	8.45	8	0.4	–19	18.05	12.35
0.20	12	2.4	–7	9.80	18	3.6	–9	16.2	12.6
0.50	20	10	1	0.50	28	14	1	0.5	0.5
0.20	24	4.8	5	5	34	6.8	7	9.8	7
0.05	30	1.5	11	6.05	44	2.2	17	14.45	9.35
	$\bar{x}$	19		σ^2 29.8	$\bar{x}$	27		σ^2 59	41.8
				σ 5.46				σ 7.68	COV_{AB}

2) σp

$$COR_{AB} = \frac{COV_{AB}}{\sigma A \sigma B} = \frac{41.8}{5.46 \times 7.68} = 0.9968$$

$$\sigma p = \sqrt{\sigma^2 Awt^2 A + \sigma^2 Bwt^2 B + 2\sigma A \sigma B wtAwtBCOR_{AB}}$$

$$= \sqrt{29.8 \times (0.7)^2 + 59 \times (0.3)^3 + 2 \times 5.46 \times 7.68 \times 0.7 \times 0.3 \times 0.9968}$$

$$= 6.12$$

Question 3 :
May 2009 - RTP

You have the following five stocks in your portfolio :

Security	No of Shares	Price / Share	Beta
A	10000	50	1.2
B	5000	20	2.0
C	8000	25	0.7
D	10000	100	1.0
E	500	200	1.3

(i) Compute portfolio beta

(ii) How much additional investment is required in Risk free investment to have beta to 0.8 ?

(iii) How much additional investment is required in Security B to increase beta to 1.4 ?

(iv) If the Nifty future is 2700 points and future have a contract multiplier of 50, how many future contracts to be hedged to obtain the position as in (iii) above ?

Solution :

(i) Portfolio Beta

Security	No. of Shares	Price	Total	β	Total × β
A	10000	50	5,00,000	1.2	6,00,000
B	5000	20	1,00,000	2.0	2,00,000
C	8000	25	2,00,000	0.7	1,40,000
D	10000	100	10,00,000	1.0	10,00,000
E	500	200	1,00,000	1.3	1,30,000
			19,00,000		20,70,000

$\beta p = \frac{20,70,000}{19,00,000} = 1.089$

(ii) Additional investment in Rf to bring β= 0.8

Let the investment in Rf be

$\therefore \frac{20,70,000 + (x \times 0)}{19,00,000 + x} = 0.8$

20,70,000 = 15,20,000 + 0.8x

∴x = 6,87,500

(iii) Additional investment in security B to increase β to 1.4

$\frac{20,70,000 + (x \times 2)}{19,00,000 + x} = 1.4$

= 20,70,000 + 2x = 26,60,000 + 1.4x

∴x = 9,83,333

(iv) No. of lots $= \frac{V_p \times (\beta_t - \beta_p)}{F \times M \times B_f}$

$= \frac{19,00,000 \times (1.4 - 1.089)}{2,700 \times 50 \times 1} = 4.38F^{-}$ i.e. 5 lots (Approx.)

Question 4 :
May 2009 – RTP

Details of portfolio held by your client which yields average return of 18% are given below

Shares	Cost (Rs.)	Dividend/Interest	Market Price	Beta
A	30,000	5000	33000	0.7
B	40,000	4000	42000	0.9
C	20,000	2000	23000	0.8

D	15,000	2250	14000	1.1
Govt. Bond	50,000	5000	52000	1

Find out expected return of each investment using CAPM and average return of the portfolio.

Solution :

1.

Shares	Cost (Rs.)	Dividend (Rs.)	Market Value (Rs.)	Beta
A	30,000	5000	33,000	0.7
B	40,000	4000	42,000	0.9
C	20,000	2000	23,000	0.8
D	15,000	2250	14,000	1.1
Govt. bond	50,000	5000	52,000	1
Total	1,55,000	18,250	1,64,000	

R = $\left(\frac{D_1 + P_1}{Po}\right) - 1 = \left(\frac{18,250 + 1,64,000}{1,55,000}\right) - 1 = 17.58\%$

2. Average β = $\frac{0.7 + 0.9 + 0.8 + 1.1 + 1}{5}$ = 0.9

∴ Re = Rf + β(Rm – Rf)

18 = Rf + 0.9 (17.58 – Rf)

18 = Rf + 15.822 – 0.9 Rf

∴ = 21.78%

3. Re of each stock

A = 21.78 + 0.7(17.58 – 21.78) = 18.84

B = 21.78 + 0.9(17.58 – 21.78) = 18

C = 21.78 + 0.8(17.58 – 21.78) = 18.42

D = 21.78 + 1.1(17.58 – 21.78) = 17.16

GOI = 21.78 + 1 (17.58 – 21.78) = 17.58

Check = $\frac{18.84 + 18 + 18.42 + 17.16 + 17.58}{5}$ = 18%

Question 5 :
May 2009 – Paper / Nov 2018 – Paper

Mr. X owns a portfolio with the following characteristics:

	Security A	Security B	Risk Free security
Factor 1 sensitivity	0.80	1.50	0
Factor 2 sensitivity	0.60	1.20	0
Expected Return	15%	20%	10%

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

1. If Mr. X has Rs.1,00,000 to invest and sells short Rs.50,000 of security B and purchases Rs.1,50,000 of security A what is the sensitivity of Mr. X's portfolio to the two factors?

2. If Mr. X 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 A and B in the same proportion as described in part (i), what is the sensitivity of the portfolio to the two factors?
3. What is the expected return premium of factor 2?

Solution :

1) Portfolio

B 1,00,000

Short B = 50,000 Buy 1,50,000 A

	Amt.	wt.
B	(50,000)	(0.5)
C	1,50,000	1.5
	1,00,000	1

Factor 1 = 0.8 × 1.5 + 1.5 × (0.5) = 0.45

Factor 2 = 0.6 × 1.5 + 1.2 × (0.5) = 0.30

2) Portfolio

Rs.1,00,000
+ Borrow 1,00,000
2,00,000

Short B = 1,00,000 Buy 3,00,000 A

	Amt.	wt.
B	(1,00,000)	(1)
C	3,00,000	3
Borrowing	(1,00,000)	(1)
	1,00,000	1

Factor 1 = 0.8 × 3 + 1.5 × (1) + Nil × (1) = 0.90

Factor 2 = 0.6 × 3 × 1.2 × (1) × Nil × (1) = 0.60

3) Expected Return Premium

Return = 3 × 15 + (1) × 20 + (1) × 10 = 15
– Risk free return 10
5

Question 6 :
May 2009 - Paper

An investor has two portfolios known to be on minimum variance set for a population of three securities A, B and C having below mentioned weights:.

	WA	WB	WC
Portfolio X	0.30	0.40	0.30
Portfolio Y	0.20	0.50	0.30

It is supposed that there are no restrictions on short sales.

(i) What would be the weight for each stock for a portfolio constructed by investing Rs.5,000 in portfolio X and Rs.3,000 in portfolio Y?.

(ii) Suppose the investor invests Gain Rs.4,000 out of Rs.8,000 in security A. How he will allocate the balance between security B and C to ensure that his portfolio is on minimum variance set?

Solution :

(i) Investment committed to each security would be:-

	A	B	C	Total
Portfolio X	Rs.1,500	Rs.2,000	Rs.1,500	Rs.5,000
Portfolio Y	Rs.600	Rs.1,500	Rs.900	Rs.3,000
Combined Portfolio	Rs.2,100	Rs.3,500	Rs.2,400	Rs.8,000
Therefore, Stock weights	0.26	0.44	0.30	1

(ii) The equation of critical line takes the following form:-

WB = a + bWA

Substituting the values of WA & WB from portfolio X and Y in above equation, we get

0.40 = a + 0.30b, and

0.50 = a + 0.20b

Solving above equation we obtain the slope and intercept, a = 0.70 and b= -1 and thus, the critical line is

WB = 0.70– WA

If half of the funds is invested in security A then,

WB = 0.70–0.50 = 0.20

Since WA + WB + WC = 1

WC = 1- 0.50– 0.20 = 0.30

Therefore Allocation of funds to security B = 0.20 x 8,000 = Rs.1,600,

= 0.30 x8,000

Security C = Rs.2,400

Question 7 :
May 2009 – Paper

The rates of return on the security of Company X and market portfolio for 6 periods are given below:

Period	Return of Security X (%)	Return on Market Portfolio (%)
1	12	8
2	15	12
3	11	11
4	2	-4
5	10	9.5
6	–12	-2

1. What is the beta of Security X?
2. What is the characteristic line for security X?

Solution :

Characteristic line is given by

αi +βi Rm

Return X	d (X – $\bar{X}$)	d² = (x – $\bar{x}$)²	Return M	d (Market)	d^2 (Market)	Dxdm
12	5.67	32.15	8	2.25	5.06	12.7575
15	8.67	75.17	12	6.25	39.06	54.1875
11	4.67	21.81	11	5.25	27.56	24.5175
2	-4.33	18.75	-4	-9.75	95.06	42.2175
10	3.67	13.47	9.5	3.75	14.06	13.7625
-12	-18.33	335.99	-2	-7.75	60.06	142.0575
38		Variance $= \frac{d^2}{n} = \frac{497.34}{n}$	34.5		Variance $= \frac{d^2}{n} = \frac{240.86}{n}$	COVxm = $\frac{dxdm}{n}$
Mean = $\sum x/n$		= 82.89	Mean = $\sum x/n$		40.14	$= \frac{289.5}{6}$
38 / 6 = 6.33		$\sigma = \sqrt{82.89}$ = 9.104	34.5 / 6 = 5.75		$\sigma = \sqrt{40.14}$ =6.34	= 48.25

1) $\beta x = \frac{CovXM}{\sigma^2 M} = \frac{48.25}{40.14} = 1.202$

2) As per CL

$R_x = \alpha + \beta (R_m)$

$6.33 = \alpha + 1.202 (5.75)$

$\alpha = -0.58$

3) Characteristic line

$R_x = 0.58 + 1.202 (R_m)$

Question 8 :
Nov 2009 – RTP

The following data are available to you as a portfolio manager.

Security	Expected Return	Beta	Standard Deviation
O	0.32	1.70	0.50
P	0.30	1.40	0.35
Q	0.25	1.10	0.40
R	0.22	0.95	0.24
S	0.20	1.05	0.28
T	0.14	0.70	0.18
Composite Index	0.12	1.000	0.20
T-bills	0.08	0.00	0.00

(i) In terms of a security market line (SML) , which of the securities listed above are undervalued? Why?

(ii) Assume that a portfolio is constructed using equal portions of the six stocks listed above.

(a) Why is the expected return of such a portfolio?

(b) What would the expected return if this portfolio was increased by 40% through borrowed funds with the cost of borrowing at 12%?

Solution :

(i)

Security	Expected Return	Beta (β)	Required Return =0.08 + 0.04β	Valuation
O	0.32	1.70	0.148	Under Valued
P	0.30	1.40	0.136	Under Valued
Q	0.25	1.10	0.124	Under Valued
R	0.22	0.95	0.118	Under Valued
S	0.20	1.05	0.122	Under Valued
T	0.14	0.70	0.108	Under Valued

All the securities listed above are undervalued because their expected returns plot above the SML.

(ii)

(a) Expected return on the portfolio

$$= \frac{0.32+0.30+0.25+0.22+0.20+0.14}{6} = 0.2383$$

(b) Expected return on the portfolio

RP = XRM – (X– 1) RP = (1.4) (0.2383)– (0.4) (0.12)

= 0.33362– 0.048 = 0.28562

Question 9 :

Nov 2009 – RTP / Nov 2019 (Old) – RTP

Mr. Nirmal Kumar has categorized all the available stock in the market into the following types:

(i) Small cap growth stocks

(ii) Small cap value stocks

(iii) Large cap growth stocks

(iv) Large cap value stocks

Mr. Nirmal Kumar also estimated the weights of the above categories of stocks in the market index. Further more, the sensitivity of returns on these categories of stocks to the three important factor are estimated to be:

Category of Stocks	Weight in the Market Index	Factor I (Beta)	Factor II (Price Book)	Factor III (Inflation)
Small cap growth	25%	0.80	1.39	1.35
Small cap value	10%	0.90	0.75	1.25
Large cap growth	50%	1.165	2.75	8.65

Large cap value	15%	0.85	2.05	6.75
Risk Premium		6.85%	-3.5%	0.65%

The rate of return on treasury bonds is 4.5%

Required:

(a) Using Arbitrage Pricing Theory, determine the expected return on the market index.

(b) Using Capital Asset Pricing Model (CAPM), determine the expected return on the market index.

(c) Mr. Nirmal Kumar wants to construct a portfolio constituting only the 'small cap value' and 'large cap growth' stocks. If the target beta for the desired portfolio is 1, determine the composition of his portfolio.

Solution :

(i) Portfolio's return

Small cap growth = 4.5 + 0.80 x 6.85 + 1.39 x (-3.5) + 1.35 x 0.65 = 5.9925%

Small cap value = 4.5 + 0.90 x 6.85 + 0.75 x (-3.5) + 1.25 x 0.65 = 8.8525%

Large cap growth = 4.5 + 1.165 x 6.85 + 2.75 x (-3.5) + 8.65 x 0.65 = 8.478%

Large cap value = 4.5 + 0.85 x 6.85 + 2.05 x (-3.5) + 6.75 x 0.65 = 7.535%

Expected return on market index

0.10 x 8.8525 + 0.25 x 5.9925 + 0.15 x 7.535 + 0.50 x 8.478 = 7.7526%

(ii) Using CAPM,

Small cap growth = 4.5 + 6.85 x 0.80 = 9.98%

Small cap value = 4.5 + 6.85 x 0.90 = 10.665%

Large cap growth = 4.5 + 6.85 x 1.165 = 12.48%

Large cap value = 4.5 + 6.85 x 0.85 = 10.3225%

Expected return on market index

= 0.10 x 10.665 + 0.25 x 9.98 + 0.15 x 10.3225 + 0.50 x 12.45 = 11.33%

(iii) Let us assume that Mr. Nirmal will invest X1% in small cap value stock and X2% in large cap growth stock

X1 + X2 = 1

0.90 X1 + 1.165 X2 = 1

0.90 X1 + 1.165(1– X1) = 1

0.90 X1+ 1.165– 1.165 X1 = 1

0.165 = 0.265 X1

$\frac{0.165}{0.265}$ = X1

0.623 = X1

X2 = 0.377

62.3% in small cap value

37.7% in large cap growth.

Question 10 :
Nov 2009 – Paper / Nov 2009 – RTP / May 2018 (Old) – RTP

An investor holds two stocks A and B. An analyst prepared ex-ante probability distribution for the possible economic scenarios and the conditional returns for two stocks and the market index as shown below:

Economic scenario	Probability	Conditional		Returns %
		A	B	Market
Growth	0.40	25	20	18
Stagnation	0.30	10	15	13
Recession	0.30	–5	–8	–3

The risk free rate during the next year is expected to be around 11%. Determine whether the investor should liquidate his holdings in stocks A and B or on the contrary make fresh investments in them. CAPM assumptions are holding true.

Solution :

MC	P	Ra	Ra.P	da	d²a.p	Rb	Rb.P	db	d²b.P	Rm	Rm.P	dm	d²m.P	dadm.P	dbdm.P
G	0.4	25	10	13.5	72.9	20	8	9.9	39.204	18	7.2	7.8	24.336	42.12	30.888
S	0.3	10	3	–1.5	0.675	15	4.5	4.9	7.203	13	3.9	2.8	2.352	-1.26	4.116
R	0.3	-5	–1.5	–16.5	81.675	-8	–2.4	-18.1	98.283	–3	-0.9	-13.2	52.272	65.34	71.676
			$\bar{x}$ =11.5		σ²=155.25		$\bar{x}$ =10.1		σ²=144.69		$\bar{x}$ =10.2		σ²=78.96	106.2	106.68
					σ=12.46				σ=12.028				σ=8.88	COVam=	COVbm=

1) $\beta_A = \frac{COVam}{\sigma^2 m} = \frac{106.2}{78.96} = 1.345$

$\beta_B = \frac{COVbm}{\sigma^2 m} = \frac{106.68}{78.96} = 1.351$

2) Re = Rf + β (Rm – Rf)
A = 11 + 1.345 (10.2 – 11) = 9.924
B = 11 + 1.351 (10.2 – 11) = 9.9192

3) α = $\bar{x}$ – Re
A = 11.5 – 9.924 = 1.576
B = 10.1 – 9.9192 = 0.1808

4) **Revision :**
The α of both the stock are showing positive return which means that we should stay invested in both the stock.
However, Rf gives a return of 11% whereas stock B gives a return of 10.1% and ∴ we shall recommend replacing stock B with Rf.

Question 11 :
Nov 2009 – Paper / Nov 2015 (RTP) / Nov 2010 (New) – RTP

A study by a Mutual fund has revealed the following data in respect of three securities:

Security	σ (%)	Correlation with Index, Pm
A	20	0.60
B	18	0.95
C	12	0.75

The standard deviation of market portfolio (BSE Sensex) is observed to be 15%.

(i) What is the sensitivity of returns of each stock with respect to the market?

(ii) What are the covariances among the various stocks?

(iii) What would be the risk of portfolio consisting of all the three stocks equally?

(iv) What is the beta of the portfolio consisting of equal investment in each stock?

(v) What is the total, systematic and unsystematic risk of the portfolio in (iv)?

Solution :

1) β of each stock

$\beta_A = COR_{AM} \times \frac{\sigma_A}{\sigma_M} = 0.6 \times \frac{20}{15} = 0.8$

$\beta_B = 0.95 \times \frac{18}{15} = 1.14$

$\beta_C = 0.75 \times \frac{12}{15} = 0.6$

2) β_P = Wt Average

$= \frac{0.8 + 1.14 \times 0.6}{3} = 0.8466$

3) COV_{AB}, AC and BC

$\beta_A = \frac{COV_{AM}}{\sigma^2_M}$ $\beta_B = \frac{COV_{BM}}{\sigma^2_M}$

$\therefore COV_{AB} = \beta_A \beta_B \sigma^2_M$

OR $COR_{AM} = \frac{COV_{AM}}{\sigma_M \sigma_A}$ $CORBM = \frac{COV_{BM}}{\sigma_M \sigma_B}$

$\therefore COV_{AB} = COR_{AM} \times COR_{BM} \times \sigma_A \sigma_B$

$COV_{AB} = 0.8 \times 1.14 \times 225 = 205.2$

$COV_{AC} = 0.8 \times 0.6 \times 225 = 108$

$COV_{BC} = 1.14 \times 0.6 \times 225 = 153.9$

4) Variance of Portfolio

		A	B	C
		1/3	1/3	1/3
A	1/3	400	205.2	108
B	1/3	205.2	324	153.9
C	1/3	108	153.9	144

σ^2_P = 1/3 × 1/3 × 400 = 44.44

+ 1/3 × 1/3 × 324 = 36

+ 1/3 × 1/3 × 144 = 16

+ (1/3 × 1/3 × 205.2)2 = 45.6

+ (1/3 × 1/3 × 108)2 = 24

+ (1/3 × 1/3 × 153.9)2 = 34.2

200.24

5) SP of Portfolio = $\sqrt{\sigma^2}$

= $\sqrt{200.24}$ = 14.15

Question 12 :

May 2010 – RTP

Mr. Sunil Mukharjee has estimated probable under different macroeconomic conditions for the following three stocks:

Stock	Current Price (Rs.)	Rates of return (%) during different macroeconomics scenarios		
		Recession	Moderate	Boom
Him Ice Ltd	12	-12	15	35
Kalahari Biotech	18	20	12	-5
Puma Softech	60	18	20	15

Mr. Sunil Mukharjee is exploring if it is possible to make any arbitrage profits from the above information.

Required :

Using the above information construct an arbitrage portfolio and show the payoffs under different economic scenarios.

Solution :

The rates of return in different scenarios should be changed in to rupee pay – off per share as indicated below:

Stock	Price Rs.	Price under various Macroeconomic Scenarios		
		Recession	Moderate	Boom
Him Ice Ltd	12	12 – 12% = 10.56	12 + 15% = 13.8	12 + 35% = 16.20
Kalahari Biotech	18	18 + 20% = 21.60	18 + 12% = 20.16	18 – 5% = 17.10
Puma Softech	60	60 + 18% = 70.80	60 + 20% = 72.00	60 + 15% = 69.00

Construction of an arbitrage portfolio requires formation of a zero investment portfolio. The essential condition is that portfolio must not give a negative return.

If we short sell two stocks each of the Him Ice Ltd and Kalahari Biotech one stock of Puma Softech can be purchased and this portfolio will qualify as zero investment portfolio.

(-2) x Rs.12 + (-2) x Rs.18 + Rs.60 = 0

The payoff from this arbitrage portfolio under different market conditions:

	Price Rs.	No of Shares	Investment Rs.	Scenarios		
				Recession	Moderate	Boom
Him Ice Ltd	12	- 2	- 24	- 21.12	- 27.60	- 32.40
Kalahari	18	- 2	- 36	- 43.20	- 40.32	- 32.40
Biotech	60	+ 1	60	+ 70.80	+ 72.00	+ 69.00
Puma Softech						
Net Pay off			0	+ 6.48	+ 4.08	+ 2.40

Net payoff from the portfolio clearly shows that this is an arbitrage portfolio as it has produced positive return in all the market scenarios.

Question 13 :
May 2010 – RTP

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).

Solution :

Tσ 25%

Uσ 40%

Correlation	Portfolio Variance	S.D.
-1	56.25	7.50%
-0.8	156.25	12.50%
-0.6	256.25	16.01%
-0.4	356.25	18.87%
-0.2	456.25	21.36%
0	556.25	23.58%
0.2	656.25	25.62%
0.4	756.25	27.50%
0.6	856.25	29.26%
0.8	956.25	30.92%
1	1056.25	32.50%

$\sigma p = \sqrt{\sigma^2 awt^2 a + \sigma^2 bwt^2 b + 2 \times \sigma a \times \sigma b \times wta \times wtb \times COR_{AB}}$

If COR = 1

$\sigma p = \sqrt{(625 \times 0.25) + (1600 \times 0.25) + (2 \times 25 \times 40 \times 0.5 \times 0.5 \times (1))}$

σ^2 = 56.25 & σ = 7.50%

Other variances have been computed accordingly.

Question 14 :
May 2010 - RTP

Suppose Mr. X in a world where there are only two assets, gold and stocks. He is interested in investing his money in one, the other or both assets. Consequently he collects the following data on the returns on the two assets over the last six years.

	Gold	Stock Market
Average return	8%	20%
Standard deviation	25%	22%
Correlation	-	0.4

a. Mr. X is constrained to pick just one, which one he would choose?

b. Mr. Y, a friend of Mr. X argues that this is wrong. He says that Mr. X is ignoring the big payoffs that he can get on gold. How would Mr. X go about alleviating his concern?

c. How would a portfolio composed of equal proportions in gold and stocks do in terms of mean and variance?

d. Mr. X came to know that GPEC (a cartel of gold-producing countries) is going to vary the amount of gold it produces with stock prices in the country. (GPEC will produce less gold when stock markets are up and more when it is down.) What effect will this have on his portfolios? Explain.

Solution :

(i) Mr. X would pick the stock market portfolio, since it dominates gold on both average return and standard deviation.

(ii) The higher possible returns on gold are balanced by the lower possible returns at other times. Note that the average return on gold is much less than that on the stock market.

(III) The expected return on this portfolio would be (8+20)/2 = 14%. The variance would equal

$=c\sigma^2mwt^2m + \sigma^2gwt^2g + 2\sigma m\sigma gwtmwtgCORmg$

$= (25)^2 (0.5)^2 + (22)^2 (0.5)^2 + 2 \times 25 \times 22 \times 0.5 \times 0.5 \times 0.4$

= 387.25

SD = $\sqrt{\sigma^2}$ = 19.68

(IV) If the supply of gold is negatively correlated with the level of the market, and the price of gold is inversely related to the supply of gold, there is a positive correlation between the return on the market and the return on gold. This would make gold less desirable, since it does not help as much in reducing portfolio variance. The optimal amount to invest in gold would drop.

Question 15 :
Nov 2010 – RTP

Suppose that in the universe of available risky securities contains a large number of shares two stocks, identically distributed with E(r) = 15%, or σ = 60%, and with a common correlation coefficient of ρ= 0.5.

(a) What is the expected return and standard deviation of an equally weighted risky portfolio of 25 stocks?

(b) What is the smallest number of stocks necessary to generate an efficient portfolio with a standard deviation equal to or smaller than 43%?

(c) What is the systematic risk in this security universe?

(d) If T-bills are available and yield 10%, what is the slope of the CAL?

Solution :

The parameters are E(R) = 15, σ = 60, and the correlation between any pair of stocks is ρ = 0.5.

a. The portfolio expected return is invariant to the size of the portfolio because all stocks have identical expected returns. The standard deviation of a portfolio with n = 25 stock is

$$\sigma p = [\frac{\sigma^2}{n} + p \times \frac{\sigma^2(n-1)}{n}]^{½}$$

$$= [\frac{60^2}{25} + 0.5 \times \frac{60^2 \times 25}{25}]^{½} = 43.27$$

b. Because the stocks are identical, efficient portfolios are equally weighted. To obtain a standard deviation of 43%, we need to solve for n:

$$4.3^2 = \frac{60^2}{n} - 0.5 \times \frac{60^2(n-1)}{n}$$

n = 36.73 - Thus we need 37 stock and will come in with volatility slightly under the target.

c. As n gets very large, the variance of an efficient (equally weighted) portfolio diminishes, leaving only the variance that comes from the covariances among stocks, that is

$\sigma\rho = \sqrt{p \times \sigma^2} = \sqrt{0.5 \times 60^2} = 42.43$

d. If the risk-free is 10%, then the risk premium on any size portfolio is 15% - 10% = 5%. The standard deviation of a well-diversified portfolio is (practically) 42.43%; hence the slope of the Capital Allocation Line (CAL) is S = 5/42.43 = 0.1178

Question 16 :
May 2011 – RTP

As on 1.4.10 ABC Ltd. is expecting net income and capital expenditure over the next five years (2010-11 to 2014-15) as follows:

Year	2010-11	2011-12	2012-13	2013-14	2014-15
Net Income	27,00,000	32,00,000	28,00,000	30,000,000	38,00,000
Capital	24,00,000	28,00,000	22,00,000	26,00,000	32,00,000

CEO of the company is planning to finance their capital outlay with debt and equity in the ratio of 1:1 Suppose you as a CFO advises for residual dividend policy then what will be the expected stream under the following approaches:

(i) Pure Residual Dividend Policy

(ii) Fixed Dividend Payout Ratio

Solution :

As per planed financing of capital expenditures in equal proportions by debt and equity , the retained earning to support capital expenditure over the period of 2010-11 to 2014-15 will be as follows:

$$= \frac{24,00,000+28,00,000+22,00,000+26,00,000+32,00,000}{2} = \text{Rs. } 66,00,000$$

The expected stream of net income over the period will be

27,00,000 + 32,00,000 + 28,00,000 + 30,00,000 + 38,00,000 = 1,55,00,000

Thus, the total amount of dividend expected to paid over the period forthcoming is expected to be Rs. 1,55,00,00 – Rs. 66,00,000= Rs. 89,00,000

And expected average dividend payout will be: $\frac{89,00,000}{1,55,00,000} \times 100 = 100 = 57.42\%$

Accordingly expected dividend stream under the two approaches will be as follows:

	2010-11	2011-12	2012-13	2013-14	2014-15	Total
A. Net Income	27,00,000	32,00,000	28,00,000	30,00,000	38,00,000	1,55,00,000
B. Capital Outlay	24,00,000	28,00,000	22,00,000	26,00,000	32,00,000	1,32,00,000
C. Equity Financing	12,00,000	14,00,000	11,00,000	13,00,000	16,00,000	66,00,000
Pure Residual Dividend (A – C)	15,00,000	18,00,000	17,00,000	17,00,000	22,00,000	89,00,000
Fixed Dividend Payout (57.42%)	15,50,340	18,37,440	16,07,760	17,22,600	21,81,960	89,00,100

Question 17 :
May 2011 – RTP

Following information is available regarding expected return; standard deviation and beta of 6 share are available in the stock market.

Security	Expected Return	Beta	S.D(%)
1	5	0.70	9
2	10	1.05	14
3	11	0.95	12
4	12.5	1.10	20
5	15	1.40	17.5
6	16	1.70	25

Suppose risk free rate of return is 4% and Market return is 6% and standard deviation is 10%. You are required to compute.

(i) Which security is undervalued and which is over valued.

(ii) Assuming that funds are equally invested these six stocks, then compute.

(a) Return of portfolio (b) Risk of Portfolio

(iii) Suppose if above portfolio is invested in with margin of 40% and cost of borrowing is 4% then what will be the position.

Solution :

(i) Using capital Assets Pricing Model (CAPM) we shall find out which security is under- valued and which security is over -valued.

Required Rate of Return = Rf + β (Rm - Rf)

R f = Risk Free Rate

β = Beta of Security

R m = Market Return

Security	Required Rate of Return	Expected Return (%)	Overvalued / Undervalued
1	4 + 0.70(6 – 4) = 5.4	5	Over Valued
2	4+1.05(6 – 4) = 6.10	10	Under Valued
3	4+0.95(6 – 4)=5.90	11	Under Valued
4	4+1.10(6 – 4)=6.20	12.5	Under Valued
5	4+1.40(6 – 4)=6.80	15	Under Valued
6	4+1.70(6 – 4)=7.40	16	Under Valued

Securities 2 to 6 are under- valued because their required rate of return is less than the expected rate of return. Security 1 is over-valued as its expected return is less than required rate of return

(ii) Return in the Portfolio = Average return of all securities

$$= \frac{5+10+11+12.5+15+16}{6} = 11.58\%$$

$$\text{Portfolio Beta} = \frac{0.7+1.05+0.95+1.10+1.4+1.7}{6} = 1.15$$

(iii) Where portfolio was margined out 40% with cost of borrowings at 4% the position expected return and risk will be as follow:

R P = 1.40(0.1158) + (-0.4)(0.04) = 0.14612 = 14.612%

Risk = σP = 1.4σm = 1.4 x 0.1183 = 0.16562 = 16.56%

Question 18 :
May 2011 – Paper / May 2013 – RTP / Nov 2017 – RTP

Mr. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

Factor	Beta	Expected in % Value	Actual value in %
GNP	1.2	7.70	7.70
Inflation	1.75	5.50	7.00
Interest rate	1.3	7.75	9.00
Stock market index	1.7	10.0	12.0
Industrial production	1.00	7.0	7.50

If the risk free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory?

Solution :

Factor	Expected in % Value	Actual value in %	Difference	Beta	Diff x β
GNP	7.70	7.70	0.00	1.2	0.00
Inflation	5.50	7.00	1.50	1.75	2.625
Interest rate	7.75	9.00	1.25	1.3	1.625
Stock market index	10.0	12.0	2.00	1.7	3.40
Industrial production	7.00	7.50	0.50	1.00	0.50
Total					8.15
Rf					9.25
Return under APT					17.40

Question 19 :
May 2011 - Paper / Nov 2018 (Old) – RTP / Nov 2019 (Old) – RTP

Mr. Tempest has the following portfolio of four shares:

Name	Beta	Investment? Lakh
Oxy Rin Ltd.	0.45	0.80
Boxed Ltd.	0.35	1.50
Square Ltd.	1.15	2.25
Ellipse Ltd.	1.85	4.50

The risk free rate of return is 7% and the market rate of return is 14%.

Required:

1. Determine the portfolio return 2. Calculate the portfolio beta

Solution :

(i) Portfolio Beta = Wt Average Beta of Individual Securities

$$= 0.45 \times \frac{0.80}{9.05} + 0.35 \times \frac{1.5}{9.05} + 1.15 \times \frac{2.25}{9.05} + 1.85 \times \frac{4.5}{9.05} = 1.3035$$

(ii) Portfolio Return = Rf + β (RM – Rf)

= 7 + 1.3035 (14 – 7) = 16.1245%

Question 20 :

Nov 2011 – RTP

Assuming that shares of ABC Ltd. and XYZ Ltd. are correctly priced according to Capital Asset Pricing Model. The expected return from and Beta of these shares are as follows:

Share	Beta	Expected return
ABC	1.2	19.8%
XYZ	0.9	17.1%

You are required to derive Security Market Line

Solution :

Expected Return as per CAPM

Re = Rf + β (RM – Rf)

Accordingly,

Re_{ABC} = Rf + 1.2 (Rm – Rf) = 19.8

Re_{XYZ} = Rf + 0.9 (Rm – Rf) = 17.1

19.8 = Rf + 1.2 (Rm – Rf) Equation 1

17.1 = Rf + 0.9 (Rm – Rf) Equation 2

By deducting (2) from (1)

2.7 = 0.3 (Rm – R f)

Rm – Rf = 9

Substituting Rm – Rf = 9 in Equation 1

19.8 = Rf + 1.2(9)

Rf = 9%

Rm – Rf = 9

Rm = 18

Security Line Market = = Rf + β (Market Risk Premium) = 9% + β x 9%

Question 21 :
Nov 2011 – Paper / Nov 2016 – RTP / May 2020 (New) – RTP

A Portfolio Manager (PM) has the following four stocks in his portfolio:

Security	No. of Shares	Market Price per share (Rs.)	b
VSL	10,000	50	0.9
CSL	5,000	20	1.0
SML	8,000	25	1.5
APL	2,000	200	1.2

Compute the following:

(i) Portfolio beta.

(ii) If the PM seeks to reduce the beta to 0.8, how much risk free investment should he bring in?

(iii) If the PM seeks to increase the beta to 1.2, how much risk free investment should he bring in?

Solution :

1) Portfolio Beta

Security	No of shares	Market Price	Total	β	Total × β
VSL	10,000	50	5,00,000	0.9	4,50,000
CSL	5,000	20	1,00,000	1	1,00,000
SML	8,000	25	2,00,000	1.5	3,00,000
APL	2,000	200	4,00,000	1.2	4,80,000
Total			**12,00,000**		**13,30,000**

$$\beta = \frac{13,30,000}{12,00,000} = 1.108$$

2) Rf to be purchased to reduce Beta to 0.8

$$= \frac{13,30,000 + (x \times 0)}{12,00,000 + x} = 0.8$$

$\therefore x = 4,62,500$

3) Rf to be purchased to increase Beta to 1.2

$$\frac{13,30,000 + (x \times 0)}{12,00,000 + x} = 1.2$$

= –91,667 (Rf should be shorted)

Question 22 :
May 2012 – RTP

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

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

You are required to determine,

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

(b) Risk Free Rate of Return

Solution :

A Security market line exhibits relationship between expected returns (Calculated on the basis of CAPM) of investments and their Betas. (By expected return we mean, the total return an investor should get considering the risk he has undertaken)

To Draw the line, Betas are taken on X-axis and the expected returns on Y - axis

Accordingly, lets calculate Expected Returns as per CAPM

Expected Return = Rf + β (RM – Rf)

Rf = Risk Free Rate

β = Beta

Rm = Market Return

Thus,

Expected Return for x = 9.40 = Rf + 0.80 (Rm – Rf) Equation 1

Expected Return for y = 13.40 = Rf + 1.30 (Rm – Rf) Equation 2

Solving Equation 1 from Equation 2, we get Rf = 3% and Rm = 11%

(i) Thus, claim of Mr. A is not correct. The correct rate is 11%.

(ii) Risk Free Rate of Return is 3%.

Question 23 :

May 2012 – Paper / May 2019 (New) – RTP

Indira has a fund of Rs.3 lacs which she wants to invest in share market with rebalancing target after every 10 days to start with for a period of one month from now. The present NIFTY is 5326. The minimum NIFTY within a month can at most be 4793.4. She wants to know as to how she should rebalance her portfolio under the following situations, according to the theory of Constant Proportion Portfolio Insurance Policy, using "2" as the multiplier:

(1) Immediately to start with.

(2) 10 days later-being the 1st day of rebalancing if NIFTY falls to 5122.96.

(3) 10 days further from the above date if the NIFTY touches 5539.04.

For the sake of simplicity, assume that the value of her equity component will change in tandem with that of the NIFTY and the risk free securities in which she is going to invest will have no Beta.

Solution :

1) Immediately to start with

Present Nifty = 5326

Maximum fall = 4793.4

i.e. $\frac{5326 - 4793.4}{5326} \times 100 = 10\%$

Investment in Equity

= 2 × (3,00,000 – 2,70,000) = 60,000

Balance investment in Rf = 2,40,000

2) After 10 days

Value of investments

Equity = 60,000 × $\frac{5122.96}{5326}$ = 57,713

Rf = 2,40,000

2,97,713

Investment in Equity should be

= 2(2,97,713 – 2,70,000) = 55,426

∴ Rf = (2,97,713 – 55,426) = 2,42,287

2,97,713

3) After 10 more days

Investment in Equity should be

= 55,426 × $\frac{5339.04}{5122.96}$ = 59,928

Rf = 2,42,287

3,02,215

Investment in Equity should be

= 2(3,02,215 – 2,70,000) = 64,430

Rf (3,02,215 – 64,430) = 2,37,785

Total 3,02,215

Question 24 :

May 2012 – Paper / Nov 2016 – RTP

A has portfolio having following features

Security	B	Random Error	Weight
L	1.6	7	0.25
M	1.15	11	0.3
N	1.4	3	0.25
K	1	9	0.2

You are required to find out the risk of the portfolio if the standard deviation of the market index is 18%

Solution :

1) βp = wt. Average

= (1.6 × 0.25) + (1.15 × 0.3) + (1.4 × 0.25) + (1 × 0.2)

= 1.295

2) σp $= \sqrt{\beta p^2\sigma^2 p + wt^2 L\sigma^2 L + wt^2 M\sigma^2 M + wt^2 N\sigma^2 N + wt^2 K\sigma^2 K}$

$= \sqrt{(1.295)^2 + (18)^2 + (.0.25)^2(7)^2 + (0.3)^2(11)^2 + (0.25)^2(3)^2 + (0.2)^2(9)^2}$

$= \sqrt{543.36 + 3.0625 + 10.89 + 0.5625 + 3.24}$

= 23.69%

Question 25 :
Nov 2012 – RTP

Suppose that economy A is growing rapidly and you are managing a global equity fund that has so far invested only in developed-country stocks. Now you have decided to add stocks of economy A to your portfolio. The table below shows the expected rates of return, standard deviations, and correlation coefficients (all estimated for the aggregate stock market of developed countries and stock market of Economy A).

	Developed Country Stock	**Stocks of Economy A**
Expected rate of return (annualized percent)	10	15
Risk [Annualized Standard Deviation (%)]	16	30
Correlation Coefficient (r)	0.30	

Assuming the risk-free interest rate to be 3%, you are required to determine:

(a) What percentage of your portfolio should you allocate to stocks of Economy A if you want to increase the expected rate of return on your portfolio by 0.5%?

(b) What will be the standard deviation of your portfolio assuming that stocks of Economy A are included in the portfolio as calculated above?

(c) Also show how well the Fund will be compensated for the risk undertaken due to inclusion of stocks of Economy A in the portfolio?

Solution :

(a) Let the weight of stocks of Economy A is expressed as w, then

(1- w) × 10.0 + w × 15.0 = 10.5

i.e. w = 0.1 or 10%.

(b) Variance of portfolio shall be:

$= (16)^2 (0.9)^2 + (30)^2 (0.1)^2 + 2 \times 16 \times 30 \times 0.9 \times 0.1 \times 0.3$

= 242.28

σ $= \sqrt{\sigma^2}$

$= \sqrt{242.28}$

= 15.57

(c) The Sharpe ratio will improve by approximately 0.04, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return - Risk Free Rate of Return}}{\text{Standard Deviation}}$$

Investment only in developed countries : $\frac{10 - 3}{16} = 0.437$

With inclusion of stocks of Economy A: $\frac{10.5 - 3}{15.6} = 0.481$

Question 26 :
Nov 2012 - Paper / Nov 2018 (New) – RTP

Mr. FedUp wants to invest an amount of Rs. 520 lakhs and had approached his Portfolio Manager. The Portfolio Manager had advised Mr. FedUp to invest in the following manner:

Security	Moderate	Better	Good	Very Good	Best
Amount in Lakhs	60	80	100	120	160
Beta	0.5	1.00	0.80	1.20	1.50

You are required to advise Mr. FedUp in regard to the following, using Capital Asset Pricing Methodology:

(i) Expected return on the portfolio, if the Government Securities are at 8% and the NIFTY is yielding 10%.

(ii) Advisability of replacing Security 'Better' with NIFTY.

Solution :

1) Re of Portfolio

Sec	Amt.	β	Amt. × β
Moderate	60	0.5	30
Better	80	1	80
Good	100	0.8	80
Very Good	120	1.2	144
Best	160	1.5	240
	520		574

$\beta p = \frac{574}{520} = 1.1038$

Re = Rf + β(Rm – Rf)

= 8 + 1.1038(10 – 8)

= 10.2076.

2) Investing in in security better is no different from investing in Nifty as both of than Beta of 1.

Question 27 :
May 2013 – RTP / Nov 2016 – Paper / May 2018 (New) – RTP

The following information is available in respect of Security X

Equilibrium Return 15%

Market Return 15%

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

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

Solution :

1) Rf = Return of Treasury Bond

IV = $\frac{Coupan}{YTM}$

140 = $\frac{7}{YTM}$ $\therefore$ YTM = $\frac{7}{140} \times 100$ = 5%

2) Equilibrium Return = 15% i.e. Re = 15%

Re = Rf + β(Rm – Rf)

15 = 5 + β(15 – 5)

$\therefore$ β = 1

3) β = $\frac{COV_{SM}}{\sigma^2 m}$

1 = $\frac{225}{\sigma^2 m}$

σ^2m = 225

σm = $\sqrt{225}$ = 15

4) COR_{SM} = $\frac{COV_{SM}}{\sigma m \sigma s}$

0.75 = $\frac{225}{15 \times \sigma s}$

$\therefore$ σs = 20%

i.e. σm = 15% & σs = 20%

Question 28 :
May 2013 – Paper

On Jan 1, 2013 an investor has a portfolio of 5 shares as given below.

Security	Price	No of Shares	Beta
A	349.60	5,000	1.15
B	480.50	7,000	0.40
C	593.52	8,000	0.90
D	734.70	10,000	0.95
E	824.85	2,000	0.85

The cost of capital to the investor is 10.5%per annum.

You are required to calculate:

(i) The beta of his portfolio.

(ii) The theoretical value of the NIFTY futures for February 2013.

(iii) The number of contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio if the current value of NIFTY is 5900 and NIFTY futures have a minimum trade lot requirement of 200 units. Assume that the futures are trading at their fair value.

(iv) The number of future contracts the investor should trade if he desires to reduce the beta of his portfolios to 0.6.

No. of days in a year be treated as 365.

Given: In (1.105) = 0.0998

e(0.015858) = 1.01598

Solution :

1) Beta of Portfolio

Security	Price	No of Shares	Amt.	β	Total
A	349.60	5,000	17,48,000	1.15	20,10,200
B	480.50	7,000	33,63,400	0.40	13,45,400
C	593.52	8,000	47,48,160	0.90	42,73,344
D	734.70	10,000	73,47,000	0.95	69,79,650
E	824.85	2,000	16,49,700	0.85	14,02,245
			1,88,56,360		1,60,10,839

$$\beta = \frac{1,60,10,839}{1,88,56,360} = 0.849$$

2) Theoretical F

F = S + Interest (Continuous Compounding)

= 5,900 × 1.01598

= 5994.28

Interest = e^{rt}

= rate = 10.5 i.e. 0.0998

= t = 58/365 = 0.1598

= $e^{0.0998 \times 0.1598}$ = e(0.015858) = 1.01598.

3) No. of lots $= \dfrac{Vp \times (\beta_t - \beta_p)}{F \times M \times \beta_f}$

$$= \frac{1,88,56,360 \times (0.849)}{5994.28 \times 200 \times 1} = 13.35\ F^{-}$$

4) No. of lots to reduce β to 0.6

$$= \frac{1,88,56,360 \times (0.849 - 0.6)}{5994.28 \times 200 \times 1} = 3.92\ F^{-}$$

Question 29 :

Nov 2013 – RTP / Nov 2015 – RTP

Following data is related to Company X, Market Index and Treasury Bonds for the current year and last 4 years:

Year	Company X		Market Index		Return on Treasury Bonds
	Average Share Price	Dividend Per share	Average Market Index	Market Dividend Yield	
2009	Rs.139	Rs.7.00	1300	3%	7%
2010	Rs.147	Rs.8.50	1495	5%	9%
2011	Rs.163	Rs.9.00	1520	5.5%	8%
2012	Rs.179	Rs.9.50	1640	4.75%	8%
2013 (Current Year)	Rs.203.51	Rs.10.00	1768	5.5%	8%

With the above data estimate the beta of Company X's share.

Solution :

(i) Calculation of Capital Gain for share X

Share price has increased from 139 at the end of year 2009 to Rs. 203.51 at the end of year 2013

So the appreciation is in 4 periods (From end of 2009 to end of 2013)

$139 (1 + r)^4 = 203.51$

Therefore $r = \frac{203.51}{139} - 1 = 10\%$

(ii) Average annual dividend yield (%)

Year	Dividend / Share Price	Dividend Yield
2009	7 / 139 x 100	5%
2010	8.5 / 147 x 100	5.8%
2011	9 / 163 x 100	5.5%
2012	9.5 / 179 x 100	5.3%
2013	10 / 203.51 x 100	4.9%

Average $= \frac{5+5.8\%+5.5\%+5.3\%+4.9\%}{5} = 5.35$

Therefore Expected Return on the company's stock

= Capital Appreciation + Annual Dividend Yield

= 10% + 5.3% = 15.3%

(iii) Calculation of Capital Gain for Market Index

Market Index has increased from 1300 at the end of year 2009 to Rs. 1768 at the end of year 2013

So the appreciation is in 4 periods (From end of 2009 to end of 2013)

$1300 (1 + r)^4 = 1768$

Therefore $r = \left(\frac{1768}{1300}\right)^{1/4} - 1 = 8\%$

(iv) Average Annual Dividend Yield (%)

$= \frac{3\%+5\%+5.5\%+4.75\%+5.5\%}{5} = 4.75\%$

Therefore Expected Return on the market Index

= Capital Appreciation + Annual Dividend Yield

= 8% + 4.75% = 12.75%

(v) Average Annual Risk Free Rate

$= \frac{7\%+9\%+8\%+8\%+8\%}{5} = 8\%$

(vi) With the help of above information and using CAPM, we can calculate β

Expected Return on Stock = Rf + β (RM – Rf

15.3% = 8% + β[12.75% - 8%]

β = 1.54

Question 30 :
Nov 2013 – RTP / May 2015 – RTP

The rates of return on the security of Company X and market portfolio for 10 periods are given below:

Period	Return of Security X (%)	Return on Market Portfolio (%)
1	20	22
2	22	20
3	25	18
4	21	16
5	18	20
6	–5	8
7	17	–6
8	19	5
9	–7	6
10	20	11

1. What is the beta of Security X?
2. What is the characteristic line for security X?

Solution :

Period	R_x	R_m	d_x	${d_x}^2$	d_m	${d_m}^2$	$d_x d_m$
1	20	22	5	25	10	100	50
2	22	20	7	49	8	64	56
3	25	18	10	100	6	36	60
4	21	16	6	36	4	16	24
5	18	20	3	9	8	64	24
6	–5	8	-20	400	-4	16	80
7	17	–6	2	4	-18	324	-36
8	19	5	4	16	-7	49	-28
9	–7	6	-22	484	-6	36	132
10	20	11	5	25	-1	1	-5
Total	150	120		1148		706	357
Return = $\frac{\Sigma Rx}{n}$	15	12		Variance $= \frac{\Sigma d2}{n}$ = 114.8		Variance $= \frac{\Sigma d2}{n}$ = 70.6	COVxm $= \frac{dxdm}{n}$ = 35.7
				SD = $\sqrt{\text{Variance}}$ = 10.71		SD = $\sqrt{\text{Variance}}$ = 8.40	Bx = $\frac{COVxm}{\sigma^2 m}$ = 0.505

(ii) Characteristic line for security X = α + β × RM

Alpha (α) = 15 – (0.505 × 12) = 8.94%

∴Characteristic line for security X = 8.94 + 0.505 RM

Question 31 :
Nov 2013 – Paper / May 2017 – Paper

A trader is having in its portfolio shares worth Rs.85 lakhs at current price and cash Rs.15 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%.

Determine:

(i) Current portfolio beta

(ii) Portfolio beta after 3 months if the trader on current date goes for long position on Rs.100 lakhs Nifty futures.

Solution :

Current portfolio

Current Beta for share = 1.6

Beta for cash = 0

Current portfolio beta = 0.85 x 1.6 + 0 x 0.15 = 1.36

Portfolio beta after 3 months:

Beta for portfolio of shares $= \frac{\text{Change in the value of portfoli of shares}}{\text{change in value of market index}}$

$$1.6 = \frac{0.032}{\text{change in value of market index}}$$

Change in value of market portfolio (Index) = (0.032 / 1.6) x 100 = 2%

Position taken on 100 lakh Nifty futures Long

Value of index after 3 months = Rs.100 lakh x (100 - 0.02)

= Rs.98 lakh

Mark-to-market paid = Rs.2 lakh

Cash balance after payment of mark-to-market = Rs.13 lakh

Value of portfolio after 3 months = 85 lakh x (1-0.032) + Rs.13 lakh

= Rs.95.28 lakh

Change in value of portfolio $= \frac{100 - 95.28}{100}$ = 4.72%

Portfolio beta = 0.0472/0.02 = 2.36

Question 32 :
Nov 2013 - Paper / May 2015 – Paper

Mr Ram is holding the following securities:

Particulars of Securities	Cost	Dividends/Interest (Rs.)	Market price (Rs.)	Beta (Rs.)
Equity Shares:				
Gold Ltd.	11,000	1,800	12,000	0.6
Silver Ltd.	16,000	1,000	17,200	0.8
Bronze Ltd.	12,000	800	18,000	0.6
GOI Bonds	40,000	4,000	37,500	0.1

Average return of the portfolio is 14%, calculate:

1. Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).
2. Risk free rate of return.

Solution :

(i) Expected Rate of Return on market portfolio

Securities	Cost	Dividends/Interest Rs.	Market price Rs.
Equity Shares:			
Gold Ltd.	11,000	1,800	12,000
Silver Ltd.	16,000	1,000	17,200
Bronze Ltd.	12,000	800	18,000
GOI Bonds	40,000	4,000	37,500
Total	79,000	7,600	

$$\text{Return} = \frac{\text{Dividend + Capital Gains}}{\text{Total Investment}} \times 100$$

$$= \frac{7,600 + 84,700}{79,000} \times 100 = 16.84\%$$

(ii) Average β = $\frac{0.6 + 0.8 + 0.6 + 0.1}{4}$ = 0.525 (Alternatively we can also calculate wt average beta also)

(ii) Calculation of Rf

Average Return = Rf + β (RM – Rf)

14 = Rf + 0.525 (16.84 – Rf)

14 = Rf + 8.841 + 0.525 Rf

Therefore Rf = 10.86%

(iv) Calculation of Expected return of each security by CAPM

Gold = 10.86 + 0.6 (16.84 – 10.86) = 14.448

Silver = 10.86 + 0.8 (16.84 – 10.86) = 15.644

Bronze = 10.86 + 0.6 (16.84 – 10.86) = 14.448

GOI = 10.86 + 0.1 (16.84 – 10.86) = 11458

Question 33 :
May 2014 – RTP / May 2020 (Old) - /RTP

XYZ Ltd. has substantial cash flow and until the surplus funds are utilized to meet the future capital expenditure, likely to happen after several months, are invested in a portfolio of short-term equity investments, details for which are given below:

Investment	No. of shares	Beta	Market price per share (Rs.)	Expected dividend Yield
I	60,000	1.16	4.29	19.50%
II	80,000	2.28	2.92	24.00%
III	1,00,000	0.90	2.17	17.50%
IV	1,25,000	1.50	3.14	26.00%

The current market return is 19% and the risk free rate is 11%. Required to:

a. Calculate the risk of XYZ's short-term investment portfolio relative to that of the market;

b. Whether XYZ should change the composition of its portfolio.

Solution :

Investment	No of shares	Market Price	Market Value	Weight	Dividend Yield	Dividend	B	Weighted B
I	60,000	4.29	2,57,400	23.39%	19.50%	50,193	1.16	0.27
II	80,000	2.92	2,33,600	21.23%	24.00%	56,064	2.28	0.48
III	1,00,000	2.17	2,17,000	19.72%	17.50%	37,975	0.9	0.18
IV	1,25,000	3.14	3,92,500	35.66%	26.00%	1,02,050	1.5	0.53
			11,00,500	100		2,46,282		1.46

Return on the Portfolio = $\frac{2,46,282}{11,00,500}$ x 100 = 22.38%

Market Risk implicit

2238 = 11 + β× (19 – 11)

β = 1.42

Market β implicit is 1.42 while the port folio β is 1.46. Thus the portfolio is marginally risky compared to the market.

Question 34 :

May 2014 – RTP / May 2018 (New) – RTP / May 2020 (Old) – RTP

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

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

You are required to calculate:

1. The Betas of the two stocks.
2. Expected return of each stock, if the market return is equally likely to be 7% to 25%.
3. The security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.
4. The Alphas of the two stocks.

Solution :

(a) The Betas of two stocks:

Aggressive stock - 40% - 4%/25% - 7% = 2

Defensive stock - 18% - 9%/25% - 7% = 0.50

(b) Expected returns of the two stocks:-

Aggressive stock - 0.5 x 4% + 0.5 x 40% = 22%

Defensive stock - 0.5 x 9% + 0.5 x 18% = 13.5%

(c) Expected return of market portfolio = 0.5 x 7% + 0.5% x 25% = 16%

∴Market risk prem. = 16% - 7.5% = 8.5%

∴SML is, required return = 7.5% + βi 8.5%

(d) R s = α + βRm

Where α = Alpha

β = Beta

R m= Market Return

For Aggressive Stock 22% = αA + 2(16%) αA = -10%

For Defensive Stock 13.5% = αD + 0.50(16%) αD = 5.5%

Question 35 :

Nov 2014 – RTP

Mr. A has a portfolio of Rs.5 crore consisting of equity shares of X Ltd. and Y Ltd. with beta of 1.15. Other information is as follows:

Spot Value of Index Future = 21000

Multiplier = 150

You are requested to reduce beta of portfolio to 0.85 and increase beta to 1.45 by using:

(a) Change in composition through Risk Free securities

(b) Index futures

Solution :

1) Change in composition through Rf

Current β = 1.15

∴ wt portfolio = 5 cr. × 1.15 = 5.75

i.e. $\frac{5.75}{5}$ = 1.15

a) To reduce β to 0.85

$$\frac{5.75-(x\times 1.15)+(x\times 0)}{5+x-x} = 0.85$$

5.75 – 1.15x = 4.25

∴ x = 1.305

i.e. Entity should sell 1.30 share of portfolio and invest in Rf

b) To increase β to 1.45

$$\frac{5.75-(x\times 1.15)+(x\times 0)}{5+x-x} = 1.45$$

= 5.75 – 1.15x = 7.25

x = –1.305

i.e. Entity should short Rf for –1.305 and invest that funds in portfolio.

2) β management by index futures

a) Reduce β = 0.85

No. of lots = $\frac{5,00,00,000\times(0.85-1.15)}{21,000\times 150\times 1}$

= 4.75 F^- (sell future)

b) Increase β = 1.45

No. of lots = $\frac{5,00,00,000\times(1.45-1.15)}{21,000\times 150\times 1}$

= 4.76 F^+ (Buy futures)

Question 36 :
May 2015 – Paper – 8 Marks / May 2018 (New) – RTP

Following are the details of a portfolio consisting of three shares

Share	Portfolio Weight	Beta	Expected return in %	Total Variance
A	0.20	0.40	14	0.015

B	0.50	0.50	15	0.025
C	0.30	1.10	21	0.100

Standard Deviation of Market Portfolio Returns = 10%

You are given the following additional data :

Covariance (A,B) = 0.030

Covariance (A,C) = 0.020

Covariance (B,C) = 0.040

Calculate the following

i) The portfolio Beta

ii) Residual variance of each of the three shares

iii) Portfolio variance using sharpe index Model

Portfolio variance (on the basis of Modern portfolio theory given by Markowitz)

Solution :

1) βp = wt average

$= 0.2 \times 0.4 + 0.5 \times 0.5 + 0.3 \times 1.1 = 0.66$

2) Residual variance = (Calculate Systematic Risk)

Unsystematic Risk = Total Risk – Systematic Risk

	A	B	C
Total Risk (σ^2)	0.015	0.025	0.100
– Systematic Risk			
(β^2 stock $\times$ σ^2m)	0.0016	0.0025	0.0121
Unsystematic Risk	0.0134	0.0225	0.0879

Unsystematic Risk

$A = (0.4)^2 (0.1)^2 = 0.0016$

$B = (0.5)^2 (0.1)^2 = 0.0025$

$C = (1.1)^2 (0.1)^2 = 0.0121$

3) Portfolio Variance

= Systematic Risk + Unsystematic Risk

Systematic Risk $= \beta^2 p \times \sigma^2 m = (0.66)^2 (0.1)^2 = 0.004356$

Unsystematic Risk $= 0.0134 \times (0.2)^2 + 0.0225 \times (0.5)^2 + 0.0879 \times (03)^2 = 0.14072$

Total Risk = 0.004356 + 0.14072 = 0.018428

4) Portfolio Variance by Markowitz Model

Co-variance Matrix

		A	B	C
		0.20	0.50	0.30
A	0.20	0.015	0.030	0.020
B	0.50	0.030	0.025	0.040
C	0.30	0.020	0.040	0.100

$\sigma^2 p$ $= 0.2 \times 0.2 \times 0.015$ $= 0.0006$

$+ 0.5 \times 0.5 \times 0.025$ $= 0.00625$

$+ 0.3 \times 0.3 \times 0.100$ $= 0.009$

$+ (0.2 \times 0.5 \times 0.030)^2$ $= 0.006$

$+ (0.2 \times 0.3 \times 0.020)^2$ $= 0.0024$

$+ (0.5 \times 0.3 \times 0.040)^2$ $= \underline{0.012}$

0.03625

Question 37 :
May 2016 – RTP / May 2017 – Paper

The following information is available for the share of X Ltd. and stock exchange for the last 4 years.

Year	Jay Kay Ltd.		Market		Return on Govt. Bonds
	Avg Share Price	DPS	Average Index	Dividend Yield (%)	
2002	242	20	1812	4	6
2003	279	25	1950	5	5
2004	305	30	2258	6	4
2005	322	35	2220	7	5

Compute Beta Value of the company at the end of the year 2005.

Solution :

1) Return on Jay Kay Ltd.

(a) Capital Appreciation

$242 (1 + r)^3 = 322$

$$r = \left(\frac{322}{242}\right)^{1/3} - 1 = 9.99\%$$

(b) Dividend Yield

2002 $= 20/242 \times 100 = 8.26\%$

2003 $= 25/279 \times 100 = 8.96\%$

2004 = 30/305 × 100 = 9.84%

2005 = 35/322 × 100 = 10.87%

Avg. $= \frac{8.26\% + 8.96\% + 9.84\% + 10.87\%}{4}$

= 9.4825

Expected Return = 9.99 + 9.4825 = 19.4725%

2) Return from Market

(a) Capital Appreciation

$1812(1 + r)^3 = 2220$

$r = \left(\frac{2220}{1812}\right)^{1/3} - 1 = 7.00$

(b) Dividend Yield

$= \frac{4+5+6+7}{4} = 5.55$

Return = 7 + 5.55 = 12.5

3) Average Rf $= \frac{6+5+4+5}{4} = 5$

4) β

Re = Rf + β (Rm – Rf)

19.4725 = 5 + β(12.5 – 5)

β = 1.93

Question 38 :
May 2016 – Paper / Nov 2017 –RTP / Nov 2018 (New) – RTP / May 2019 (Old) – RTP

The following are the data on five mutual funds:

Fund	Return	Standard Deviation	Beta
A	15	7	1.25
B	18	10	0.75
C	14	5	1.40
D	12	6	0.98
E	16	9	1.50

You are required to compute Reward to Volatility Ratio and rank these portfolio using:

- Sharpe method and
- Treynor's method

Assuming the risk free rate is 6%.

Solution :

Sharpe Ratio S $= (R_p - R_f)/ \sigma_p$

Treynor Ratio T $= (R_p - R_f)/ \beta_p$

Reward to Variability (Sharpe Ratio)

Mutual Fund	R_p	R_f	R_p - R_F	σ_p	Reward to Variability	Ranking
A	15	6	9	7	1.285	2
B	18	6	12	10	1.20	3
C	14	6	8	5	1.60	1
D	12	6	6	6	1.00	5
E	16	6	10	9	1.11	4

Reward to Variability (Treynor Ratio)

Mutual Fund	R_p	R_f	R_p - R_F	β	Reward to Variability	Ranking
A	15	6	9	1.25	7.2	2
B	18	6	12	0.75	16	1
C	14	6	8	1.40	5.71	5
D	12	6	6	0.98	6.12	4
E	16	6	10	1.50	6.67	3

Question 39 :

Nov 2016 – RTP / May 2017 –RTP / Nov 2018 (Old) – RTP / Nov 2019 (New) – RTP

A company has a choice of investments between several different equity oriented mutual funds. The company has an amount of Rs.1 crore to invest. The details of the mutual funds are as follows:

Mutual Fund	Beta
A	1.6
B	1.0
C	0.9
D	2.0
E	0.6

Required:

(i) If the company invests 20% of its investment in the first two mutual funds and an equal amount in the mutual funds C, D and E, what is the beta of the portfolio?

(ii) If the company invests 15% of its investment in C, 15% in A, 10% in E and the balance in equal amount in the other two mutual funds, what is the beta of the portfolio?

(iii) If the expected return of market portfolio is 12% at a beta factor of 1.0, what will be the portfolios expected return in both the situations given above?

Solution :

With 20% investment in each MF Portfolio Beta is the weighted average of the Betas of various securities calculated as below:

(i)

Investment	Beta (β)	Investment (Rs.Lacs)	Weighted Investment
A	1.6	20	32
B	1.0	20	20
C	0.9	20	18
D	2.0	20	40
E	0.6	20	12
		100	**122**
$\beta p = \frac{122}{100} = 1.22$			

(ii) With varied percentages of investments portfolio beta is calculated as follows:

Investment	Beta (β)	Investment (Rs.Lacs)	Weighted Investment
A	1.6	15	24
B	1.0	30	30
C	0.9	15	13.5
D	2.0	30	60
E	0.6	10	6
		100	**133.5**
Weighted Beta (β) = 1.335			

(iii) Expected return of the portfolio with pattern of investment as in case (i)

= 12% × 1.22 i.e. 14.64%

Expected Return with pattern of investment as in case ii

= 12% × 1.335 i.e., 16.02%.

Question 40 :
Nov 2016 – Paper

The returns and market portfolio for a period of four years are as under:

Year	% Return of Stock B	% Return on Market Portfolio
1	10	8
2	12	10
3	9	9
4	3	-1

For stock B, you are required to determine:

(i) characteristic line; and

(ii) the Systematic and Unsystematic risk.

Solution :

Yr.	Rb	db	d^2b	Rm	dm	d^2m	dbdm
1	10	1.5	2.25	8	1.5	2.25	2.25
2	12	3.5	12.25	10	3.5	12.25	12.25
3	9	0.5	0.25	9	2.5	6.25	1.25
4	3	–5.5	30.25	–1	–7.5	56.25	41.25
	34		45	26		77	57
	$\bar{x}$ 8.5		σ^2 11.25	$\bar{x}$ 6.5		σ^2 19.25	14.25
			σ 3.354			σ 4.387	COV_{AM}

1) $\beta a = \frac{COV_{AM}}{\sigma^2 m} = \frac{14.25}{19.25} = 0.74$

2) According to Characteristics line

Ra = $\alpha + \beta$(Rm)

8.5 = α + 0.74(6.5)

α = 3.625

3) Characteristics line

Ra = 3.625 + 0.74(Rm)

4) Systematic and Unsystematic Risk

(Various Approach)

Total Risk (σ^2a)	11.25
– Systematic Risk (σ^2m $\times$ β^2)	
[19.25 $\times$ $(0.74)^2$]	10.54
Unsystematic Risk	0.71

Question 41 :

May 2017 – Paper

A Stock costing Rs.150 pays no dividends. The possible prices at which the stock may be sold for at the end of the year with the respective probabilities are:

Price (in Rs.)	Probability
130	0.2
150	0.1
160	0.1
165	0.3
175	0.1

180	0.2
Total	**1.0**

You are required to:

(i) calculate the Expected Return,

(ii) calculate the Standard Deviation (⍰) of Returns.

Show calculations upto three decimal points.

Solution :

Return from stock & SD

Price	Calculation	Return	P	Return (Per cent)	ds	d^2 S.P.
130	$\frac{130}{150}-1$	–13.33	0.2	–2.67	–20	80
150	$\frac{150}{150}-1$	–	0.1	–	–6.67	4.44
160	$\frac{160}{150}-1$	6.67	0.1	0.67	–	–
165	$\frac{165}{150}-1$	10	0.3	3	3.33	3.33
175	$\frac{175}{150}-1$	16.67	0.1	1.67	10	10
180	$\frac{180}{150}-1$	20	0.2	4	13.33	35.54
			α	6.67		σ^2 133.31
						σ 11.55

Question 42 :
May 2017 – Paper

The five portfolios of a mutual fund experienced following result during last 10 years periods :

Portfolio	Average annual return %	Standard Deviation	Correlation with the market return
A	20.0	2.3	0.8869
B	17.0	1.8	0.6667
C	18.0	1.6	0.600
D	16.0	1.8	0.867
E	13.5	1.9	0.5437

Market risk : 1.2

Market rate of return : 14.3%

Risk free rate : 10.1%

Beta may be calculated only upto two decimal. Rank the portfolio using JENSEN's ALPHA method.

Solution :

1) Calculation of β

$\beta x = COR_{XY} \times \frac{\sigma_X}{\sigma_M}$

Portfolio	Calculation	β
A	0.8869 × 2.3/1.2	1.7
B	0.6667 × 1.8/1.2	1
C	0.6 × 1.6/1.2	0.8
D	0.867 × 1.8/1.2	1.3
E	0.5437 × 1.9/1.2	0.86

2) Calculation of Re

Re = Rf + β(Rm – Rf)

Portfolio	Calculation	
A	10.1 + 1.7 (14.3 – 10.1)	17.24
B	10.1 + 1 (14.3 – 10.1)	14.3
C	10.1 + 0.8 (14.3 – 10.1)	13.46
D	10.1 + 1.3 (14.3 – 10.1)	15.56
E	10.1 + 0.86 (14.3 – 10.1)	13.71

3) Jensen's Alpha = Actual Return – Expected Return

Portfolio	Amt. Return	Re(APM)	α	Rank
A	20	17.24	2.76	2
B	17	14.30	2.70	3
C	18	13.46	4.54	1
D	16	15.56	0.44	4
E	13.5	13.71	–0.21	5

Question 43 :
Nov 2017 – RTP

ABC Ltd. manufactures Car Air Conditioners (ACs), Window ACs and Split ACs constituting 60%, 25% and 15% of total market value. The stand-alone Standard Deviation and Coefficient of Correlation with market return of Car AC and Window AC is as follows:

	S.D.	Coefficient of Correlation
Car AC	0.30	0.6
Window AC	0.35	0.7

No data for stand-alone SD and Coefficient of Correlation of Split AC is not available. However, a company who derives its half value from Split AC and half from Window AC has a SD of 0.50 and

Coefficient of correlation with market return is 0.85. Index has a return of 10% and has SD of 0.20. Further, the risk-free rate of return is 4%.

You are required to determine:

(i) Beta of ABC Ltd.

(ii) Cost of Equity of ABC Ltd.

Assuming that ABC Ltd. wants to raise debt of an amount equal to half of its Market Value then determine equity beta, if yield of debt is 5%.

Solution :

1) Beta of ABC Ltd.

(a) β of Car AC and window AC.

$\beta x = COR_{XY} \times \frac{\sigma_X}{\sigma_M}$

Car AC = $0.6 \times \frac{0.3}{0.2} = 0.90$

Window AC = $0.7 \times \frac{0.35}{0.2} = 1.225$

(b) β of Split AC

Note : Since stand due dater of Split AC is not available, we shall calculate the sum from proving firm

β proving firm = $0.85 \times \frac{0.50}{0.2} = 2.125$

β firm = Wt Average

$2.125 = 0.5 \times 1.225 + 0.5 \times \beta$ Split

β Split = 3.025

(c) β of ABC Ltd. = Wt Average

$= 0.90 \times 60\% + 1.225 \times 25\% + 3.025 \times 15\%$

= 1.30

2) Cost of Equity

Re = Rf + β (Rm – Rf)

= 4 + 1.3 (10 – 4) = 11.80%

3) Calculate of Equity Beta

Debt β = $\frac{5.4}{10.4} = 0.167$

∴ Equity Beta

$1.3 = 0.5 \times 0.167 + 0.5 \times \beta e$

$\therefore \beta e = 2.433$

Question 44 :
Nov 2017 – Paper

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

Year	Security – L Return %	Security – K Return %
2012	10	11
2013	04	-06
2014	05	13
2015	11	08
2016	15	14

Calculate the risk and return of portfolio consisting above information.

Solution :

Note : We have assumed equal investment in stock L and stock K in portfolio.

Yr.	RL	dL	d^2L	RK	dK	d^2K	dLdK
2012	10	+1	1	11	3	9	3
2013	4	–5	25	–6	–14	196	70
2014	5	–4	16	13	5	25	–20
2015	11	2	4	8	–	–	–
2016	15	6	36	14	6	36	36
	45		82	40		266	89
	$\bar{x}$ 9		σ^2 16.4	$\bar{x}$ 8		σ^2 53.2	17.8
			σ 4.05			σ 7.29	COV_{LK}

1) $COR_{LK} = \frac{COV_{LK}}{\sigma_L \sigma_K} = \frac{17.8}{4.05 \times 7.29} = 0.60$

2) $\bar{x}_P$ = wt Average

$= 0.5 \times 9 + 0.5 \times 8 = 8.5$

3) $\sigma_P(COR \neq 1) = \sqrt{\sigma^2 Lwt^2 L + \sigma^2 Kwt^2 K + 2\sigma L \sigma Kwt Lwt K COR_{KL}}$

$= \sqrt{16.4 \times (0.5)^2 + 53.2 \times (0.5)^2 + 2 \times 4.05 \times 7.29 \times 0.5 \times 0.5 \times 0.60}$

$= 5.124$

Question 45 :
May 2018 (Old) – Paper / Nov 2019 (New) – Paper

As an investment manager, you are given the following information:

Particulars	Initial Price (Rs.)	Dividend (Rs.)	Market price of the dividends (Rs.)	Beta (Risk Factor)
A. Equity Shares:				
Manufacturing Ltd.	30	2	55	0.8
Pharma Ltd.	40	2	65	0.7
Auto Ltd.	50	2	140	0.5

B. Government of India Bonds	1005	140	1010	0.99

By assuming risk free return as 16%, Calculate:

(i) Expected rate of return on the portfolio (aggregate) of investor;

(ii) Expected rate of return of portfolio in each above stated share/ bond using Capital Asset Pricing Model (CAPM); and

(iii) Average Rate of Return.

Solution :

1) Return from portfolio = $\left(\frac{D_1 + P_1}{P_0}\right) - 1$

$= \left(\frac{146 + 1{,}270}{1{,}125}\right) - 1 = 25.87\%$

2) $\beta_P = \frac{0.8 + 0.7 + 0.5 + 0.99}{4} = 0.7475$

3) Rep = Rf + β(Rm – Rf)

= 16 + 0.7475(25.87 – 16) = 23.38

4) Re of each stock

Manufacturing = 16 + 0.8 (25.87 – 16) = 23.896

Pharma = 16 + 0.7 (25.87 – 16) = 22.909

Auto = 16 + 0.5 (25.87 – 16) = 20.935

GOI = 16 + 0.99 (25.87 – 16) = 25.771

5) Average Return

$= \frac{23.896 + 22.909 + 20.935 + 25.771}{4} = 23.38\%$

Question 46 :
Nov 2018 (Old) – RTP / May 2019 (New) – RTP

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

Name of Co.	No. of shares	Cost (Rs.)
M Ltd.	1,000 (Rs.100 each)	2,00,000
N Ltd.	500 (Rs.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 Rs.220 and Rs.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.

Solution :

1) Average Return of Portfolio for year ended 31.3.2010

Name	No	Cost	CPU	Face value	Div. Rate	DPS	Closing
M	1,000	2,00,000	200	100	10%	10	220
N	500	1,50,000	300	10	30%	3	290
Total		3,50,000					

$$R = \left(\frac{D_1 + P_1}{P_0}\right) - 1$$

$$M = \left(\frac{10+220}{200}\right) - 1 = 15\% \qquad N = \left(\frac{3+290}{300}\right) - 1 = -2.33\%$$

$\overline{X}_P$ = Wt Average

$$= 15 \times \frac{2,00,000}{3,50,000} + -2.33 \times \frac{1,50,000}{3,50,000} = 7.57\%$$

2) Expected Return for year 2010-11

Name	No	OP	Amt.	Face value	Div. Rate	DPS	Closing
M	1,000	220	2,20,000	100	20%	20	253
N	500	290	1,45,000	10	35%	3.5	312
Total			3,65,000				

Expected Closing Price

$M = 220 \times 0.2 + 250 \times 0.5 + 280 \times 0.3 = 253$

$N = 290 \times 0.2 + 310 \times 0.5 + 330 \times 0.3 = 312$

$$R_M = \left(\frac{20+253}{220}\right) - 1 = 24.09 \qquad R_N = \left(\frac{3.5+312}{290}\right) - 1 = 8.79\%$$

$\overline{X}_P$ = Wt Average

$$= 24.09 \times \frac{2,20,000}{3,65,000} + 8.79 \times \frac{1,45,000}{3,65,000} = 18.01\%$$

3) Calculation of standard deviation (SD) (σ)

M Ltd.

Exp. Market value	Exp. Gain	Exp. div.	Exp. Yield (1)	Prob. Factor (2)	(1) x (2)	Dev. $\left(\frac{P_m}{P_M}\right)$	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	4.5
280	60	20	80	0.3	24	27	729	218.70
					53			σ_M^2 = 441

Standard Deviation (σ_M) **21**

N Ltd.

Exp. Market value	Exp. Gain	Exp. div.	Exp. Yield (1)	Prob. Factor (2)	(1) x (2)	Dev. $\left(\frac{P_n}{P_N}\right)$	Square of Dev. (3)	(2) x (3)
290	0	3.5	3.5	0.2	0.8	-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			σ_N^2 = 196

Standard Deviation (σ_N) 14

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

Question 47 :
Nov 2018 (Old) – Paper / May 2020 (New) – RTP

Mr. Gupta is considering investment in the share of R. Ltd. He has the following expectations of return on the stock and the market:

Probability	Return (%)	
	R Ltd.	Market
0.35	30	25
0.30	25	20
0.15	40	30
0.20	20	10

You are required to:

a. Calculate the expected return, variance and standard deviation for R Ltd.

b. Calculate the expected return variance and standard deviation for the market.

c. Find out the beta co-efficient for R Ltd. shares.

Solution :

P	R	R.P.	d.R.	$d^2R.P.$	M	M.P.	dm	$d^2M.P.$	dRdM.P
0.35	30	10.5	2	1.4	25	8.75	3.75	4.92	2.625
0.30	25	7.5	-3	2.7	20	6	-1.25	0.47	1.125
0.15	40	6	12	21.6	30	4.5	8.75	11.48	15.75
0.20	20	4	-8	12.8	10	2	-11.25	25.31	18
	$\bar{X}$	28		σ^2 = 38.5 σ = 6.20	$\bar{X}$	21.25		σ^2 = 42.18 σ = 6.49	37.5

COV_{RM} = 37.5

$\beta_R = \frac{COV_{RM}}{\sigma^2 M} = \frac{37.5}{42.18} = 0.889$

Question 48 :
May 2019 (New) – RTP

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

Probability	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 proportions.

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

Solution :

1) Return and Risk of individual shares

Prob.	ABC	R.P	d_{ABC}	d^2ABC	XYZ	R.P.	d_{XYZ}	d^2XYZ	dAdX.P
0.20	12	2.4	–0.55	0.0605	16	3.2	3.9	3.042	–0.429
0.25	14	3.5	1.45	0.5256	10	2.5	–2.1	1.1025	–0.76125
0.25	–7	–1.75	–19.55	95.55	28	7	15.9	63.2025	–77.71
0.30	28	8.4	15.45	71.61	–2	–0.6	–14.1	59.645	–65.35
	$\bar{X}$	12.55	σ^2	167.75	$\bar{X}$	12.1	σ^2	126.99	–144.25
			σ	12.95			σ	11.27	COV_{AX}

2) Risk and Return of portfolio with shares in equal proportion

Return($\bar{X}$) = 12.55 0.5 + 12.1 × 0.5 = 12.325

Risk (σp)

$COR_{AX} = \frac{COV_{AX}}{\sigma_A \sigma_X} = \frac{-144.25}{12.95 \times 11.27} = -0.9884$

$$\sigma p = \sqrt{\sigma^2 A wt^2 A \times \sigma^2 \times wt^2 X + 2\sigma A \sigma \times wtA \times wtX \times COR_{XY}}$$

$$= \sqrt{167.75 \times (0.5)^2 + 126.99 \times (0.5)^2 + 2 \times 12.95 \times 11.27 \times 0.5 \times 0.5 \times -0.9884}$$

$$= \sqrt{41.9375 + 31.7475 - 72.126}$$

$$= 1.25$$

3) Minimum Risk Portfolio

Minimum variance portfolio is a collection of securities that combine to minimize the price volatility of overall portfolio.

Volatility is a statistical measure of particular security price movement (up and down).

So minimum Risk portfolio mean portfolio should have less ups and down.

Bottom line

Minimum variance portfolio can hold investments types that are volatile on their own, but when combined, create a diversified portfolio that has lower volatility than any of the individual parts.

Let proportion of funds invested in ABC be X.

$$\therefore \text{Wt ABC} = \frac{\sigma^2 X - COR_{AX} \sigma_A \sigma_X}{\sigma^2 A + \sigma^2 X - 2 \times COR_{AX} \sigma_A \sigma_X}$$

$$= \frac{126.99 - (-0.9884 \times 12.95 \times 11.27)}{167.75 + 126.99 - (2 \times -0.9884 \times 12.95 \times 11.27)}$$

$$= \frac{271.23}{583.24} = 0.46$$

i.e. % Investments in ABC = 0.46

% Investments in XYZ = 1 – 0.46 = 0.54

$$wtx = \frac{\sigma^2{}_Y - COV_{XY}}{\sigma^2{}_X + \sigma^2{}_Y - 2COV_{XY}} \rightarrow \frac{a^2 - ab}{a^2 + b^2 - 2ab}$$

Question 49 :
May 2019 (New) – Paper

Following are the details of a portfolio consisting of 3 shares:

Shares	Portfolio Weight	Beta	Expected Return (%)	Total Variance
X Ltd.	0.3	0.50	15	0.020
Y Ltd.	0.5	0.60	16	0.010
Z Ltd.	0.2	1.20	20	0.120

Standard Deviation of Market Portfolio Return = 12%

You are required to calculate the following:

(i) The Portfolio Beta.

(ii) Residual Variance of each of the three shares.

(iii) Portfolio Variance using Sharpe Index Model.

Solution :

1) Portfolio β = Wt Average

= 0.50 × 0.3 + 0.60 × 0.5 + 1.2 × 0.2 = 0.69

2) Residual variance = Unsystematic Risk

	X	Y	□
Total Risk (σ^2)	0.020	0.010	0.120
Systematic Risk			
(σ2m × β^2 stock)	0.0036	0.0052	0.0207
Unsystematic Risk	0.0164	0.0048	0.0993

3) Portfolio variance by sharpe Index Model

Portfolio variance = Systematic Risk + Unsystematic Risk

Systematic Risk = σ^2m × β^2p

= $(0.12)^2$ $(0.69)^2$ = 0.006856

Unsystematic Risk = Wt Average

= 0.0164 × $(0.3)^2$ + 0.0048 × $(0.5)^2$ + 0.0993 × $(0.2)^2$

= 0.006648

Total = 0.006856 + 0.006648 = 0.013504

Question 50 :
May 2019 (Old) – Paper

Ms. Preeti, a school teacher, after retirement has built up a portfolio of Rs.1,20,000 which is as follow:

Stock	No. of shares	Market price per share (Rs.)	Beta
ABC Ltd.	1000	50	0.9
DEF Ltd.	500	20	1
GHI Ltd.	800	25	1.5
JKL Ltd.	200	200	1.2

Her portfolio consultant Sri Vijay has advised her to bring down the, beta to 0.8. You are required to compute:

(i) Present portfolio beta

(ii) How much risk free investment should be bought in, to reduce the beta to 0.8 ?

Solution :

Stock	No. of shares	Market Price of Per Share (2)	Amt.	β	Amt. β
ABC	1000	50	50,000	0.9	45,000
DEF	500	20	10,000	1	10,000
GHI	800	25	20,000	1.5	30,000
JKL	200	200	40,000	1.2	48,000

			1,20,000	1	1,33,000

(i) $\beta p = \frac{1,33,000}{1,20,000} = 1.108$

(ii) Rf to be brought to reduce β to 0.8

$= \frac{1,33,000 + (x \times 0)}{1,20,000 + x} = 0.8$

= 1,33,000 = 96,000 + 0.8x

∴x = 46,250

Question 51 :
Nov 2019 (New) – Paper

Following are risk and return estimates for two stocks :

Stock	Expected returns (%)	Beta	Specific SD of expected return (%)
A	14	0.8	35
B	18	1.2	45

The market index has a Standard Deviation (SD) of 25% and risk free rate on Treasury Bills is 6%.

You are required to calculate :

(i) The standard deviation of expected return on A and B.

(ii) Suppose a portfolio is to be constructed with the proportions of 25%, 40% and 35% in stock A, B and Treasury Bills respectively, what would be the expected return, standard deviation of expected return of the portfolio?

Solution :

1) Standard deviation of expected return i.e. total of Systematic Risk and Unsystematic Risk.

Total Risk = Systematic Risk + Unsystematic Risk

Stock A

Systematic Risk = $\beta^2 \sigma^2 m$ = (0.8)2 (25)2 = 400

Unsystematic Risk = (35)2 = 1225

∴Total Risk = $\sqrt{400 + 1225}$ = 40.31%

Stock B

Systematic Risk = $(1.2)^2 (25)^2$ = 900

Unsystematic Risk = (45)2 = 2025

∴Total Risk = $\sqrt{900 + 2025}$ = 54.08%

2) Expected Return and S.D. of portfolio

a) Expected Return = Wt Average

= (0.25 × 14) + (0.40 + 18) + (0.35 × 6) = 12.8%

b) Total Risk = Systematic Risk and Unsystematic Risk

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

$\beta p = 0.25 \times 0.8 + 0.4 \times 1.2 + 0.35 \times 0 = 0.68$

$\beta^2 p = (0.68)^2 = 0.4624$

$\sigma^2 m = (25)^2 = 625$

$\therefore$ Systematic Risk = $\sqrt{625 \times 0.4624} = \sqrt{289}$

Unsystematic Risk

$= \sqrt{(0.25)^2(35)^2 + (0.40)^2(45)^2 + 0} = \sqrt{400.56}$

$\therefore$ Total Risk = $\sqrt{289 + 400.56} = 26.26$

Question 52 :
Nov 2019 (Old) – Paper

The returns of a portfolio A and market portfolio for the last 12 months are included 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 sheet 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.

Solution :

1)

Month	R_A	d_A	d^2_A	R_M	d_M	d^2_M	$d_A d_M$
Jan.	–0.52	–2.7025	7.3035	0.82	–0.6358	0.4042	
Feb.	2.20	0.0175	0.0003	0.04	–1.4158	2.0045	
March	2.17	–0.0125	0.0001	2.80	1.3442	1.8069	
April	4.17	1.9875	3.9502	1.72	0.2642	0.0698	
May	2.04	–0.1425	0.0203	0.27	–1.1858	1.4061	

June	3.00	0.8175	0.6683	0.39	–1.0658	1.1359	
July	1.99	–0.1925	0.0371	1.95	0.4942	0.2442	
Aug.	4.00	1.8175	3.3033	0.64	–0.8158	0.6655	
Sept.	–1.38	–3.5625	12.6914	1.53	0.0742	0.0055	
Oct.	2.67	0.4875	0.2377	2.70	1.2442	1.5480	
Nov.	3.99	1.8075	3.2671	2.52	1.0642	1.352	
Dec.	1.86	–0.3225	0.1040	2.09	0.6342	0.4022	
	26.19		31.5833	17.47		10.8277	
	$\overline{X}$ 2.1825		σ^2 2.6319	1.4558		σ^2 0.9023	
			σ 1.6223			σ 0.9499	

2) Since portfolio is fully diversified βp can be computed with reference to market
i.e. $\sigma^2 p = \beta^2 p \times \sigma^2 m$

$$\therefore \beta p = \frac{\sigma_p}{\sigma_m} = \frac{1.6223}{0.9499} = 1.708$$

3) Rep = Rf + β(Rm – Rf)
= 1 + 1.708 (1.4558 – 1) (Rf is taken monthly)
= 1.7785

4) α(Return due to skill of Portfolio Manager)
= 2.1825 – 1.7785 = 0.404% per month

5) Return due to higher Risk
= 1.7785 – 1.4558 = 0.3227% per month

Question 53 :
Nov 2020 (New) – RTP

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

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

Solution :

1) Variance MFX = 4.800 | MFY = 4.250 | Market = 3.100

2) Rp, βp, σ^2p, σp

i) Wts of x = $\frac{120000}{200000}$ = 6.6

ii) Wts of y = $\frac{80000}{200000}$ = 0.4

A) Rp = 15 x 0.6 + 14 x 0.4 = 14.6

1) βx = $\frac{COVxm}{\sigma^2 m}$ = $\frac{3.370}{3.1}$ = 1.087

2) βy = $\frac{COVym}{\sigma^2 m}$ = $\frac{2.8}{3.1}$ = 0.903

B) βp = 1.087 x 0.6 + 0.903 x 0.4 = 1.013

C) σ^2p = $W^2x\ \sigma^2x + w^2y\sigma^2y + 2WxWyCOVxy$

= (0.6)2(4.8) + (0.4)2(4.250) + 2 × 0.6 × 0.4 × 4.3

= 4.472

D) σp = $\sqrt{4.472}$ = 2.115

3) Expected Return, Systematic and Unsystematic Risk

Rep = Rf + β (Rm – Rf)

= 10 + 1.013 (12 – 10) = 12.03%

Rex = 10 + 1.087 (12 – 10) = 12.17%

Rey = 10 + 0.903 (12 – 10) = 11.81%

	X	Y	M
Total Risk (σ^2)	4.8	4.250	3.100
Unsystematic Risk (σ^2mxβ^2x)	3.663	2.528	3.181
	1.137	1.722	1.291

4) A) Sharpe Ratio = $\frac{R - Rf}{\sigma}$

X = $\frac{15-10}{\sqrt{4.8}}$ = 2.282 Y = $\frac{14-10}{\sqrt{4.250}}$ = 1.94

Market = $\frac{14.6-10}{2.115}$ = 2.175

B) Treyno Ratio = $\frac{R - Rf}{\beta}$

X = $\frac{15-10}{1.087}$ = 4.6 Y = $\frac{14-10}{0.903}$ = 4.43 P = $\frac{14.6-10}{1.013}$ = 4.54

C) Treynor α = $\overline{X}$ – Re

X = 15 – 12.17 = 2.83
Y = 14 – 11.83 = 2.19
Portfolio = 14.6 – 12.03 = 2.57

Question 54 :
Nov 2020 (New) – Paper

The following are the details of three mutual funds of MFL

	Growth Fund	Balanced Fund	Regular Fund	Market
Average Return (%)	7	6	5	9
Variance	92.16	54.76	40.96	57.76
Co-efficient of Determination	0.3025	0.6561	0.9604	

The yield on 182 days treasure bill is 9% PA.

You are required to:

1. Rank the funds as per Sharpe's measure.
2. Rank the funds as per Treynor's measure.
3. Compare the performance with the market.

Solution :

	Growth Fund	Balanced Fund	Regular Fund	Market
Average Return (%)	7	6	5	9
Variance	92.16	54.76	40.96	57.76
Std. Deviation	9.60	7.40	6.40	7.60
Coefficient of Determination	0.3025	0.6561	0.9604	
Coefficient of Correlation	0.55	0.81	0.98	
Beta (β)	$\frac{9.60}{7.60} \times 0.55 =$ 0.695	$\frac{7.40}{7.60} \times 0.81 =$ 0.789	$\frac{6.40}{7.60} \times 0.98 =$ 0.825	

(i) Ranking of Funds as per Sharpe Ratio

$$\text{Sharpe Ratio} = \frac{\text{Expected Return - Risk Free Rate of Return}}{\text{Standard Deviation}}$$

	Growth Fund	Balance Fund	Regular Fund
Sharpe Ratio	$\frac{7-9}{9.60} = -0.208$	$\frac{6-9}{7.40} = -0.405$	$\frac{5-9}{6.40} = -0.625$
Ranking	1	2	3

(ii) Ranking of Funds as per Treynor Ratio

$$\text{Treynor Ratio} = \frac{\text{Expected Return - Risk Free Rate of Return}}{\text{Beta}}$$

	Growth Fund	Balance Fund	Regular Fund
Treynor Ratio	$\frac{7-9}{0.695} = -2.878$	$\frac{6-9}{0.789} = -3.802$	$\frac{5-9}{0.825} = -4.84$
Ranking	1	2	3

(iii) Comparison of performance with the Market

Sharpe Ratio	$\frac{9-9}{7.60} = 0$
Treynor Ratio	$\frac{9-9}{1} = 0$

Thus, the performance of funds is very poor since all values are negative as compared to market performance.

Question 55 :
Jan 2021 (New) – Paper

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 Rs.)	B (Market Price per share in Rs.)
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 Stock if he invest in Stock A and B in proportion of 6 : 4

(iii) The better opportunity for investment.

Solution :

	A				B				
Year	**Market Price Per Share in Rs.**	**Return (%)**	**Return - $\bar{A}$**	**Squared**	**Market Price Per Share in Rs.**	**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	4128.063	16.20	26.56	10.37	107.5369	666.2725
2016	42.64	27.59	13.60	184.96	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	1301.766	18.60	40.38	24.19	585.1561	-872.7752
		83.95		6226.688		97.14		3582.175	-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) = $\sqrt{1037.7814}$ = 32.2146 and Return B = 16.19% and Risk (SD) = $\sqrt{597.0291}$ = 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 56 :
May 2021 (New) – RTP

K Ltd. has invested in a portfolio of short-term equity investments. You are required to calculate the risk of K Ltd.'s short-term investment portfolio relative to that of the market from the information given below:

Investment	A	B	C	D
No. of shares	1,20,000	1,60,000	2,00,000	2,50,000
Market price per share (Rs.)	8.58	5.84	4.34	6.28
Beta	2.32	4.56	1.80	3.00
Expected Dividend Yield	9.50%	14.00%	7.50%	16.00%

The current market return is 20% and the risk free return is 10%.

Advise whether K Ltd. should change the composition of its portfolio. If yes, then how.

Note: Make calculations upto 4 decimal points.

Solution :

(i) To determine whether K Ltd. should change composition of its portfolio first we should determine the Beta of the Portfolio and compare it with implicit Beta as justified by the Return on Portfolio.

Calculation of Beta of Portfolio

Investment	No. of shares	Market Price (Rs.)	Market Value	Dividend Yield	Dividend	Composition	β	Weighted β
A	1,20,000	8.58	10,29,600	9.50%	97,812	0.2339	2.32	0.5426
B	1,60,000	5.84	9,34,400	14.00%	1,30,816	0.2123	4.56	0.9681
C	2,00,000	4.34	8,68,000	7.50%	65,100	0.1972	1.80	0.3550
D	2,50,000	6.28	15,70,000	16.00%	2,51,200	0.3566	3.00	1.0698
			44,02,000		5,44,928	1.0000		2.9355

Return of the Portfolio $\frac{5,44,928}{44,02,000}$ = 0.1238

Beta of Port Folio 2.9355

Market Risk implicit

0.1238 = 0.10 + β × (0.20 – 0.10)

Or, 0.10 β + 0.10 = 0.1238

$$\beta = \frac{0.1238 - 0.10}{0.10} = 0.238$$

Market β implicit is 0.238 while the portfolio β is 2.93. Thus, the portfolio is marginally risky compared to the market.

(ii) To decide whether K Ltd. should change the composition of its portfolio the dividend yield (given) should be compared with the Expected Return as per CAPM as follows:

Expected return as per CAPM is $R_f + (R_M - R_f)\ \beta$

Accordingly,

Expected Return for investment A	=	0.10 + (0.20 - 0.10) 2.32
	=	33.20%
Expected Return for investment B	=	0.10 + (0.20 - 0.10) 4.56
	=	55.60%
Expected Return for investment C	=	0.10 + (0.20 - 0.10) 1.80
	=	28%
For investment D, Rs	=	0.10 + (0.20 - 0.10) 3
	=	40%

Comparing dividend yields with the expected returns of investment as per CAPM it can be observed that all investments are over-priced and they should be sold by the K Ltd. and acquire new securities.

Thanks ....

CHP - 12 RISK MANAGEMENT

Question 1 :
Nov 2019 – Paper

Following is the information about Mr.J's portfolio :

Investment in shares of ABC Ltd.	Rs.200 lakh
Investment in shares of XYZ Ltd.	Rs.200 lakh
Daily standard deviation of both shares	1%
Co-efficient of correlation between both shares	0.3

Required :

Determine the 10 days 99% Value AT Risk (VAR) for Mr.J's portfolio. Given : The Z score from the Normal table at 99% confidence level is 2.33. (Show your calculations up to four decimal points).

Solution :

Volatility (standard deviation) of the daily change in the investment in each share in terms of rupees

1% of Rs.200 lakh = Rs.2 lakh

The variance of the portfolio's daily change –

V = $2^2 + 2^2 + 2 \times 0.3 \times 2 \times 2 = 10.4$ lakh

Standard Deviation of the portfolio's daily change = $\sqrt{10.4}$ = Rs.3.2249 lakhs

The standard deviation of the 10-day change = Rs.3.2249 lakhs x $\sqrt{10}$ = Rs.10.1981 lakhs

Therefore, the 10-days 99% VAR = 2.33 × Rs.10.1981 lakhs = Rs.23.7616 lakhs

Question 2 :
Nov 2019 – Paper

List the main applications of Value At Risk (VAR).

Solution :

Applications of Value at Risk (VAR) VAR can be applied

(a) To measure the maximum possible loss on any portfolio or a trading position.

(b) As a benchmark for performance measurement of any operation or trading.

(c) To fix limits for individuals dealing in front office of a treasury department.

(d) To enable the management to decide the trading strategies.

(e) As a tool for Asset and Liability Management especially in banks.

Question 3 :
May 2020 – RTP

What is Value at Risk? Identify its main features.

Solution :

VAR is a measure of risk of investment. Given the normal market condition in a set of period, say, one day it estimates how much an investment might lose. This investment can be a portfolio, capital investment or foreign exchange etc., VAR answers two basic questions –

(i) What is worst case scenario?

(ii) What will be loss?

It was first applied in 1922 in New York Stock Exchange, entered the financial world in 1990s and become world's most widely used measure of financial risk.

Following are main features of VAR

(i) **Components of Calculations :** VAR calculation is based on following three components:
   (a) Time Period
   (b) Confidence Level – Generally 95% and 99%
   (c) Loss in percentage or in amount

(ii) **Statistical Method :** It is a type of statistical tool based on Standard Deviation

(iii) **Time Horizon :** VAR can be applied for different time horizons say one day, one week, one month and so on.

(iv) **Probability :** Assuming the values are normally attributed, probability of maximum loss can be predicted.

(v) **Control Risk :** Risk can be controlled by selling limits for maximum loss.

(vi) **Z Score :** Z Score indicates how many standard Deviations is away from Mean value of a population. When it is multiplied with Standard Deviation it provides VAR.

Question 4 :
Nov 2020 (New) – RTP

What is Financial Risk? How it can be evaluated from point of views.

Solution :

Financial Risk is referred as the unexpected changes in financial conditions such as prices, exchange rate, Credit rating, and interest rate etc. Though political risk is not a financial risk in direct sense but same can be included as any unexpected political change in any foreign country may lead to country risk which may ultimately result in financial loss.

The financial risk can be evaluated from different point of views as follows:

(a) **From stakeholder's point of view :** Major stakeholders of a business are equity shareholders and they view financial gearing i.e. ratio of debt in capital structure of company as risk since in event of winding up of a company they will be least prioritized.

Even for a lender, existing gearing is also a risk since company having high gearing faces more risk in default of payment of interest and principal repayment.

(b) **From Company's point of view :** From company's point of view if a company borrows excessively or lend to someone who defaults, then it can be forced to go into liquidation.

(c) **From Government's point of view:** From Government's point of view, the financial risk can be viewed as failure of any bank or (like Lehman Brothers) down grading of any financial institution leading to spread of distrust among society at large. Even this risk also includes willful defaulters. This can also be extended to sovereign debt crisis.

Question 5 :
Nov 2020 (New) – Paper

On Tuesday morning (before opening of capital market) an investor, while going through his bank statement has observed an amount of Rs 7,00,000 is lying in his bank account. This amount is available for use from Tuesday till Friday. The bank requires minimum balance of Rs 1000 at all 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 security is 1.5% per day the required confidence level is 99%.

Standard Normal Probabilities										
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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.

Solution :

Particulars	Amount (Rs.)
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) = 150000/0.015	1,00,00,000

Question 6 :
Jan 2021 (New) – Paper

Risks are inherent and integral part of the market. Discuss.

Solution :

Yes, Risk is an integral part of market and this is a type of systematic risk that affects prices of any particular share move up or down consistently for some time periods in line with other shares in the market. A general rise in share prices is referred to as a bullish trend, whereas a general fall in share prices is referred to as a bearish trend. In other words, the share market moves between the bullish phase and the bearish phase. The market movements can be easily seen in the movement of share price indices such as the BSE Sensitive Index, BSE National Index, NSE Index etc.

Thanks ....

CHP - 13 SECURITIZATION

Question 1 :
May 2018 – Paper / May 2019 – Paper / May 2020 – RTP

Discuss briefly the steps involved in the Securitization mechanism.

Solution :

The steps involved in securitization mechanism are as follows:

1. **Creation of Pool of Assets :** The process of securitization begins with creation of pool of assets by segregation of assets backed by similar type of mortgages in terms of interest rate, risk, maturity and concentration units.
2. **Transfer to SPV :** One assets have been pooled, they are transferred to Special Purpose Vehicle (SPV) especially created for this purpose.
3. **Sale of Securitized Papers :** SPV designs the instruments based on nature of interest, risk, tenure etc. based on pool of assets. These instruments can be Pass through Security or Pay Through Certificates.
4. **Administration of assets :** The administration of assets in subcontracted back to originator which collects principal and interest from underlying assets and transfer it to SPV, which works as a conduct.
5. **Recourse to Originator :** Performance of securitized papers depends on the performance of underlying assets and unless specified in case of default they go back to originator from SPV.
6. **Repayment of funds :** SPV will repay the funds in form of interest and principal that arises from the assets pooled.
7. **Credit Rating of Instruments:** Sometime before the sale of securitized instruments credit rating can be done to assess the risk of the issuer.

Question 2 :
May 2018 – Paper / Nov 2019 – Paper

Explain the benefits of Securitization from the perspective of both originator as well as the investor.

Solution :

The benefits of securitization can be viewed from the angle of various parties involved as follows:

(A) **From the angle of originator :** Originator (entity which sells assets collectively to Special Purpose Vehicle) achieves the following benefits from securitization.

(i) **Off – Balance Sheet Financing :** When loan/receivables are securitized it release a portion of capital tied up in these assets resulting in off Balance Sheet financing leading to improved liquidity position which helps expanding the business of the company.

(ii) **More specialization in main business:** By transferring the assets the entity could concentrate more on core business as servicing of loan is transferred to SPV. Further, in case of non-recourse arrangement even the burden of default is shifted.

(iii) **Helps to improve financial ratios:** Especially in case of Financial Institutions and Banks, it helps to manage Capital –To-Weighted Asset Ratio effectively.

(iv) **Reduced borrowing Cost:** Since securitized papers are rated due to credit enhancement even they can also be issued at reduced rate as of debts and hence the originator earns a spread, resulting in reduced cost of borrowings.

(B) **From the angle of investor:** Following benefits accrues to the investors of securitized securities.

(i) **Diversification of Risk:** Purchase of securities backed by different types of assets provides the diversification of portfolio resulting in reduction of risk.

(ii) **Regulatory requirement :** Acquisition of asset backed belonging to a particular industry say micro industry helps banks to meet regulatory requirement of investment of fund in industry specific.

(iii) **Protection against default :** In case of recourse arrangement if there is any default by any third party then originator shall make good the least amount. Moreover, there can be insurance arrangement for compensation for any such default.

Question 3 :
Nov 2018 – Paper

Discuss about the Primary Participants in the process of Securitization.

Solution :

Primary Participants are main parties to the process of securitization. The primary participants in the process of securitization are as follows:

(i) **Originator:** It is the initiator of deal or can be termed as securitizer. It is an entity which sells the assets lying in its books and receives the funds generated through the sale of such assets. The originator transfers both legal as well as beneficial interest to the Special Purpose Vehicle.

(ii) **Special Purpose Vehicle:** Also, called SPV, it is created for the purpose of executing the deal. Since issuer originator transfers all rights in assets to SPV, it holds the legal title of these assets. It is created especially for the purpose of securitization only and normally could be in form of a company, a firm, a society or a trust. The main objective of creating SPV is to remove the asset from the Balance Sheet of Originator. Since, SPV makes an upfront payment to the originator, it holds the key position in the overall process of securitization. Further, it also issues the securities (called Asset Based Securities or Mortgage Based Securities) to the investors.

(iii) **The Investors:** Investors are the buyers of securitized papers which may be an individual, an institutional investor such as mutual funds, provident funds, insurance companies, Financial Institutions etc. Since, they acquire a participating share in the total pool of assets/receivable, they receive their money back in the form of interest and principal as per the agreed terms.

Question 4 :
Nov 2019 – Paper / Nov 2020 (New) – RTP

State the main problems faced in Securitization in India?

Solution :

Following are main problems faced in growth of Securitization of instruments especially in Indian context:

1. **Stamp Duty :** Stamp Duty is one of the obstacles in India. Under Transfer of Property Act, 1882, a mortgage debt stamp duty which even goes upto 12% in some states of India and this impeded the growth of securitization in India. It should be noted that since pass through certificate does not evidence any debt only able to receivable, they are exempted from stamp duty. Moreover, in India, recognizing the special nature of securitized instruments in some states has reduced the stamp duty on them.
2. **Taxation :** Taxation is another area of concern in India. In the absence of any specific provision relating to securitized instruments in Income Tax Act, experts' opinion differs a lot. Some are of opinion that SPV as a trustee is liable to be taxed in a representativ e capacity. While, others are of view that instead of SPV, investors will be taxed on their share of income. Clarity is also required on the issues of capital gain implications on passing payments to the investors.
3. **Accounting :** Accounting and reporting of securitized assets in the books of originator is another area of concern. Although securitization is slated to an off-balance sheet instrument but in true sense receivables are removed from originator's balance sheet. Problem arises especially when assets are transferred without recourse.
4. **Lack of standardization :** Every originator following his own format for documentation and administration having lack of standardization is another obstacle in the growth of securitization.
5. **Inadequate Debt Market :** Lack of existence of a well-developed debt market in India is another obstacle that hinders the growth of secondary market of securitized or asset backed securities.
6. **Ineffective Foreclosure laws :** For many years efforts are on for effective foreclosure but still foreclosure laws are not supportive to lending institutions and this makes securitized instruments especially mortgaged backed securities less attractive as lenders face difficulty in transfer of property in event of default by the borrower.

Question 5 :
Nov 2020 – Paper

Distinguish between Pass Through Certificates (PTC) and Pay Through Securities (PTS).

Solution :

Pass Through Certificates (PTC) - In case of PTCs, the originator transfers the entire receipt of cash in the form of interest or principal repayment from the asset sold. Thus, PTC represent a direct claim of the investors on all assets securitized. Investors carry a proportional benefit. Skewness of cash flow occurs at an early stage in case of prepayment of principals.

Pay Through Securities (PTS) – In PTS, SPV debt securities are backed by the assets and hence it can restructure different tranches from varying maturities of receivables. PTS also permits the SPV to reinvest surplus funds for short term as per there requirement.

Question 6 :
Jan 2021 – Paper

"The process of securitisation can be viewed as process of creation of additional financial product of securities in the market backed by collaterals." What are the other features? Describe.

Solution :

The other features of Securitization are as follows:

(i) Bundling and Unbundling – When all the assets are combined in one pool it is bundling and when these are broken into instruments of fixed denomination it is unbundling.

(ii) Tool of Risk Management – In case of assets are securitized on non-recourse basis, then securitization process acts as risk management as the risk of default is shifted.

(iii) Structured Finance – In the process of securitization, financial instruments are tailor structured to meet the risk return trade off profile of investor, and hence, these securitized instruments are considered as best examples of structured finance.

(iv) Trenching – Portfolio of different receivable or loan or asset are split into several parts based on risk and return they carry called 'Trenche'. Each Trench carries a different level of risk and return.

(v) Homogeneity – Under each tranche the securities issued are of homogenous nature and even meant for small investors who can afford to invest in small amounts.

Question 7 :
Jan 2021 – Paper

Participants are required for the success of the securitisation process. Discuss their roles.

Solution :

Role of various participants in the process of securitization is as follows:

(a) **Originator:** It is the initiator of deal or can be termed as securitizer. It is an entity which sells the assets lying in its books and receives the funds generated through the sale of such assets.

(b) **Special Purpose Vehicle:** Since issuer originator transfers all rights in assets to SPV, it holds the legal title of these assets. It is created especially for the purpose of securitization only and normally could be in form of a company, a firm, a society or a trust

(c) **The Investors:** Investors are the buyers of securitized papers which may be an individual, an institutional investor such as mutual funds, provident funds, insurance companies, mutual funds, Financial Institutions etc.

(d) **Obligors:** The amount due from the obligor is transferred to SPV and hence they form the basis of securitization process and their credit standing is of paramount importance in the whole process.

(e) **Rating Agency:** Since the securitization is based on the pools of assets rather than the originators, the assets have to be assessed in terms of its credit quality and credit support available.

(f) **Receiving and Paying agent (RPA):** Also, called Servicer or Administrator, it collects the payment due from obligor(s) and passes it to SPV. It also follow up with defaulting borrower and if required initiate appropriate legal action against them. Generally, an originator or its affiliates acts as servicer.

(g) **Agent or Trustee:** Trustees are appointed to oversee that all parties to the deal perform in the true spirit of terms of agreement. Normally, it takes care of interest of investors who acquires the securities.

(h) **Credit Enhancer:** Since investors in securitized instruments are directly exposed to performance of the underlying and sometime may have limited or no recourse to the originator, they seek additional comfort in the form of credit enhancement.

(i) **Structurer:** It brings together the originator, investors, credit enhancers and other parties to the deal of securitization. Normally, these are investment bankers also called arranger of the deal. It ensures that deal meets all legal, regulatory, accounting and tax laws requirements.

Thanks ....

Rahul Malkan

CHP - 14 STARTUP FINANCE

Question 1 :
May 2018 – Paper

Explain the advantages of bringing venture capital in the company.

Solution :

Advantages of bringing VC in the company:

- It injects long- term equity finance which provides a solid capital base for future growth.
- The venture capitalist is a business partner, sharing both the risks and rewards. Venture capitalists are rewarded with business success and capital gain.
- The venture capitalist is able to provide practical advice and assistance to the company based on past experience with other companies which were in similar situations.
- The venture capitalist also has a network of contacts in many areas that can add value to the company.
- The venture capitalist may be capable of providing additional rounds of funding should it be required to finance growth.
- Venture capitalists are experienced in the process of preparing a company for an initial public offering (IPO) of its shares onto the stock exchanges or overseas stock exchange such as NASDAQ.
- They can also facilitate a trade sale.

Question 2 :
Nov 2018 – Paper

Explain Angel Investors.

Solution :

Angel investors invest in small startups or entrepreneurs. Often, angel investors are entrepreneur's family and friends. The capital angel investors provide may be a one-time investment to help the business propel or an ongoing injection of money to support and carry the company through its difficult early stages.

Angel investors provide more favorable terms compared to other lenders, since they usually invest in the entrepreneur starting the business rather than the viability of the business. Angel investors are focused on helping startups take their first steps, rather than the possible profit they may get from the business. Essentially, angel investors are the opposite of venture capitalists.

Angel investors are also called informal investors, angel funders, private investors, seed investors or business angels. These are affluent individuals who inject capital for startups in exchange for ownership equity or convertible debt. Some angel investors invest through crowdfunding platforms online or build angel investor networks to pool in capital.

Angel investors typically use their own money, unlike venture capitalists who take care of pooled money from many other investors and place them in a strategically managed fund.

Though angel investors usually represent individuals, the entity that actually provides the fund may be a limited liability company, a business, a trust or an investment fund, among many other kinds of vehicles.

Angel investors who seed startups that fail during their early stages lose their investments completely. This is why professional angel investors look for opportunities for a defined exit strategy, acquisitions or initial public offerings (IPOs)

Question 3 :
May 2019 – Paper / May 2020 – RTP

Explain briefly the sources for funding a Start-up.

Solution :

Some of the sources for funding a start-up:

(i) **Personal financing :** It may not seem to be innovative but you may be surprised to note that most budding entrepreneurs never thought of saving any money to start a business. This is important because most of the investors will not put money into a deal if they see that you have not contributed any money from your personal sources.

(ii) **Personal credit lines :** One qualifies for personal credit line based on one's personal credit efforts. Credit cards are a good example of this. However, banks are very cautious while granting personal credit lines. They provide this facility only when the business has enough cash flow to repay the line of credit.

(iii) **Family and friends:** These are the people who generally believe in you, without even thinking that your idea works or not. However, the loan obligations to friends and relatives should always be in writing as a promissory note or otherwise.

(iv) **Peer-to-peer lending:** In this process group of people come together and lend money to each other. Peer to peer to lending has been there for many years. Many small and ethnic business groups having similar faith or interest generally support each other in their start up endeavors.

(v) **Crowdfunding :** Crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business initiative. Crowdfunding makes use of the easy accessibility of vast networks of people through social media and crowdfunding websites to bring investors and entrepreneurs together.

(vi) **Microloans :** Microloans are small loans that are given by individuals at a lower interest to a new business ventures. These loans can be issued by a single individual or aggregated across a number of individuals who each contribute a portion of the total amount.

(vii) **Vendor financing:** Vendor financing is the form of financing in which a company lends money to one of its customers so that he can buy products from the company itself. Vendor financing also takes place when many manufacturers and distributors are convinced to defer payment until the goods are sold. This means extending the payment terms to a longer period for e.g. 30 days payment period can be extended to 45 days or 60 days. However, this depends on one's credit worthiness and payment of more money.

(viii) **Purchase order financing:** The most common scaling problem faced by startups is the inability to find a large new order. The reason is that they don't have the necessary cash to produce and deliver the product. Purchase order financing companies often advance the required

funds directly to the supplier. This allows the transaction to complete and profit to flow up to the new business.

(ix) **Factoring accounts receivables:** In this method, a facility is given to the seller who has sold the good on credit to fund his receivables till the amount is fully received. So, when the goods are sold on credit, and the credit period (i.e. the date up to which payment shall be made) is for example 6 months, factor will pay most of the sold amount upfront and rest of the amount later. Therefore, in this way, a startup can meet his day to day expenses

Question 4 :
Nov 2019 – RTP

Question State briefly the basic characteristics of venture capital financing?

Solution :

Basic characteristics of Venture Capital Financing:

(i) Long time horizon: The fund would invest with a long time horizon in mind. Minimum period of investment would be 3 years and maximum period can be 10 years.

(ii) Lack of liquidity: When VC invests, it takes into account the liquidity factor. It assumes that there would be less liquidity on the equity it gets and accordingly it would be investing in that format. They adjust this liquidity premium against the price and required return.

(iii) High Risk: VC would not hesitate to take risk. It works on principle of high risk and high return. So, high risk would not eliminate the investment choice for a venture capital.

(iv) Equity Participation: Most of the time, VC would be investing in the form of equity of a company. This would help the VC participate in the management and help the company grow. Besides, a lot of board decisions can be supervised by the VC if they participate in the equity of a company.

Question 5 :
Nov 2019 – Paper

What is a startup to avail the benefits of government scheme ?

Solution :

Startup India scheme was initiated by the Government of India on 16th of January, 2016. The definition of startup was provided which is applicable only in case of Government Schemes.

Startup means an entity, incorporated or registered in India (at the date of initiation of the scheme):

- Not prior to five years,
- With annual turnover not exceeding Rs 25 crore in any preceding financial year, and
- Working towards innovation, development, deployment or commercialization of new products, processes or services driven by technology or intellectual property.

Provided that such entity is not formed by splitting up, or reconstruction, of a business already in existence. Provided also that an entity shall cease to be a Startup if its turnover for the previous financial years has exceeded Rs.25 crore or it has completed 5 years from the date of incorporation/ registration. Provided further that a Startup shall be eligible for tax benefits only after it has obtained certification from the Inter Ministerial Board, setup for such purpose.

Question 6 :
Nov 2020 (New) - RTP

Explain the methods in which a Stratup firm can bootstrap.

Solution :

Here are some of the methods in which a startup firm can bootstrap:

(i) **Trade Credit:** When a person is starting his business, suppliers are reluctant to give trade credit. They will insist on payment of their goods supplied either by cash or by credit card. However, a way out in this situation is to prepare a well-crafted financial plan. The next step is to pay a visit to the supplier's office. If the business organization is small, the owner can be directly contacted. On the other hand, if it is a big firm, the Chief Financial Officer can be contacted and convinced about the financial plan.

Communication skills are important here. The financial plan has to be shown. The owner or the financial officer has to be explained about the business and the need to get the first order on credit in order to launch the venture. The owner or financial officer may give half the order on credit and balance on delivery. The trick here is to get the goods shipped and sell them before paying to them. One can also borrow to pay for the good sold. But there is interest cost also. So trade credit is one of the most important ways to reduce the amount of working capital one needs. This is especially true in retail operations.

(ii) **Factoring :** This is a financing method where accounts receivable of a business organization is sold to a commercial finance company to raise capital. The factor then got hold of the accounts receivable of a business organization and assumes the task of collecting the receivables as well as doing what would've been the paperwork. Factoring can be performed on a non-notification basis. It means customers may not be told that their accounts have been sold.

In addition to reducing internal costs of a business, factoring also frees up money that would otherwise be tied to receivables. This is especially true for businesses that sell to other businesses or to government; there are often long delays in payment that this would offset. This money can be used to generate profit through other avenues of the company. Factoring can be a very useful tool for raising money and keeping cash flowing.

(iii) **Leasing:** Another popular method of bootstrapping is to take the equipment on lease rather than purchasing it. It will reduce the capital cost and also help lessee (person who take the asset on lease) to claim tax exemption. So, it is better to a take a photocopy machine, an automobile or a van on lease to avoid paying out lump sum money which is not at all feasible for a startup organization.

Question 7 :
Nov 2020 (New) - Paper

Peer – to – Peer Lending and Crowd funding are same and traditional methods of funding. Do you agree? Justify your stand.

Solution :

No, I do not agree with the given statement because while peer-to-peer lending is in existence for many years the crowd funding is contemporary source of finance for Startup finance.

Further in peer-to-peer lending a group of people come together and lend money to each other. Many small and ethnic business groups having similar faith or interest generally support each other in their start up endeavors.

On the other hand, Crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business initiative. Crowdfunding makes use of the easy accessibility of vast networks of people through social media and crowdfunding websites to bring investors and entrepreneurs together.

Question 8 :
Jan 2021 (New) - Paper

Venture Capital Funding passes through various stages. Discuss.

Solution :

Stages of Venture Capital Funding:

The various stages of Venture Capital Funding are as follows:

1. Seed Money: Low level financing needed to prove a new idea.
2. Start-up: Early stage firms that need funding for expenses associated with marketing and product development.
3. First-Round: Early sales and manufacturing funds.
4. Second-Round: Working capital for early stage companies that are selling product, but not yet turning in a profit.
5. Third Round: Also called Mezzanine financing, this is expansion money for a newly profitable company.
6. Fourth-Round: Also called bridge financing, it is intended to finance the "going public" process.

Question 9 :
Jan 2021 (New) - Paper

Non-bank Financial Sources are becoming popular to finance Start-ups. Discuss.

Solution :

Non-bank Financial Sources to finance Start-ups:

(i) **Personal financing.** It may not seem to be innovative but you may be surprised to note that most budding entrepreneurs never thought of saving any money to start a business. This is important because most of the investors will not put money into a deal if they see that you have not contributed any money from your personal sources.

(ii) **Personal credit lines.** One qualifies for personal credit line based on one's personal credit efforts. Credit cards are a good example of this. However, banks are very cautious while granting personal credit lines. They provide this facility only when the business has enough cash flow to repay the line of credit.

(iii) **Family and friends.** These are the people who generally believe in you, without even thinking that your idea works or not. However, the loan obligations to friends and relatives should always be in writing as a promissory note or otherwise.

(iv) **Peer-to-peer lending.** In this process group of people come together and lend money to each other. Peer to peer to lending has been there for many years. Many small and ethnic business groups having similar faith or interest generally support each other in their start up endeavours.

(v) **Crowdfunding**. Crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business initiative. Crowdfunding makes use of the easy accessibility of vast networks of people through social media and crowdfunding websites to bring investors and entrepreneurs together.

(vi) **Micro Loans.** Microloans are small loans that are given by individuals at a lower interest to a new business ventures. These loans can be issued by a single individual or aggregated across a number of individuals who each contribute a portion of the total amount.

(vii) **Vendor financing.** Vendor financing is the form of financing in which a company lends money to one of its customers so that he can buy products from the company itself. Vendor financing also takes place when many manufacturers and distributors are convinced to defer payment until the goods are sold. This means extending the payment terms to a longer period for e.g. 30 days payment period can be extended to 45 days or 60 days. However, this depends on one's credit worthiness and payment of more money.

(viii) **Purchase order financing.** The most common scaling problem faced by start-ups is the inability to find a large new order. The reason is that they don't have the necessary cash to produce and deliver the product. Purchase order financing companies often advance the required funds directly to the supplier. This allows the transaction to complete and profit to flow up to the new business.

(ix) **Factoring accounts receivables.** In this method, a facility is given to the seller who has sold the good on credit to fund his receivables till the amount is fully received. So, when the goods are sold on credit, and the credit period (i.e. the date up to which payment shall be made) is for example 6 months, factor will pay most of the sold amount up front and rest of the amount later. Therefore, in this way, a start-up can meet his day to day expenses.

Thanks ....

CHP - 15 OTHER TOPICS

Question 1 :
May 2018 – Paper

Write a Short note on RERA ?

Solution :

India has a vast population with needs regarding food, house and jobs on an ever-increase mode. The housing among these fields is one of the major ones. Thousands of people have grown to be rich and as many of them have made loss in real estate business. It is the one of the leading revenue generators for the government. Even though it has such strong presence in the country, it never had a regulating body. Due to the failure of the government to observe this, many people have become the victims of some scheming people doing the real estate business. The buyers who come from a middle-class background have time and again fallen prey to such petty real estate developers. There was a growing need to bring a transparent government body which can check the developers. Finally, the government delivered by making an authority known as RERA which stands for Real Estate Regulatory Authority. It was passed in March 2016 by the parliament. This promises to bring a justice to the buyer through making strict policies that have to be fulfilled by the developers to sell their projects. The major problem that real estate in India is facing is that of the delayed possession given to the home seeker by the rich and the cunning builders. Thus, RERA will help people by bringing in a high level of transparency and discipline that these builders must have to follow. The laws under RERA are still in the early days of development but one thing is for sure that there will be a huge relief for the buyers regarding developer-specific risk. The mechanism of RERA will be made such that it provides a common ground for both the buyers as well as the developers. Transparency is the key point regarding the rules under RERA as the government wants that every aspect of information that the general public should know should be made available on an informational portal. The regulatory risk will also be laid upon the developer as he will have to pay compensation if any mishap happens while giving the possession of a unit. All the builders will have to register themselves under RERA which will see a low risk in the property business.

Question 2 :
May 2018 – Paper

Discuss what you understand about Embedded Derivatives.

Solution :

Embedded Derivatives: A derivative is defined as a contract that has all the following characteristics:

- Its value changes in response to a specified underlying, e.g. an exchange rate, interest rate or share price;
- It requires little or no initial net investment;

- It is settled at a future date;
- The most common derivatives are currency forwards, futures, options, interest rate swaps etc.

An embedded derivative is a derivative instrument that is embedded in another contract - the host contract. The host contract might be a debt or equity instrument, a lease, an insurance contract or a sale or purchase contract. Derivatives require to be marked-to-market through the income statement, other than qualifying hedging instruments. This requirement on embedded derivatives are designed to ensure that mark-to-market through the income statement cannot be avoided by including - embedding - a derivative in another contract or financial instrument that is not marked-to market through the income statement. An embedded derivative can arise from deliberate financial engineering and intentional shifting of certain risks between parties. Many embedded derivatives, however, arise inadvertently through market practices and common contracting arrangements. Even purchase and sale contracts that qualify for executory contract treatment may contain embedded derivatives. An embedded derivative causes modification to a contract's cash flow, based on changes in a specified variable.

Question 3
May 2018 – Paper

Interpret the Capital Asset Pricing Model (CAPM) and its relevant assumptions.

Solution :

The Capital Asset Pricing Model was developed by Sharpe, Mossin and Linter in 1960. The model explains the relationship between the expected return, non-diversifiable risk and the valuation of securities. It considers the required rate of return of a security on the basis of its contribution to the total risk.

It is based on the premises that the diversifiable risk of a security is eliminated when more and more securities are added to the portfolio. However, the systematic risk cannot be diversified and is or related with that of the market portfolio.

All securities do not have same level of systematic risk. The systematic risk can be measured by beta, ß under CAPM, the expected return from a security can be expressed as:

Expected return on security = Rf + Beta (Rm – Rf)

The model shows that the expected return of a security consists of the risk -free rate of interest and the risk premium. The CAPM, when plotted on the graph paper is known as the Security Market Line (SML). A major implication of CAPM is that not only every security but all portfolios too must plot on SML.

This implies that in an efficient market, all securities are having expected returns commensurate with their riskiness, measured by ß.

Relevant Assumptions of CAPM

(i) The investor's objective is to maximize the utility of terminal wealth;

(ii) Investors make choices on the basis of risk and return;

(iii) Investors have identical time horizon;

(iv) Investors have homogeneous expectations of risk and return;

(v) Information is freely and simultaneously available to investors;

(vi) There is risk-free asset, and investor can borrow and lend unlimited amounts at the risk-free rate;

(vii) There are no taxes, transaction costs, restrictions on short rates or other market imperfections;

(viii) Total asset quantity is fixed, and all assets are marketable and divisible.

Thus, CAPM provides a conceptual framework for evaluating any

Question 4 :
May 2019 – Paper

State the important features of National Pension Scheme (NPS).

Solution :

Important features of NPS are as under:

(i) Any citizen of India, whether resident or non-resident who are aged between 18 – 60 years as on the date of submission of his/her application can join NPS.

(ii) NPS is an easily accessible, low cost, tax-efficient, flexible and portable retirement savings account.

(iii) Under the NPS, the individual contributes to his retirement account and his employer can also co-contribute for the social security/welfare of the individual.

(iv) NPS is designed on defined contribution basis wherein the subscriber contributes to his account.

(v) In NPS, there is no defined benefit that would be available at the time of exit from the system and the accumulated wealth depends on the contributions made and the income generated from investment of such wealth.

(vi) In NPS, Accumulated Pension Wealth = Contributions + Investment Growth – Charges.

Question 5 :
Nov 2020 (New) – RTP

Explain the difference between Forward and Future Contract.

Solution :

Difference between forward and future contract is as follows :

No.	Features	Forward	Futures
1	Trading	Forward contracts are traded on personal basis or on telephone or otherwise.	Futures Contracts are traded in a competitive arena.
2	Size of Contract	Forward contracts are individually tailored and have no standardized size	Futures contracts are standardized in terms of quantity or amount as the case may be

3	Organized exchanges	Forward contracts are traded in an over the counter market.	Futures contracts are traded on organized exchanges with a designated physical location.
4	Settlement	Forward contracts settlement takes place on the date agreed upon between the parties.	Futures contracts settlements are made daily via. Exchange's clearing house.
5	Delivery date	Forward contracts may be delivered on the dates agreed upon and in terms of actual delivery.	Futures contracts delivery dates are fixed on cyclical basis and hardly takes place. However, it does not mean that there is no actual delivery.
6	Transaction costs	Cost of forward contracts is based on bid – ask spread.	Futures contracts entail brokerage fees for buy and sell orders.
7	Marking to market	Forward contracts are not subject to marking to market	Futures contracts are subject to marking to market in which the loss on profit is debited or credited in the margin account on daily basis due to change in price.
8	Margins	Margins are not required in forward contract.	In futures contracts every participants is subject to maintain margin as decided by the exchange authorities
9	Credit risk	In forward contract, credit risk is born by each party and, therefore, every party has to bother for the creditworthiness.	In futures contracts the transaction is a two way transaction, hence the parties need not to bother for the risk.

Thanks ....