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STRATEGIC FINANCIAL MANAGEMENT
New Questions added in May 21 Study Material
(For Practice – Jan 21/May 21 onwards)

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CA Final Strategic Financial Management (New Syllabus)
New Questions added in May 21 Edition
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SECURITY VALUATION

TYK 3 *(PG NO 4.28)*

MNP Ltd. has declared and paid annual dividend of ₹ 4 per share. It is expected to grow @ 20% for the next two years and 10% thereafter. The required rate of return of equit y 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

D_0 = ₹ 4

D_1 = ₹ 4 (1.20) = ₹ 4.80

D_2 = ₹ 4 $(1.20)^2$ = ₹ 5.76

D_3 = ₹ 4 $(1.20)^2$ (1.10) = ₹ 6.336

$$P = \frac{D_1}{(1+k_e)} + \frac{D_2}{(1+k_e)^2} + \frac{TV}{(1+k_e)^2}$$

$$TV = \frac{D_3}{k_e - g} = \frac{6.336}{0.15 - 0.10} = 126.72$$

$$P = \frac{4.80}{(1+0.15)} + \frac{5.76}{(1+0.15)^2} + \frac{126.72}{(1+0.15)^2}$$

= 4.80 x 0.8696 + 5.76 x 0.7561 + 126.72 x 0.7561 = 104.34

TYK 5 *(PG NO 4.29)*

X Limited, just declared a dividend of ₹ 14.00 per share. Mr. B is planning to purchase the share of X 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 ₹ 360.00 after three years.

You are required to determine:

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

per annum.

(ii) the maximum price Mr. B 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.

Calculate rupee amount up to two decimal points.

	Year-1	**Year-2**	**Year-3**
FVIF @ 9%	1.090	1.188	1.295
FVIF @ 13%	1.130	1.277	1.443
PVIF @ 13%	0.885	0.783	0.693

Solution

(i) Expected dividend for next 3 years.

Year 1 (D_1) ₹ 14.00 (1.09) = ₹

15.26 Year 2 (D_2) ₹ 14.00 $(1.09)^2$ = ₹

16.63 Year 3 (D_3) ₹ 14.00 $(1.09)^3$ = ₹

18.13 Required rate of return = 13% (Ke)

Market price of share after 3 years = (P_3) = ₹ 360

The present value of share

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

$$P = \frac{15.26}{(1+0.13)} + \frac{16.63}{(1+0.13)^2} + \frac{18.13}{(1+0.13)^3} + \frac{360}{(1+0.13)^3}$$

P_0 = 15.26 (0.885) + 16.63 (0.783) + 18.13 (0.693) + 360 (0.693)

P_0 = 13.50 + 13.02 + 12.56 + 249.48 P_0 =

₹ 288.56

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

$$P_0 = \frac{D_1}{(k_e - g)} = \frac{₹\ 15.26}{0.13 - 0.09} = \frac{₹\ 15.26}{0.04} = ₹\ 381.50$$

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

$$P_3 = \frac{D_4}{k_e - g} = \frac{D_3(1.09)}{0.13 - 0.09} = \frac{18.13 \times 1.09}{0.04} = \frac{19.76}{0.04} = ₹\ 494$$

TYK 8 *(PG NO 4.30)*

ABC Ltd. has been maintaining a growth rate of 10 percent in dividends. The company has paid dividend @ ₹ 3 per share. The rate of return on market portfolio is 12 percent and the risk free rate of return in the market has been observed as 8 percent. The Beta co-efficient of company's share is 1.5.

You are required to calculate the expected rate of return on company's shares as per CAPM model and equilibrium price per share by dividend growth model.

Solution

CAPM formula for calculation of Expected Rate of Return is :

ER $= R_f + \beta (R_m - R_f)$
$= 8 + 1.5 (12 - 8)$
$= 8 + 1.5 (4)$
$= 8 + 6$
$=14\%$ or 0.14

Applying Dividend Growth Model for the calculation of per share equilibrium price:

$$ER = \frac{D_1}{P_0} + g$$

$$0.14 = \frac{3(1.10)}{P_0} + 0.10$$

$$0.14 - 0.10 = \frac{3.30}{P_0}$$

$0.04\ P_0 = 3.30$

$P_0 = \frac{3.30}{0.04}$ = ₹ 82.50

Per share equilibrium price will be ₹ 82.50

TYK 10 *(PG NO 4.30)*

Calculate the value of share from the following information:

Profit after tax of the company	₹ 290 crores
Equity capital of company	₹ 1,300 crores
Par value of share	₹ 40 each
Debt ratio of company (Debt/ Debt + Equity)	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	₹ 47
Depreciation per share	₹ 39
Change in Working capital	₹ 3.45 per share

Solution

No. of Shares $= \frac{₹\ 1{,}300\ \text{crores}}{₹\ 40\ \text{crores}} = 32.5$ Crores

EPS $= \frac{\text{PAT}}{\text{No. of shares}}$

No. of shares $= \frac{₹\ 290\ \text{crores}}{32.5\ \text{crores}} = ₹\ 8.923$

FCFE = Net income – [(1-b) (capex – dep) + (1-b) (ΔWC)]

FCFE = 8.923 – [(1-0.27) (47-39) + (1-0.27) (3.45)]

= 8.923 – [5.84 + 2.5185] = 0.5645

Cost of Equity = R_f + ß (R_m – R_f)

= 8.7 + 0.1 (10.3 – 8.7) = 8.86%

$P_0 = \frac{\text{FCFE}\ (1+g)}{K_e - g} = \frac{0.5645\ (1.08)}{0.0886 - .08} = ₹\ 70.89$

TYK 12 ***(PG NO 4.31)***

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

	(₹ in lakh)
8% debentures	125
10% bonds (2007)	50
Equity shares (₹ 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 of earnings

(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
Workings:

Asset turnover ratio = 1.1

Total Assets = ₹ 600

Turnover ₹ 600 lakhs × 1.1 = ₹ 660 lakhs

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

Liabilities = ₹ 125 lakhs + 50 lakhs = 175 lakh

Interest = ₹ 175 lakhs × 0.08 = ₹ 14 lakh

Operating Margin = 10%

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

Dividend Payout = 16.67%

Tax rate = 40%

(i) Income statement

	(₹ 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) SGR = ROE (1-b)

ROE = $\frac{\text{PAT}}{\text{NW}}$ and NW = ₹100 lakh + ₹ 300 lakh + 400 lakh

ROE = $\frac{₹\ 31.2\ \text{lakhs}}{₹\ 400\ \text{lakhs}} \times 100\ \text{lakhs} = 7.8\%$

SGR = 0.078 (1 - 0.1667) = 6.5% or $\frac{0.078 \times 0.8333}{1 - 0.078 \times 0.8333} = 6.95\%$

(iii) Calculation of fair price of share using dividend discount model

$P_0 = \frac{D_0(1+g)}{(k_e - g)}$

Dividends = $\frac{₹\ 5.2\ \text{lakhs}}{₹\ 10\ \text{lakhs}}$ = ₹ 0.52

Growth Rate = 6.5% or 6.95%

Hence $P_o = \frac{₹\ 0.52\ (1 + 0.065)}{0.15 - 0.065} = \frac{0.5538}{0.0085} = ₹\ 6.51$ or $\frac{₹\ 0.52\ (1 + 0.065)}{0.15 - 0.065}$

$= \frac{0.5561}{0.0805} = ₹\ 6.91$

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

TYK 14 ***(PG NO 4.32)***

Mr. A is thinking of buying shares at ₹ 500 each having face value of ₹ 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 ₹ 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	Divd. /Sale	PVF (12%)	PV (₹)
1	₹ 20/-	0.893	17.86
2	₹ 20/-	0.797	15.94
3	₹ 20/-	0.712	14.24
4	₹ 24/-	0.636	15.26
5	₹ 24/	0.567	13.61
6	₹ 24/	0.507	12.17
7	₹ 24/	0.452	10.85
7	₹ 1026/- (₹ 900 x 1.2 x 0.95)	0.452	463.75
			₹ 563.68
	Less : - Cost of Share (₹ 500 x 1.05)		₹ 525.00
	Net gain		₹ 38.68

Since Mr. A is gaining ₹ 38.68 per share, he should buy the share.

Maximum price Mr. A should be ready to pay is ₹ 563.68 which will include incidental expenses. So the maximum price should be ₹ 563.68 x 100/105 = ₹ 536.84

TYK 15 ***(PG NO 4.32)***

The risk free rate of return Rf is 9 percent. The expected rate of return on the market portfolio Rm is 13 percent. The expected rate of growth for the dividend of Platinum Ltd. is 7 percent. The last dividend paid on the equity stock of firm A was ₹ 2.00. The beta of Platinum Ltd. equity stock is 1.2.

(i) What is the equilibrium price of the equity stock of Platinum Ltd.?

(ii) How would the equilibrium price change when

- The inflation premium increases by 2 percent?
- The expected growth rate increases by 3 percent?
- The beta of Platinum Ltd. equity rises to 1.3?

Solution

(i) Equilibrium price of Equity using CAPM

= 9% + 1.2(13% - 9%)

= 9% + 4.8%= 13.8%

$$P = \frac{D_1}{k_e - g} = \frac{2.00\ (1.07)}{0.138 - 0.07} = \frac{2.14}{0.068} = ₹\ 31.47$$

(ii) New Equilibrium price of Equity using CAPM

= 9.18% + 1.3(13% - 9.18%)

= 9.18% + 4.966%= 14.146%

$$P = \frac{D_1}{k_e - g} = \frac{2.00\ (1.10)}{0.14146 - 0.10} = \frac{2.20}{0.04146} = ₹\ 53.06$$

Alternatively, it can also be computed as follows:

= 11% + 1.3(15% - 8%)

= 11% + 5.2%= 16.20%

$$P = \frac{D_1}{k_e - g} = \frac{2.00\ (1.10)}{0.162 - 0.10} = ₹\ 35.48$$

Alternatively, if all the factors are taken separately then solution will be as follows:

(i) Inflation Premium increase by 3%. This raises R_X to 15.80%. Hence, new equilibrium price will be:

$$\frac{2.00\ (1.07)}{0.158 - 0.07} = ₹\ 24.32$$

(ii) Expected Growth rate decrease by 3%. Hence, revised growth rate stands at 10%:

$$\frac{2.00\ (1.10)}{0.138 - 0.10} = ₹\ 57.89$$

(iii) Beta decreases to 1.3. Hence, revised cost of equity shall be:

= 9% + 1.3 (13% - 9%)

= 9% + 5.2% = 14.2%

As a result, New Equilibrium price shall be:

$$P = \frac{D_1}{k_e - g} = \frac{2.00\ (1.07)}{0.142 - 0.07} = ₹\ 29.72$$

TYK 16 ***(PG NO 4.32)***

SAM Ltd. has just paid a dividend of ₹ 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 ₹ 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 ₹ 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 = $P = \frac{D_1}{k_e - g}$

$= \frac{2.00(1.06)}{0.08 - 0.06} =$ ₹ 1.06

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

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

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

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

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

10 shares in first year @ ₹ 214.33 for	₹ 2,143.30
9 shares in second year @ ₹ 231.48 for	₹ 2,083.32
8 shares in third year @ ₹ 250 for	₹ 2,000.00

At the end of 3rd year, he would be having 973 shares valued @ ₹ 250 each i.e.₹ 2,43,250. On these 973 shares, his dividend income for year 4 would be @ ₹ 2.50 i.e. ₹ 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 ₹ 2,000 for first three years and would be getting increased income thereafter.

TYK 17 *(PG NO 4.32)*

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 (₹)	PVF (19.75%,n)	Present Value (₹)
1	2.80	0.835	2.34
2	3.92	0.697	2.73
3	5.49	0.582	3.19
4	7.68	0.486	3.73
5	10.76	0.406	4.37
			16.36

PV of Terminal Value = $\frac{10.76(1.15)}{0.1975 - 0.15} \times 0.406$ = ₹ 105.77

Intrinsic Value = ₹ 16.36 + ₹ 105.77 = ₹ 122.13

TYK 18 *(PG NO 4.33)*

Rahul Ltd. has surplus cash of ₹ 100 lakhs and wants to distribute 27% of it to the shareholders. The company decides to buy back shares. The Finance Manager of the company estimates that its share price after re-purchase is likely to be 10% above the buyback price-if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is ₹ 3.

You are required to determine:

a. The price at which the shares can be re-purchased, if the market capitalization of the company should be ₹ 210 lakhs after buyback,

b. The number of shares that can be re-purchased, and

c. The impact of share re-purchase on the EPS, assuming that net income is the same.

Solution

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

Market Capitalisation after Buyback

1.1P (Original Shares – Shares Bought Back)

$= 1.1P\left(10 \text{ lakhs} - \frac{27\% \text{ of } 100 \text{ lakhs}}{P}\right)$

= 11 lakhs × P – 27 lakhs × 1.1 = 11 lakhs P – 29.7 lakhs

Again, 11 lakhs P – 29.7 lakhs

or 11 lakhs P = 210 lakhs + 29.7 lakhs

or P = $\frac{239.7}{11}$ = ₹ 21.79 per share

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

$\frac{₹\ 27 \text{ lakhs}}{₹\ 21.79}$ = ₹ 3.43

(iii) New Equity Shares :-

10 lakhs – 1.24 lakhs = 8.76 lakhs or 10,00,000 – 1,23,910 = 8,76,090 shares

∴ EPS = $\frac{3 \times 10 \text{ lakhs}}{8.76 \text{ lakhs}}$ = ₹ 3.43 lakhs

Thus, EPS of Rahul Ltd., increases to ₹ 3.43.

TYK 19 ***(PG NO 4.33)***

Nominal value of 10% bonds issued by a company is ₹100. The bonds are redeemable at ₹ 110 at the end of year 5. Determine the value of the bond if required yield is (i) 5%, (ii) 5.1%, (iii) 10% and (iv) 10.1%.

Solution

Case (i) Required yield rate = 5%

Year	Cash Flow ₹	DF (5%)	Present Value ₹
1-5	10	4.3295	43.295

5	110	0.7835	86.185
Value of bond			129.48

Case (ii) Required yield rate = 5.1%

Year	Cash Flow ₹	DF (5.1%)	Present Value ₹
1-5	10	4.3175	43.175
5	110	0.7798	85.778
Value of bond			128.953

Case (iii) Required yield rate = 10%

Year	Cash Flow ₹	DF (10%)	Present Value ₹
1-5	10	3.7908	37.908
5	110	0.6209	68.299
Value of bond			106.207

Case (iv) Required yield rate = 10.1%

Year	Cash Flow ₹	DF (10.1%)	Present Value ₹
1-5	10	3.7811	37.811
5	110	0.6181	67.991
Value of bond			105.802

TYK 20 *(PG NO 4.33)*

An investor is considering the purchase of the following Bond:

Face value	₹ 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 ₹ 97.60, what would be his yield?

Solution

(i) Calculation of Maximum price

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

= ₹ 11 × 2.361 + ₹ 100 × 0.693 = ₹ 25.97 + ₹ 69.30 = ₹ 95.27

(ii) Calculation of yield

At 12% the value = ₹ 11 × PVIFA (12%,3) + 100 × PVIF (12%,3)

= ₹ 11×2.402 + ₹ 100×0.712 = ₹ 26.42 + ₹ 71.20 = ₹ 97.62

It the bond is selling at ₹ 97.60 which is more than the fair value, the YTM of the bond would be less than 13%. This value is almost equal to the amount price of ₹ 97.60. Therefore, the YTM of the bond would be 12%.

Alternatively

$$\text{YTM} = \frac{₹\ 11 + \frac{(₹\ 100 - ₹\ 97.60)}{3}}{\frac{(₹\ 100 + ₹\ 97.60)}{2}} = 0.1194 \text{ or } 11.94\% \text{ say } 12\%$$

TYK 21 *(PG NO 4.33)*

Calculate Market Price of:

(i) 10% Government of India security currently quoted at ₹ 110, but yield 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

(i) Current yield = (Coupon Interest / Market Price) X 100

(10/110) X 100 = 9.09%

If current yield go up by 1% i.e. 10.09 the market price would be

10.09 = 10 / Market Price X 100

Market Price = ₹ 99.11

(ii) Market Price of Bond = P.V. of Interest + P.V. of Principal

= ₹ 1,394 + ₹ 8,885 = ₹ 10,279

TYK 22 *(PG NO 4.33)*

A convertible bond with a face value of ₹ 1,000 is issued at ₹ 1,350 with a coupon rate of 10.5%. The conversion rate is 14 shares per bond. The current market price of bond and share is ₹ 1,475 and ₹ 80 respectively. What is the premium over conversion value?

Solution

Conversion rate is 14 shares per bond. Market price of share ₹ 80 Conversion Value 14 x ₹ 80 = ₹ 1,120

Market price of bond = ₹ 1,475

Premium over Conversion Value (₹ 1475 - ₹ 1,120) = $\frac{355}{1,120} \times 100$ = 31.7%

TYK 24 *(PG NO 4.34)*

The data given below relates to a convertible bond :

Face value	₹ 250
Coupon rate	12%
No. of shares per bond	20
Market price of share	₹ 12
Straight value of bond	₹ 235
Market price of convertible bond	₹ 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 or conversion value of bond

12 × 20 = ₹ 240\

(ii) Percentage of the downside risk

$\frac{₹\,265 - ₹\,235}{₹\,235}$ = 0.1277 or 12.77% or $\frac{₹\,265 - ₹\,235}{₹\,265}$ = 0.1132 or 11.32%

This ratio gives the percentage price decline experienced by the bond if the stock becomes worthless.

(iii) Conversion Premium

$$\frac{\text{Market Price} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$$

$\frac{₹\,265 - ₹\,240}{₹\,240} \times 100$ = 10.42%

(iv) Conversion Parity Price

$$\frac{\text{Bond Price}}{\text{No. of Shares on Conversion}}$$

$\frac{₹\ 265}{20}$ = ₹ 13.25

This indicates that if the price of shares rises to ₹ 13.25 from ₹ 12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that ₹ 1.25 (₹ 13.25 – ₹ 12.00) is 10.42% of ₹ 12, the Conversion Premium.

TYK 25 ***(PG NO 4.34)***

ABC Ltd. has ₹ 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 ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 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

(i) Calculation of initial outlay:-

		₹ (million)
a.	Face value	300
	Add:-Call premium	12
	Cost of calling old bonds	312
b.	Gross proceed of new issue	300
	Less: Issue costs	6
	Net proceeds of new issue	294
c.	Tax savings on call premium and unamortized cost 0.30 (12 + 9)	6.3

∴ Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million = ₹ 11.7 million

(ii) Calculation of net present value of refunding the bond:-

	₹ (million)
Saving in annual interest expenses [300 x (0.12 – 0.10)]	6.00
Less:- Tax saving on interest and amortization 0.30 x [6 + (9-6)/6]	1.95
Annual net cash saving	4.05
PVIFA (7%, 6 years)	4.766
∴ Present value of net annual cash saving	₹ 19.30 million
Less:- Initial outlay	₹ 11.70 million
Net present value of refunding the bond	₹ 7.60 million

Decision: The bonds should be refunded

TYK 26 *(PG NO 4.34)*

The following data are available for a bond

Face value	₹ 1,000
Coupon Rate	16%
Years to Maturity	6
Redemption value	₹ 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. Calculation of Market price:

$$TM = \frac{\text{Coupon interest} + \left(\frac{\text{Discount or premium}}{\text{Years left}}\right)}{\frac{\text{Face Value} + \text{Market value}}{2}}$$

Discount or premium – YTM is more than coupon rate, market price is less than Face Value i.e. at discount.

Let x be the market price

$$0.17 = \frac{160 + \left\{\frac{(1{,}000 - x)}{6}\right\}}{\frac{1{,}000 + x}{2}}$$ x = ₹ 960.26

Alternatively, the candidate may attempt by

160 (PVIAF 17%,6) + 1,000 (PVIF 17%,6)

= 160 (3.589) + 1,000 (0.390) = 574.24 + 390 = 964.24

2. Duration

Year	Cash flow	P.V. @ 17%		Proportion of bond value	Proportion of bond value x time (years)
1	160	.855	136.80	0.142	0.142
2	160	.731	116.96	0.121	0.246
3	160	.624	99.84	0.103	0.309
4	160	.534	85.44	0.089	0.356
5	160	.456	72.96	0.076	0.380
6	1160	.390	452.40	0.469	2.814
			964.40	1.000	4.247

Duration of the Bond is 4.247 years

Alternatively, as per Short Cut Method

$$D = \frac{1+ YTM}{YTM} - \frac{(1+ YTM) + t\,(c - YTM)}{c\,[(1+YTM)^{t}-1] + YTM}$$

Where YTM = Yield to Maturity

c = Coupon Rate

t = Years to Maturity

$$= \frac{1.17}{0.17} - \frac{1.17 + 6\,(0.16 - 0.17)}{0.16\,[(1.17)^{6} - 1] + 0.17}$$

D = 4.24 years

3. Volatility

Volatility of the bonds $= \frac{\text{Duration}}{(1+ \text{yields})} = \frac{4.247}{1.17} = 3.63$ Or $= \frac{4.2422}{1.17} = 3.6258$

4. The expected market price if increase in required yield is by 75 basis points.

= ₹ 960.26 × .75 (3.63/100) = ₹ 26.142
Hence expected market price is ₹ 960.26 – ₹ 26.142 = ₹ 934.118
Hence, the market price will decrease
This portion can also be alternatively done as follows

= ₹ 964.40 × .75 (3.63/100) = ₹ 26.26

then the market price will be = ₹ 964.40 – 26.26 = ₹ 938.14

TYK 27 *(PG NO 4.35)*

Mr. A will need ₹ 1,00,000 after two years for which he wants to make one time necessary investment now. He has a choice of two types of bonds. Their details are as below:

	Bond X	Bond Y
Face value	₹ 1,000	₹ 1,000
Coupon	7% payable annually	8% payable annually
Years to maturity	1	4
Current price	₹ 972.73	₹ 936.52
Current yield	10%	10%

Advice Mr. A whether he should invest 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 not be any call risk or default risk.

Solution

Duration of Bond X

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	1070	.909	972.63	1.000	1.000

Duration of the Bond is 1 year

Duration of Bond Y

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (years)
1	80	.909	72.72	0.077	0.077
2	80	.826	66.08	0.071	0.142
3	80	.751	60.08	0.064	0.192
4	1080	.683	737.64	0.788	3.152
			936.52	1.000	3.563

Duration of the Bond is 3.563 years

Let x_1 be the investment in Bond X and therefore investment in Bond Y shall be $(1 - x_1)$. Since the required duration is 2 year the proportion of investment in each of these two securities shall be computed as follows:

$2 = x_1 + (1 - x_1)\ 3.563$

$x_1 = 0.61$

Accordingly, the proportion of investment shall be 61% in Bond X and 39% in Bond Y respectively.

Amount of investment

Bond X	Bond Y
PV of ₹ 1,00,000 for 2 years @ 10% x 61% = ₹ 1,00,000 (0.826) x 61% = ₹ 50,386 No. of Bonds to be purchased = ₹ 50,386/₹ 972.73 = 51.79 i.e. approx. 52 bonds	PV of ₹ 1,00,000 for 2 years @ 10% x 39% = ₹ 1,00,000 (0.826) x 39% = ₹ 32,214 No. of Bonds to be purchased = ₹ 32,214/₹ 936.52 = 34.40 i.e. approx. 34 bonds

Note: The investor has to keep the money invested for two years. Therefore, the investor can invest in both the bonds with the assumption that Bond X will be reinvested for another one year on same returns.

Further, in the above computation, Modified Duration can also be used instead of Duration.

TYK 28 *(PG NO 4.35)*

RBI sold a 91-day T-bill of face value of ₹ 100 at an yield of 6%. What was the issue price?

Solution

Let the issue price be X

By the terms of the issue of the T-bills:

$$6\% = \frac{100 - x}{x} \times \frac{365}{91} \times 100$$

$$\frac{6 \times 91 \times x}{36{,}500} = (100 - x)$$

$$0.01496\, x = 100 - x$$

$$x = \frac{100}{1.01496} = ₹\ 98.53$$

TYK 29 *(PG NO 4.35)*

Wonderland Limited has excess cash of ₹ 20 lakhs, which it wants to invest in short term

marketable securities. Expenses relating to investment will be ₹ 50,000.

The securities invested will have an annual yield of 9%.

The company seeks your advice

(i) as to the period of investment so as to earn a pre-tax income of 5%. (discuss)

(ii) the minimum period for the company to breakeven its investment expenditure overtime value of money.

Solution

(i) Pre-tax Income required on investment of ₹ 20,00,000

Let the period of Investment be 'P' and return required on investment ₹ 1,00,000 (₹ 20,00,000 x 5%)

Accordingly,

$$(₹\ 20{,}00{,}000 \times \frac{9}{100} \times \frac{P}{12}) - ₹\ 50{,}000 = ₹\ 1{,}00{,}000$$

P = 10 months

(ii) Break-Even its investment expenditure

$$(₹\ 20{,}00{,}000 \times \frac{9}{100} \times \frac{P}{12}) - ₹\ 50{,}000 = 0$$

P = 3.33 months

TYK 30 ***(PG NO 4.35)***

Z Co. Ltd. issued commercial paper worth ₹10 crores as per

following details:

Date of issue : 16th January, 2019

Date of maturity: 17th April, 2019

No. of days : 91

Interest rate 12.04% p.a

What was the net amount received by the company on issue of CP? (Charges of intermediary may be ignored)

Solution

The company had issued commercial paper worth ₹10 crores No. of days Involves = 91 days

Interest rate applicable = 12.04 % p.a.

Interest for 91 days = 12.04% × $\frac{91\ \text{Days}}{365\ \text{Days}}$ = 3.002%

= or ₹ 10 crores × $\frac{3.002}{100 + 3.002}$ = ₹ 29,14,507

= or ₹ 29.14507 Lakhs

∴ Net amount received at the time of issue:- ₹ 10.00 Crores – ₹ 0.29151 Crores = ₹ 9.70849 Crores

Alternatively, it can also be computed as follows:

Price = $\frac{\text{Rs. 10 Crores}}{\left(1 + 12.04\% \times \frac{91\ \text{Days}}{365\ \text{Days}}\right)}$ = 9.70855

TYK 31 *(PG NO 4.35)*

Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2028 @ 5.65% for ₹ 8 crore. Assuming that clean price (the price that does not have accrued interest) be ₹ 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

(i) Dirty Price

= Clean Price + Interest Accrued

= 99.42 + 100 × $\frac{10}{100}$ × $\frac{262}{360}$ = 106.70

(ii) First Leg (Start Proceed)

= Nominal value × $\frac{\text{Dirty Picture}}{100}$ × $\frac{100 - \text{Initial Margin}}{100}$

= ₹ 8,00,000 × $\frac{106.70}{100}$ × $\frac{100 - 2}{100}$ = ₹ 8,36,52,800

Second Leg (Repayment at Maturity) = Start Proceed x (1 + Repo Rate × $\frac{\text{No.of Days}}{360}$)

= ₹ 8,36,52,800 x (1+ 0.0565 × $\frac{14}{360}$) = ₹ 8,38,36,604

PORTFOLIO MANAGEMENT

Illustration 9 ***(PG NO 5.45)***

With the help of following data determine the return on the security X.

Factor	Risk Premium associated with the Factor	β_i
Market	4%	1.3
Growth Rate of GDP	1%	0.3
Inflation	-4%	0.2

Risk Free Rate of Return is 8%.

Solution

Expected Return $= R_f + \lambda_1\beta_1 + \lambda_2\beta_2 + \lambda_3\beta_3$

$= 8\% + 1.3 \times 4\% + 0.3 \times 1\% + 0.2 \times (-4\%)$

$= 8\% + 5.2\% + 0.3\% - 0.8\%$

$= 12.7\%$

TYK 2 ***(PG NO 5.64)***

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

Market condition	Probability	Market Price	Dividend per share
		₹	₹
Good	0.25	115	9
Normal	0.50	107	5
Bad	0.25	97	3

The existing market price of an equity share is ₹ 106 (F.V. ₹ 1), which is cum 10% bonus debenture of ₹ 6 each, per share. M/s. X Finance Company Ltd. had offered the buy-back of debentures at face value.

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

And also advise-Whether to accept buy back offer?

Solution

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

Market Condition	Probability	Total Return	Cost (*)	Net Return
Good	0.25	₹ 124	₹ 100	₹ 24
Normal	0.50	₹ 112	₹ 100	₹ 12
Bad	0.25	₹ 100	₹ 100	₹ 0

Expected Return = (24 × 0.25) + (12 × 0.50) + (0 × 0.25) = 12= $\left(\frac{12}{100}\right)$ × 100 = 12%

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

V SD = $0.25\ (24 - 12)^2 + 0.50\ (12 - 12)^2 + 0.25\ (0 - 12)^2$

= $0.25\ (12)^2 + 0.50\ (0)^2 + 0.25\ (-12)^2$

= 36 + 0 + 36

SD = $\sqrt{72}$

SD = 8.485 or say 8.49

(*) The present market price of the share is ₹ 106 cum bonus 10% debenture of ₹ 6 each; hence the net cost is ₹ 100.

M/s X Finance company has offered the buyback of debenture at face value. There is reasonable 10% rate of interest compared to expected return 12 % from the market. Considering the dividend rate and market price the creditworthiness of the company seems to be very good. The decision regarding buy-back should be taken considering the maturity period and opportunity in the market. Normally, if the maturity period is low say up to 1 year better to wait otherwise to opt buy back option.

TYK 6 ***(PG NO 5.65)***

The historical rates of return of two securities over the past ten years are given.

Calculate the Covariance and the Correlation coefficient of the two securities:

Years:	1	2	3	4	5	6	7	8	9	10
Security 1: (Return per cent)	12	8	7	14	16	15	18	20	16	22
Security 2: (Return per cent)	20	22	24	18	15	20	24	25	22	20

Solution

Calculation of Covariance

Year	R_1	Deviation $(R_1 - \overline{R_1})$	Deviation $(R_1 - \overline{R_1})^2$	R_2	Deviation $(R_2 - \overline{R_2})$	Deviation $(R_2 - \overline{R_2})^2$	Product of deviations
1	12	-2.8	7.84	20	-1	1	2.8
2	8	-6.8	46.24	22	1	1	-6.8
3	7	-7.8	60.84	24	3	9	-23.4
4	14	-0.8	0.64	18	-3	9	2.4
5	16	1.2	1.44	15	-6	36	-7.2
6	15	0.2	0.04	20	-1	1	-0.2
7	18	3.2	10.24	24	3	9	9.6
8	20	5.2	27.04	25	4	16	20.8
9	16	1.2	1.44	22	1	1	1.2
10	22	7.2	51.84	20	-1	1	-7.2
$R_1 = \frac{148}{10} = 14.8$			Σ=207.60		$R_2 = \frac{210}{10} = 21$	Σ=84.00	

$$\text{Covariance} = \frac{\sum_{i=1}^{N} [R_1 - \overline{R_1}]\,[R_2 - \overline{R_2}]}{N}$$

= -8/10 = 0.8

Standard Deviation of Security 1

$$\sigma_1 = \sqrt{\frac{(R_1 - \overline{R_1})^2}{N}}$$

$$\sigma 1 = \sqrt{\frac{207.60}{10}} = \sqrt{20.76}$$

$\sigma_1 = 4.56$

Standard Deviation of Security 2

$$\sigma_2 = \sqrt{\frac{(R_2 - \overline{R_2})^2}{N}}$$

$$\sigma_2 = \sqrt{\frac{84}{10}} = \sqrt{8.40}$$

$\sigma_2 = 2.90$

Alternatively, Standard Deviation of securities can also be calculated as follows:

Calculation of Standard Deviation

Year	R1	$R1^2$	R2	$R2^2$
1	12	144	20	400
2	8	64	22	484
3	7	49	24	576
4	14	196	18	324
5	16	256	15	225
6	15	225	20	400
7	18	324	24	576
8	20	400	25	625
9	16	256	22	484
10	22	484	20	400
	148	2398	210	4494

Standard deviation of security 1:

$$\sigma_1 = \sqrt{\frac{N \Sigma R_1^2 - (\Sigma R_1)^2}{N^2}}$$

$$= \sqrt{\frac{(10 \times 2{,}398) - (148)^2}{10 \times 10}}$$

$$= \sqrt{\frac{23{,}980 - 21{,}904}{100}}$$

$$= \sqrt{20.76} = 4.56$$

Standard deviation of security 2 :

$$\sigma_2 = \sqrt{\frac{N \Sigma R_2^2 - (\Sigma R_2)^2}{N^2}}$$

$$= \sqrt{\frac{(10 \times 4{,}494) - (210)^2}{10 \times 10}} = \sqrt{\frac{44{,}490 - 44{,}100}{100}}$$

$$= \sqrt{\frac{840}{100}} = \sqrt{8.4} = 2.90$$

Correlation Coefficient

$$r_{12} = \frac{Cov}{\sigma_1 \sigma_2} = \frac{-0.8}{4.56 \times 2.90} = \frac{-0.8}{13.22} = -0.0605$$

TYK 7 *(PG NO 5.65)*

An investor has decided to invest to invest ₹ 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

(i)

Probability	ABC (%)	XYZ (%)	1X2 (%)	1X3 (%)

(1)	(2)	(3)	(4)	(5)
0.20	12	16	2.40	3.2
0.25	14	10	3.50	2.5
0.25	-7	28	-1.75	7.0
0.30	28	-2	8.40	-0.6
	Average return		12.55	12.1

Hence the expected return from ABC = 12.55% and XYZ is 12.1%

Probability (1)	$(ABC- \overline{ABC})$ (2)	$(ABC- \overline{ABC})^2$ (3)	1X3 (4)	$(XYZ- \overline{XYZ})$ (5)	$(XYZ- \overline{XYZ})^2$ (6)	(1)X(6)
0.20	-0.55	0.3025	0.06	3.9	15.21	3.04
0.25	1.45	2.1025	0.53	-2.1	4.41	1.10
0.25	-19.55	382.2025	95.55	15.9	252.81	63.20
0.30	15.45	238.7025	71.61	-14.1	198.81	59.64
			167.75			126.98

σ^2_{ABC} = 167.75(%)^2 ; σ_{ABC} = 12.95%

σ^2_{XYZ} = 126.98(%)^2 ; σ_{XYZ} = 11.27%

(ii) In order to find risk of portfolio of two shares, the covariance between the two is necessary here.

Probability	$(ABC- \overline{ABC})$	$(XYZ- \overline{XYZ})$	2X3	1X4
(1)	(2)	(3)	(4)	(5)
0.20	-0.55	3.9	-2.145	-0.429
0.25	1.45	-2.1	-3.045	-0.761
0.25	-19.55	15.9	-310.845	-77.71
0.30	15.45	-14.1	-217.845	-65.35
				-144.25

$\sigma^2 P$ = (0.5^2 x 167.75) + (0.5^2 x 126.98) + 2 x (-144.25) x 0.5 x 0.5

$\sigma^2 P$ = 41.9375 + 31.745 – 72.125

$\sigma^2 P$ = 1.5575 or 1.56(%)

$\sigma_P = \sqrt{1.56}$ = 1.25%

E (Rp) = (0.5 x 12.55) + (0.5 x 12.1) = 12.325%

Hence, the return is 12.325% with the risk of 1.25% for the portfolio. Thus the portfolio results in the reduction of risk by the combination of two shares.

(iii) For constructing the minimum risk portfolio the condition to be satisfied is

$$X_{ABC} = \frac{\sigma_X^2 - r_{AX}\,\sigma_A\sigma_X}{\sigma_A^2 + \sigma_X^2 - 2\,r_{AX}\,\sigma_A\sigma_X} \text{ or } = \frac{\sigma_X^2 - \text{Cov.}_{AX}}{\sigma_A^2 + \sigma_X^2 - 2\,\text{Cov.}_{AX}}$$

σ_X = Std. Deviation of XYZ

σ_A = Std. Deviation of ABC

r_{AX}= Coefficient of Correlation between XYZ and ABC

Cov.AX = Covariance between XYZ and ABC.

Therefore,

$$\%\ ABC = \frac{126.98 - (-144.25)}{126.98 + 167.75 - [2\times(-144.25)]} = \frac{271.23}{583.23]} = 0.46 \text{ or } 46\%$$

% ABC = 46%, XYZ = 54%

(1 – 0.46) =0.54

TYK 8 ***(PG NO 5.66)***

The following information are available with respect of Krishna Ltd.

Year	Krishna Ltd. Average share price	Dividend per Share	Average Market Index	Dividend Yield	Return on Govt. bonds
	₹	₹			
2012	245	20	2013	4%	7%
2013	253	22	2130	5%	6%
2014	310	25	2350	6%	6%
2015	330	30	2580	7%	6%

Compute Beta Value of the Krishna Ltd. at the end of 2015 and state your observation.

Solution

(i) Computation of Beta Value

Calculation of Returns

Returns $= \frac{D_1 + P_1 - P_0}{P_0} \times 100$

Year	Returns
2012 – 13	$\frac{22 + (253 - 245)}{245} \times 100 = 12.24\%$
2013 – 14	$\frac{25 + (310 - 253)}{253} \times 100 = 32.41\%$
2014 – 15	$\frac{30 + (330 - 310)}{310} \times 100 = 16.13\%$

Calculation of Returns from market Index

Year	% of Index Appreciation	Dividend Yield %	Total Return %
2012–13	$\frac{(2,130 - 2,013)}{2,013} \times 100 = 5.81\%$	5%	10.81%
2013–14	$\frac{(2,350 - 2,130)}{2,130} \times 100 = 10.33\%$	6%	16.33%
2014–15	$\frac{(2,580 - 2,350)}{2,350} \times 100 = 9.79\%$	7%	16.79%

Computation of Beta

Year	Krishna Ltd. (X)	Market Index (Y)	XY	Y^2
2012–13	12.24%	10.81%	132.31	116.86
2013–14	32.41%	16.33%	529.25	266.67
2014–15	16.13%	16.79%	270.82	281.90
Total	60.78%	43.93%	932.38	665.43

Average Return of Krishna Ltd. $= \frac{60.78}{3} = 20.26\%$

Average Market Return $= \frac{43.93}{3} = 14.64\%$

Beta (β) $= \frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma Y^2 - n(\bar{Y})^2} = \frac{932.38 - 3 \times 20.26 \times 14.64}{665.43 - 3(14.64)^2} = 1.897$

(ii) Observation

	Expected Return (%)	Actual Return (%)	Action
2012 – 13	6%+ 1.897(10.81% - 6%) = 15.12%	12.24%	Sell
2013 – 14	6%+ 1.897(16.33% - 6%) = 25.60%	32.41%	Buy
2014 – 15	6%+ 1.897(16.79% - 6%) = 26.47%	16.13%	Sell

TYK 10 ***(PG NO 5.66)***

Given below is information of market rates of Returns and Data from two Companies A and B:

	Year 2007	Year 2008	Year 2009
Market (%)	12.0	11.0	9.0
Company A (%)	13.0	11.5	9.8
Company B (%)	11.0	10.5	9.5

You are required to determine the beta coefficients of the Shares of Company A and Company B.

Solution

Company A:

Year	Return % (Ra)	Market return % (Rm)	Deviation R(a)	Deviation Rm	D Ra × DRm	Rm 2
1	13.0	12.0	1.57	1.33	2.09	1.77
2	11.5	11.0	0.07	0.33	0.02	0.11
3	9.8	9.0	–1.63	/1.67	2.72	2.79
	34.3	32.0			4.83	4.67

Average Ra = 11.43 Average

Rm = 10.67

Covariance = $\frac{\sum(R_m - \bar{R}_m)(R_a - \bar{R}_a)}{N}$

Covariance = $\frac{4.83}{3}$ = 1.61

Variance (σ_m^2) = $\frac{\sum(R_m - \bar{R}_m)^2}{N}$

= $\frac{4.67}{3}$ = 1.557

$\beta = \frac{1.61}{1.557} = 1.03$

Company B:

Year	Return % (Rb)	Market return % (Rm)	Deviation R(b)	Deviation Rm	D Rb × D Rm	Rm^2
1	11.0	12.0	0.67	1.33	0.89	1.77
2	10.5	11.0	0.17	0.33	0.06	0.11
3	9.5	9.0	–0.83	–1.67	1.39	2.79
	31.0	32.0			2.34	4.67

Average Rb = 10.33 Average

Rm = 10.67

Covariance = $\frac{\sum(R_m - \bar{R}_m)(R_b - \bar{R}_b)}{N}$

Covariance = $\frac{2.34}{3} = 0.78$

Variance (σm^2) = $\frac{\sum(R_m - \bar{R}_m)^2}{N}$

$= \frac{4.67}{3} = 1.557$

$\beta = \frac{0.78}{1.557} = 0.50$

TYK 11 ***(PG NO 5.66)***

The returns on stock A and market portfolio for a period of 6 years are as follows:

Year	Return on A (%)	Return on market portfolio (%)
1	12	8
2	15	12
3	11	11
4	2	-4
5	10	9.5
6	-12	-2

You are required to determine:

(i) Characteristic line for stock A

(ii) The systematic and unsystematic risk of stock A.

Solution

Characteristic line is given by

$\alpha + \beta$ Rm

$$\beta_i = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n(\bar{x})^2}$$

$$\alpha_i = \bar{y} - \beta\bar{x}$$

Return on A (Y)	Return on market (X)	xy	x^2	$(x-\bar{x})$	$(x-\bar{x})^2$	$(y-\bar{y})$	$(y-\bar{y})^2$
12	8	96	64	2.25	5.06	5.67	32.15
15	12	180	144	6.25	39.06	8.67	75.17
11	11	121	121	5.25	27.56	4.67	21.81
2	-4	-8	16	-9.75	95.06	-4.33	18.75
10	9.5	95	90.25	3.75	14.06	3.67	13.47
-12	-2	24	4	-7.75	60.06	-18.33	335.99
38	34.5	508	439.25		240.86		497.34

$\bar{y} = {}^{38}/_{6} = 6.33$

$\bar{x} = {}^{34.5}/_{6} = 5.75$

$$\beta = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n(\bar{x})^2} = \frac{508 - 6(5.75)(6.33)}{439.25 - 6(5.75)^2} = \frac{508 - 218.385}{439.25 - 198.375}$$

$$= \frac{289.615}{240.875} = 1.202$$

$\alpha = \bar{y} - \beta\bar{x} = 6.33 - 1.202\ (5.75) = -0.58$

Hence the characteristic line is -0.58 + 1.202 (R_m)

Total Risk of Market = $\sigma_{m^2} = \frac{\Sigma (x - \bar{x})^2}{n} = \frac{240.86}{6} = 40.14(\%)$

Total Risk of Stock = $\frac{497.34}{6} = 82.89(\%)$

Systematic Risk = $\beta i^2 \sigma_2 = (1.202)^2 \times 40.14 = 57.99(\%)$

Unsystematic Risk is = Total Risk – Systematic Risk

= 82.89 - 57.99 = 24.90(%)

TYK 13 ***(PG NO 5.67)***

Expected returns 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:

(a) The Betas of the two stocks.

(b) Expected return of each stock, if the market return is equally likely to be 7% or 25%.

(c) The Security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.

(d) 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

Alternatively, it can also be solved by using the Characteristic Line Relationship as follows:

$R_S = \alpha + \beta R_m$

Where

α = Alpha

β = Beta

R_m= Market Return

For Aggressive Stock

$4\% = \alpha + \beta(7\%)$

$40\% = \alpha + \beta(25\%)$

$36\% = \beta(18\%)$

$\beta = 2$

For Defensive Stock

$9\% = \alpha + \beta(7\%)$

$18\% = \alpha + \beta(25\%)$

$9\% = \beta(18\%)$

$\beta = 0.50$

(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%

$\therefore$ Market risk prem. = 16% - 7.5% = 8.5%

$\therefore$ SML is, required return = 7.5% + βi 8.5%

(d) $R_S = \alpha + \beta R_m$

For Aggressive Stock

$22\% = \alpha_A + 2(16\%)$

$\alpha_A = -10\%$

For Defensive Stock

$13.5\% = \alpha_D + 0.50(16\%)$

$\alpha_D = 5.5\%$

TYK 14 ***(PG NO 5.68)***

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

(i) Sensitivity of each stock with market is given by its beta.

Standard deviation of market Index = 15%

Variance of market Index = 0.0225

Beta of stocks = $\sigma_i \ r/\ \sigma_m$

A = 20 × 0.60/15 = 0.80

B = 18 × 0.95/15 = 1.14 C = 12 × 0.75/15 = 0.60

(ii) Covariance between any 2 stocks = $\beta_1\beta_2\sigma^2_m$

Covariance matrix

Stock/Beta	0.80	1.14	0.60
A	400.000	205.200	108.000
B	205.200	324.000	153.900
C	108.000	153.900	144.000

(iii) Total risk of the equally weighted portfolio (Variance) = $400(1/3)^2 + 324(1/3)^2 + 144(1/3)^2 + 2\,(205.20)(1/3)^2 + 2(108.0)(1/3)^2 + 2(153.900)\,(1/3)^2 = 200.244$

(iv) β of equally weighted portfolio = $\beta p = \sum \beta i/N = \frac{0.80+1.14+0.60}{3}$

$= 0.8467$

(v) Systematic Risk $\beta P^2 \sigma m^2$ $= (0.8467)^2\,(15)^2 = 161.302$

Unsystematic Risk = Total Risk – Systematic Risk

= 200.244 – 161.302 = 38.942

TYK 15 ***(PG NO 5.68)***

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.

(i) If Mr. X has ₹ 1,00,000 to invest and sells short ₹ 50,000 of security B and purchases ₹ 1,50,000 of security A what is the sensitivity of Mr. X's portfolio to the two factors?

(ii) If Mr. X borrows ₹ 1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹ 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?

(iii) What is the expected return premium of factor 2?

Solution

(i) Mr. X's position in the two securities are +1.50 in security A and -0.5 in security B. Hence the portfolio sensitivities to the two factors:-

b prop. 1 =1.50 x 0.80 + (-0.50 x 1.50) = 0.45

b prop. 2 = 1.50 x 0.60 + (-0.50 x 1.20) = 0.30

(ii) Mr. X's current position:-

Security A ₹ 3,00,000 / ₹ 1,00,000 = 3

Security B -₹ 1,00,000 / ₹ 1,00,000 = -1

Risk free asset -₹ 1,00,000 / ₹ 1,00,000 = -1

b prop. 1 = 3.0 x 0.80 + (-1 x 1.50) + (- 1 x 0) = 0.90

b prop. 2 = 3.0 x 0.60 + (-1 x 1.20) + (-1 x 0) = 0.60

(iii) Expected Return = Risk Free Rate of Return + Risk Premium

Let λ_1 and λ_2 are the Value Factor 1 and Factor 2 respectively.

Accordingly

$15 = 10 + 0.80\ \lambda_1 + 0.60\ \lambda_2$

$20 = 10 + 1.50\ \lambda_1 + 1.20\ \lambda_2$

On solving equation, the value of $\lambda_1 = 0$, and Securities A & B shall be as follows:

Security A

Total Return = 15%

Risk Free Return = 10%

Risk Premium = 5%

Security B

Total Return = 20%

Risk Free Return = 10%

Risk Premium = 10%

TYK 16 ***(PG NO 5.68)***

Mr. Tempest has the following portfolio of four shares:

Name	Beta	Investment ₹ Lac.
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.

(i) Determine the portfolio return. (ii) Calculate the portfolio Beta.

Solution

Market Risk Premium (A) = 14% – 7% = 7%

Share	Beta	Risk Premium (Beta x A) %	Risk Free Return %	Return %	Return ₹
Oxy Rin Ltd.	0.45	3.15	7	10.15	8,120
Boxed Ltd.	0.35	2.45	7	9.45	14,175
Square Ltd.	1.15	8.05	7	15.05	33,863
Ellipse Ltd.	1.85	12.95	7	19.95	89,775
Total Return					1,45,933

Total Investment ₹ 9,05,000

(i) Portfolio Return $= \frac{₹\ 1,45,933}{₹\ 9,05,000} \times 100 = 16.13\%$

(ii) Portfolio Beta

Portfolio Return = Risk Free Rate + Risk Premium x β = 16.13%

7% + 7β = 16.13%

β = 1.30

Alternative Approach

First we shall compute Portfolio Beta using the weighted average method as follows:

$$Beta_P = 0.45 \times \frac{0.80}{9.05} + 0.35 \times \frac{1.50}{9.05} + 1.15 \times \frac{2.25}{9.05} + 1.85 \times \frac{4.50}{9.05}$$

= 0.45 x 0.0884+ 0.35 X 0.1657+ 1.15 X 0.2486 + 1.85 X 0.4972 = 0.0398 + 0.058 + 0.2859 + 0.9198 = 1.3035

Accordingly,

(i) Portfolio Return using CAPM formula will be as follows:

$R_P = R_F + Beta_P(R_M - R_F)$

= 7% + 1.3035(14% - 7%) = 7% + 1.3035(7%)

= 7% + 9.1245% = 16.1245%

(ii) Portfolio Beta

As calculated above 1.3035

TYK 17 *(PG NO 5.69)*

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

(i) Invest ₹ 2,00,000 in Mutual Fund X (MFX)

(ii) Invest ₹ 2,00,000 in Mutual Fund Y (MFY)

(iii) Invest ₹ 1,20,000 in Mutual Fund X (MFX) and ₹ 80,000 in Mutual Fund Y (MFY)

Average annual return earned by MFX and MFY is 15% and 14% respectively. Risk free ra te 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

(i) Variance of Returns

$Cov_{i,j} = \frac{Cov_{(i,j)}}{\sigma_i \sigma_i}$

Accordingly, for MFX

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

$\sigma_X^2 = 4.800$

Accordingly, for MFY

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

$\sigma_Y^2 = 4.250$

Accordingly, for Market Return

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

$\sigma_M^2 = 3.100$

(ii) Portfolio return, beta, variance and standard deviation

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

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

Accordingly Portfolio Return

0.60 × 15% + 0.40 × 14% = 14.60%

Beta of each Fund

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

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

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

Portfolio Beta

0.60 x 1.087 + 0.40 x 0.903 = 1.013

Portfolio Variance

$\sigma_{XY}^2 = W_X^2\sigma_X^2 + W_Y^2\sigma_Y^2 + 2W_XW_YCov_{X,Y}$

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

= 4.472

Or Portfolio Standard Deviation

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

(iii) Expected Return, Systematic and Unsystematic Risk of Portfolio Portfolio Return = 10% + 1.0134(12% - 10%) = 12.03%

MF X Return = 10% + 1.087(12% - 10%) = 12.17%

MF Y Return = 10% + 0.903(12% - 10%) = 11.81%

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

Accordingly,

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

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

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

Unsystematic Risk = Total Risk – Systematic Risk Accordingly,

Unsystematic Risk of MFX = 4.80 – 3.663 = 1.137

Unsystematic Risk of MFY = 4.250 – 2.528 = 1.722

Unsystematic Risk of Portfolio = 4.472 – 3.181 = 1.291

(iv) Sharpe and Treynor Ratios and Alpha

Sharpe Ratio

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

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

Portfolio = $\frac{14.6\% - 10\%}{2{,}115}$ = 2.175

Treynor Ratio

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

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

Portfolio = $\frac{14.6\% - 10\%}{1.0134}$ = 4.54

Alpha

MFX = 15% - 12.17% = 2.83%

MFY = 14% - 11.81% = 2.19%

Portfolio = 14.6% - 12.03% = 2.57%

TYK 18 ***(PG NO 5.69)***

Amal Ltd. has been maintaining a growth rate of 12% in dividends. The company has paid dividend @ ₹ 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

Capital Asset Pricing Model (CAPM) formula for calculation of expected rate of return is E_R

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

E_R = Expected Return

β = Beta of Security R_m = Market Return R_f = Risk free Rate

$= 10 + [1.2 (15 - 10)]$

$= 10 + 1.2 (5)$

$= 10 + 6 = 16\%$ or 0.16

Applying dividend growth mode for the calculation of per share equilibrium price:-

$E_R = \frac{D_1}{P_0} + g$

or $0.16 = \frac{3(1.12)}{P_0} + 0.12$ or $0.16 - 0.12 = \frac{3.36}{P_0}$

or $0.04\ P_0 = 3.36$ or $P_0 = \frac{3.36}{0.04} =$ ₹ 84

Therefore, equilibrium price per share will be ₹ 84.

TYK 19 ***(PG NO 5.69)***

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

First we shall compute the β of Security X.

Risk Free Rate = $\frac{\text{Coupon Payment}}{\text{Current Market Price}} = \frac{7}{140}$ = 5%

Assuming equilibrium return to be equal to CAPM return then: 15% = Rf + βX(Rm- Rf)

15%= 5% + βX(15%- 5%)

βX = 1

or it can also be computed as follows:

$\frac{R_m}{R_s} = \frac{15\%}{15\%}$ = 1

(i) Standard Deviation of Market Return

$\beta_m = \frac{Cov_{X,m}}{\sigma_m^2} = \frac{225\%}{\sigma_m^2}$ = 1

σ_m^2 = 225

$\sigma_m = \sqrt{225}$ = 15%

(ii) Standard Deviation of Security Return

$\beta_X = \frac{\sigma_X}{\sigma_m} \times \rho_{Xm} = \frac{\sigma_X}{15} \times 0.75 = 1$

$\sigma_X = \frac{15}{0.75}$ = 20%

TYK 20 ***(PG NO 5.70)***

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

CAPM = Rf+ β (Rm –Rf)

Accordingly

R_{ABC} = Rf+1.2 (Rm – Rf) = 19.8 R_{XYZ} = Rf+ 0.9 (Rm – Rf) = 17.1

19.8 = Rf+1.2 (Rm – Rf) ---------- (1)

17.1 = Rf+0.9 (Rm – Rf) ---------- (2)

Deduct (2) from (1) 2.7 = 0.3 (Rm – R f) Rm – Rf = 9

Rf = Rm – 9

Substituting in equation (1)

19.8 = (Rm – 9) + 1.2 (Rm – Rm+ 9)

19.8 = Rm - 9 + 10.8

19.8 = Rm+1.8

Then Rm=18% and Rf= 9% Security Market Line

= Rf + β (Market Risk Premium)

= 9% + β× 9%

TYK 21 ***(PG NO 5.70)***

A Ltd. has an expected return of 22% and Standard deviation of 40%. B Ltd. has an expected return of 24% and Standard deviation of 38%. A Ltd. has a beta of 0.86 and B Ltd. a beta of 1.24. The correlation coefficient between the return of A Ltd. and B Ltd. is 0.72. The Standard deviation of the market return is 20%. Suggest:

(i) Is investing in B Ltd. better than investing in A Ltd.?

(ii) If you invest 30% in B Ltd. and 70% in A Ltd., what is your expected rate of return and portfolio Standard deviation?

(iii) What is the market portfolios expected rate of return and how much is the risk -free rate?

(iv) What is the beta of Portfolio if A Ltd.'s weight is 70% and B Ltd.'s weight is 30%?

Solution

(i) A Ltd. has lower return and higher risk than B Ltd. investing in B Ltd. is better than in A Ltd. because the returns are higher and the risk, lower. However, investing in both will yield diversification advantage.

(ii) rAB = $.22 \times 0.7 + .24 \times 0.3 = 22.6\%$

σ^2_{AB} = 0.40^2 X 0.7^2 + 0.38^2 X 0.3^2 + 2X 0.7 X 0.3 X 0.72 X 0.40 X 0.38 = 0.1374

$\sigma_{AB} = \sqrt{\sigma^2_{AB}} = \sqrt{.1374} = .37 = 37^*$

* Answer = 37.06% is also correct and variation may occur due to approximation.

(iii) This risk-free rate will be the same for A and B Ltd. Their rates of return are given as follows:

$r_A = 22 = r_f + (r_m - r_f)\ 0.86$

$r_B = 24 = r_f + (r_m - r_f)\ 1.24$

$r_A - r_B = -2 = (r_m - r_f)\ (-0.38)$

$r_m - r_f = -2/-0.38 = 5.26\%$

$r_A = 22 = r_f + (5.26)\ 0.86$

$r_f = 17.5\%$*

$r_B = 24 = r_f + (5.26)\ 1.24$

$r_f = 17.5\%$*

$r_m - 17.5 = 5.26$

$r_m = 22.76\%$**

*Answer = 17.47% might occur due to variation in approximation.

**Answer may show small variation due to approximation. Exact answer is 22.73%.

(iv) $\beta_{AB} = \beta_A \times W_A + \beta_B \times W_B$

$= 0.86 \times 0.7 + 1.24 \times 0.3 = 0.974$

TYK 23 ***(PG NO 5.70)***

A company has a choice of investments between several different equity oriented mutual funds. The company has an amount of ₹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 each of 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 (₹ 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
	Weighted Beta (β) = 1.22		

(ii) With varied percentages of investments portfolio beta is calculated as follows:

Investment	Beta (β)	Investment (₹ 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%.

TYK 24 *(PG NO 5.71)*

Suppose that economy A is growing rapidly and you are managing a global equity fund and so far you have invested only in developed-country stocks only. 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 estimates are for aggregate stock market of developed countries and stock market of Economy A).

	Developed Country Stocks	**Stocks of Economy A**
Expected rate of return (annualized percentage)	10	15
Risk [Annualized Standard Deviation (%)]	16	30
Correlation Coefficient (ρ)	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

$(1- w)\times 10.0 + w \times 15.0 = 10.5$

i.e. w = 0.1 or 10%.

(b) Variance of portfolio shall be:

$(0.9)^2 (0.16)^2 + (0.1)^2 (0.30)^2 + 2(0.9)(0.1)(0.16)(0.30)(0.30) = 0.02423$

Standard deviation is $(0.02423)^{1/2} = 0.15565$ or 15.6%.

(c) The Sharpe ratio will improve by approximately 0.04, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return} - \text{Risk Free Rate of Return}}{\text{Standard Deviation}}$$

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

TYK 26 *(PG NO 5.72)*

Your client is holding the following securities:

Particulars of Securities	Cost ₹	Dividends/Interest ₹	Market price ₹	Beta
Equity Shares:				
Gold Ltd.	10,000	1,725	9,800	0.6
Silver Ltd.	15,000	1,000	16,200	0.8
Bronze Ltd.	14,000	700	20,000	0.6
GOI Bonds	36,000	3,600	34,500	0.01

Average return of the portfolio is 15.7%, calculate:

(i) Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).

(ii) Risk free rate of return.

Solution

Particulars of Securities	Cost ₹	Dividend	Capital gain
Gold Ltd.	10,000	1,725	–200
Silver Ltd.	15,000	1,000	1,200
Bronz Ltd.	14,000	700	6,000
GOI Bonds	36,000	3,600	–1,500
Total	75,000	7,025	5,500

Expected rate of return on market portfolio

$$\frac{\text{Dividend Earned} + \text{Capital appreciation}}{\text{Standard Deviation}} \times 100$$

$$= \frac{₹\,7{,}025 + ₹\,5{,}500}{₹\,75{,}000} \times 100 = 16.7\%$$

Risk free return

Average of Betas $= \frac{0.6 + 0.8 + 0.6 + 0.01}{4}$ = Average of Betas* = 0.50

Average return = Risk free return + Average Betas (Expected return – Risk free return)

15.7 = Risk free return + 0.50 (16.7 – Risk free return) Risk free return = 14.7%

* Alternatively, it can also be calculated through Weighted Average Beta. Expected Rate of Return for each security is

Rate of Return = Rf + B (Rm – Rf)

Gold Ltd. = 14.7 + 0.6 (16.7 – 14.7) = 15.90%

Silver Ltd. = 14.7 + 0.8 (16.7 – 14.7) = 16.30%

Bronz Ltd. = 14.7 + 0.6 (16.7 – 14.7) = 15.90%

GOI Bonds = 14.7 + 0.01 (16.7 – 14.7) = 14.72%

* Alternatively, it can also be computed by using Weighted Average Method.

TYK 27 *(PG NO 5.72)*

A holds the following portfolio:

Share/Bond	**Beta**	**Initial Price** ₹	**Dividends** ₹	**Market Price at end of year** ₹
Epsilon Ltd.	0.8	25	2	50
Sigma Ltd.	0.7	35	2	60
Omega Ltd.	0.5	45	2	135
GOI Bonds	0.01	1,000	140	1,005

Calculate:

(i) The expected rate of return of each security using Capital Asset Pricing Method (CAPM)

(ii) The average return of his portfolio. Risk-free return is 14%.

Solution

(i) Expected rate of return

	Total Investments	Dividends	Capital Gains
Epsilon Ltd.	25	2	25
Sigma Ltd.	35	2	25
Omega Ltd.	45	2	90
GOI Bonds	1,000	140	5
	1,105	146	145

Expected Return on market portfolio= $\frac{146+145}{1{,}105}$ = 26.33%

CAPM E(Rp) = RF + β [E(RM) – RF]

Epsilon Ltd	14+0.8 [26.33-14] =	14+9.86	=	23.86%
Sigma Ltd.	14+0.7 [26.33-14] =	14+8.63	=	22.63%
Omega Ltd.	14+0.5 [26.33-14] =	14+6.17	=	20.17%
GOI Bonds	14+0.01 [26.33-14] =	14+0.12	=	14.12%

(ii) Average Return of Portfolio

$\frac{23.86 + 22.63 + 20.17 + 14.12}{4} = \frac{80.78}{4}$ = 20.20%

Alternatively, $\frac{0.8+ 0.7+ 0.5+ 0.01}{4} = \frac{2.01}{4}$ = 0.5025

14 + 0.5025 (26.33 - 14) = 14+ 6.20 = 20.20%

TYK 29 *(PG NO 5.73)*

An investor is holding 1,000 shares of Fatlass Company. Presently the rate of dividend being paid by the company is ₹ 2 per share and the share is being sold at ₹ 25 per share in the market. However, several factors are likely to change during the course of the year as indicated below:

	Existing	**Revised**
Risk free rate	12%	10%
Market risk premium	6%	4%
Beta value	1.4	1.25
Expected growth rate	5%	9%

In view of the above factors whether the investor should buy, hold or sell the shares? And why?

Solution

On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

= R_f + Beta (R_m – R_f) = 12% + 1.4 (6%) = 20.4%

Revised rate of return

= 10% + 1.25 (4%) = 15%

Price of share (original)

$P_0 = \frac{D(1+g)}{K_e - g} = \frac{2(1.05)}{2.04 - .05} = \frac{2.10}{154}$ = ₹ 13.63

Price of share (Revised)

$P_0 = \frac{2(1.09)}{.15 - .09} = \frac{2.18}{.06}$ = ₹ 36.33

In case of existing market price of ₹ 25 per share, rate of return (20.4%) and possible equilibrium price of share at ₹ 13.63, this share needs to be sold because the share is overpriced (₹ 25 – 13.63) by ₹ 11.37. However, under the changed scenario where growth of dividend has been revised at 9% and the return though decreased at 15% but the possible price of share is to be at ₹ 36.33 and therefore, in order to expect price appreciation to ₹ 36.33 the investor should hold the shares, if other things remain the same

TYK 30 ***(PG NO 5.73)***

An investor is holding 5,000 shares of X Ltd. Current year dividend rate is ₹ 3/ share. Market price of the share is ₹ 40 each. The investor is concerned about several factors which are likely to change during the next financial year as indicated below:

	Current Year	**Next Year**
Dividend paid /anticipated per share (₹)	3	2.5
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

On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

= R_f + Beta (R_m – R_f)

= 12% + 1.3 (5%) = 18.5%

Revised rate of return

= 10% + 1.4 (4%) = 15.60%

Price of share (original)

$$P_0 = \frac{D(1+g)}{K_e - g} = \frac{3(1.09)}{0.185 - 0.09} = \frac{3.27}{0.095} = ₹\ 34.42$$

Price of share (Revised)

$$P_0 = \frac{2.50(1.07)}{0.156 - 0.07} = \frac{2.675}{0.086} = ₹\ 31.10$$

Market price of share of ₹ 40 is higher in comparison to current equilibrium price of ₹ 34.42 and revised equity price of ₹ 31.10. Under this situation investor should sell the share.

TYK 31 ***(PG NO 5.74)***

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 5,000 in portfolio X and ₹ 3,000 in portfolio Y?.

(ii) Suppose the investor invests ₹ 4,000 out of ₹ 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	1,500	2,000	1,500	5,000
Portfolio Y	600	1,500	900	3,000
Combined Portfolio	2,100	3,500	2,400	8,000
∴Stock weights	0.26	0.44	0.30	

(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

∴ Allocation of funds to security B = 0.20 x 8,000 = ₹ 1,600, and

Security C = 0.30 x 8,000 = ₹ 2,400

TYK 32 *(PG NO 5.74)*

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

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

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

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

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

You are required to:

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

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

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

Solution

Workings:

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

(i) Average Return from Portfolio for the year ended 31.03.2010 is 7.55%.

(ii) Expected Average Return from portfolio for the year 2010-11 is 18.02%

(iii) Calculation of Standard Deviation M Ltd.

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

Standard Deviation (σM) 21

N Ltd.

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

Standard Deviation (σ_N) 14

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

TYK 33 *(PG NO 5.75)*

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

Expected Return on stock A = E (A) = $\sum_{i=G,S,R} P_i A_i$

(G,S & R, denotes Growth, Stagnation and Recession) (0.40)(25) + 0.30(10)+ 0.30(-5) = 11.5%

Expected Return on 'B'

(0.40×20) + (0.30×15) +0.30× (-8)=10.1%

Expected Return on Market index

(0.40 × 18) + (0.30 × 13) + 0.30 × (-3) =10.2%

Variance of Market index

$(18 - 10.2)^2 (0.40) + (13 - 10.2)^2 (0.30) + (-3 - 10.2)^2 (0.30)$

= 24.34 + 2.35 + 52.27 = 78.96%

Covariance of stock A and Market Index M

Cov.(AM) = $\sum_{i=G,S,R} ([A_i E(A)][M_i - \mathrm{E(M)}]\mathrm{P}$

(25 -11.5) (18 - 10.2)(0.40) + (10 - 11.5) (13 - 10.2) (0.30) + (-5-11.5) (-3-10.2)(0.30)

= 42.12 + (-1.26) + 65.34=106.20

Covariance of stock B and Market index M

(20-10.1) (18-10.2)(0.40)+(15-10.1)(13-10.2)(0.30) + (-8-10.1)(-3-10.2)(0.30)= 30.89 + 4.12 + 71.67=106.68

Beta for stock A = $\frac{\mathrm{CoV(AM)}}{\mathrm{VAR(M)}} = \frac{106.20}{78.96}$ = 1.345

Beta for stock B = $\frac{\mathrm{CoV(BM)}}{\mathrm{Var(M)}} = \frac{106.68}{78.96}$ = 1.351

Required Return for A

R (A) = $R_f + \beta (M-R_f)$

11% + 1.345(10.2 - 11) % = 9.924%

Required Return for B

11% + 1.351 (10.2 – 11) % = 9.92%

Alpha for Stock A

E (A) – R (A) i.e. 11.5 % – 9.924% = 1.576%

Alpha for Stock B

E (B) – R (B) i.e. 10.1% - 9.92% = 0.18%

Since stock A and B both have positive Alpha, therefore, they are UNDERPRICED. The investor should make fresh investment in them.

TYK 35 ***(PG NO 5.76)***

Ramesh wants to invest in stock market. He has got the following information about individual securities:

Security	Expected Return	Beta	σ^2 ci
A	15	1.5	40
B	12	2	20
C	10	2.5	30
D	09	1	10
E	08	1.2	20
F	14	1.5	30

Market index variance is 10 percent and the risk free rate of return is 7%. What should be the optimum portfolio assuming no short sales?

Solution

Securities need to be ranked on the basis of excess return to beta ratio from highest to the lowest.

Security	R_i	β_i	$R_i - R_f$	$\frac{R_i - R_f}{\beta_i}$
A	15	1.5	8	5.33
B	12	2	5	2.5
C	10	2.5	3	1.2

D	9	1	2	2
E	8	1.2	1	0.83
F	14	1.5	7	4.67

Ranked Table:

Security	$R_i - R_f$	β_i	σ^2_{ei}	$\frac{(R_i - R_f) \times \beta_i}{\sigma^2_{ei}}$	$\sum_{e=i}^{N} \frac{(R_i - R_f) \times \beta}{\sigma^2_{ei}}$	$\frac{\beta_i^2}{\sigma^2_{ei}}$	$\sum_{e=i}^{N} \frac{\beta_i^2}{\sigma^2_{ei}}$	C_i
A	8	1.5	40	0.30	0.30	0.056	0.056	1.923
F	7	1.5	30	0.35	0.65	0.075	0.131	2.814
B	5	2	20	0.50	1.15	0.20	0.331	2.668
D	2	1	10	0.20	1.35	0.10	0.431	2.542
C	3	2.5	30	0.25	1.60	0.208	0.639	2.165
E	1	1.2	20	0.06	1.66	0.072	0.711	2.047

CA = 10 x 0.30 / [1 + (10 x 0.056)] = 1.923

CF = 10 x 0.65 / [1 + (10 x 0.131)] = 2.814

CB = 10 x 1.15 / [1 + (10 x 0.331)] = 2.668

CD = 10 x 1.35 / [1 + (10 x 0.431)] = 2.542

CC = 10 x 1.60 / [1 + (10 x 0.639)] = 2.165

CE = 10 x 1.66 / [1 + (10 x 0.7111)] = 2.047

Cut off point is 2.814

$Z_i = \frac{\beta_i^2}{\sigma^2_{ei}} \left[\left(\left[\frac{(R_i - R_f)}{(\beta_i)} \right] \right) \right]$

$Z_A = \frac{1.5}{40} (5.33 - 2.814) = 0.09435$

$Z_F = \frac{1.5}{30} (4.67 - 2.814) = 0.0928$

$X_A = 0.09435 / [0.09435 + 0.0928] = 50.41\%$

$X_F = 0.0928 / [0.09435 + 0.0928] = 49.59\%$

Funds to be invested in security A & F are 50.41% and 49.59% respectively.

TYK 36 ***(PG NO 5.76)***

A Portfolio Manager (PM) has the following four stocks in his portfolio:

Security	No. of Shares	Market Price per share (₹)	β
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

(i)

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	ß (x)	wx
VSL	10,000	50	5,00,000	0.4167	0.9	0.375
CSL	5,000	20	1,00,000	0.0833	1	0.083
SML	8,000	25	2,00,000	0.1667	1.5	0.250
APL	2,000	200	4,00,000	0.3333	1.2	0.400
			12,00,000	1		1.108

Portfolio beta 1.108

(ii) Required Beta 0.8

It should become (0.8 / 1.108) 72.2 % of present portfolio

If ₹ 12,00,000 is 72.20%, the total portfolio should be

₹ 12,00,000 × 100/72.20 or ₹ 16,62,050

Additional investment in zero risk should be (₹ 16,62,050 – ₹ 12,00,000) = ₹ 4,62,050

Revised Portfolio will be

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	ß (x)	wx
VSL	10,000	50	5,00,000	0.3008	0.9	0.271
CSL	5,000	20	1,00,000	0.0602	1	0.060
SML	8,000	25	2,00,000	0.1203	1.5	0.180
APL	2,000	200	4,00,000	0.2407	1.2	0.289
Risk free asset	46,205	10	4,62,050	0.2780	0	0
			1662050	1		0.800

(iii) To increase Beta to 1.2

Required beta 1.2

It should become 1.2 / 1.108 108.30% of present beta

If 12,00,000 is 108.30%, the total portfolio should be

12,00,000 × 100/108.30 or 11,08,033 say 11,08,030

Additional investment should be (-) 91,967 i.e. Divest ₹ 91,970 of Risk Free Asset

Revised Portfolio will be

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	ß (x)	wx
VSL	10,000	50	5,00,000	0.4513	0.9	0.406
CSL	5,000	20	1,00,000	0.0903	1	0.090
SML	8,000	25	2,00,000	0.1805	1.5	0.271
APL	2,000	200	4,00,000	0.3610	1.2	0.433
Risk free asset	-9,197	10	-91,970	-0.0830	0	0
			11,08,030	1		1.20

Portfolio beta 1.20

TYK 37 *(PG NO 5.76)*

A has portfolio having following features:

Security	β	Random Error σ_{ei}	Weight
L	1.60	7	0.25
M	1.15	11	0.30
N	1.40	3	0.25
K	1.00	9	0.20

You are required to find out the risk of the portfolio if the standard deviation of the market index (σm) is 18%.

Solution

$$\beta_p = \sum_{i=1}^{4} X_i \beta_i$$

= 1.60 x 0.25 + 1.15 x 0.30 + 1.40 x 0.25 + 1.00 x 0.20

= 0.4 + 0.345 + 0.35 + 0.20 = 1.295

The Standard Deviation (Risk) of the portfolio is

$= [(1.295)^2(18)^2+(0.25)^2(7)^2+(0.30)^2(11)^2+(0.25)^2(3)^2+(0.20)^2(9)^2)]$

$= [543.36 + 3.0625 + 10.89 + 0.5625 + 3.24] = [561.115]^{½} = 23.69\%$

Alternative Answer

The variance of Security's Return

$\sigma^2 = \beta i^2 \sigma^2 m + \sigma^2 \varepsilon i$

Accordingly, variance of various securities

		σ^2	Weight(w)	$\sigma^2 Xw$
L	$(1.60)^2 (18)^2 + 7^2 =$	878.44	0.25	219.61
M	$(1.15)^2 (18)^2 + 11^2 =$	549.49	0.30	164.85
N	$(1.40)^2 (18)^2 + 3^2 =$	644.04	0.25	161.01
K	$(1.00)^2 (18)^2 + 9^2 =$	405.00	0.20	81
		Variance		626.47

SD = $\sqrt{626.47}$ = 25.03

TYK 39 *(PG NO 5.77)*

The total market value of the equity share of O.R.E. Company is ₹ 60,00,000 and the total value of the debt is ₹ 40,00,000. The treasurer estimate that the beta of the stock is currently 1.5 and that the expected risk premium on the market is 10 per cent. The treasury bill rate is 8 per cent.

Required:

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

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

Solution

(i) $\beta_{company} = \beta_{equity} \times \frac{V_E}{V_0} + \beta_{debt} \times \frac{V_D}{V_0}$

Note: Since β_{debt} is not given it is assumed that company debt capital is virtually riskless.

If company's debt capital is riskless than above relationship become:

Here β_{equity} = 1.5; $\beta_{company} = \beta_{equity} \frac{V_E}{V_0}$

As $\beta_{debt} = 0$

V_E = ₹ 60 lakhs.

V_D = ₹ 40 lakhs.

V_0 = ₹ 100 lakhs.

$$\beta_{company} = 1.5 \times \frac{₹\ 60\ lakhs}{₹\ 100\ lakhs}$$

= 0.9

(ii) Company's cost of equity = $R_f + \beta_A \times$ Risk premium

Where R_f = Risk free rate of return

β_A = Beta of company assets

Therefore, company's cost of equity = 8% + 0.9 □ 10 = 17% and overall cost of capital shall be

$$= 17\% \times \frac{60,00,000}{₹\ 1,00,00,000} + 8\% \times \frac{40,00,000}{₹\ 1,00,00,000}$$

= 10.20% + 3.20% = 13.40%

Alternatively it can also be computed as follows:

Cost of Equity = 8% + 1.5 x 10 = 23% Cost of

Debt = 8%

WACC (Cost of Capital) = $23\% \times \frac{60,00,000}{₹\ 1,00,00,000} + 8\% \times \frac{40,00,000}{₹\ 1,00,00,000} = 17\%$

In case of expansion of the company's present business, the same rate of return i.e. 13.40% will be used. However, in case of diversification into new business the risk profile of new business is likely to be different. Therefore, different discount factor has to be worked out for such business.

TYK 40 ***(PG NO 5.77)***

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, 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 (Book Price)	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

(a) Method I

Stock'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

0.25 x 5.9925 + 0.10 x 8.8525 + 0.50 x 8.478 + 0.15 x 7.535 = 7.7526%

Method II

Expected return on the market index

= 4.5% + [0.1x0.9 + 0.25x0.8 + 0.15x0.85 + 0.50x1.165] x 6.85 + [(0.75 x 0.10 + 1.39 x 0.25 + 2.05 x 0.15 + 2.75 x 0.5)] x (-3.5) + [{1.25 x 0.10 + 1.35 x 0.25 + 6.75 x 0.15 + 8.65 x 0.50)] x 0.65

= 4.5 + 6.85 + (-7.3675) + 3.77 = 7.7525%.

(b) 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

= 0.25 x 9.98 + 0.10 x 10.665 + 0.50 x 12.45 + 0.15 x 10.3225 = 11.33%

(c) Let us assume that Mr. Nirmal will invest X_1% in small cap value stock and X_2% in large cap growth stock

$X_1 + X_2 = 1$

$0.90\ X_1 + 1.165\ X_2 = 1$

$0.90\ X_1 + 1.165(1 - X_1) = 1$

$0.90\ X_1 + 1.165 - 1.165\ X_1 = 1$

$0.165 = 0.265\ X_1$

$\frac{0.165}{0.265} = X_1$

$0.623 = X_1$, $X_2 = 0.377$

62.3% in small cap value

37.7% in large cap growth.

MUTUAL FUNDS

TYK 2 *(PG NO 17.18)*

The unit price of Equity Linked Savings Scheme (ELSS) of a mutual fund is ₹ 10/-. The public offer price (POP) of the unit is ₹ 10.204 and the redemption price is ₹ 9.80.

Calculate:

(i) Front-end Load

(ii) Back end Load

Solution

Public Offer Price = NAV/ (1 – Front end Load) Public Offer Price: ₹ 10.204 and NAV: ₹10

Accordingly,

10.204 = 10/(1 – F) F = 0.0199 say 2%

Redemption Price = NAV/ (1 – Back End Load)

₹ 9.80 = 10/ (1 – Back End Load) B = 0.0204 i.e. 2.04%

Alternative

(i) Front End Load = $\frac{10.204 - 10.00}{10.00}$ = 0.0204 or 2.04%

(ii) Exit Load = = $\frac{10.00 - 9.80}{10.00}$ = 0.020 or 2.00%

TYK 3 *(PG NO 17.18)*

A mutual fund that had a net asset value of ₹ 20 at the beginning of month - made income and capital gain distribution of ₹ 0.0375 and ₹ 0.03 per share respectively during the month, and then ended the month with a net asset value of ₹ 20.06. Calculate monthly return.

Solution

Calculation of Monthly Return on the Mutual Funds

$$r = \left[\frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}}\right]$$

Where,

r = Return on the mutual fund

NAV_t = Net assets value at time

period t NAV_{t-1} = Net assets value at time

period t – 1 I_t = Income at time period t

G_t = Capital gain distribution at time period t

$$= \left[\frac{(₹\ 20.06 - ₹\ 20.00) + (₹\ 0.0375 + ₹\ 0.03}{20}\right]$$

$$= \frac{0.06 + 0.0675}{20}$$

$$= \frac{0.1275}{20} = 0.006375$$

Or, r = 0.6375% p.m.

Or = 7.65% p.a.

TYK 4 *(PG NO 17.19)*

An investor purchased 300 units of a Mutual Fund at ₹ 12.25 per unit on 31st December, 2009. As on 31st December, 2010 he has received ₹ 1.25 as dividend and ₹ 1.00 as capital gains distribution per unit.

Required :

(i) The return on the investment if the NAV as on 31st December, 2010 is ₹ 13.00.

(ii) The return on the investment as on 31st December, 2010 if all dividends and capital gains distributions are reinvested into additional units of the fund at ₹ 12.50 per unit.

Solution

Return for the year (all changes on a per year basis)

Particulars	**₹ /Unit**
Change in price (₹ 13.00 – ₹ 12.25)	0.75
Dividend received	1.25
Capital gain distribution	1.00
Total Return	3.00

Return on investment = $\frac{3.00}{12,25} \times 100 = 24.49\%$

Alternatively, it can also be computed as follows:

$$\frac{(NAV_1 - NAV_0) + D_1 + CG_1}{NAV_0} \times 100$$

$$= \frac{(13 - 12.25) + 1.25 + 1.00}{12.25} \times 100$$

= 24.49%

If all dividends and capital gain are reinvested into additional units at ₹ 12.50 per unit the position would be.

Total amount reinvested = ₹ 2.25 × 300 = ₹ 675

Additional units added = $\frac{₹\ 675}{12.50}$ = 54 units

Value of 354 units as on 31-12-2010 = ₹ 4,602

Price paid for 300 units on 31-12-2009 (300 × ₹ 12.25) = ₹ 3,675

Return = $\frac{₹\ 4{,}602 - ₹\ 3{,}675}{₹\ 3.675} = \frac{₹\ 927}{₹\ 3.675}$ = 25.22%

TYK 5 *(PG NO 17.19)*

SBI mutual fund has a NAV of ₹ 8.50 at the beginning of the year. At the end of the year NAV increases to ₹ 9.10. Meanwhile fund distributes ₹ 0.90 as dividend and ₹ 0.75 as capital gains.

(i) What is the fund's return during the year?

(ii) Had these distributions been re-invested at an average NAV of ₹ 8.75 assuming 200 units were purchased originally. What is the return?

Solution

(i) Normal Return for the year (all changes on a per year basis)

Particulars	₹ /Unit
Change in price (₹ 9.10 – ₹ 8.50)	0.60
Dividend received	0.90
Capital gain distribution	0.75
Total Return	2.25

Return on investment = $\frac{2.25}{8.50} \times 100$ = 26.47%

(ii) If all dividends and capital gain are reinvested into additional units at ₹ 8.75 per unit the position would be.

Total amount reinvested = ₹ 1.65 × 200 = ₹ 330

Additional units added = $\frac{₹\ 330}{8.75}$ = 37.71 units

Value of 237.71 units at end of year = ₹ 2,163.16

Price paid for 200 units in beginning of the year (200 × ₹ 8.50) = ₹ 1,700

= $\frac{₹\ 2{,}163.16 - ₹\ 1{,}700}{₹\ 1{,}700} = \frac{₹\ 463.16}{₹\ 1{,}700}$ = 27.24%

TYK 6 *(PG NO 17.19)*

The following information is extracted from Steady Mutual Fund's Scheme:

- Asset Value at the beginning of the month - ₹ 65.78
- Annualised return -15 %
- Distributions made in the nature of Income & Capital gain (per unit respectively). - ₹ 0.50 and ₹ 0.32

You are required to:

(i) Calculate the month end net asset value of the mutual fund scheme (limit your answers to two decimals).

(ii) Provide a brief comment on the month end NAV.

Solution

(i) Calculation of NAV at the end of month:

Given Annual Return = 15%

Hence Monthly Return = 1.25% (r)

$$r = \frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}}$$

$$0.0125 = \frac{(NAV_t - ₹\,65.78) + ₹\ 0.50 + ₹\,0.32}{₹\,65.78}$$

$0.82 = NAV_t$ - ₹ 64.96

NAV_t = ₹ 65.78

(ii) There is no change in NAV.

TYK 9 *(PG NO 17.20)*

On 1st April 2009 Fair Return Mutual Fund has the following assets and prices at 4.00 p.m.

Shares	No. of Shares	Market Price Per Share (₹)
A Ltd.	10,000	19.70
B Ltd.	50,000	482.60
C Ltd.	10,000	264.40
D Ltd.	1,00,000	674.90
E Ltd.	30,000	25.90
No. of units of funds		8,00,000

Please calculate:

(a) NAV of the Fund on 1st April 2009.

(b) Assuming that on 1st April 2009, Mr. X, a HNI, send a cheque of ₹ 50,00,000 to the Fund and Fund Manager immediately purchases 18000 shares of C Ltd. and balance is held in bank. Then what will be position of fund.

(c) Now suppose on 2 April 2009 at 4.00 p.m. the market price of shares is as follows:

Shares	₹
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

(a) NAV of the Fund.

$$= \frac{₹\ 1,97,000 + ₹\ 2,41,30,000 + ₹\ 26,44,000 + ₹\ 6,74,90,000 + ₹\ 7,77,000}{8,00,000}$$

$$= \frac{₹\ 9,52,38,000}{8,00,000} = ₹\ 119.0475 \text{ rounded to } ₹\ 119.05$$

(b) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (Rs.)
A Ltd.	10,000	19.70	1,97,000
B Ltd.	50,000	482.60	2,41,30,000
C Ltd.	28,000	264.40	74,03,200
D Ltd.	1,00,000	674.90	674,90,000
E Ltd.	30,000	25.90	7,77,000
Cash			2,40,800
			10,02,38,000

$$\text{No. of units of fund} = 8,00,000 + \frac{50,00,000}{119.0475} = 8,42,000$$

(c) On 2nd April 2009, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
A Ltd.	10,000	20.30	2,03,000
B Ltd.	50,000	513.70	2,56,85,000
C Ltd.	28,000	290.80	81,42,400
D Ltd.	1,00,000	671.90	6,71,90,000
E Ltd.	30,000	44.20	13,26,000
Cash			2,40,800

			10,27,87,200

NAV as on 2nd April 2009 = $\frac{₹\ 10,27,87,200}{8,42,000}$ = ₹ 122.075 per unit

TYK 10 *(PG NO 17.21)*

A has invested in three Mutual Fund Schemes as per details below:

Particulars	**MF A**	**MF B**	**MF C**
Date of investment	01.12.2009	01.01.2010	01.03.2010
Amount of investment	₹ 50,000	₹ 1,00,000	₹ 50,000
Net Asset Value (NAV) at entry date	₹ 10.50	₹ 10	₹ 10
Dividend received upto 31.03.2010	₹ 950	₹ 1,500	Nil
NAV as at 31.03.2010	₹ 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. A upto 31.03.2010?

Solution

Scheme	**Investment**	**Unit Nos. (Investment/NAV at entry date)**	**Unit NAV 31.3.2010**	**Total NAV 31.3.2010 (Unit Nos. X Unit NAV as on 31.3.2010)**
	₹		**₹**	**₹**
MF A	50,000	4761.905	10.40	49,523.812
MF B	1,00,000	10,000	10.10	1,01,000
MF C	50,000	5,000	9.80	49,000

Scheme	**NAV (+) / (–) (NAV as on 31.3.2010 –Investment)**	**Dividend Received**	**Total Yield Change in NAV +Dividend**	**Number of days**	**Effective Yield (% P.A.) (Total Yield/ Investment) X (365/No. of days) X 100**
	₹	₹	₹		
MF A	(–)476.188	950	473.812	121	2.858%
MF B	(+)1,000	1,500	2,500	90	10.139%

MF C	(–)1,000	Nil	(–)1,000	31	(–)24%

TYK 11 *(PG NO 17.21)*

Mr. Sinha has invested in three Mutual fund schemes as per details below:

	Scheme X	**Scheme Y**	**Scheme Z**
Date of Investment	01.12.2008	01.01.2009	01.03.2009
Amount of Investment	₹ 5,00,000	₹ 1,00,000	₹ 50,000
Net Asset Value at entry date	₹ 10.50	₹ 10.00	₹ 10.00
Dividend received upto 31.03.2009	₹ 9,500	₹ 1,500	Nil
NAV as at 31.3.2009	₹ 10.40	₹ 10.10	₹ 9.80

You are required to calculate the effective yield on per annum basis in respect of each of the three schemes to Mr. Sinha upto 31.03.2009.

Solution

Calculation of effective yield on per annum basis in respect of three mutual fund schemes to Mr. Sinha up to 31-03-2009:

Particulars	**MF X**	**MF Y**	**MF Z**
(a) Investments	₹ 5,00,000	₹ 1,00,000	₹ 50,000
(b) Opening NAV	₹10.50	₹10.00	₹10.00
(c) No. of units (a/b)	47,619.05	10,000	5,000
(d) Unit NAV ON 31-3-2009	₹ 10.40	₹ 10.10	₹ 9.80
(e) Total NAV on 31-3-2009 (c x d)	₹ 4,95,238.12	₹ 1,01,000	₹ 49,000
(f) Increase / Decrease of NAV (e - a)	(₹ 4,761.88)	₹ 1,000	(₹ 1,000)
(g) Dividend Received	₹ 9,500	₹ 1,500	Nil
(h) Total yield (f + g)	₹ 4,738.12	₹ 2,500	(₹ 1,000)
(i) Number of Days	121	90	31
(j) Effective yield p.a. (h/a x 365/i x 100)	2.859%	10.139%	(-) 23.55%

TYK 12 *(PG NO 17.21)*

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

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

Assume 1 Year =365 days

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

(i) Number of units in each scheme;

(ii) Total NAV;

(iii) Total Yield; and

(iv) Number of days investment held.

Solution

(i) Number of Units in each Scheme

MF 'X'	₹ 2,00,000 / ₹ 10.30	= 19,417.48
MF 'Y'	₹ 4,00,000 / ₹ 10.10	= 39,603.96
MF 'Z'	₹ 2,00,000 / ₹10.00	= 20,000.00

(ii) Total NAV on 31.03.2018

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

(iii) Total Yield

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

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

(iv) No. of Days Investment Held

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

TYK 13 *(PG NO 17.22)*

Mr. X on 1.7.2007, during the initial offer of some Mutual Fund invested in 10,000 units having face value of ₹ 10 for each unit. On 31.3.2008, the dividend paid by the M.F. was 10% and Mr. X found that his annualized yield was 153.33%. On 31.12.2009, 20% dividend was given. On 31.3.2010, Mr. X redeemed all his balance of 11,296.11 units when his annualized yield was 73.52%. What are the NAVs as on 31.3.2008, 31.3.2009 and 31.3.2010?

Solution

Yield for 9 months = (153.33 x 9/12) = 115%

Market value of Investments as on 31.03.2008 = 1,00,000/- + (1,00,000 x 115%)

= ₹2,15,000/-

Therefore, NAV as on 31.03.2008 = (2,15,000-10,000)/10,000 = ₹ 20.50

(NAV would stand reduced to the extent of dividend payout, being (10,000x10x10%) = ₹10,000)

Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹\ 10{,}000}{₹\ 20.50}$ = 487.80 units

Therefore, units as on 31.03.2008 = 10, 000+ 487.80 = 10,487.80

[Alternately, units as on 31.03.2008 = (2,15,000/20.50) = 10,487.80]

Dividend as on 31.03.2009 = 10,487.80 x 10 x 0.2 = ₹ 20,975.60

Let X be the NAV on 31.03.2009, then number of new units reinvested will be ₹ 20,975.60/ X. Accordingly 11296.11 units shall consist of reinvested units and 10487.80 (as on 31.03.2008). Thus, by way of equation it can be shown as follows:

$11{,}296.11 = \frac{20{,}975.60}{X} + 10{,}487.80$

Therefore, NAV as on 31.03.2009 = 20,975.60/(11,296.11- 10,487.80)

= ₹25.95

NAV as on 31.03.2010 = ₹ 1,00,000 (1+0.7352x33/12)/11296.11

= ₹ 26.75

TYK 14 *(PG NO 17.22)*

Mr. X on 1.7.2012, during the initial public offer of a Mutual Fund (MF) invested ₹ 1,00,000 at Face Value of ₹ 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

Yield for 9 months = 115%

Market value of Investments as on 31.03.2013 = 1,00,000/- + (1,00,000x 115%)

= ₹ 2,15,000/-

Therefore, NAV as on 31.03.2013 = (2,15,000 -10,000)/10,000 = ₹ 20.50

(NAV would stand reduced to the extent of dividend payout, being (₹100,000 x 10%)

= ₹ 10,000)

Since dividend was reinvested by Mr. X, additional units acquired

$= \frac{₹\ 10,000}{₹\ 20.50}$ = 487.80 units

Therefore, units as on 31.03.2013 = 10,000+ 487.80 = 10,487.80

[Alternately, units as on 31.03.2013 = (2,15,000/20.50) = 10,487.80]

Dividend as on 31.03.2014 = 10,487.80 x 10 x 0.2 = ₹ 20,975.60

Let X be the NAV on 31.03.2014, then number of new units reinvested will be ₹ 20,975.60/X. Accordingly 11296.11 units shall consist of reinvested units and 10487.80 (as on 31.03.2013). Thus, by way of equation it can be shown as follows:

$11,296.11 = \frac{20,975.60}{X} + 10,487.80$

Therefore, NAV as on 31.03.2014 = 20,975.60/(11,296.11- 10,487.80)

= ₹ 25.95

NAV as on 31.03.2015 = ₹ 1,00,000 (1+2.0217)/11296.11

= ₹ 26.75

TYK 15 ***(PG NO 17.22)***

A Mutual Fund having 300 units has shown its NAV of ₹ 8.75 and ₹ 9.45 at the beginning and at the end of the year respectively. The Mutual Fund has given two options:

(i) Pay ₹ 0.75 per unit as dividend and ₹ 0.60 per unit as a capital gain, or

(ii) These distributions are to be reinvested at an average NAV of ₹ 8.65 per unit.

What difference it would make in terms of return available and which option is preferable?

Solution

(i) Returns for the year

(All changes on a Per -Unit Basis)

Change in Price:	₹ 9.45 – ₹8.75 = ₹ 0.70
Dividends received:	₹ 0.75
Capital gains distribution	₹ 0.60
Total reward	₹ 2.05

Holding period reward: $\frac{₹\ 2.05}{₹\ 8.75} \times 100$ = 23.43%

(ii) When all dividends and capital gains distributions are re-invested into additional units of the fund @ (₹ 8.65/unit)

Dividend + Capital Gains per unit

= ₹ 0.75 + ₹ 0.60 = ₹ 1.35

Total received from 300 units = ₹1.35 x 300 = ₹405/-.

Additional Units Acquired

= ₹405/₹8.65 = 46.82 Units.

Total No.of Units = 300 units + 46.82 units = 346.82 units.

Value of 346.82 units held at the end of the year

= 346.82 units x ₹9.45 = ₹ 3277.45

Price Paid for 300 Units at the beginning of the year

= 300 units x ₹8.75 = ₹2,625.00

Holding Period Reward

₹ (3277.45 – 2625.00) = ₹652.45

Holding Period Reward =: $\frac{652.45}{₹\ 2,625.00} \times 100 =$ 24.85%

Conclusion: Since the holding period reward is more in terms of percentage in option-two i.e., reinvestment of distributions at an average NAV of ₹8.65 per unit, this option is preferable.

TYK 16 ***(PG NO 17.22)***

On 1-4-2012 ABC Mutual Fund issued 20 lakh units at ₹ 10 per unit. Relevant initial expenses involved were ₹ 12 lakhs. It invested the fund so raised in capital market instruments to build a portfolio of ₹ 185 lakhs. During the month of April 2012 it disposed off some of the instruments costing ₹ 60 lakhs for ₹ 63 lakhs and used the proceeds in purchasing securities for ₹ 56 lakhs. Fund management expenses for the month of April 2012 was ₹ 8 lakhs of which 10% was in arrears. In April 2012 the fund earned dividends amounting to ₹ 2 lakhs and it distributed 80% of the realized earnings. On 30-4-2012 the market value of the portfolio was ₹ 198 lakhs.

Mr. Akash, an investor, subscribed to 100 units on 1-4-2012 and disposed off the same at closing NAV on 30-4-2012. What was his annual rate of earning?

Solution

	Amount in ₹ lakhs	**Amount in ₹ lakhs**	**Amount in ₹ lakhs**
Opening Bank (200 - 185 -12)	3.00		
Add: Proceeds from sale of securities	63.00		
Add: Dividend received	2.00	68.00	
Deduct:			
Cost of securities purchased	56.00		
Fund management expenses paid (90% of 8)	7.20		

Capital gains distributed = 80% of (63 – 60)	2.40		
Dividend distributed =80% of 2.00	1.60	67.20	
Closing Bank			0.80
Closing market value of portfolio			198.00
			198.80
Less: Arrears of expenses			0.80
Closing Net Assets			198.00
Number of units (Lakhs)			20
Closing NAV per unit (198.00/20)			9.90

Rate of Earning (Per Unit)

	Amount
Income received (₹ 2.40 + ₹ 1.60)/20	₹ 0.20
Loss: Loss on disposal (₹ 200 - ₹ 198)/20	₹ 0.10
Net earning	₹ 0.10
Initial investment	₹ 10.00
Rate of earning (monthly)	1%
Rate of earning (Annual)	12%

TYK 17 ***(PG NO 17.22)***

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 1.4.1999, Mr. Anand, Mr. Bacchan & Mrs. Charu, three investors invested ₹ 1,00,000 each & chosen 'B', 'C' & 'A' Plan respectively.

The History of the Fund is as follows:

Date	**Dividend %**	**Bonus Ratio**	**Net Asset Value per Unit (F.V. ₹ 10)**		
			Plan A	**Plan B**	**Plan C**
28.07.2003	20		30.70	31.40	33.42
31.03.2004	70	5 : 4	58.42	31.05	70.05
31.10.2007	40		42.18	25.02	56.15
15.03.2008	25		46.45	29.10	64.28
31.03.2008		1 : 3	42.18	20.05	60.12
24.03.2009	40	1 : 4	48.10	19.95	72.40

31.07.2009			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:

1. Long-term Capital Gain is exempt from Income tax.
2. Short-term Capital Gain is subject to 10% Income tax.
3. Security Transaction Tax 0.2 per cent only on sale/redemption of units.
4. Ignore Education Cess.

Solution

Mrs. Charu Plan A Dividend Reinvestment

(Amount in ₹)

Date	Investment	Dividend payout (%)	Dividend Re-invested (Closing Units X Face value of '10 X Dividend Payout %)	NAV	Units	Closing Unit Balance ∑ Units
01.04.1999	1,00,000.00			10.00	10,000.00	10,000.00
28.07.2003		20	20,000.00	30.70	651.47	10,651.47
31.03.2004		70	74,560.29	58.42	1,276.28	11,927.75
30.10.2007		40	47,711.00	42.18	1,131.13	13,058.88
15.03.2008		25	32,647.20	46.45	702.85	13,761.73
24.03.2009		40	55,046.92	48.10	1,144.43	14,906.16

Redemption value 14,906.16 × 53.75	8,01,206.10
Less: Security Transaction Tax (STT) is 0.2%	1,602.41
Net amount received	7,99,603.69
Less: Short term capital gain tax @ 10% on 1,144.43 (53.64* – 48.10≈) = 6,340	634
Net of tax	7,98,969.69
Less: Investment	1,00,000.00
	6,98,969.69

*(53.75 – STT @ 0.2%)

≈ This value can also be taken as zero

Annual average return (%) = $\frac{6,98,969.69}{1,00,000} \times \frac{12}{124} \times 100 = 67.64\%$

Mr. Anand Plan B – Bonus

(Amount in ₹)				
Date	**Units**	**Bonus units**	**Total Balance**	**NAV per unit**
01.04.1999	10,000		10,000	10
31.03.2004		12,500	22,500	31.05
31.03.2008		7,500	30,000	20.05
24.03.2009		7,500	37,500	19.95

Redemption value 37,500 × 22.98	8,61,750.00
Less: Security Transaction Tax (STT) is 0.2%	1,723.50
Net amount received	8,60,026.50
Less: Short term capital gain tax @ 10%	
7,500 × (22.93† – 19.95) = 22,350	2,235.00
Net of tax	8,57,791.50
Less: Investment	1,00,000.00
Net gain	7,57,791.50

†(22.98 – STT @ 0.2%)

Annual average return (%) = $\frac{7,57,791.50}{1,00,000} \times \frac{12}{124} \times 100 = 73.33\%$

Mr. Bacchan Plan C – Growth

Particulars	**(Amount in ₹)**
Redemption value 10,000 × 82.07	8,20,700.00
Less: Security Transaction Tax (S.T.T) is .2%	1,641.40
Net amount received	8,19,058.60
Less: Short term capital gain tax @ 10%	0.00
Net of tax	8,19,058.60
Less: Investment	1,00,000.00
Net gain	7,19,058.60

Annual average return (%)= $\frac{7,19,058}{1,00,000} \times \frac{12}{124} \times 100 = 69.59\%$

Note: Alternatively, figure of * and † can be taken as without net of Tax because, as per Proviso 5 of Section 48 of IT Act, no deduction of STT shall be allowed in computation of Capital Gain.

TYK 18 ***(PG NO 17.23)***

A mutual fund company introduces two schemes i.e. Dividend plan (Plan-D) and Bonus plan (Plan-B). The face value of the unit is ₹ 10. On 1-4-2005 Mr. K invested ₹ 2,00,000 each in Plan-D and Plan-B when the NAV was ₹ 38.20 and ₹ 35.60 respectively. Both the plans matured on 31-3-2010.

Particulars of dividend and bonus declared over the period are as follows:

Date	**Dividend %**	**Bonus Ratio**	**Net Asset Value (₹)**	
			Plan D	**Plan B**

30-09-2005	10		39.10	35.60
30-06-2006		1:5	41.15	36.25
31-03-2007	15		44.20	33.10
15-09-2008	13		45.05	37.25
30-10-2008		1:8	42.70	38.30
27-03-2009	16		44.80	39.10
11-04-2009		1:10	40.25	38.90
31-03-2010			40.40	39.70

What is the effective yield per annum in respect of the above two plans?

Solution

Plan – D

Unit acquired = $\frac{2,00,000}{38.20}$ = 5.235.60

Date	Units held	Dividend		Reinvestment	New	Total
		%	Amount	Rate	Units	Units
01.04.2005						5235.60
30.09.2005	5235.60	10	5235.60	39.10	133.90	5369.50
31.03.2007	5369.50	15	8054.25	44.20	182.22	5551.72
15.09.2008	5551.72	13	7217.24	45.05	160.20	5711.92
27.03.2009	5711.92	16	9139.07	44.80	204	5915.92
31.03.2010	Maturity Value		(₹ 40.40 X 5915.92)			₹ 2,39,003.17
	Less: Cost of Acquisition					₹ 2,00,000.00
	Total Gain					₹ 39,003.17

$\therefore$ Effective Yield = $\frac{₹\ 39,003.17}{₹\ 2,00,000} \times \frac{1}{5} \times 100 = 3.09\%$

Alternatively, it can be computed by using the IRR method as follows:

NPV at 4% = -2,00,000 + 1,96,443 = -3,557

NPV at 2% = -2,00,000 + 2,16,473 = 16,473

IRR= LR + = $\frac{\text{NPV at LR}}{\text{NPV at LR}-\text{NPV at HR}}\ (\text{HR} - \text{LR}) = 2\% + \frac{16,473}{16,473-(-3,557)}\ (4\% - 2\%) = 3.645\%$

Plan – B

Date	Particulars	Calculation Working	No. of Units	NAV (₹)
1.4.05	Investment	₹2,00,000/35.60=	5,617.98	35.60
30.6.06	Bonus	5,617.98/5 =	1,123.60	36.25
			6,741.58	
30.10.08	"	6,741.58/8 =	842.70	38.30
			7,584.28	
11.4.09	"	7,584.28/10 =	758.43	38.90
			8,342.71	
31.3.10	Maturity Value	8,342.71 x ₹ 39.70=		3,31,205.59
	Less: Investment			2,00,000.00
	Gain			1,31,205.59

$\therefore$ Effective Yield $\frac{1.31,205.59}{2,00,000} \times \frac{1}{5} \times 100 = 13.12\%$

Alternatively, it can be computed by using the IRR method as follows:

NPV at 13% = -2,00,000 + 1,79,765 = -20,235

NPV at 8% = -2,00,000 + 2,25,413 = 25,413

IRR= LR + = $\frac{\text{NPV at LR}}{\text{NPV at LR}-\text{NPV at HR}} (\text{HR} - \text{LR}) = 8\% + \frac{25,413}{25,413-(-20,235)} (13\% - 8\%) = 10.78\%$

TYK 19 ***(PG NO 17.24)***

A mutual fund made an issue of 10,00,000 units of ₹ 10 each on January 01, 2008. No entry load was charged. It made the following investments:

Particulars	**₹**
50,000 Equity shares of ₹ 100 each @ ₹ 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 ₹ 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 ₹ 5,00,000. Also find out the NAV, if the Mutual fund had distributed a dividend of ₹ 0.80 per unit during the year to the unit holders.

Solution

In order to find out the NAV, the cash balance at the end of the year is calculated as follows-

Particulars	**₹**
Cash balance in the beginning (₹ 100 lakhs – ₹ 98 lakhs)	2,00,000
Dividend Received	12,00,000
Interest on 7% Govt. Securities	56,000
Interest on 9% Debentures	45,000
Interest on 10% Debentures	50,000
	15,51,000
(-) Operating expenses	5,00,000

Net cash balance at the end	10,51,000
Calculation of NAV	₹
Cash Balance	10,51,000
7% Govt. Securities (at par)	8,00,000
50,000 equity shares @ ₹ 175 each	87,50,000
9% Debentures (Unlisted) at cost	5,00,000
10% Debentures @90%	4,50,000
Total Assets	1,15,51000
No. of Units	10,00,000
NAV per Unit	₹ 11.55

Calculation of NAV, if dividend of ₹ 0.80 is paid –

Net Assets (₹ 1,15,51,000 – ₹ 8,00,000)	₹ 1,07,51,000
No. of Units	10,00,000
NAV per unit	₹ 10.75

TYK 20 ***(PG NO 17.24)***

Based on the following information, determine the NAV of a regular income scheme on per unit basis:

Particulars	**₹ Crores**
Listed shares at Cost (ex-dividend)	20
Cash in hand	1.23
Bonds and debentures at cost	4.3
Of these, bonds not listed and quoted	1
Other fixed interest securities at cost	4.5
Dividend accrued	0.8
Amount payable on shares	6.32
Expenditure accrued	0.75
Number of units (₹ 10 face value)	20 lacs
Current realizable value of fixed income securities of face value of ₹ 100	106.5
The listed shares were purchased when Index was	1,000
Present index is	2,300
Value of listed bonds and debentures at NAV date	8

There has been a diminution of 20% in unlisted bonds and debentures. Other fixed interest securities are at cost.

Solution

Particulars	**Adjusted Values ₹ crores**
Equity Shares	46.00
Cash in hand	1.23
Bonds and debentures not listed	0.80
Bonds and debentures listed	8.00
Dividends accrued	0.80
Fixed income securities	4.50
Sub total assets (A)	**61.33**
Less: Liabilities	
Amount payable on shares	6.32
Expenditure accrued	0.75
Sub total liabilities (B)	**7.07**
Net Assets Value (A) – (B)	**54.26**
No. of units	20,00,000
Net Assets Value per unit (₹ 54.26 crore / 20,00,000)	₹ 271.30

TYK 21 ***(PG NO 17.25)***

On 1st April, an open ended scheme of mutual fund had 300 lakh units outstanding with Net Assets Value (NAV) of ₹ 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:

	₹ in lakh
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

Calculation of Income available for Distribution

	Units (Lakh)	Per Unit (₹)	Total (₹ In lakh)
Income from April	300	0.0765	22.9500
Add: Dividend equalization collected on issue	6	0.0765	0.4590
	306	0.0765	23.4090
Add: Income from May		0.1125	34.4250
	306	0.1890	57.8340
Less: Dividend equalization paid on repurchase	3	0.1890	(0.5670)
	303	0.1890	57.2670
Add: Income from June		0.1500	45.4500
	303	0.3390	102.7170
Less: Dividend Paid		0.2373	(71.9019)
	303	0.1017	30.8151

Calculation of Issue Price at the end of April

	₹
Opening NAV	18.750
Add: Entry Load 2% of ₹ 18.750	(0.375)
	19.125
Add: Dividend Equalization paid on Issue Price	0.0765
	19.2015

Calculation of Repurchase Price at the end of May

	₹
Opening NAV	18.750
Less: Exit Load 2% of ₹ 18.750	(0.375)
	18.375
Add: Dividend Equalization paid on Issue Price	0.1890
	18.564

Closing NAV

		₹ (Lakh)
Opening Net Asset Value (₹ 18.75 × 300)		5625.0000
Portfolio Value Appreciation		425.4700
Issue of Fresh Units (6 × 19.2015)		115.2090
Income Received (22.950 + 34.425 + 45.450)		102.8250
		6268.504
Less: Units repurchased (3 × 18.564)	-55.692	
Income Distributed	-71.9019	(-127.5939)
Closing Net Asset Value		6140.9101
Closing Units (300 + 6 – 3) lakh		303 lakh
∴ Closing NAV as on 30th June		₹ 20.2670

TYK 22 ***(PG NO 17.25)***

Five portfolios experienced the following results during a 7- year period:

Portfolio	**Average Annual Return (R_p) (%)**	**Standard Deviation (S_p)**	**Correlation with the market returns (r)**
A	19.0	2.5	0.840
B	15.0	2.0	0.540
C	15.0	0.8	0.975
D	17.5	2.0	0.750
E	17.1	1.8	0.600
Market Risk (σ_m)		1.2	
Market rate of Return (R_m)	14.0		
Risk-free Rate (R_f)	9.0		

Rank the portfolios using (a) Sharpe's method, (b) Treynor's method and (c) Jensen's Alpha

Solution

Let portfolio standard deviation be σ_p

Market Standard Deviation = σ_m

Coefficient of correlation = r

Portfolio Beta (β_p) = $\frac{\sigma_p r}{\sigma_m}$

Required portfolio return (R_p) = $R_f + \beta_p (R_m - R_f)$

Portfolio	Beta	Return from the portfolio (R_p) (%)
A	1.75	17.75
B	0.90	13.50
C	0.65	12.25
D	1.25	15.25
E	0.90	13.50

Portfolio	Sharpe Method		Treynor Method		Jensen's Alpha	
	Ratio	Rank	Ratio	Rank	Ratio	Rank
A	4.00	IV	5.71	V	1.25	V
B	3.00	V	6.67	IV	1.50	IV
C	7.50	I	9.23	I	2.75	II
D	4.25	III	6.80	III	2.25	III
E	4.50	II	9.00	II	3.60	I

TYK 23 *(PG NO 17.25)*

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 ₹ 70.71 (consisting 99% equity and remaining cash balance) and that of K Mutual Fund Ltd. is 62.50 (consisting 96% equity and balance in cash).

Following is the other information:

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

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

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

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

Solution

(i) Decomposition of Funds in Equity and Cash Components

	D Mutual Fund Ltd.	**K Mutual Fund Ltd.**
NAV on 31.12.14	` 70.71	` 62.50
% of Equity	99%	96%
Equity element in NAV	` 70	` 60
Cash element in NAV	` 0.71	` 2.50

(ii) Calculation of Beta

(a) D Mutual Fund Ltd.

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

$E(R) - R_f$ = 22.50

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

β_D =22.50/15 = 1.50

(b) K Mutual Fund Ltd.

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

$E(R) - R_f$ = 16.50

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

β_D =16.50/15 = 1.10

(iii) Decrease in the Value of Equity

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

(iv) Balance of Cash after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Cash in Hand on 31.12.14	₹ 0.71	₹ 2.50
Less: Exp. Per month	₹ 0.25	₹ 0.25
Balance after 1 month	₹ 0.46	₹ 2.25

NAV after 1 month

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

TYK 24 ***(PG NO 17.26)***

ANP Plan, a hedge fund currently has assets of ₹ 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 ₹ 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%

	₹
Fixed fee (A) 0.10% of ₹ 20 crore	2,00,000
New Fund Value (1.29 x ₹ 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%

	₹
Fixed (A) 0.10% of ₹ 20 crore	2,00,000
New Fund Value (1.045 x ₹ 20 crore)	20.90 crore
Excess Value of best achieved (20.90 crore – 21.00 crore)	(₹ 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 ₹ 2,00,000 will be paid

TYK 25 ***(PG NO 17.26)***

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 (₹/unit)**	**Month Ending**	**NAV (₹/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 ₹ 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

Constant Ratio Plan:

Stock Portfolio NAV (₹)	Value of Conservative Portfolio (₹)	Value of aggressive Portfolio (₹)	Total value of Constant Ratio Plan (₹)	Revaluation Action	Total No. of units in aggressive portfolio
40.00	1,00,000	1,00,000	2,00,000	-	2,500
25.00	1,00,000	62,500	1,62,500	-	2,500
	81,250	81,250	1,62,500	Buy 750 units	3,250
36.00	81,250	1,17,000	1,98,250	-	3,250
	99,125	99,125	1,98,250	Sell 496.53 units	2,753.47
32.00	99,125	88,111.04	1,87,236.04	-	2,753.47
38.00	99,125	1,04,631.86	2,03,756.86	-	2,753.47
	1,01,878.43	1,01,878.43	2,03,756.86	Sell 72.46 units	2,681.01
37.00	1,01,878.50	99,197.37	2,01,075.87	-	2,681.01
42.00	1,01,878.50	1,12,602.42	2,14,480.92	-	2,681.01
43.00	1,01,878.50	1,15,283.43	2,17,161.93	-	2,681.01
50.00	1,01,878.50	1,34,050.50	2,35,929	-	2,681.01
	1,17,964.50	1,17,964.50	2,35,929	Sell 321.72 units	2359.29
52.00	1,17,964.50	1,22,683.08	2,40,647.58	-	2359.29

Hence, the ending value of the mechanical strategy is ₹ 2,40,647.58 and buy & hold strategy is ₹ 2,60,000.

DERIVATIVES ANALYSIS AND VALUATION

TYK 1 *(PG NO 8.41)*

The 6-months forward price of a security is ₹ 208.18. The borrowing rate is 8% per annum payable with monthly rests. What should be the spot price?

Solution

Calculation of spot price

The formula for calculating forward price is:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Where A = Forward price
P = Spot Price
r = rate of interest
n = no. of compounding
t = time

Using the above formula, 208.18

$= P (1 + 0.08/12)^{6}$

Or 208.18 = P x 1.0409

P = 208.18/1.0409 = 200

Hence, the spot price should be ₹ 200.

TYK 2 *(PG NO 8.41)*

The following data relate to Anand Ltd.'s share price:

Current price per share	₹ 1,800
6 months future's price/share	₹ 1,950

Assuming it is possible to borrow money in the market for transactions in securities at 12% per annum, you are required:

(i) to calculate the theoretical minimum price of a 6-months forward purchase; and

(ii) to explain arbitrate opportunity.

Solution

Anand Ltd

(i) Calculation of theoretical minimum price of a 6 months forward contract-

Theoretical minimum price = ₹ 1,800 + (₹ 1,800 x 12/100 x 6/12) = ₹ 1,908

(ii) Arbitrage Opportunity-

The arbitrageur can borrow money @ 12 % for 6 months and buy the shares at ₹ 1,800. At the same time he can sell the shares in the futures market at ₹ 1,950. On the expiry date 6 months later, he could deliver the share and collect ₹ 1,950 pay off ₹ 1,908 and record a profit of ₹ 42 (₹ 1,950 – ₹ 1,908)

TYK 3 ***(PG NO 8.41)***

On 31-8-2011, the value of stock index was ₹ 2,200. The risk free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	Dividend Paid p.a.
January	3%
February	4%
March	3%
April	3%
May	4%
June	3%
July	3%
August	4%
September	3%
October	3%
November	4%
December	3%

Assuming that interest is continuously compounded daily, find out the future price of contract deliverable on 31-12-2011. Given: $e^{0.01583} = 1.01593$

Solution

The duration of future contract is 4 months. The average yield during this period will be:

$\frac{3\% + 3\% + 4\% + 3\%}{4} = 3.25\%$

As per Cost to Carry model the future price will be

$F = Se^{(r_f - D)t}$

Where S = Spot Price

r_f = Risk Free interest

D = Dividend Yield

t = Time Period

Accordingly, future price will be

= ₹ 2,200 $e^{(0.08 - 0.0325)\times 4/12}$ = ₹ 2,200 $e^{0.01583}$

= ₹ 2,200 x 1.01593 = ₹ 2235.05

TYK 5 ***(PG NO 8.42)***

BSE	5,000
Value of portfolio	₹ 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.

Solution

(i) Current future price of the index = 5,000 + 5,000 (0.09-0.06)$\frac{4}{12}$ = 5,000 + 50 = 5,050

∴ Price of the future contract = ₹ 50 x 5,050 = ₹ 2,52,500

(ii) Hedge ratio = $\frac{10,10,000}{2,52,500} \times 1.5$ = 6 contracts

Index after there months turns out to be 4,500

Future price will be = 4500 + 4500 (0.09-0.06) × $\frac{1}{12}$ = 4,511.25

Therefore, Gain from the short futures position is = 6 x (5050 – 4511.25) x 50

= ₹1,61,625

Note: Alternatively we can also use daily compounding (exponential) formula.

TYK 6 *(PG NO 8.42)*

The share of X Ltd. is currently selling for ₹ 300. Risk free interest rate is 0.8% per month. A three months futures contract is selling for ₹ 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

The appropriate value of the 3 months futures contract is –

Fo = ₹ 300 $(1.008)^3$ = ₹ 307.26

Since the futures price exceeds its appropriate value it pays to do the following:-

Action	Initial Cash flow	Cash flow at time T (3 months)
Borrow ₹ 300 now and repay with interest after 3 months	+ ₹ 300	- ₹ 300 $(1.008)^3$ =- ₹ 307.26
Buy a share	- ₹ 300	ST
Sell a futures contract (Fo = 312/-)	0	₹ 312 – ST
Total	₹ 0	₹ 4.74

Such an action would produce a risk less profit of ₹ 4.74.

TYK 7 *(PG NO 8.42)*

A Mutual Fund is holding the following assets in ₹ Crores :

Investments in diversified equity shares	90.00
Cash and Bank Balances	10.00
	100.00

The Beta of the equity shares 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

Number of index future to be sold by the Fund Manager is:

$$\frac{1.1 \times 90,00,00,000}{4,300 \times 50} = 4,605$$

Justification of the answer:

Loss in the value of the portfolio if the index falls by 10% is ₹ $\frac{11}{100} \times 90\ Crore$ = ₹ 9.90 Crore

Gain by short covering of index future is: $\frac{0.1 \times 4{,}300 \times 50 \times 4{,}605}{1{,}00{,}00{,}000}$ = ₹ 9.90 Crore

This justifies the answer. Further, cash is not a part of the portfolio.

TYK 8 ***(PG NO 8.42)***

A trader is having in its portfolio shares worth ₹ 85 lakhs at current price and cash ₹ 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 ₹ 100 lakhs Nifty futures.

Solution

(i) Current Portfolio Beta

Current Beta for share portfolio = 1.6

Beta for cash = 0

Current portfolio beta = 0.85 x 1.6 + 0 x 0.15 = 1.36

(ii) Portfolio beta after 3 months:

Beta for portfolio of shares = $\frac{\text{Change in value of portfolio of share}}{\text{Change in value of market portfolio (Index)}}$

1.6 = $\frac{0.32}{\text{Change in value of market portfolio (Index)}}$

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 = ₹ 100 lakh x (1.00 - 0.02)

= ₹ 98 lakh

Mark-to-market paid = ₹ 2 lakh

Cash balance after payment of mark-to-market = ₹ 13 lakh

Value of portfolio after 3 months = ₹ 85 lakh x (1 - 0.032) + ₹ 13 lakh

= ₹ 95.28 lakh

Change in value of portfolio = $\frac{₹100\ lakh - ₹95.28\ lakh}{₹100\ lakh}$ = 4.72%

Portfolio beta = 0.0472/0.02 = 2.36

TYK 9 *(PG NO 8.43)*

Which position on the index future gives a speculator, a complete hedge against the following transactions:

(i) The share of Right Limited is going to rise. He has a long position on the cash market of ₹ 50 lakhs on the Right Limited. The beta of the Right Limited is 1.25.

(ii) The share of Wrong Limited is going to depreciate. He has a short position on the cash market of ₹ 25 lakhs on the Wrong Limited. The beta of the Wrong Limited is 0.90.

(iii) The share of Fair Limited is going to stagnant. He has a short position on the cash market of ₹ 20 lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.

Solution

Sl. No. (1)	Company Name (2)	Trend (3)	Amount (₹) (4)	Beta (5)	(₹) (6) [(4) x (5)]	Position (7)
(i)	Right Ltd.	Rise	50 lakh	1.25	62,50,000	Short
(ii)	Wrong Ltd.	Depreciate	25 lakh	0.90	22,50,000	Long
(iii)	Fair Ltd.	Stagnant	20 lakh	0.75	15,00,000	Long
					25,00,000	Short

TYK 10 *(PG NO 8.43)*

Ram buys 10,000 shares of X Ltd. at a price of ₹ 22 per share whose beta value is 1.5 and sells 5,000 shares of A Ltd. at a price of ₹ 40 per share having a beta value of 2. He obtains a complete hedge by Nifty futures at ₹ 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

No. of the Future Contract to be obtained to get a complete hedge

$$= \frac{10{,}000 \times ₹22 \times 1.5 - 5{,}000 \times ₹40 \times 2}{₹1{,}000}$$

$$= \frac{₹\ 3{,}30{,}000 - ₹\ 4{,}00{,}000}{₹1{,}000} = 70 \text{ contracts}$$

Thus, by purchasing 70 Nifty future contracts to be long to obtain a complete hedge.

Cash Outlay

= 10,000 x ₹ 22 – 5,000 x ₹ 40 + 70 x ₹ 1,000

= ₹ 2,20,000 – ₹ 2,00,000 + ₹ 70,000 = ₹ 90,000

Cash Inflow at Close Out

= 10,000 x ₹ 22 x 0.98 – 5,000 x ₹ 40 x 1.03 + 70 x ₹ 1,000 x 0.985

= ₹ 2,15,600 – ₹ 2,06,000 + ₹ 68,950 = ₹ 78,550

Gain/ Loss

= ₹ 78,550 – ₹ 90,000 = - ₹ 11,450 (Loss)

TYK 11 ***(PG NO 8.43)***

On January 1, 2013 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 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 and $e^{(0.015858)}$ = 1.01598

Solution

(i) Calculation of Portfolio Beta

Security	Price of the Stock	No. of shares	Value	Weightage w_i	Beta B_i	Weighted Beta
A	349.30	5,000	17,46,500	0.093	1.15	0.107
B	480.50	7,000	33,63,500	0.178	0.40	0.071
C	593.52	8,000	47,48,160	0.252	0.90	0.227
D	734.70	10,000	73,47,000	0.390	0.95	0.370

E	824.85	2,000	16,49,700	0.087	0.85	0.074
			1,88,54,860			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 ln (1.105) = 0.0998

For February 2013 contract, t= 58/365= 0.1589 Further

$F = Se^{rt}$

$F = ₹\ 5,900e^{(0.0998)(0.1589)}$

$F = ₹\ 5,900e^{0.015858}$

F = ₹ 5,900 X 1.01598 = ₹ 5,994.28

Alternatively, it can also be taken as follows:

$= ₹\ 5,900\ e^{0.105\times 58/365}$

$= ₹\ 5,900\ e^{0.01668}$

= ₹ 5,900 x 1.01682 = ₹ 5,999.24

(iii) When total portfolio is to be hedged:

$$= \frac{\text{Value of Spot Position requiring hedging}}{\text{Value of Future Contract}} \times \text{Portfolio Beta}$$

$$= \frac{1,88,54,860}{5,994.28 \times 200} \times 0.849 = 13.35 \text{ contracts say 13 or 14 contracts}$$

(iv) When total portfolio beta is to be reduced to 0.6:

$$\text{Number of Contracts to be sold} = \frac{P\ (\beta_P - \beta'_P)}{F}$$

$$= \frac{1,88,54,860\ (0.849 - 0.600)}{5,994.28 \times 200} = 3.92 \text{ contracts say 4 contracts}$$

TYK 12 ***(PG NO 8.44)***

Details about portfolio of shares of an investor is as below:

Shares	No. of shares (lakh)	Price per share	Beta
A Ltd.	3.00	₹ 500	1.40
B Ltd.	4.00	₹ 750	1.20
C Ltd.	2.00	₹ 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 ₹ 8125 and each Nifty points is worth ₹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

Shares	No. of shares (lakhs) (1)	Market Price of Per Share (2)	× (2) (₹ lakhs)	% to total (w)	ß (x)	w x
A Ltd.	3.00	500.00	1,500.00	0.30	1.40	0.42
B Ltd.	4.00	750.00	3,000.00	0.60	1.20	0.72
C Ltd.	2.00	250.00	500.00	0.10	1.60	0.16
			5,000.00	1.00		1.30

(1) Portfolio beta 1.30

(2) Required Beta 0.91

Let the proportion of risk free securities for target beta 0.91 = p

$$0.91 = 0 \times p + 1.30 (1 – p)$$

$$p = 0.30 \text{ i.e. } 30\%$$

Shares to be disposed off to reduce beta (5000 × 30%) ₹ 1,500 lakh and Risk Free securities to be acquired.

(3) Number of shares of each company to be disposed off

Shares	% to total (w)	Proportionate Amount (₹ lakhs)	Market Price Per Share	No. of Shares (Lakh)
A Ltd.	0.30	450.00	500.00	0.90
B Ltd.	0.60	900.00	750.00	1.20
C Ltd.	0.10	150.00	250.00	0.60

(4) Number of Nifty Contract to be sold

$$\frac{(1.30-0.91) \times 5{,}000 \text{ lakh}}{8{,}125 \times 200} = 120 \text{ contracts}$$

(5) 2% rises in Nifty is accompanied by 2% x 1.30 i.e. 2.6% rise for portfolio of shares

	₹ Lakh
Current Value of Portfolio of Shares	5,000
Value of Portfolio after rise	5,130
Mark-to-Market Margin paid (8,125 × 0.020 × ₹ 200 × 120)	39
Value of the portfolio after rise of Nifty	5,091
% change in value of portfolio (5,091 – 5,000)/ 5,000	1.82%
% rise in the value of Nifty	2%
Beta	0.91

TYK 13 ***(PG NO 8.44)***

On April 1, 2015, an investor has a portfolio consisting of eight securit ies as shown below:

Security	Market Price	No. of Shares	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 for the investor is 20% p.a. continuously compounded. The investor fears a fall in the 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:

(1) The current NIFTY value is 8,500.

(2) NIFTY futures can be traded in units of 25 only.

(3) Futures for May are currently quoted at 8,700 and Futures for June are being quoted at 8,850.

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

Security	Market Price	No. of Shares	Value	β	Value x β
A	29.40	400	11,760	0.59	6,938.40
B	318.70	800	2,54,960	1.32	3,36,547.20
C	660.20	150	99,030	0.87	86,156.10
D	5.20	300	1,560	0.35	546.00
E	281.90	400	1,12,760	1.16	1,30,801.60
F	275.40	750	2,06,550	1.24	2,56,122.00
G	514.60	300	1,54,380	1.05	1,62,099.00
H	170.50	900	1,53,450	0.76	1,16,622.00
			9,94,450		10,95,832.30

Portfolio Beta = $\frac{10,95,832.30}{9,94,450}$ = 1.102

(ii) Theoretical Value of Future Contract Expiring in May and June

$F = Se^{rt}$

F_{May}= 8500 x $e^{0.20 \times (2/12)}$ = 8500 x $e^{0.0333}$

$e^{0.0333}$ shall be computed using Interpolation Formula as follows:

$e^{0.03}$	= 1.03045
$e^{0.04}$	= 1.04081

$e^{0.01}$	= 0.01036
$e^{0.0033}$	= 0.00342
$e^{0.0067}$	= 0.00694

$e^{0.0333}$ = 1.03045 + 0.00342 = 1.03387 or 1.04081 – 0.00694 = 1.03387

According the price of the May Contract

8,500 X 1.03387 = ₹ 8,788

Price of the June Contract

F_{May}= 8,500 x $e^{0.20}$ x (3/12) = 8,500 x $e^{0.05}$= 8,500 x 1.05127 = 8,935.80

(iii) No. of NIFTY Contracts required to sell to hedge until June

$$= \frac{\text{Value of Position to be hedged}}{\text{Value of Contract}} \times \beta$$

(A) Total portfolio

$$= \frac{9,94,450}{8,850 \times 25} \times 1.102 = 4.953 \text{ say 5 contracts}$$

(B) 50% of Portfolio

$$= \frac{9,94,450 \times 0.50}{8,850 \times 25} \times 1.102 = 2.47 \text{ say 3 contracts}$$

(C) 120% of Portfolio

$$= \frac{9,94,450 \times 1.20}{8,850 \times 25} \times 1.102 = 5.94 \text{ say 6 contracts}$$

TYK 15 ***(PG NO 8.46)***

Mr. A purchased a 3 month call option for 100 shares in XYZ Ltd. at a premium of ₹ 30 per share, with an exercise price of ₹ 550. He also purchased a 3 month put option for 100 shares of the same company at a premium of ₹ 5 per share with an exercise price of ₹ 450. The market price of the share on the date of Mr. A's purchase of options, is ₹ 500. Calculate the profit or loss that Mr. A would make assuming that the market price falls to ₹ 350 at the end of 3 months.

Solution

Since the market price at the end of 3 months falls to ₹ 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:	
Gain per share (₹450 – ₹ 350)	100
Total gain per 100 shares	10,000

Cost or premium paid (₹ 30 x 100) + (₹ 5 x 100)	3,500
Net gain	6,500

TYK 16 *(PG NO 8.46)*

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 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 ₹ 42 for ₹ 2 premium, and paid Re.1 per share premium for a 3 months put with a striking price of ₹ 40.

(i) Determine the Investor's position if the tie up offer bids the price of ABC Corporation's stock up to ₹ 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 ₹ 36 in 3 months.

Solution

Cost of Call and Put Options

= (₹ 2 per share) x (100 share call) + (₹ 1 per share) x (100 share put)

= ₹ 2 x 100 + 1 x 100

= ₹ 300

(i) Price increases to ₹43. Since the market price is higher than the strike price of the call, the investor will exercise it.

Ending position = (- ₹ 300 cost of 2 option) + (₹ 1 per share gain on call) x 100

= - ₹ 300 + 100

Net Loss = - ₹ 200

(ii) The price of the stock falls to ₹36. Since the market price is lower than the strike price, the investor may not exercise the call option.

Ending Position = (- ₹300 cost of 2 options) + (₹4 per stock gain on put) x 100

= - ₹300 + 400

Gain = ₹100

TYK 17 *(PG NO 8.46)*

Equity share of PQR Ltd. is presently quoted at ₹ 320. The Market Price of the share after 6 months has the following probability distribution:

Market Price	₹ 180	260	28	32	400

			0	0	
Probability	0.1	0.2	0.5	0.1	0.1

A put option with a strike price of ₹ 300 can be written.

You are required to find out expected value of option at maturity (i.e. 6 months)

Solution

Expected Value of Option

(300 – 180) X 0.1	12
(300 – 260) X 0.2	8
(300 – 280) X 0.5	10
(300 – 320) X 0.1	Not Exercised*
(300 – 400) X 0.1	Not Exercised*
	30

* If the strike price goes beyond ₹ 300, option is not exercised at all.

In case of Put option, since Share price is greater than strike price Option Value would be zero.

TYK 18 ***(PG NO 8.46)***

You as an investor had purchased a 4 month call option on the equity shares of X Ltd. of ₹ 10, of which the current market price is ₹ 132 and the exercise price ₹ 150. You expect the price to range between ₹ 120 to ₹ 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:

(i) Expected Share price at the end of 4 months.

(ii) Value of Call Option at the end of 4 months, if the exercise price prevails.

(iii) In case the option is held to its maturity, what will be the expected value of the call option?

Solution

(i) Expected Share Price

= ₹120X 0.05 + ₹140X 0.20 + ₹160X 0.50 + ₹180X 0.10 + ₹190X 0.15

= ₹6 + ₹28 + ₹80 + ₹18 + ₹28.50 = ₹160.50

(ii) Value of Call Option

= ₹150 - ₹150 = Nil

(iii) If the option is held till maturity the expected Value of Call Option

Expected price (X)	Value of call (C)	Probability (P)	CP
₹ 120	0	0.05	0
₹ 140	0	0.20	0
₹ 160	₹ 10	0.50	₹ 5
₹ 180	₹ 30	0.10	₹ 3
₹ 190	₹ 40	0.15	₹ 6
	Total		₹ 14

Alternatively, it can also be calculated as follows:

Expected Value of Option

(120 – 150) X 0.1	Not Exercised*
(140 – 150) X 0.2	Not Exercised*
(160 – 150) X 0.5	5
(180 – 150) X 0.1	3
(190 – 150) X 0.15	6
	14

* If the strike price goes below ₹ 150, option is not exercised at all.

TYK 22 *(PG NO 8.47)*

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

(i) What combination of share and option should Mr. Dayal select if he wants a perfect hedge?

(ii) What should be the value of option today (the risk free rate is 10% p.a.)?

(iii) What is the expected rate of return on the option?

Solution

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

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

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

(ii) Value of Option today

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

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

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

Sale Proceeds of Investment (0.50 x ₹ 480)	₹ 240

Accordingly, Premium say P shall be computed as follows:

(₹ 300 – P) 1.025 = ₹ 240

P = ₹ 65.85

(iii) Expected Return on the Option

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

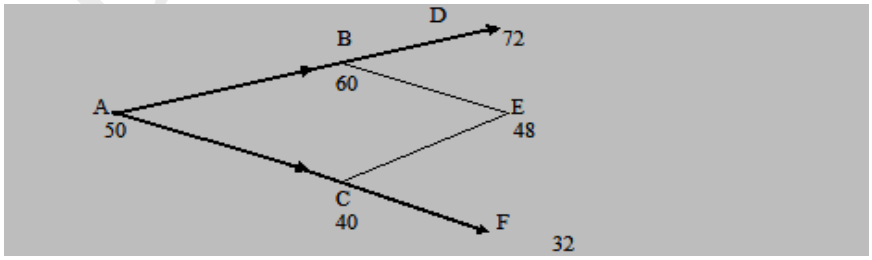
Expected Rate of Return $= \frac{90 - 65.85}{65.85} \times 100$ = 36.67%

TYK 23 ***(PG NO 8.48)***

Consider a two-year call option with a strike price of ₹ 50 on a stock the current price of which is also ₹ 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

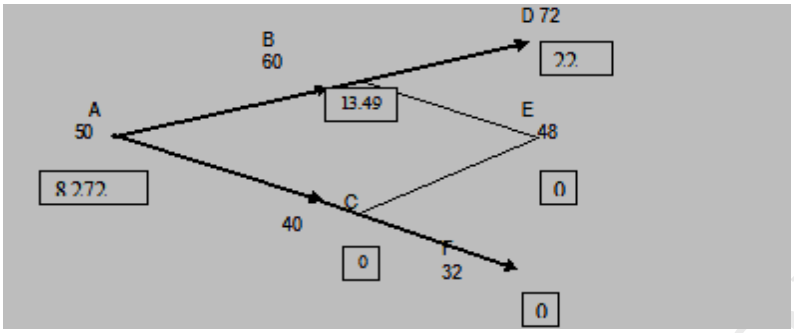


Using the single period model, the probability of price increase is

$$P = \frac{R-d}{u-d} = \frac{1.06-0.80}{1.20-0.80} = \frac{0.26}{0.40} = 0.65$$

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

$$\frac{13.49 \times 0.65 + 0 \times 0.35}{1.06} = 8.272$$

TYK 24 *(PG NO 8.48)*

The current market price of an equity share of Penchant Ltd is ₹ 420. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 500 and ₹ 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 ₹ 450?

Given $e^{0.02} = 1.0202$

Solution

Let the probability of attaining the maximum price be p (500 - 420) x p+(400 - 420) x (1-p) =

420 x ($e^{0.02}$-1)

or, 80p - 20(1 - p) = 420 x 0.0202

or, 80p – 20 + 20p = 8.48

or, 100p = 28.48

p = 0.2848

The value of Call Option in ₹ = $\frac{0.2848 \times (500 - 450)}{1.0202}$ = $\frac{0.2848\ x\ 50 + 0.7152 \times 0}{1.0202}$ = 13.96

TYK 25 ***(PG NO 8.48)***

From the following data for certain stock, find the value of a call option:

Price of stock now	=	₹ 80
Exercise price	=	₹ 75
Standard deviation of continuously compounded annual return	=	0.40
Maturity period	=	6 months
Annual interest rate	=	12%

Given

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	0.2743

$e^{0.12x0.5}$ = 1.062

In 1.0667 = 0.0646

Solution

Applying the Black Scholes Formula,

Value of the Call option now:

The Formula $C = SN(d_1) - Ke^{(-rt)} N(d_2)$

$d_1 = \frac{\text{In}\,(S/K) + (r + \sigma^2/2)t}{\sigma\sqrt{t}}$

$d_2 = d_1 - \sigma\sqrt{t}$

Where,

C = Theoretical call premium S = Current stock price

t = time until option expiration K = option striking price

r = risk-free interest rate

N = Cumulative standard normal distribution e = exponential term

σ = Standard deviation of continuously compounded annual return.

In = natural logarithim

$$d_1 = \frac{\text{In } (1.0667) + (12\% + 0.08)0.5}{0.40\sqrt{0.5}}$$

$$= \frac{0.0646 + (0.2)0.5}{0.40 \times 0.7071}$$

$$= \frac{0.1646}{0.2828}$$

= 0.5820

d_2 = 0.5820 – 0.2828 = 0.2992 $N(d_1)$ = N (0.5820)

$N(d_2)$ = N (0.2992)

Price = $SN(d_1)$ □$Ke^{(□rt)}$ $N(d_2)$

= 80 x $N(d_1)$ – (75/1.062) x $N(d_2)$

Value of option

$$= 80\ N(d_1) - \frac{75}{1.062} \times N(d_2)$$

$N(d_1)$ = N (0.5820) = 0.7197 $N(d_2)$ = N(0.2992) = 0.6176

$$\text{Price} = 80 \times 0.7197 - \frac{75}{1.062} \times 0.6176$$

= 57.57 – 70.62 x 0.6176

= 57.57 – 43.61

= ₹13.96

Teaching Notes:

Students may please note following important point:

Values of $N(d_1)$ and $N(d_2)$ have been computed by interpolating the values of areas under respective numbers of SD from Mean (Z) given in the question.

It may also be possible that in question paper areas under Z may be mentioned otherwise e.g. Cumulative Area or Area under Two tails. In such situation the areas of the respective Zs given in the question will be as follows:

Cumulative Area

Number of S.D. from Mean, (z)	Cumulative Area
0.25	0.5987
0.30	0.6179
0.55	0.7088
0.60	0.7257

Two tail area

Number of S.D. from Mean, (z)	Area of the left and right (two tail)
0.25	0.8026
0.30	0.7642
0.55	0.5823
0.60	0.5485

FOREIGN EXCHANGE EXPOSURE AND RISK MANAGEMENT

TYK 2 *(PG NO 9.42)*

ABN-Amro Bank, Amsterdam, wants to purchase ₹ 15 million against US$ for funding their Nostro account with Canara Bank, New Delhi. Assuming the inter-bank, rates of US$ is ₹ 51.3625/3700, what would be the rate Canara Bank would quote to ABN-Amro Bank? Further, if the deal is struck, what would be the equivalent US$ amount.

Solution

Here Canara Bank shall buy US$ and credit ₹ to Vostro account of ABN-Amro Bank. Canara Bank's buying rate will be based on the Inter-bank Buying Rate (as this is the rate at which Canara Bank can sell US$ in the Interbank market)

Accordingly, the Interbank Buying Rate of US$ will be ₹ 51.3625 (lower of two) i.e. (1/51.3625) = $ 0.01947/₹

Equivalent of US$ for ₹ 15 million at this rate will be

$= \frac{15,00,000}{51.3625}$ = US$ 2,92,041.86

or = 15,000,000 x $ 0.01947 = US$ 2,92,050

TYK 3 *(PG NO 9.43)*

XYZ Bank, Amsterdam, wants to purchase ₹ 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 $, ₹ 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:

$(£/₹)_{ask}$

The available rates are as follows:

$(\$/£)_{bid}$ = $1.5260

$(\$/£)_{ask}$ = $1.5270

$(₹/\$)_{bid}$ = ₹ 61.3625

$(₹/\$)_{ask}$ = ₹ 61.3700

From above available rates we can compute required rate as follows:

$(£/₹)_{ask}$ = $(£/\$)_{ask}$ x $(\$/₹)_{ask}$

= (1/1.5260) x (1/61.3625)

= £ 0.01068 or £ 0.0107

Thus, amount of £ to be credited

= ₹ 25,000,000 x £ 0.0107

= £ 267,500

TYK 5 *(PG NO 9.43)*

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)	70	90
Swap Points for 3 months (b)	160	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)	66.2525	67.5945
Swap Points for 2 months & 15 days (b)	0.0115	0.0138
	66.2640	67.6083

(iii) Annual Rate of Premium

	Bid	Ask
Spot Rate (a)	66.2525	67.5945
Foreign Exchange Rates for 20th June 2016 (b)	66.2640	67.6083
Premium (c)	0.0115	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%

TYK 6 *(PG NO 9.43)*

JKL Ltd., an Indian company has an export exposure of JPY 10,000,000 receivable August 31, 2014. Japanese Yen (JPY) is not directly quoted against Indian Rupee.

The current spot rates are:

INR/US $ = ₹ 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 ₹ 65.

Forward rates for August 2014 are

INR/US $ = ₹ 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 $= ₹ 66.25

JPY/US$ = JPY 110.85

Is the decision to take forward cover justified?

Solution

Since the direct quote for ¥ and ₹ is not available it will be calculated by cross exchange rate as follows:

₹/$ x $/¥ = ₹/¥ 62.22/102.34 = 0.6080

Spot rate on date of export 1¥ = ₹ 0.6080

Expected Rate of ¥ for August 2014 = ₹ 0.5242 (₹ 65/¥124)

Forward Rate of ¥ for August 2014 = ₹ 0.6026 (₹ 66.50/¥110.35)

(i) Calculation of expected loss without hedging

Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2014 (₹ 0.5242 x ¥10,000,000)	₹ 52,42,000
Loss	₹ 8,38,000

Hedging of loss under Forward Cover

₹ Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Payment to be received under Forward Cover (₹ 0.6026 x ¥10,000,000)	₹ 60,26,000
Loss	₹ 54,000

By taking forward cover loss is reduced to ₹ 54,000.

(ii) Actual Rate of ¥ on August 2014 = ₹ 0.5977 (₹ 66.25/¥110.85)

Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2014 (₹ 0.5977 x ¥10,000,000)	₹ 59,77,000

Loss	₹ 1,03,000

The decision to take forward cover is still justified.

TYK 7 *(PG NO 9.44)*

You sold Hong Kong Dollar 1,00,00,000 value spot to your customer at ₹ 5.70 & covered yourself in London market on the same day, when the exchange rates were

US$ 1 = H.K.$ 7.5880 7.5920

Local inter bank market rates for US$ were

Spot US$ 1 = ₹ 42.70 42.85

Calculate cover rate and ascertain the profit or loss in the transaction. Ignore brokerage.

Solution

The bank (Dealer) covers itself by buying from the market at market selling rate. Rupee – Dollar selling rate = ₹ 42.85

Dollar – Hong Kong Dollar = HK $ 7.5880

Rupee – Hong Kong cross rate = ₹ 42.85 / 7.5880

= ₹ 5.6471

Profit / Loss to the Bank

Amount received from customer (1 crore × 5.70)	₹ 5,70,00,000
Amount paid on cover deal (1 crore × 5.6471)	₹ 5,64,71,000
Profit to Bank	₹ 5,29,000

TYK 8 *(PG NO 9.44)*

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 = ₹ 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	₹ 74.3000	₹ 74.3200
Mumbai-New York	₹ 49.2500	₹ 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

Amount realized on selling Danish Kroner 10,00,000 at ₹ 6.5150 per Kroner = ₹ 65,15,000.

Cover at London:

Bank buys Danish Kroner at London at the market selling rate.

Pound sterling required for the purchase (DKK 10,00,000 ÷ DKK 11.4200) = GBP 87,565.67

Bank buys locally GBP 87,565.67 for the above purchase at the market selling rate of ₹ 74.3200.

The rupee cost will be = ₹ 65,07,88

Profit (₹ 65,15,000 - ₹ 65,07,881) = ₹ 7,119

Cover at New York:

Bank buys Kroners at New York at the market selling rate.

Dollars required for the purchase of Danish Kroner (DKK10,00,000 ÷ 7.5670) = USD 1,32,152.77

Bank buys locally USD 1,32,152.77 for the above purchase at the market selling rate of ₹ 49.2625.

The rupee cost will be = ₹ 65,10,176.

Profit (₹ 65,15,000 - ₹ 65,10,176) = ₹ 4,824

The transaction would be covered through London which gets the maximum profit of ₹ 7,119 or lower cover cost at London Market by (₹ 65,10,176 - ₹ 65,07,881) = ₹ 2,295

TYK 10 ***(PG NO 9.45)***

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

	(Millions)	(Millions)	(Millions)		Exposure (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

TYK 11 ***(PG NO 9.45)***

The following 2-way quotes appear in the foreign exchange market:

	Spot	2-months forward
RS/US $	₹46.00/₹46.25	₹47.00/₹47.50

Required:

(i) How many US dollars should a firm sell to get ₹ 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 ₹ 25 lakhs after 2 months at the Rate of ₹ 47/$

$\therefore \frac{₹\ 25,00,000}{₹\ 47}$ = US $ 53,191.489

(ii) ₹ required to get US$ 2,00,000 now at the rate of ₹ 46.25/$

∴ US $ 2,00,000 × ₹ 46.25 = ₹ 92,50,000

(iii) Encashing US $ 69,000 Now Vs 2 month later

Proceed if we can encash in open mkt $ 69,000 × ₹46 = ₹ 31,74,000

Opportunity gain

$= 31,74,000 \times \frac{10}{100} \times \frac{2}{12}$ ₹ 52,900

Likely sum at end of 2 months 32,26,900

Proceeds if we can encash by forward rate :

$ 69,000 × ₹47.00 32,43,000

It is better to encash the proceeds after 2 months and get opportunity gain.

TYK 12 *(PG NO 9.45)*

Z Ltd. importing goods worth USD 2 million, requires 90 days to make the payment. The overseas supplier has offered a 60 days interest free credit period and for additional credit for 30 days an interest of 8% per annum.

The bankers of Z Ltd offer a 30 days loan at 10% per annum and their quote for foreign exchange is as follows:

	₹
Spot 1 USD	56.50
60 days forward for 1 USD	57.10
90 days forward for 1 USD	57.50

You are required to evaluate the following options:

(i) Pay the supplier in 60 days, or

(ii) 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 for 1 USD	₹ 57.10
Payment Due	USD 20,00,000
Outflow in Rupees (USD 20,00,000 × ₹57.10)	₹1,14,200,000
Add: Interest on loan for 30 days@10% p.a.	₹ 9,51,667
Total Outflow in ₹	₹11,51,51,667

(ii) Availing supplier's offer of 90 days credit

Amount Payable	USD 20,00,000
Add: Interest on credit period for 30 days@8% p.a.	USD 13,333
Total Outflow in USD	USD 2,013,333
Applicable forward rate for 1 USD	₹57.50
Total Outflow in ₹ (USD 2,013,333 ×₹57.50)	₹1,15,766,648

Alternative 1 is better as it entails lower cash outflow.

TYK 13 *(PG NO 9.46)*

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 USD1,00,00,000. 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 ₹ from USD 1,00,00,000 At Mumbai 48.30 × 1,00,00,000 ₹48,30,00,000

(ii) Convert these ₹ to GBP at London $\left(\frac{₹\ 48{,}30{,}00{,}000}{₹\ 77.52}\right)$ GBP 62,30,650.155

(iii) Convert GBP to USD at New York GBP 6,230,650.155 × 1.6231 USD 1,01,12,968.26

There is net gain of USD 1,01,12,968.26 less USD 10,000,000 i.e. USD 1,12,968.26

TYK 14 *(PG NO 9.46)*

The US dollar is selling in India at ₹ 55.50. If the interest rate for 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

(i) Under the given circumstances, the USD is expected to quote at a premium in India as the interest rate is higher in India.

(ii) Calculation of the forward rate:

$$\frac{1+ R_h}{1+ R_f} = \frac{F_1}{E_0}$$

Where: R_h is home currency interest rate, R_f is foreign currency interest rate, F_1 is end of the period forward rate, and E_o is the spot rate.

Therefore $\frac{1\ +(0.10/2)}{1\ +(0.04/2)} = \frac{F_1}{55.50}$

$\frac{1\ + 0.05}{1\ + 0.02} = \frac{F_1}{55.50}$

or $\frac{1.05}{1.02} \times 55.50 = F_1$

$\frac{58.275}{1.02} = F_1$

or F_1 = ₹57.13

(iii) Rate of premium:

$\frac{57.13 - 55.50}{55.50} \times \frac{12}{6} \times 100$ = 5.87%

TYK 15 ***(PG NO 9.46)***

In March, 2009, the Multinational Industries make the following assessment of dollar rates per British pound to prevail as on 1.9.2009:

$/Pound	Probability
1.60	0.15
1.70	0.20
1.80	0.25
1.90	0.20
2.00	0.20

(i) What is the expected spot rate for 1.9.2009?

(ii) If, as of March, 2009, the 6-month forward rate is $ 1.80, should the firm sell forward its pound receivables due in September, 2009?

Solution

(i) Calculation of expected spot rate for September, 2009:

$ for £ (1)	Probability (2)	Expected $/£ (1) × (2) = (3)
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	0.40

	1.00	EV = 1.81

Therefore, the expected spot value of $ for £ for September, 2009 would be $ 1.81.

(ii) If the six-month forward rate is $ 1.80, the expected profits of the firm can be maximised by retaining its pounds receivable.

TYK 16 ***(PG NO 9.47)***

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 /₹		**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

USD/ ₹ on 3rd September	49.3800
Swap Point for October	0.1300
	49.5100
Add: Exchange Margin	0.0500
	49.5600
USD/ SGD on 3rd September	1.7058
Swap Point for 2nd month Forward	0.0096
	1.7154

Cross Rate for SGD/ ₹ of 30th October

USD/ ₹ selling rate = ₹ 49.5600

SGD/ ₹ buying rate = SGD 1.7154

SGD/ ₹ cross rate = ₹ 49.5600 / 1.7154 = ₹ 28.8912

TYK 17 ***(PG NO 9.47)***

A company operating in Japan has today effected sales to an Indian company, the payment being due 3 months from the date of invoice. The invoice amount is 108 lakhs yen. At today's spot rate, it is equivalent to ₹ 30 lakhs. It is anticipated that the exchange rate will decline by 10% over the 3 months period and in order to protect the yen payments, the importer proposes to take appropriate action in the foreign exchange market. The 3 months forward rate is presently quoted as 3.3 yen per rupee. You are required to calculate the expected loss and to show how it can be hedged by a forward contract.

Solution

Spot rate of ₹ 1 against yen = 108 lakhs yen/₹ 30 lakhs = 3.6 yen 3 months forward rate of

Re. 1 against yen = 3.3 yen

Anticipated decline in Exchange rate = 10%.

Expected spot rate after 3 months = 3.6 yen – 10% of 3.6 = 3.6 yen – 0.36 yen = 3.24 yen per rupee

	₹ (in lakhs)
Present cost of 108 lakhs yen	30.00
Cost after 3 months: 108 lakhs yen/ 3.24 yen	33.33
Expected exchange loss	3.33
If the expected exchange rate risk is hedged by a Forward contract:	
Present cost	30.00
Cost after 3 months if forward contract is taken 108 lakhs yen/ 3.3 yen	32.73
Expected loss	2.73

Suggestion: If the exchange rate risk is not covered with forward contract, the expected exchange loss is ₹ 3.33 lakhs. This could be reduced to ₹ 2.73 lakhs if it is covered with Forward contract. Hence, taking forward contract is suggested.

TYK 18 ***(PG NO 9.47)***

ABC Co. have taken a 6 month loan from their foreign collaborators for US Dollars 2 millions. Interest payable on maturity is at LIBOR plus 1.0%. Current 6-month LIBOR is 2%.

Enquiries regarding exchange rates with their bank elicits the following information:

Spot USD 1	₹ 48.5275
6 months forward	₹ 48.4575

(i) What would be their total commitment in Rupees, if they enter into a forward contract?

(ii) Will you advise them to do so? Explain giving reasons.

Solution

Firstly, the interest is calculated at 3% p.a. for 6 months. That is: USD 20,00,000 × 3/100 × 6/12 = USD 30,000

From the forward points quoted, it is seen that the second figure is less than the first, this means that the currency is quoted at a discount.

(i) The value of the total commitment in Indian rupees is calculated as below:

Principal Amount of loan	USD 20,00,000
Add: Interest	USD 30,000
Amount due	USD 20,30,000
Spot rate	₹ 48.5275
Forward Points (6 months)	(–) 0.0700
Forward Rate	₹ 48.4575
Value of Commitment	₹ 9,83,68,725

(ii) It is seen from the forward rates that the market expectation is that the dollar will depreciate. If the firm's own expectation is that the dollar will depreciate more than what the bank has quoted, it may be worthwhile not to cover forward and keep the exposure open.

If the firm has no specific view regarding future dollar price movements, it would be better to cover the exposure. This would freeze the total commitment and insulate the firm from undue market fluctuations. In other words, it will be advisable to cut the losses at this point of time.

Given the interest rate differentials and inflation rates between India and USA, it would be unwise to expect continuous depreciation of the dollar. The US Dollar is a stronger currency than the Indian Rupee based on past trends and it would be advisable to cover the exposure.

TYK 20 ***(PG NO 9.48)***

In International Monetary Market an international forward bid for December, 15 on pound sterling is $ 1.2816 at the same time that the price of IMM sterling future for delivery on December, 15 is $ 1.2806. The contract size of pound sterling is £ 62,500. How could the dealer use arbitrage in profit from this situation and how much profit is earned?

Solution

Buy £ 62,500 × 1.2806	= $ 80,037.50
Sell £ 62,500 × 1.2816	= $ 80,100.00
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 $ 62.5.

TYK 21 *(PG NO 9.48)*

An Indian importer has to settle an import bill for $ 1,30,000. The exporter has given the Indian exporter two options:

a. Pay immediately without any interest charges.

b. 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 (₹ /$) : 48.35 /48.36

3-Months forward rate (₹/$) : 48.81 /48.83

The importer seeks your advice. Give your advice.

Solution

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

	₹
Amount required to purchase $1,30,000[$1,30,000X₹48.36]	62,86,800
Add: Overdraft Interest for 3 months @15% p.a.	2,35,755
	65,22,555

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 to be paid in Indian Rupee after 3 month under the forward purchase contract

₹ 64,27,249 (US$ 131625 X ₹ 48.83)

Since outflow of cash is least in (ii) option, it should be opted for.

TYK 22 *(PG NO 9.48)*

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?

(i) Pay the supplier on 60th day and avail bank loan for 30 days.

(ii) 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 for 1 USD	₹ 63.15
Payment Due	USD 1 crore
Outflow in Rupees (USD 1 crore × ₹ 63.15)	₹ 63.15 crore
Add: Interest on loan for 30 days@9.5% p.a.	₹ 0.50 crore
Total Outflow in ₹	₹ 63.65 crore

(ii) Availing supplier's offer of 90 days credit

Amount Payable	USD 1.00000 crore
Add: Interest on credit period for 30 days@7.75% p.a.	USD 0.00646 crore
Total Outflow in USD	USD 1.00646 crore
Applicable forward rate for 1 USD	₹ 63.45
Total Outflow in ₹ (USD 1.00646 crore ×₹ 63.45)	₹ 63.86 crore

Alternative 1 is better as it entails lower cash outflow.

TYK 23 *(PG NO 9.48)*

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 $ = ₹ 65. It can purchase forward 1 $ at ₹ 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) ₹ 68 per US $.
(ii) ₹ 62 per US $.
(iii) ₹ 70 per US $.
(iv) ₹ 65 per US $.

Solution

	(₹)
Present Exchange Rate ₹65 = 1 US$	
If company purchases US$ 60,000 forward premium is	
60,000 × 64 × 2%	76,800
Interest on ₹76,800 for 6 months at 12%	4,608
Total hedging cost	81,408
If exchange rate is ₹68	
Then gain (₹68 – ₹64) for US$ 60,000	2,40,000
Less: Hedging cost	81,408
Net gain	1,58,592
If US$ = ₹62	
Then loss (₹64 – ₹62) for US$ 60,000	1,20,000
Add: Hedging Cost	81,408
Total Loss	2,01,408
If US$ = ₹70	
Then Gain (₹70 – ₹64) for US$ 60,000	3,60,000
Less: Hedging Cost	81,408
Total Gain	2,78,592
If US$ = ₹65	
Then Gain (₹ 65 – ₹ 64) for US$ 60,000	60,000
Less: Hedging Cost	81,408
Net Loss	21,408

TYK 24 *(PG NO 9.49)*

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	₹225	₹395	₹510
Export sale price per unit	Yen 650	US$10.23	Euro 11.99
Receipts from sale due in 90 days	Yen 78,00,000	US$1,02,300	Euro 95,920

Foreign exchange rate information:

	Yen/₹	US$/₹	Euro/₹
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

Advise AKC Ltd. by calculating average contribution to sales ratio whether it should hedge it's foreign currency risk or not.

Solution

If foreign exchange risk is hedged

				Total (₹)
Sum due	Yen 78,00,000	US$1,02,300	Euro 95,920	
Unit input price	Yen 650	US$10.23	Euro 11.99	
Unit sold	12,000	10,000	8,000	
Variable cost per unit	₹225/-	₹395/-	₹510/-	
Variable cost	₹27,00,000	₹ 39,50,000	₹ 40,80,000	₹ 1,07,30,000
Three months forward rate for selling	2.427	0.0216	0.0178	
Rupee value of receipts	₹32,13,844	₹ 47,36,111	₹ 53,88,764	₹ 1,33,38,719
Contribution	₹5,13,844	₹ 7,86,111	₹ 13,08,764	₹ 26,08,719
Average contribution to sale ratio				19.56%
If risk is not hedged				

Rupee value of receipt	₹31,72,021	₹ 47,44,898	₹ 53,58,659	₹ 1,32,75,578
Total contribution				₹ 25,45,578
Average contribution to sale ratio				19.17%

AKC Ltd. Is advised to hedge its foreign currency exchange risk.

TYK 25 ***(PG NO 9.49)***

EFD Ltd. is an export business house. The company prepares invoice in customers' currency. Its debtors of US$. 10,000,000 is due on April 1, 2015.

Market information as at January 1, 2015 is:

Exchange rates US$/INR		**Currency Futures US$/INR**	
Spot	0.016667	Contract size: ₹ 24,816,975	
1-month forward	0.016529	1-month	0.016519
3-months forward	0.016129	3-month	0.016118
	Initial Margin	**Interest rates in India**	
1-Month	₹ 17,500	6.5%	
3-Months	₹ 22,500	7%	

On April 1, 2015 the spot rate US$/INR is 0.016136 and currency future rate is 0.016134. Which of the following methods would be most advantageous to EFD Ltd?

a. Using forward contract
b. Using currency futures
c. Not hedging the currency risk

Solution

Receipts using a forward contract = $10,000,000/0.016129 = ₹ 6,20,001,240

Receipts using currency futures

The number of contracts needed is ($10,000,000/0.016118)/24,816,975 = 25

Initial margin payable is 25 contracts x ₹ 22,500 = ₹ 5,62,500

On April 1,2015Close at 0.016134		
Receipts = US$10,000,000/0.016136	=	₹ 619,732,276
Variation Margin =		
[(0.016134 – 0.016118) x 25 x 24,816,975/-]/0.016136		
OR (0.000016x 25 x 24,816,975)/.016136 = 9926.79/0.016136	=	₹ 615,195
Less: Interest Cost – ₹ 5,62,500x 0.07 x 3/12	=	₹ 9,844
Net Receipts		₹ 620,337,627

Receipts under different methods of hedging

Forward contract	₹ 620,001,240
Futures	₹ 620,337,627
No hedge (US$ 10,000,000/0.016136)	₹ 619,732,276

The most advantageous option would have been to hedge with futures.

TYK 26 ***(PG NO 9.50)***

Spot rate 1 US $ = ₹ 48.0123

180 days Forward rate for 1 US $ = ₹ 48.8190 Annualised interest rate for 6 months – Rupee =

12% Annualised interest rate for 6 months – US $ = 8%

Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow ₹ 40,00,000 or US $83,312.

Solution

Spot Rate = ₹40,00,000 /US$83,312 = 48.0123

Forward Premium on US$ = [(48.8190 – 48.0123)/48.0123] x 12/6 x 100

= 3.36%

Interest rate differential = 12% - 8%

= 4%

Since the negative Interest rate differential is greater than forward premium there is a possibility of arbitrage inflow into India.

The advantage of this situation can be taken in the following manner:

1. Borrow US$ 83,312 for 6 months

   Amount to be repaid after 6 months

   = US $ 83,312 (1+0.08 x 6/12) = US$86,644.48

2. Convert US$ 83,312 into Rupee and get the principal i.e.₹40,00,000

   Interest on Investments for 6 months – ₹40,00,000/- x 0.06 = ₹2,40,000/-

   Total amount at the end of 6 months = ₹(40,00,000 + 2,40,000) = ₹42,40,000/-

   Converting the same at the forward rate

   = ₹42,40,000/ ₹48.8190= US$ 86,851.43

Hence the gain is US $ (86,851.43 – 86,644.48) = US$ 206.95OR

₹10,103 i.e., ($206.95 x ₹48.8190)

TYK 27 *(PG NO 9.50)*

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 take the possible arbitrage gains?

Solution

In this case, DM is at a premium against the Can$.

Premium = [(0.67 – 0.665) /0.665] x (12/3) x 100 = 3.01 per cent

Interest rate differential = 9% - 7% = 2 per cent.

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

(i) Borrow Can$ 1,000 at 9 per cent for 3- months;

(ii) Change this sum into DM at the spot rate to obtain DM

= (1,000/0.665) = 1503.76

(iii) Place DM 1503.76 in the money market for 3 months to obtain a sum of

DM Principal:	1503.76
Add: Interest @ 7% for 3 months =	26.32
Total	1530.08

(iv) Sell DM at 3-months forward to obtain Can$= (1530.08x0.67) = 1025.15

(v) Refund the debt taken in Can$ with the interest due on it, i.e.,

	Can$
Principal	1,000.00
Add: Interest @9% for 3 months	22.50
Total	1022.50

Net arbitrage gain = 1025.15 – 1022.50 = Can$ 2.65

TYK 29 ***(PG NO 9.50)***

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

Identify: Foreign currency is an asset. Amount $ 3,50,000.

Create: $ Liability.

Borrow: In $. The borrowing rate is 9% per annum or 2.25% per quarter.

Amount to be borrowed: 3,50,000 / 1.0225 = $ 3,42,298.29

Convert: Sell $ and buy £. The relevant rate is the Ask rate, namely, 1.5905 per £,

(**Note:** This is an indirect quote). Amount of £s received on conversion is 2,15,214.27 (3,42,298.29/1.5905).

Invest: £ 2,15,214.27 will be invested at 5% for 3 months and get £ 2 ,17,904.45

Settle: The liability of $3,42,298.29 at interest of 2.25 per cent quarter matures to $3,50,000 receivable from customer.

Using forward rate, amount receivable is = 3,50,000 / 1.6140 = £2,16,852.54 Amount received

through money market hedge = £2,17,904.45

Gain = 2,17,904.45 – 2,16,852.54 = £1,051.91

So, money market hedge is beneficial for the exporter

TYK 32 ***(PG NO 9.51)***

An importer requests his bank to extend the forward contract for US$ 20,000 which is due for maturity on 30th October, 2010, for a further period of 3 months. He agrees to pay the required margin money for such extension of the contract.

Contracted Rate – US$ 1= ₹ 42.32

The US Dollar quoted on 30-10-2010:- Spot – 41.5000/41.5200
3 months' Premium -0.87% /0.93%

Margin money for buying and selling rate is 0.075% and 0.20% respectively. Compute:

(i) The cost to the importer in respect of the extension of the forward contract, and

(ii) The rate of new forward contract.

Solution

(i) The contract is to be cancelled on 30-10-2010 at the spot buying rate of US$ 1 = ₹ 41.5000

Less: Margin Money 0.075% = ₹ 0.0311

= ₹ 41.4689 or ₹ 41.47

US$ 20,000 @ ₹ 41.47 = ₹ 8,29,400

US$ 20,000 @ ₹ 42.32 = ₹ 8,46,400

The difference in favour of the Bank/Cost to the importer ₹ 17,000

(ii) The Rate of New Forward Contract

Spot Selling Rate US$ 1 = ₹ 41.5200

Add: Premium @ 0.93% = ₹ 0.3861

= ₹ 41.9061

Add: Margin Money 0.20% = ₹ 0.0838

= ₹ 41.9899 or ₹ 41.99

TYK 33 *(PG NO 9.51)*

XYZ, an Indian firm, will need to pay JAPANESE YEN (JY) 5,00,000 on 30th June. In order to hedge the risk involved in foreign currency transaction, the firm is considering two alternative methods i.e. forward market cover and currency option contract.

On 1st April, following quotations (JY/INR) are made available:

Spot	3 months forward
1.9516/1.9711.	1.9726./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

(i) Forward Cover

3-month Forward Rate = $\frac{1}{1.9726}$ = ₹ 0.5070/JY

Accordingly, INR required for JY 5,00,000 (5,00,000 X ₹ 0.5070) ₹ 2,53,500

(ii) Option Cover

To purchase JY 5,00,000, XYZ shall enter into a Put Option @ JY 2.125/INR

Accordingly, outflow in INR $\left(\frac{JY\ 5{,}00{,}000}{2.125}\right)$ ₹ 2,35,294

Premium $\frac{\text{INR } 2{,}35{,}294 \times 0.098}{1.9516}$	₹ 11,815
	₹ 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.

TYK 35 ***(PG NO 9.52)***

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% p.a. and cover risk forward for 3 months.

(ii) Settle now at a current spot rate and pay interest of the over draft for 3 months. The rates are as follows:

Mumbai ₹ /$ spot	:	60.25-60.55
3 months swap points	:	35/25

Solution

Option – I

$20 x 5,000 = $ 1,00,000

Repayment in 3 months time = $1,00,000 x (1 + 0.10/4) = $ 1,02,500

3- months outright forward rate = ₹ 59.90/ ₹ 60.30
Repayment obligation in ₹ ($1,02,500 X ₹ 60.30) = ₹ 61,80,750

Option –II

Overdraft ($1,00,000 x ₹ 60.55)	₹ 60,55,000
Interest on Overdraft (₹ 60,55,000 x 0.14/4)	₹ 2,11,925
	₹ 62,66,925

Option I should be preferred as it has lower outflow.

TYK 36 ***(PG NO 9.52)***

An American firm is under obligation to pay interests of Can$ 10,10,000 and Can$ 7,05,000 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 Months Forward
0.9284-0.9288	0.9301	0.9356

Price for a Can$ /US$ option on a U.S. stock exchange (cents per Can$, payable on purchase of the option, contract size Can$ 50,000) are as follows:

Strike Price	Calls		Puts	
(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. Transaction 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

Forward Market Cover

Hedge the risk by buying Can$ in 1 and 3 months time will be:

July - 10,10,000 X 0.9301 = US $ 9,39,401
Sept. - 7,05,000 X 0.9356 = US $ 6,59,598

Option Contracts

July Payment = 10,10,000/ 50,000 = 20.20

September Payment = 7,05,000/ 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	10,00,000	9,40,000	7,00,000	6,65,000

Balance bought at spot rate	10,000	9,301	5,000	4,678
Option Costs:				
Can $ 50,000 x 20 x 0.0102		10,200	---	
Can $ 50,000 x 14 x 0.0164	---			11,480
Total cost in US $ of using Option Contract		9,59,501		6,81,158

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.

TYK 37 ***(PG NO 9.53)***

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 €/£ average 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

Spot Rate	€ 1.1960 - €1.1970/£
6 months forward points	0.60 – 0.55 Euro Cents.
6 month further contract is currently trading at	€ 1.1943/£
6 month future contract size is	£62,500
After 6 month Spot rate and future rate	€ 1.1873/£

You are required to

(a) Calculate (to the nearest £) the £ receipt for Zaz plc, under each of 3 above proposals.

(b) 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 = $\frac{€\ 2.8\ \text{million}}{1.1965}$ = £ 2.340 million

(b) Proposal of Mr. Wilson

Forward Rate = €1.1970-0.0055 = 1.1915

Using Forward Market hedge Sterling receipt would be $\frac{€\ 2.8\ \text{million}}{1.1915}$ = £ 2.35 million

(c) Proposal of Ms. Karen

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

$= \frac{€\ 2.8\ \text{million}}{1.1943}$ = £ 23,44,470 (rounded off)

Number of Contracts = $\frac{£\ 23{,}44{,}470}{62{,}500}$ = 37 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 37 × £62,500 = £23,12,500

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

Total loss on Future Contracts = 37 × £62,500 × €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 = $\frac{€\ 27{,}83{,}812}{1.1873}$ = £ 2.3446 million

(ii) Proposal of option (b) is preferable because the option (a) & (c) produces least receipts. Further, in case of proposal (a) there must be a doubt as to whether this would be acceptable to German firm as it is described as a competitive market and Zaz is moving into it first time.

TYK 38 ***(PG NO 9.53)***

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.
USA:	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

£ Exposure

Since Columbus has a £ receipt (£ 138,000) and payment of (£ 480,000) maturing at the same time i.e. 3 months, it can match them against each other leaving a net liability of £ 342,000 to be hedged.

(i) Forward market hedge

Buy 3 months' forward contract accordingly, amount payable after 3 months will be

£ 342,000 / 0.9520 = US$ 359,244

(ii) Money market hedge

To pay £ after 3 months' Columbus shall requires to borrow in US$ and translate to £ and then deposit in £.

For payment of £ 3,42,000 in 3 months (@2.5% interest) amount required to be deposited now (£ 3,42,000 ÷ 1.025) = £ 3,33,658

With spot rate of 0.9830 the US$ loan needed will be = US$ 3,39,429

Loan repayable after 3 months (@3.25% interest) will be = US$ 3,50,460

In this case the money market hedge is a cheaper option.

€ Receipt

Amount to be hedged = € 5,90,000

(i) Forward market hedge

Sell 4 months' forward contract accordingly, amount receivable after 4 months will be (€ 5,90,000 x 1.9510) = US$ 11,51,090

(ii) Money market hedge

For money market hedge Columbus shall borrow in € and then translate to US$ and deposit in US$

For receipt of € 590,000 in 4 months (@ 5.33% interest) amount required to be borrowed now (€590,000 ÷ 1.0533) = € 5,60,144

With spot rate of 1.8890 the US$ deposit will be = US$ 10,58,113

Deposit amount will increase over 3 months (@3.83% interest) will be = US$ 10,98,639

In this case, more will be received in US$ under the forward hedge.

TYK 41 ***(PG NO 9.55)***

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 premium	0.55-0.60 Euro Cents
6 months future contract is currently trading at	€1.1760/£
6 months future contract size is	£62500
Spot rate and 6 months future rate	€1.1785/£

(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 $= \frac{€\ 4\ \text{million}}{1.1770}$ = £33,98,471

(b) Use of Forward Contract

Forward Rate = €1.1770+0.0055 = 1.1825

Using Forward Market hedge Sterling receipt would be $= \frac{€\ 4\ million}{1.1825}$ = £ 33,82,664

Use of Future Contract

The equivalent sterling of the order placed based on future price (€1.1760)

$= \frac{€\ 4.00\ \text{million}}{1.1760}$ = £ 34,01,360

Number of Contracts $= \frac{£\ 34,01,360}{62,500}$ = 54 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 54 × £62,500
= £33,75,000

Buy Future at	€1.1760
Sell Future at	€1.1785
	€0.0025

Total profit on Future Contracts = 54 × £62,500 × €0.0025 = € 8,438

After 6 months

Amount Received	€ 40,00,000
Add: Profit on Future Contracts	€ 8,438
	€ 40,08,438

Sterling Receipts

On sale of € at spot = $\frac{€\ 40,08,438}{1.1785}$ = € 34,01,305

(ii) Proposal of option (c) is preferable because the option (a) & (b) produces least receipts**.**

TYK 42 ***(PG NO 9.56)***

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 quarterly rests 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	₹ 100 = 340 yen
180 day's forward rate	₹ 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

Option I (To finance the purchases by availing loan at 18% per annum):

Cost of equipment	₹ in lakhs
3400 lakh yen at ₹100 = 340 yen	1,000.00
Add: Interest at 4.5% I Quarter	45.00
Add: Interest at 4.5% II Quarter (on ₹1,045 lakhs)	47.03
Total outflow in Rupees	1,092.03
Alternatively, interest may also be calculated on compounded basis, i.e., ₹1,000 × $[1.045]^2$	₹1,092.03

Option II (To accept the offer from foreign branch):

Cost of letter of credit	
At 1 % on 3,400 lakhs yen at ₹100 = 340 yen	₹ 10.00 lakhs
Add: Interest for 2 Quarters	₹ 0.90 lakhs
(A)	₹ 10.90 lakhs
Payment at the end of 180 days:	
Cost	3,400.00 lakhs yen
Interest at 2% p.a. [3,400 × 2/100 × 180/365]	33.53 lakhs yen
	3,433.53 lakhs yen
Conversion at ₹100 = 345 yen [3,433.53 / 345 ×100] (B)	₹ 995.23 lakhs
Total Cost: (A) + (B)	₹ 1,006.13 lakhs

Advise: Option 2 is cheaper by (1092.03 – 1006.13) lakh or ₹ 85.90 lakh. Hence, the offer may be accepted.

TYK 43 *(PG NO 9.56)*

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 ₹ 48.90.

The market rates for Rupee and Dollar 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

(A) To cover payable and receivable in forward Market

Amount payable after 3 months	$7,00,000
Forward Rate	₹ 48.45
Thus Payable Amount (₹) (A)	₹ 3,39,15,000
Amount receivable after 2 months	$ 4,50,000
Forward Rate	₹ 48.90
Thus Receivable Amount (₹) (B)	₹ 2,20,05,000
Interest @ 12% p.a. for 1 month (C)	₹ 2,20,050
Net Amount Payable in (₹) (A) – (B) – (C)	₹ 1,16,89,950

(B) Assuming that since the forward contract for receivable was already booked it shall be cancelled if we lag the receivables. Accordingly, any profit/ loss on cancellation of contract shall also be calculated and shall be adjusted as follows:

Amount Payable ($)	$7,00,000
Amount receivable after 3 months	$ 4,50,000
Net Amount payable	$2,50,000
Applicable Rate	₹ 48.45
Amount payable in (₹) (A)	₹ 1,21,12,500
Profit on cancellation of Forward cost (48.90 – 48.30) × 4,50,000 (B)	₹ 2,70,000
Thus, net amount payable in (₹) (A) + (B)	₹ 1,18,42,500

Since net payable amount is least in case of first option, hence the company should cover payable and receivables in forward market.

Note: In the question it has not been clearly mentioned that whether quotes given for 2 and 3 months (in points terms) are premium points or direct quotes. Although above solution is based on the assumption that these are direct quotes, but students can also consider them as premium points and solve the question accordingly.

TYK 44 *(PG NO 9.56)*

A customer with whom the Bank had entered into 3 months' forward purchase contract for Swiss Francs 10,000 at the rate of ₹ 27.25 comes to the bank after 2 months and requests cancellation of the contract. On this date, the rates, prevailing, are:

Spot	CHF 1 =	₹ 27.30	27.35
One month forward		₹ 27.45	27.52

What is the loss/gain to the customer on cancellation?

Solution

The contract would be cancelled at the one-month forward sale rate of ₹ 27.52.

	₹
Francs bought from customer under original forward contract at:	27.25
It is sold to him on cancellation at:	27.52
Net amount payable by customer per Franc	0.27

At ₹ 0.27 per Franc, exchange difference for CHF 10,000 is ₹ 2,700.

Loss to the Customer:

Exchange difference (Loss) ₹ 2,700

Note: The exchange commission and other service charges are ignored.

TYK 45 *(PG NO 9.57)*

A bank enters into a forward purchase TT covering an export bill for Swiss Francs 1,00,000 at ₹ 32.4000 due 25th April and covered itself for same delivery in the local inter bank market at ₹ 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 dollars as under:

Spot	USD 1 = Sw. Fcs.	1.5076/1.5120
One month forward		1.5150/ 1.5160
Two months forward		1.5250 / 1.5270
Three months forward		1.5415/ 1.5445

and in the interbank market US dollars were quoted as under:

Spot	USD 1 = ₹	49.4302/.4455
Spot / April		4100/.4200
Spot/May		.4300/.4400
Spot/June		.4500/.4600

Calculate the cancellation charges, payable by the customer if exchange margin required by the bank is 0.10% on buying and selling.

Solution

First the contract will be cancelled at TT Selling Rate

USD/ Rupee Spot Selling Rate	₹ 49.4455	
Add: Premium for April	₹ 0.4200	
	₹ 49.8655	
Add: Exchange Margin @ 0.10%	₹ 0.04987	
	₹ 49.91537	Or 49.9154
USD/ Sw. Fcs One Month Buying Rate	Sw. Fcs. 1.5150	
Sw. Fcs. Spot Selling Rate (₹49.91537/1.5150)	₹ 32.9474	
Rounded Off	₹ 32.9475	
Bank buys Sw. Fcs. Under original contract	₹ 32.4000	
Bank Sells under Cancellation	₹ 32.9475	
Difference payable by customer	₹ 00.5475	

Exchange difference of Sw. Fcs. 1,00,000 payable by customer ₹ 54,750

(Sw. Fcs. 1,00,000 x ₹ 0.5475)

TYK 46 ***(PG NO 9.57)***

Your forex dealer had entered into a cross currency deal and had sold US $ 10,00,000 against EURO at US $ 1 = EURO 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

The amount of EURO bought by selling US$

US$ 10,00,000 * EURO 1.4400 = EURO 14,40,000

The amount of EURO sold for buying USD 10,00,000 * 1.4450 = EURO 14,45,000

Net Loss in the Transaction = EURO 5,000

To acquire EURO 5,000 from the market @

(a) USD 1 = EURO 1.4400 &
(b) USD1 = INR 31.4500

Cross Currency buying rate of EUR/INR is ₹ 31.4500 / 1.440 i.e. ₹ 21.8403

Loss in the Transaction ₹ 21.8403 * 5000 = ₹ 1,09,201.50

Alternatively, if delivery to be affected then computation of loss shall be as follows:

EURO to be surrendered to acquire $ 10,00,000 = EURO 14,45,000

EURO to be received after selling $ 10,00,000 = EURO 14,40,000

Loss = EURO 5,000

To acquire EURO 5,000 from market @

US $ 1 = EURO 1.4400

US $ 1 = INR 31.45

Cross Currency = $\frac{31.45}{1.440}$ = ₹ 21.8403

Loss in Transaction (21.8403 x EURO 5,000) = ₹ 1,09,201.50

TYK 47 *(PG NO 9.58)*

You have following quotes from Bank A and Bank B:

	Bank A	Bank B
SPOT	USD/CHF 1.4650/55	USD/CHF 1.4653/60
3 months	5/10	
6 months	10/15	
SPOT	GBP/USD 1.7645/60	GBP/USD 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 GBP/CHF what are the Implied Swap points for Spot over 3 months?

Solution

(i) To Buy 1 Million GBP Spot against CHF

1. First to Buy USD against CHF at the cheaper rate i.e. from Bank A. 1 USD = CHF 1.4655
2. Then to Buy GBP against USD at a cheaper rate i.e. from Bank B 1 GBP = USD 1.7650

By applying chain rule Buying rate would be

1 GBP = 1.7650 * 1.4655 CHF

1 GBP = CHF 2.5866

Amount payable CHF 2.5866 Million or CHF 25,86,600

(ii) Spot rate Bid rate GBP 1 = CHF 1.4650 * 1.7645 = CHF 2.5850

Offer rate GBP 1 = CHF 1.4655 * 1.7660 = CHF 2.5881

GBP / USD 3 months swap points are at discount

Outright 3 Months forward rate GBP 1 = USD 1.7620 / 1.7640

USD / CHF 3 months swap points are at premium

Outright 3 Months forward rate USD 1 = CHF 1.4655 / 1.4665

Hence

Outright 3 Months forward rate GBP 1 = CHF 2.5822 / 2.5869

Spot rate GBP 1 = CHF 2.5850 / 2.5881

Therefore 3-month swap points are at discount of 28/12.

TYK 48 *(PG NO 9.58)*

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 unit. The cost of imported components is S$ 800 per unit. The fixed cost and other variables cost per unit are ₹ 1,000 and ₹ 1,500 respectively. The cash flows in Foreign currencies are due in six months. The current exchange rates are as follows:

₹/Euro	51.50/55
₹/S$	27.20/25

After six months the exchange rates turn out as follows:

₹/Euro	52.00/05
₹/S$	27.70/75

(A) You are required to calculate loss/gain due to transaction exposure.

(B) Based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of air conditioners is ₹ 25,000 :

(i) the current exchange rate changes to

₹/Euro	51.75/80
₹/S$	27.10/15

(ii) Price elasticity of demand is estimated to be 1.5

(iii) Payments and receipts are to be settled at the end of six months.

Solution

(i) Profit at current exchange rates

2400 [€ 500 × ₹ 51.50 – (S$ 800 × ₹ 27.25 + ₹ 1,000 + ₹ 1,500)]

2400 [₹ 25,750 - ₹ 24,300] = ₹ 34,80,000

Profit after change in exchange rates

2400[€500× ₹ 52 – (S$ 800 × ₹ 27.75 + ₹ 1000 + ₹ 1500)]

2400[₹ 26,000 - ₹ 24,700] = ₹ 31,20,000

LOSS DUE TO TRANSACTION EXPOSURE

₹ 34,80,000 – ₹ 31,20,000 = ₹ 3,60,000

(ii) Profit based on new exchange rates

2400[₹ 25,000 - (800 × ₹ 27.15 + ₹ 1,000 + ₹ 1,500)]

2400[₹ 25,000 - ₹ 24,220] = ₹ 18,72,000

Profit after change in exchange rates at the end of six months

2400 [₹ 25,000 - (800 × ₹ 27.75 + ₹ 1,000 + ₹ 1,500)]

2400 [₹. 25,000 - ₹ 24,700] = ₹ 7,20,000

Decline in profit due to transaction exposure

₹ 18,72,000 - ₹ 7,20,000 = ₹ 11,52,000

Current price of each unit in € = $\frac{₹\ 25{,}000}{₹\ 51.50}$ = € 485.44

Price after change in Exch. Rate = $\frac{₹\ 25{,}000}{₹\ 51.75}$ = € 483.09

Change in Price due to change in Exch. Rate

€ 485.44 - € 483.09 = € 2.35 or (-) 0.48%

Price elasticity of demand = 1.5

Increase in demand due to fall in price 0.48 × 1.5 = 0.72%

Size of increased order = 2,400 ×1.0072 = 2,417 units

Profit = 2417 [₹ 25,000 – (800 × ₹ 27.75 + ₹ 1,000 + ₹ 1,500)]

= 2417 [₹ 25,000 - ₹ 24,700] = ₹ 7,25,100

Therefore, decrease in profit due to operating exposure ₹ 18,72,000 – ₹ 7,25,100 = ₹ 11,46,900

Alternatively, if it is assumed that Fixed Cost shall not be changed with change in units then answer will be as follows:

Fixed Cost = 2,400 [₹ 1,000] = ₹ 24,00,000

Profit = 2,417 [₹ 25,000 – (800 × ₹ 27.75 + ₹ 1,500)] – ₹ 24,00,000

= 2,417 (₹ 1,300) – ₹ 24,00,000 = ₹ 7,42,100

Therefore, decrease in profit due to operating exposure ₹ 18,72,000 – ₹ 7,42,100 = ₹ 11,29,900

TYK 49 ***(PG NO 9.59)***

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.

***** Due to conservative outlook.

TYK 50 ***(PG NO 9.59)***

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 ₹ 500 crore. The oil field along with equipments will be sold to Indian Government for ₹ 740 crore in one year time. Since the Indian Government will pay for the amount in Indian Rupee (₹) 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$ = ₹ 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$ = ₹ 54. Further you may also assume that the Drilldip can also take a US$ loan at 8% p.a.

Solution

(a) The following swap arrangement 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 ₹ 500 crore at spot rate of 1US$ = ₹ 50	(100.00)	---
Swap ₹ 500 crore back at agreed rate of ₹ 50	----	100.00
Sell ₹ 240 crore at 1US$ = ₹ 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 ₹ 500 crore at spot rate of 1US$ = ₹ 50	(100.00)	----
Sell ₹ 740 crore at 1US$ = ₹ 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.

TYK 51 ***(PG NO 9.60)***

You as a dealer in foreign exchange have the following position in Swiss Francs on 31st October, 2009:

	Swiss Francs
Balance in the Nostro A/c Credit	1,00,000
Opening Position Overbought	50,000
Purchased a bill on Zurich	80,000
Sold forward TT	60,000
Forward purchase contract cancelled	30,000
Remitted by TT	75,000
Draft on Zurich cancelled	30,000

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:

Particulars	Purchase Sw. Fcs.	Sale Sw. Fcs.
Opening Balance Overbought	50,000	
Bill on Zurich	80,000	
Forward Sales – TT		60,000
Cancellation of Forward Contract		30,000
TT Sales		75,000
Draft on Zurich cancelled	30,000	—
	1,60,000	1,65,000
Closing Balance Oversold	5,000	—
	1,65,000	1,65,000

Cash Position (Nostro A/c)

	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.

INTERNATIONAL FINANCIAL MANAGEMENT

TYK 1 *(PG NO 10.28)*

ABC Ltd. is considering a project in US, which will involve an initial investment of US $ 1,10,00,000. The project will have 5 years of life. Current spot exchange rate is ₹ 48 per US $. The risk free rate in US is 8% and the same in India is 12%. Cash inflow from the project is as follows:

Year	Cash inflow
1	US $ 20,00,000
2	US $ 25,00,000
3	US $ 30,00,000
4	US $ 40,00,000
5	US $ 50,00,000

Calculate the NPV of the project using foreign currency approach. Required rate of return on this project is 14%.

Solution

(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	2.00	0.910	1.820
2	2.50	0.828	2.070
3	3.00	0.753	2.259
4	4.00	0.686	2.744
5	5.00	0.624	3.120
			12.013
		Less: Investment	11.000
		NPV	1.013

Therefore, Rupee NPV of the project is = ₹ (48 x 1.013) Million= ₹48.624 Million

TYK 2 ***(PG NO 10.29)***

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	₹ 15,00,000
Man power cost (80 software professional will be working for 10 hours each day)	₹ 400 per man hour
Administrative and other costs	₹ 12,00,000

Advise the US Company on the financial viability of the project. The rupee-dollar rate is ₹48/$.

Note: Assume 365 days a year.

Solution

Proforma profit and loss account of the Indian software development unit

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
Earnings before tax		36,05,00,000
Less: Tax		10,81,50,000
Earnings after tax		25,23,50,000
Less: Withholding tax(TDS)		2,52,35,000
Repatriation amount (in rupees)		22,71,15,000
Repatriation amount (in dollars)		$4.7 million

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.

Alternatively, if is assumed that since foreign subsidiary has paid taxes it will not pay withholding taxes then solution will be as under:

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
Earnings before tax		36,05,00,000
Less: Tax		10,81,50,000
Earnings after tax		25,23,50,000
Repatriation amount (in rupees)		25,23,50,000
Repatriation amount (in dollars)		$ 5,257,292

Advise: The cost of development software in India for the US based company is $4.743 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.

Alternatively, if it assumed that first the withholding tax @ 10% is being paid and then its credit is taken in the payment of corporate tax then solution will be as follows:

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
Earnings before tax		36,05,00,000
Less: Withholding Tax		3,60,50,000
Earnings after Withholding tax @ 10%		32,44,50,000
Less: Corporation Tax net of Withholding Tax		7,21,00,000
Repatriation amount (in rupees)		25,23,50,000
Repatriation amount (in dollars)		$ 5,257,292

Advise: The cost of development software in India for the US based company is $4.743 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.

TYK 3 ***(PG NO 10.29)***

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**
Cashflows in Indian ₹ (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 ₹ 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	1.331
Inflation factor in Africa	1.00	1.40	1.96	2.744
Exchange Rate (as per IRP)	6.00	7.6364	9.7190	12.3696
Cash Flows in ₹ '000				

Real	-50,000	-1,500	-2,000	-2,500
Nominal (1)	-50,000	-1,650	-2,420	-3,327.50
Cash Flows in African Rand '000				
Real	-2,00,000	50,000	70,000	90,000
Nominal	-2,00,000	70,000	1,37,200	2,46,960
In Indian ₹ '000 (2)	-33,333	9,167	14,117	19,965
Net Cash Flow in ₹ '000 (1)+(2)	-83,333	7,517	11,697	16,637
PVF@20%	1	0.833	0.694	0.579
PV	-83,333	6,262	8,118	9,633

NPV of 3 years = -59,320 (₹ '000)

NPV of Terminal Value = $\frac{16,637}{0.20} \times 0.579$ = 48,164 (₹ '000)

Total NPV of the Project = - 59,320 (₹ '000) + 48,164 (₹ '000) = - 11,156 (₹ '000)

TYK 4 ***(PG NO 10.30)***

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 ($500Million/5)	100.00
EBIT	170.00
Taxes@35%	59.50
EAT	110.50
Add: Depreciation	100.00
CFAT (1-5 years)	210.50

(b) Cash flow at the end of the 5 years (Release of Working Capital) 35.00

(c) 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

(d) 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

lll. 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.

TYK 5 ***(PG NO 10.31)***

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 competit ion. 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 (₹) and Nepalese Currency (NC) cash flows in Nominal terms for this proposal is shown below:

Year	**Net Cash Flow (in millions)**			
	0	**1**	**2**	**3**
NC	-25.000	2.600	3.800	4.100
Indian (₹)	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 (₹) 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 ₹ 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 ₹ 1 @9%.

	Present Value	**Future Value**
Year 1	0.917	1.188
Year 2	0.842	1.090
Year 3	0.772	1

Solution
Working Notes:

(i) Computation of Forward Rates

End of Year		**NCI₹**
1	$\text{NCI } 1.60 \times \left(\frac{(1+0.09)}{(1+0.08)}\right)$	1.615
2	$\text{NCI } 1.615 \times \left(\frac{(1+0.09)}{(1+0.08)}\right)$	1.630
3	$\text{NCI } 1.630 \times \left(\frac{(1+0.09)}{(1+0.08)}\right)$	1.645

(ii) NC Cash Flows converted in Indian Rupees

Year	NC (Million)	Conversion Rate	₹ (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 Value (₹ Million)

Year	**Cash Flow in India**	**Cash Flow in Nepal**	**Total**	**PVF @ 9%**	**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 (₹ Million)	-15.625	4.479	6.53	7.09
Year 1 Cash Inflow reinvested for 2 years (1.188 x 4.479)				5.32
Year 2 Cash Inflow reinvested for 1 years (1.090 x 6.53)				7.12
				19.53

MIRR = $\sqrt[n]{\frac{\text{Terminal Cash Flow}}{\text{Initial Outlay}}} - 1 = \sqrt[3]{\frac{19.53}{15.625}} - 1 = 0.0772$ say 7.72%

INTEREST RATE RISK MANAGEMENT

TYK 2 ***(PG NO 11.15)***

TM Fincorp has bought a 6 x 9 ₹ 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 shall be calculated by using the following formula:

$$\frac{N(RR - FR)(dtm/360)}{1 + RR(dtm/360)}$$

Where

N = Notional Principal Amount

RR = Reference Rate

FR = Agreed upon Forward Rate

Dtm = FRA period specified in days.

Accordingly:

$$\frac{100\ crore(5.50\% - 5.25\%)(92^*/360)}{1+0.055(92^*/360)} = ₹\ 6,30,032$$

Hence there is profit of ₹ 6,30,032 to TM Fincorp.

* Alternatively, it can also be taken as 90 days.

TYK 3 *(PG NO 11.15)*

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:

$$P = \frac{rp}{\left[(1 \div i) - \frac{1}{i \times (1+i)^t}\right]} \times A \text{ or } \frac{rp}{PVAF\ (3.5\%,4)} \times A$$

Where

P = Premium

A = Principal Amount

rp = Rate of Premium

i = Fixed Rate of Interest

t = Time

$$= \frac{0.01}{\left[(1/0.035) - \frac{1}{0.035\ + 1.035^4}\right]} \times £\ 1{,}50{,}00{,}000 \text{ or } \frac{0.01}{(0.966 + 0.933 + 0.901 + 0.871)} \times £\ 1{,}50{,}00{,}000$$

$$= \frac{0.01}{\left[(28.5714) - \frac{1}{0.04016}\right]} \times £\ 1{,}50{,}00{,}000 \text{ or } \frac{£\ 1{,}50{,}00{,}000}{3.671} = £\ 40.861$$

Please note above solution has been worked out on the basis of four decimal points at each stage.

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 Amt. received from bank
1	£ 75,000	£ 75,000	£ 40,861	£34,139
2	£ 112,500	£ 112,500	£ 40,861	£71,639
3	£ 150,000	£ 150,000	£ 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.

Note: It may be possible that student may compute upto three decimal points or may use different basis. In such case their answer is likely to be different.

TYK 4 ***(PG NO 11.15)***

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 ₹ 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

= (N) (AIC) (Period)

Where N = Notional Principal amount = ₹5,00,000

AIC = All-in-cost = 8% = 0.08

$$= 5,00,000 \times 0.08 \left(\frac{180}{360}\right)$$

= 5,00,000 × 0.08 (0.5)

= 5,00,000 × 0.04 = ₹20,000/-

(ii) Floating Rate Payment

= N (LIBOR) $\left(\frac{dt}{360}\right)$

= 5,00,000 × 0.06 ×$\left(\frac{181}{360}\right)$

= 5,00,000 × 0.06 (0.503) or 5,00,000 × 0.06 (0.502777)

= 5,00,000 × 0.03018 or 0.30166 = ₹15,090 or 15,083

Both are correct

(iii) Net Amount

= (i) – (ii)

= ₹20,000 – ₹15,090 = ₹4,910

or = ₹20,000 – ₹15,083 = ₹4,917

TYK 6 ***(PG NO 11.16)***

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	**Receipt**	**Payment**	**Net**
Interest to be remitted to B. Inc in $ 2,00,000x9%=$18,000 Converted into ($18,000x¥120)		¥21,60,00	
Interest to be received from B. Inc in $ converted into ¥ (6%x$2,00,000 x ¥120)	¥14,40,00	-	
Interest payable on ¥ 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	**Receipt**	**Payment**	**Net**
Interest to be remitted to A. Inc in ($ 2,00,000 x 6%)		$12,000	
Interest to be received from A. Inc in ¥ 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	
¥ equivalent paid $14,000 X ¥120			¥16,80,000
Interest payable without swap in ¥($2,00,000X¥120X8%)			¥19,20,000
Opportunity gain in ¥			¥ 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	¥240,00,000X5%	¥12,00,000
Interest Receipt from B Inc.	¥2,00,000X120X6%	¥14,40,000
Net Saving (in $)	¥2,40,000/¥120	$2,000
Interest to B Inc.	$2,00,000X9%	-$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	$2,00,000X¥120	+ $2,00,000
Swap		- $2,00,000
Swap		+¥240,00,000
Net Amount		+¥240,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	$2,00,000X10%	- $20,000
Interest Receipt from A Inc.		+$18,000
Net Saving (in ¥)	-$2,000X¥120	- ¥2,40,000
Interest to A Inc.	$2,00,000X6%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%.

TYK 7 ***(PG NO 11.16)***

A textile manufacturer has taken floating interest rate loan of ₹ 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 1 st 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 9.0% and 8.25%. Show how the settlement will be executed on the perspective interest due dates.

Solution

As borrower does not want to pay more than 8.5% p.a., on this loan where the rate of interest is likely to rise beyond this, hence, he has hedge the risk by entering into an agreement to buy interest rate caps with the following parameters:

- National Principal: ₹40,00,000/-
- Strike rate: 8.5% p.a.
- Reference rate: the rate of interest applicable to this loan
- Calculation and settlement date: 31st March every year
- Duration of the caps: till 31st March 2016
- Premium for caps: negotiable between both the parties

To purchase the caps this borrower is required to pay the premium upfront at the time of buying caps. The payment of such premium will entitle him with right to receive the compensation from the seller of the caps as soon as the rate of interest on this loan rises above 8.5%. The compensation will be at the rate of the difference between the rate of none of the cases the cost of this loan will rise above 8.5% calculated on ₹ 40,00,000/-. This implies that in none of the cases the cost of this loan will rise above 8.5%. This hedging benefit is received at the respective interest due dates at the cost of premium to be paid only once**.**

The premium to be paid on 1st October 2012 is **30,000/-** (₹ 40,00,000 x 0.75/100). The payment of this premium will entitle the buyer of the caps to receive the compensation from the seller of the caps whereas the buyer will not have obligation. The compensation received by the buyer of caps will be as follows:

On 31st March 2013

The buyer of the caps will receive the compensation at the rate of 1.70% (10.20 - 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 68000/- (40,00,000 x 1.70/100).

On 31st March 2014

The buyer of the caps will receive the compensation at the rate of 3.00% (11.50 – 8.50) to be calculated on ₹ 40,00,000/-, the amount of compensation will be ₹ 120000/- (40,00,000 x 3.00/100).

On 31st March 2015

The buyer of the caps will receive the compensation at the rate of 0.75% (9.25 – 8.50) to be calculated on ₹ 40,00,000/-, the amount of compensation will be ₹ 30,000 (40,00,000 x 0.75/100).

On 31st March 2016

The buyer of the caps will not receive the compensation as the actual rate of interest is 8.25% whereas strike rate of caps is 8.5%. Hence, his interest liability shall not exceed 8.50%.

Thus, by paying the premium upfront buyer of the caps gets the compensation on the respective interest due dates without any obligations.

CORPORATE VALUATION

Illustration 2 ***(PG NO 12.16)***

A Ltd. made a Gross Profit of ₹ 10,00,000 and incurred Indirect Expenses of ₹ 4,00,000. The number of issued Equity Shares is 1,00,000. The company has a Debt of ₹ 3,00,000 and Reserves & Surplus to the tune of ₹ 5,00,000. The market related details are as follows:

Risk Free Rate of Return	4.5%
Market Rate of Return	12%
β of the Company	0.9

Determine:

(a) Per Share Earning Value of the Company.

(b) Equity Value of the company if applicable EBITDA multiple is 5.

Solution

(a) Capitalization Rate using CAPM

4.5% + 0.9(12% - 4.5%) = 11.25%

Calculation of Earning Value Per Share

	(₹ 000)
Gross Profit	1,000
Less: Indirect Expenses	(400)
EBITDA	600
Earning Value of Company (600/ 0.1125)	5,333.33
Number of Shares	1,00,000
Earning Value Per Share	₹ 53.33

(b) Equity Value of Company

	(₹ 000)
EBITDA	600
EBITDA Multiple	5
Capitalized Value	3,000
Less: Debt	(300)
Add: Surplus Funds	500
Equity Value (Enterprise Value)	3,200

Now let us see how EV can be arrived at using Balance Sheet approach in the following illustration.

Illustration 3 ***(PG NO 12.17)***

The balance sheet of H K Ltd. is as follows:

	₹ 000
Non-Current Assets	1,000
Current Assets	
Trade Receivables	500
Cash and cash equivalents	500
	2,000
Shareholders' funds	800
Long Term Debt	200
Current Liabilities and Provisions	1,000
	2,000

The shares are actively traded and the Current Market Price (CMP) is ₹ 12 per share. Shareholder funds represent 70,000 shares of ₹ 10 each and rest is retained earnings. Calculate the Enterprise Value of HK Ltd.

Solution

Shares outstanding	70,000
CMP	₹ 12
Market Capitalization	₹ 8,40,000
Add: Debt	₹ 2,00,000
Less: Cash & Cash equivalents	(₹ 5,00,000)
Enterprise Value (EV)	**₹ 5,40,000**

Illustration 4 ***(PG NO 12.20)***

Using the chop-shop approach (or Break-up value approach), assign a value for Cornett GMBH. whose stock is currently trading at a total market price of €4 million. For Cornett, the accounting data set forth in three business segments: consumer wholesaling, specialty services, and assorted centers. Data for the firm's three segments are as follows:

Business segment	**Segment sales**	**Segment assets**	**Segment income**
Consumer wholesaling	€15,00,000	€ 7,50,000	€1,00,000
Specialty services	€8,00,000	€7,00,000	€1,50,000
Assorted centers	€2,000,000	€3,000,000	€6,00,000

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

Business segment	Capitalization/ sales	Capitalization/ assets	Capitalization / operating income
Consumer wholesaling	0.75	0.60	10.00
Specialty services	1.10	0.90	7.00
Assorted centers	1.00	0.60	6.00

Solution

Cornett, GMBH. – Break-up valuation

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	0.75	€15,00,000	€11,25,000
Specialty services	1.10	€8,00,000	€8,80,000
Assorted centers	1.00	€20,00,000	€20,00,000
Total value			€4,005,000

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	0.60	€7,50,000	€4,50,000
Specialty services	0.90	€7,00,000	€6,30,000
Assorted centers	0.60	€30,00,000	€18,00,000
Total value			€28,80,000

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	10.00	€100,000	€1,000,000
Specialty services	7.00	€150,000	€1,050,000
Assorted centers	6.00	€600,000	€3,600,000
Total value			€5,650,000

Average theoretical value = $\frac{40,05,000 + 28,80,000 + 56,50,000}{3}$ = 41,78,333.33 say 41,78,000

Average theoretical value of Cornett GMBH. = € 41,78,000

TYK 3 *(PG NO 12.29)*

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	₹
Sales	20,000
Gross margin (20%)	4,000
Administration, Selling & distribution expense (10%)	2,000
PBT	2,000
Tax (30%)	600
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. From 4^{th} year onward it will stabilize. 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 assets 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.

Solution

Projected Balance Sheet

	Year 1	Year 2	Year 3	Year 4
Fixed Assets (40% of Sales)	9,600	11,520	13,824	13,824
Current Assets (20% of Sales)	4,800	5,760	6,912	6,912
Total Assets	14,400	17,280	20,736	20,736
Equity	14,400	17,280	20,736	20,736

Projected Cash Flows:-

	Year 1	Year 2	Year 3	Year 4
Sales	24,000	28,800	34,560	34,560

PBT (10% of sale)	2,400	2,880	3,456	3,456
PAT (70%)	1,680	2,016	2,419.20	2,419.20
Depreciation	800	960	1,152	1,382
Addition to Fixed Assets	2,400	2,880	3,456	1,382
Increase in Current Assets	800	960	1,152	-
Operating cash flow (FCFF)	(720)	(864)	(1,036.80)	2,419.20

Projected Cash Flows:-

Present value of Projected Cash Flows:-

Cash Flows	**PVF at 15%**	**PV**
-720	0.870	-626.40
-864	0.756	-653.18
-1,036.80	0.658	-682.21
		-1,961.79

Residual Value - 2419.20/0.15 = 16,128

Present value of Residual value = $16128/(1.15)^3$

= 16128/1.521 = 10603.55

Total shareholders' value = 10,603.55 – 1,961.79 = 8,641.76

Pre strategy value = 1,400 / 0.15 = 9,333.33

∴ Value of strategy = 8,641.76 – 9,333.33 = – 691.57

Conclusion: The strategy is not financially viable

TYK 5 ***(PG NO 12.30)***

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 ₹ 10 each. The highest and the lowest market quotation during the last 6 months were ₹ 570 and ₹ 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:

	₹ lakhs
Sources	

Share Capital	
20 lakhs equity shares of ₹10 each fully paid	200
10 lakhs equity shares of ₹10 each, ₹5 paid	50
Loans	100
Total	350
Uses	
Fixed Assets (Net)	150
Net Current Assets	200
	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	₹ lakhs
31.3.07	after tax earnings for equity	105
31.3.08	do	120
31.3.09	Do	125
31.3.10	Do	120
31.3.11	Do	100
	Terminal Value estimate	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

= (₹ 570 + ₹ 430)/2 = ₹ 500

Value of XY Ltd based on future cash flow capitalization (105x0.93)+(120x0.86)+(125x0.79)+(120x0.74)x(300x 0.68)	₹ lakhs	592.40
Value of XY Ltd based on net assets	₹ lakhs	250.00
Average value (592.40+250)/2		421.20

No. of shares in AB Ltd to be issued ₹ 4,21,20,000/500	Nos.	84,240
Basis of allocation of shares		
Fully paid equivalent shares in XY Ltd. (20+5) lakhs		25,00,000
Distribution to fully paid shareholders 84,240x20/25		67,392
Distribution to partly paid shareholders 84,240-67,392		16,848

TYK 7 ***(PG NO 12.32)***

Following information 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	- ₹ 2,000 crores
EBIT	- ₹ 300 crores
Capital expenditure	- ₹ 280 crores
Depreciation	- ₹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

High growth phase :

k_e = 0.10 + 1.15 x 0.06 = 0.169 or 16.9%.

k_d = 0.13 x (1-0.3) = 0.091 or 9.1%.

Cost of capital = 0.5 x 0.169 + 0.5 x 0.091 = 0.13 or 13%.

Stable growth phase :

k_e = 0.09 + 1.0 x 0.05 = 0.14 or 14%.

k_d = 0.1286 x (1 - 0.3) = 0.09 or 9%.

Cost of capital = 0.6 x 0.14 + 0.4 x 0.09 = 0.12 or 12%.

Determination of forecasted Free Cash Flow of the Firm (FCFF)

(₹ in crores)

	Yr. 1	Yr. 2	Yr 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Capital Expenditure	96	115.20	138.24	165.89	-
Less Depreciation					
∆ Working Capital	100.00	120.00	144.00	172.80	103.68
Free Cash Flow (FCF)	56.00	67.20	80.64	96.77	375.32

Alternatively, it can also be computed as follows:

(₹ in crores)

	Yr. 1	Yr. 2	Yr 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Add: Depreciation	240	288	345.60	414.72	456.19
	492	590.40	708.48	850.18	935.19
Less: Capital Exp.	336	403.20	483.84	580.61	456.19
∆ WC	100.00	120.00	144.00	172.80	103.68
	56.00	67.20	80.64	96.77	375.32

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 13%	PV (₹ in crores)
56.00	0.885	49.56
67.20	0.783	52.62
80.64	0.693	55.88
96.77	0.613	59.32

		₹ 217.38

Terminal Value of Cash Flow

$\frac{375.32}{0.12-0.10}$ = ₹ 18,766.00 Crores

PV of the terminal, value is:

₹ 18,766.00Crores x $\frac{1}{(1.13)^4}$ = ₹ 18,766.00 Crores x 0.613 = ₹ 11,503.56 Crores

The value of the firm is :

₹ 217.38 Crores + ₹ 11,503.56 Crores = ₹ 11,720.94 Crores

TYK 8 ***(PG NO 12.32)***

Following information is given in respect of WXY Ltd., which is expected to grow at a rat e 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	₹ 7,500 Crores
Cost of Goods Sold (COGS)	₹ 3,000 Crores
Operating Expenses	₹ 2,250 Crores
Capital Expenditure	₹ 750 Crores
Depreciation (included in Operating Expenses)	₹ 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	t_1	t_2	t_3
PVIF	0.8696	0.7561	0.6575

Solution

Determination of forecasted Free Cash Flow of the Firm (FCFF)

(₹ in crores)

	Yr. 1	**Yr. 2**	**Yr 3**	**Terminal Year**
Revenue	9,000.00	10,800.00	12,960.00	13,996.80
COGS	3,600.00	4,320.00	5,184.00	5,598.72
Operating Expenses	1,980.00*	2,376.00	2,851.20	3,079.30
Depreciation	720.00	864.00	1,036.80	1,119.74
EBIT	2,700.00	3,240.00	3,888.00	4,199.04
Tax @30%	810.00	972.00	1,166.40	1,259.71
EAT	1,890.00	2,268.00	2,721.60	2,939.33
Capital Exp. – Dep.	172.50	198.38	228.13	-
∆ Working Capital	375.00	450.00	540.00	259.20
Free Cash Flow (FCF)	1,342.50	1,619.62	1,953.47	2,680.13

* Excluding Depreciation.

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	**PVF @ 15%**	**PV (₹ in crores)**
1342.50	0.8696	1167.44
1619.62	0.7561	1224.59
1953.47	0.6575	1284.41
		3676.44

PV of the terminal, value is:

$$\frac{2{,}680.13}{0.15 - 0.08} \times \frac{1}{(1.15)^3} = ₹\ 38{,}287 \times 0.6575 = ₹\ 25{,}174.08 \text{ Crores}$$

The value of the firm is :

₹ 3676.44 Crores + ₹ 25174.08 Crores = ₹ 28,850.52 Crores

TYK 9 *(PG NO 12.33)*

With the help of the following information of Jatayu Limited compute the Economic Value Added:

Capital Structure	Equity capital ₹ 160 Lakhs Reserves and Surplus ₹ 140 lakhs 10% Debentures ₹ 400 lakhs
Cost of equity	14%
Financial Leverage	1.5 times
Income Tax Rate	30%

Solution

Financial Leverage = PBIT/PBT

1.5 = PBIT / (PBIT – Interest)

1.5 = PBIT / (PBIT – 40)

1.5 (PBIT – 40) = PBIT

1.5 PBIT – 60 = PBIT

1.5 PBIT – PBIT = 60

0.5 PBIT = 60

or PBIT $= \frac{60}{0.5} =$ ₹ 120 lakhs

NOPAT = PBIT – Tax = ₹120 lakhs (1 – 0.30) = ₹84 lakhs.

Weighted Average Cost of Capital (WACC)

= 14% × (300 / 700) + (1 – 0.30) × (10%) × (400 / 700) = 10%

EVA = NOPAT – (WACC × Total Capital)

EVA = ₹84 lakhs – 0.10 × ₹ 700 lakhs

EVA = ₹ 14 lakhs

TYK 10 *(PG NO 12.33)*

RST Ltd.'s current financial year's income statement reported its net income after tax as ₹ 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:

	₹
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:

Equity 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

Cost of Equity as per CAPM

k_e = Rf + β x Market Risk Premium

= 8.5% + 1.36 x 9%

= 8.5% + 12.24% = 20.74%

Cost of Debt k_d = 11%(1 – 0.30) = 7.70%

WACC $(k_o) = k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D}$

$= 20.74 \times \frac{125}{165} + 7.70 \times \frac{40}{165} = 15.71 + 1.87 = 17.58\%$

Taxable Income = ₹ 25,00,000/(1 - 0.30)

= ₹ 35,71,429 or ₹ 35.71 lakhs

Operating Income = Taxable Income + Interest

= ₹ 35,71,429 + ₹ 4,40,000

= ₹ 40,11,429 or ₹ 40.11 lacs

EVA = EBIT (1-Tax Rate) – WACC x Invested Capital

= ₹ 40,11,429 (1 – 0.30) – 17.58% x ₹ 1,65,00,000

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

TYK 11 *(PG NO 12.34)*

Tender Ltd has earned a net profit of ₹ 15 lacs after tax at 30%. Interest cost charged by financial institutions was ₹ 10 lacs. The invested capital is ₹ 95 lacs of which 55% is debt. The company maintains a weighted average cost of capital of 13%. Required,

(a) Compute the operating income.

(b) Compute the Economic Value Added (EVA).

(c) Tender Ltd. has 6 lac equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining?

Solution

Taxable Income = ₹ 15 lac/(1-0.30)

= ₹ 21.43 lacs or ₹ 21,42,857

Operating Income = Taxable Income + Interest

= ₹ 21,42,857 + ₹ 10,00,000

= ₹ 31,42,857 or ₹ 31.43 lacs

EVA = EBIT (1-Tax Rate) – WACC x Invested Capital

= ₹ 31,42,857(1 – 0.30) – 13% x ₹ 95,00,000

= ₹ 22,00,000 – ₹ 12,35,000 = ₹ 9,65,000

EVA Dividend = $\frac{₹\ 9{,}65{,}000}{₹\ 6{,}00{,}000}$ = ₹ 1.6083

TYK 12 *(PG NO 12.34)*

The following information is given for 3 companies that are identical except for their capital structure:

	Orange	Grape	Apple
Total invested capital	1,00,000	1,00,000	1,00,000
Debt/assets ratio	0.8	0.5	0.2
Shares outstanding	6,100	8,300	10,000
Pre tax cost of debt	16%	13%	15%
Cost of equity	26%	22%	20%

Operating Income (EBIT)	25,000	25,000	25,000

The tax rate is uniform 35% in all cases.

(i) Compute the Weighted average cost of capital for each company.

(ii) Compute the Economic Valued Added (EVA) for each company.

(iii) Based on the EVA, which company would be considered for best investment? Give reasons.

(iv) If the industry PE ratio is 11x, estimate the price for the share of each company.

(v) Calculate the estimated market capitalisation for each of the Companies.

Solution

(i) Working for calculation of WACC

	Orange	**Grape**	**Apple**
Total debt	80,000	50,000	20,000
Post tax Cost of debt	10.40%	8.45%	9.75%
Equity Fund	20,000	50,000	80,000

WACC

Orange: (10.4 x 0.8) + (26 x 0.2) = 13.52%

Grape: (8.45 x 0.5) + (22 x 0.5) = 15.225%

Apple: (9.75 x 0.2) + (20 x 0.8) = 17.95%

(ii)

	Orange	**Grape**	**Apple**
WACC	13.52	15.225	17.95
EVA [EBIT (1-T)-(WACC x Invested Capital)]	2,730	1,025	-1,700

(iii) Orange would be considered as the best investment since the EVA of the company is highest and its weighted average cost of capital is the lowest

(iv) Estimated Price of each company shares

	Orange	**Grape**	**Apple**
EBIT (₹)	25,000	25,000	25,000
Interest (₹)	12,800	6,500	3,000
Taxable Income (₹)	12,200	18,500	22,000

Tax 35% (₹)	4,270	6,475	7,700
Net Income (₹)	7,930	12,025	14,300
Shares	6,100	8,300	10,000
EPS (₹)	1.30	1.45	1.43
Stock Price (EPS x PE Ratio) (₹)	14.30	15.95	15.73

Since the three entities have different capital structures they would be exposed to different degrees of financial risk. The PE ratio should therefore be adjusted for the risk factor.

(v) Market Capitalisation

Estimated Stock Price (₹)	14.30	15.95	15.73
No. of shares	6,100	8,300	10,000
Estimated Market Cap (₹)	87,230	1,32,385	1,57,300

TYK 13 *(PG NO 12.35)*

Delta Ltd.'s current financial year's income statement reports its net income as ₹ 15,00,000. Delta's marginal tax rate is 40% and its interest expense for the year was ₹ 15,00,000. The company has ₹ 1,00,00,000 of invested capital, of which 60% is debt. In addition, Delta Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.

(i) Compute the operating income or EBIT earned by Delta Ltd. in the current year.

(ii) What is Delta Ltd.'s Economic Value Added (EVA) for the current year?

(iii) Delta Ltd. has 2,50,000 equity shares outstanding. According to the EVA you computed in (ii), how much can Delta pay in dividend per share before the value of the company would start to decrease? If Delta does not pay any dividends, what would you expect to happen to the value of the company?

Solution

(i) Taxable income = Net Income /(1 – 0.40)

or, Taxable income = ₹ 15,00,000/(1 – 0.40) = ₹ 25,00,000

Again, taxable income = EBIT – Interest

or, EBIT = Taxable Income + Interest

= ₹ 25,00,000 + ₹ 15,00,000 = ₹ 40,00,000

(ii) EVA = EBIT (1 – T) – (WACC × Invested capital)

= ₹ 40,00,000 (1 – 0.40) – (0.126 × ₹ 1,00,00,000)

= ₹ 24,00,000 – ₹ 12,60,000 = ₹ 11,40,000

(iii) EVA Dividend = ₹ 11,40,000/2,50,000 = ₹ 4.56

If Delta Ltd. 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.

TYK 14 ***(PG NO 12.35)***

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

Balance Sheet

($ Million)

Liabilities	Amount	Assets		Amount
Equity Stock (10 million share @ $ 10 each)	100	Land and Building		200
		Computers & Softwares		295
Reserves & Surplus	325	Current Assets:		
Loans	180	Debtors	150	
Current Liabilities	180	Bank	100	
		Cash	40	290
	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 $ 50 each

Solution

(a) Determination of Economic Value Added (EVA)

	$ Million
EBIT	180.00
Less: Taxes @ 35%	63.00
Net Operating Profit after Tax	117.00
Less: Cost of Capital Employed [W. No.1]	72.60
Economic Value Added	44.40

(b) Determination of Market Value Added (MVA)

	$ Million
Market value of Equity Stock [W. No. 2]	500
Equity Fund [W. No. 3]	425
Market Value Added	75

Working Notes:

(1) Total Capital Employed

Equity Stock	$ 100 Million
Reserve and Surplus	$ 325 Million
Loan	$ 180 Million
	$ 605 Million
WACC	12%
Cost of Capital employed $ 605 Million x 12%	$ 72.60 Million

(2)

Market Price per equity share (A)	$ 50
No. of equity share outstanding (B)	10 Million

	Market value of equity stock (A) x (B)	$ 500 Million
(3)	Equity Fund	
	Equity Stock	$ 100 Million
	Reserves & Surplus	$ 325 Million
		$ 425 Million

TYK 15 ***(PG NO 12.36)***

Herbal Gyan is a small but profitable producer of beauty cosmetics using the plant Aloe Vera. This is not a high-tech business, but Herbal's earnings have averaged around ₹ 12 lakh after tax, largely on the strength of its patented beauty cream for removing the pimples.

The patent has eight years to run, and Herbal has been offered ₹ 40 lakhs for the patent rights. Herbal's assets include ₹ 20 lakhs of working capital and ₹ 80 lakhs of property, plant, and equipment. The patent is not shown on Herbal's books. Suppose Herbal's cost of capital is 15 percent. What is its Economic Value Added (EVA)?

Solution

EVA = Income earned – (Cost of capital x Total Investment)

Total Investments

Particulars	Amount
Working capital	₹ 20 lakhs
Property, plant, and equipment	₹ 80 lakhs
Patent rights	₹ 40 lakhs
Total	**₹ 140 lakhs**

Cost of Capital 15%

EVA= ₹ 12 lakh – (0.15 x ₹ 140 lakhs) = ₹ 12 lakh – ₹ 21 lakh = -₹ 9 lakh

Thus, Herbal Gyan has a negative EVA of ₹ 9 lakhs.

TYK 16 ***(PG NO 12.36)***

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 ₹ 100 Crore, which is not recorded in the books. The Net Worth (NW) of Constant Engineering Ltd. is ₹ 200 Crore. Long term debt is ₹ 400 Crore.

The product generates a revenue of ₹ 84 Crore. The rate on 365 days Government bond is 10 percent per annum. Market 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 = Income Earned – (Cost of Capital x Total Investment)

Total Investments

	Amount (₹ Crore)
Net Worth	200.00
Long Term Debts	400.00
Patent Rights	100.00
Total	700.00

WACC $(k_o) = k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D}$

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

= 5.14% + 5.71% = 10.85%

EVA = Profit Earned – WACC x Invested Capital

= ₹ 84 crore – 10.85% x ₹ 700 crore

= ₹ 8.05 crore

MERGERS, ACQUISITIONS & CORPORATE RESTRUCTURING

TYK 3 ***(PG NO 13.38)***

MK Ltd. is considering acquiring NN Ltd. The following information is available:

Company	Earning after Tax (₹)	No. of Equity Shares	Market Value Per Share (₹)
MK Ltd.	60,00,000	12,00,000	200.00
NN Ltd.	18,00,000	3,00,000	160.00

Exchange of equity shares for acquisition is based on current market value as above. There is no synergy advantage available.

(i) Find the earning per share for company MK Ltd. after merger, and

(ii) Find the exchange ratio so that shareholders of NN Ltd. would not be at a loss.

Solution

(i) Earning per share of company MK Ltd after merger:-

Exchange ratio 160 : 200 = 4 : 5.

that is 4 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Total number of shares to be issued = 4/5 × 3,00,000 = 2,40,000 Shares.

∴ Total number of shares of MK Ltd. and NN Ltd.=12,00,000 (MK Ltd.)+2,40,000 (NN Ltd.)

= 14,40,000 Shares

Total profit after tax = ₹ 60,00,000 MK Ltd.

= ₹ 18,00,000 NN Ltd.

= ₹ 78,00,000

∴ EPS. (Earning Per Share) of MK Ltd. after merger

₹ 78,00,000/14,40,000 = ₹ 5.42 per share

(ii) To find the exchange ratio so that shareholders of NN Ltd. would not be at a Loss:

Present earning per share for company MK Ltd.

= ₹ 60,00,000/12,00,000 = ₹ 5.00

Present earning per share for company NN Ltd.

= ₹ 18,00,000/3,00,000 = ₹ 6.00

∴ Exchange ratio should be 6 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Shares to be issued to NN Ltd. = 3,00,000 × 6/5 = 3,60,000 shares

Now, total No. of shares of MK Ltd. and NN Ltd. =12,00,000 (MK Ltd.) + 3,60,000 (NN Ltd.)

= 15,60,000 shares

∴ EPS after merger = ₹ 78,00,000/15,60,000 = ₹ 5.00 per share

Total earnings available to shareholders of NN Ltd. after merger = 3,60,000 shares × ₹ 5.00 = ₹ 18,00,000.

This is equal to earnings prior merger for NN Ltd.

∴ Exchange ratio on the basis of earnings per share is recommended.

TYK 4 *(PG NO 13.38)*

ABC Ltd. is intending to acquire XYZ Ltd. by merger and the following information is available in respect of the companies:

	ABC Ltd.	**XYZ Ltd.**
Number of equity shares	10,00,000	6,00,000
Earnings after tax (₹)	50,00,000	18,00,000
Market value per share (₹)	42	28

Required:

(i) What is the present EPS of both the companies?

(ii) 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 is based on the current market price.

(iii) What should be exchange ratio, if XYZ Ltd. wants to ensure the earnings to members are same as before the merger takes place?

Solution

(i) Earnings per share = Earnings after tax /No. of equity shares

ABC Ltd. = ₹ 50,00,000/10,00,000 = ₹ 5

XYZ Ltd. = ₹ 18,00,000 / 6,00,000 = ₹ 3

(ii) Number of Shares XYZ limited's shareholders will get in ABC Ltd. based on market

value per share = ₹ 28/ 42 × 6,00,000 = 4,00,000 shares

Total number of equity shares of ABC Ltd. after merger = 10,00,000 + 4,00,000 = 14,00,000 shares

Earnings per share after merger = ₹ 50,00,000 + 18,00,000/14,00,000 = ₹ 4.86

(iii) Calculation of exchange ratio to ensure shareholders of XYZ Ltd. to earn the same as was before merger:

Shares to be exchanged based on EPS = (₹ 3/₹ 5) × 6,00,000 = 3,60,000 shares EPS after merger = (₹ 50,00,000 + 18,00,000)/13,60,000 = ₹ 5

Total earnings in ABC Ltd. available to shareholders of XYZ Ltd. = 3,60,000 × ₹ 5 =

₹ 18,00,000.

Thus, to ensure that Earning to members are same as before, the ratio of exchange should be 0.6 share for 1 share.

TYK 5 ***(PG NO 13.39)***

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 ₹ 80.00 lakhs and P/E multiple is 10.5. He wants to buy another firm which has current income of ₹ 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 ₹ 42 and ₹ 105 respectively?

If the CEO borrows funds at 15% and buys out Target Company by paying cash, how much cash should he offer to maintain his EPS? Assume tax rate of 30%.

Solution

(i)

	Acquirer Company	**Target Company**
Net Profit	₹ 80 lakhs	₹ 15.75 lakhs
PE Multiple	10.50	10.00
Market Capitalization	₹ 840 lakhs	₹ 157.50 lakhs
Market Price	₹ 42	₹ 105
No. of Shares	20 lakhs	1.50 lakhs
EPS	₹ 4	₹ 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.

(ii) Let x lakhs be the amount paid by Acquirer company to Target Company. Then to maintain same EPS i.e. ₹ 4 the number of shares to be issued will be:

$$\frac{(80 \text{ lakhs} + 15.75 \text{ lakhs}) - 0.70 \times 15\% \times x}{20 \text{ lakhs}} = 4$$

$$\frac{95.75 - 0.105\,x}{20} = 4$$

x = ₹ 150 lakhs

Thus, ₹ 150 lakhs shall be offered in cash to Target Company to maintain same EPS.

TYK 7 *(PG NO 13.39)*

The following information is provided related to the acquiring Firm Mark Limited and the target Firm Mask Limited:

	Firm Mark Limited	**Firm Mask Limited**
Earning after tax (₹)	2,000 lakhs	400 lakhs
Number of shares outstanding	200 lakhs	100 lakhs
P/E ratio (times)	10	5

Required:

(i) What is the Swap Ratio based on current market prices?

(ii) What is the EPS of Mark Limited after acquisition?

(iii) What is the expected market price per share of Mark Limited after acquisition, assuming P/E ratio of Mark Limited remains unchanged?

(iv) Determine the market value of the merged firm.

(v) Calculate gain/loss for shareholders of the two independent companies after acquisition.

Solution

Particulars Mark Ltd. Mask Ltd.

EPS	₹ 2,000 Lakhs/ 200 lakhs = ₹ 10	₹ 400 lakhs / 100 lakhs ₹ 4
Market Price	₹ 10 × 10 = ₹ 100	₹ 4 × 5 = ₹ 20

(i) The Swap ratio based on current market price is

₹ 20 / ₹ 100 = 0.2 or 1 share of Mark Ltd. for 5 shares of Mask Ltd. No. of shares to be issued = 100 lakh × 0.2 = 20 lakhs.

(ii) EPS after merger = $\frac{₹\,2{,}000\ \text{lakhs} + ₹\,400\ \text{lakhs}}{200\ \text{lakhs} + 20\ \text{lakhs}} = ₹\,10.91$

(iii) Expected market price after merger assuming P/E 10 times.

= ₹ 10.91 × 10 = ₹ 109.10

(iv) Market value of merged firm

= ₹ 109.10 market price × 220 lakhs shares = 240.02 crores

(v) Gain from the merger

Post merger market value of the merged firm	₹ 240.02 crores
Less: Pre-merger market value	
Mark Ltd. 200 Lakhs × ₹ 100 = 200 crores	
Mask Ltd. 100 Lakhs × ₹ 20 = 20 crores	₹ 220.00 crores
Gain from merger	₹ 20.02 crores

Appropriation of gains from the merger among shareholders:

	Mark Ltd.	Mask Ltd.
Post merger value	218.20 crores	21.82 crores
Less: Pre-merger market value	200.00 crores	20.00 crores
Gain to Shareholders	18.20 crores	1.82 crores

TYK 8 ***(PG NO 13.40)***

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 (₹)	40	28
Market price per share (₹)	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

Working Notes

(a)

	XYZ Ltd.	ABC Ltd.
Equity shares outstanding (Nos.)	10,00,000	4,00,000
EPS	₹ 40	₹ 28
Profit	₹ 4,00,00,000	₹ 1,12,00,000
PE Ratio	6.25	5.71
Market price per share	₹ 250	₹ 160

(b) EPS after merger

No. of shares to be issued (4,00,000 x 0.70)	2,80,000
Exiting Equity shares outstanding	10,00,000
Equity shares outstanding after merger	12,80,000
Total Profit (₹ 4,00,00,000 + ₹ 1,12,00,000)	₹ 5,12,00,000
EPS	₹ 40

(i) Impact of merger on EPS of both the companies

	XYZ Ltd.	ABC Ltd.
EPS after Merger	₹ 40	₹ 28
EPS before Merger	₹ 40	₹ 28*
	Nil	Nil

***** ₹ 40 x 0.70

(ii) Gain from the Merger if exchange ratio is 1: 1

No. of shares to be issued	4,00,000
Exiting Equity shares outstanding	10,00,000
Equity shares outstanding after merger	14,00,000
Total Profit (₹ 4,00,00,000 + ₹ 1,12,00,000)	₹ 5,12,00,000
EPS	₹ 36.57
Market Price of Share (₹ 36.57 x 6.25)	₹ 228.56
Market Price of Share before Merger	₹ 160.00
Impact (Increase/ Gain)	₹ 68.56

(iii) Gain/ loss from the Merger to the shareholders of XYZ Ltd.

Market Price of Share	₹ 228.56
Market Price of Share before Merger	₹ 250.00
Loss from the merger (per share)	₹ 21.44

(iv) Maximum Exchange Ratio acceptable to XYZ Ltd. shareholders

	₹ Lakhs
Market Value of Merged Entity (₹ 228.57 x 14,00,000)	3,199.98
Less: Value acceptable to shareholders of XYZ Ltd.	2,500.00
Value of merged entity available to shareholders of ABC Ltd.	699.98
Market Price Per Share	250
No. of shares to be issued to the shareholders of ABC Ltd. (lakhs)	2.80

Thus maximum ratio of issue shall be 2.80 : 4.00 or 0.70 share of XYZ Ltd. for one share of ABC Ltd.

Alternatively, it can also be computed as follows:

Earning after Merger (40 x 10,00,000 + 28 x 4,00,000)	₹ 512 lakhs
PE Ratio of XYZ Ltd.	6.25
Market Value of Firm after Merger (512 x 6.25)	₹ 3,200 lakhs
Existing Value of Shareholders of XYZ Ltd.	₹ 2,500

	lakhs
Value of Merged entity available to Shareholders of ABC Ltd.	₹ 700 lakhs
Market Price per Share	₹ 250
Total No. of shares to be issued	2.8 lakh

Thus, maximum acceptable ratio shall be 2.80:4.00 i.e. 0.70 share of XYZ Ltd. for one share of ABC Ltd.

TYK 10 ***(PG NO 13.41)***

Following information is provided relating to the acquiring company Mani Ltd. and the target company Ratnam Ltd:

	Mani Ltd.	Ratnam Ltd.
Earnings after tax (₹ lakhs)	2,000	4,000
No. of shares outstanding (lakhs)	200	1,000
P/E ratio (No. of times)	10	5

Required:

(i) What is the swap ratio based on current market prices?

(ii) What is the EPS of Mani Ltd. after the acquisition?

(iii) What is the expected market price per share of Mani Ltd. after the acquisition, assuming its P/E ratio is adversely affected by 10%?

(iv) Determine the market value of the merged Co.

(v) Calculate gain/loss for the shareholders of the two independent entities, due to the merger.

Solution

(i) SWAP ratio based on current market prices:

EPS before acquisition:	
Mani Ltd. : ₹2,000 lakhs / 200 lakhs:	₹10
Ratnam Ltd.: ₹4,000 lakhs / 1,000 lakhs:	₹ 4
Market price before acquisition:	
Mani Ltd.: ₹10 × 10	₹100
Ratnam Ltd.: ₹4 × 5	₹ 20
SWAP ratio: 20/100 or 1/5 i.e.	0.20

(ii) EPS after acquisition:

$$\frac{₹(2{,}000 + 4{,}000)\ \text{Lakhs}}{(200 + 200)\ \text{Lakhs}} = ₹\ 15.00$$

(iii) Market Price after acquisition:

EPS after acquisition :	₹15.00
P/E ratio after acquisition 10 × 0.9	9
Market price of share (₹ 15 X 9)	₹135.00

(iv) Market value of the merged Co.:

₹135 × 400 lakhs shares	₹ 540.00 Crores
	or ₹ 54,000 Lakhs

(v) Gain/loss per share:

₹ Crore

	Mani Ltd.	Ratnam Ltd.
Total value before Acquisition	200	200
Value after acquisition	270	270
Gain (Total)	70	70
No. of shares (pre-merger) (lakhs)	200	1,000
Gain per share (₹)	35	7

TYK 11 ***(PG NO 13.41)***

You have been provided the following Financial data of two companies:

	Krishna Ltd.	**Rama Ltd.**
Earnings after taxes	₹ 7,00,000	₹ 10,00,000
No. of Equity shares (outstanding)	2,00,000	4,00,000
EPS	3.5	2.5
P/E ratio	10 times	14 times
Market price per share	₹ 35	₹ 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

(i)	Exchange Ratio	1:1
	New Shares to be issued	2,00,000

	Total shares of Rama Ltd. (4,00,000+2,00,000)	6,00,000
	Total earnings (₹ 10,00,000 + ₹ 7,00,000)	₹ 17,00,000
	New EPS (₹ 17,00,000/6,00,000)	₹ 2.83
(ii)	Existing EPS of Rama Ltd.	₹ 2.50
	Increase in EPS of Rama Ltd (₹ 2.83 – ₹ 2.50)	₹ 0.33
	Existing EPS of Krishna Ltd.	₹ 3.50
	Decrease in EPS of Krishna Ltd. (₹ 3.50 – ₹ 2.83)	₹ 0.67
(iii)	P/E ratio of new firm (expected to remain same)	14 times
	New market price (14 × ₹ 2.83)	₹ 39.62
	Total No. of Shares	6,00,000
	Total market Capitalization (6,00,000 × ₹ 39.62)	₹ 2,37,72,000
	Existing market capitalization (₹ 70,00,000 + ₹ 1,40,00,000)	₹ 2,10,00,000
	Total gain	₹ 27,72,000

(iv)

	Rama Ltd.	Krishna Ltd	Total
No. of shares after merger	4,00,000	2,00,000	6,00,000
Market price	₹ 39.62	₹ 39.62	₹ 39.62
Total Mkt. Values	₹ 1,58,48,000	₹ 79,24,000	₹ 2,37,72,000
Existing Mkt. values	₹ 1,40,00,000	₹ 70,00,000	₹ 2,10,00,000
Gain to share holders	₹ 18,48,000	₹ 9,24,000	₹ 27,72,000

or ₹ 27,72,000 ÷ 3 = ₹ 9,24,000 to Krishna Ltd. and ₹ 18,48,000 to Rama Ltd. (in 2: 1 ratio)

TYK 13 *(PG NO 13.42)*

Longitude Limited is in the process of acquiring Latitude Limited on a share exchange basis. Following relevant data are available:

		Longitude Limited	Latitude Limited
Profit after Tax (PAT)	₹ in Lakhs	120	80
Number of Shares	Lakhs	15	16
Earning per Share (EPS)	₹	8	5
Price Earnings Ratio (P/E Ratio)		15	10

(Ignore Synergy)			

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

(i) Pre Merger Market Value of Per Share

P/E Ratio X EPS

Longitude Ltd. ₹ 8 X 15 = ₹ 120.00

Latitude Ltd. ₹ 5 X 10 = ₹ 50.00

(ii) (1) Maximum exchange ratio without dilution of EPS

Pre Merger PAT of Longitude Ltd.	₹ 120 Lakhs
Pre Merger PAT of Latitude Ltd.	₹ 80 Lakhs
Combined PAT	₹ 200 Lakhs
Longitude Ltd. 's EPS	₹ 8

Maximum number of shares of Longitude after merger (₹ 200 lakhs/₹ 8)	25 Lakhs
Existing number of shares	15 Lakhs
Maximum number of shares to be exchanged	10 Lakhs

Maximum share exchange ratio 10:16 or 5:8

(2) Maximum exchange ratio without dilution of Market Price Per Share

Pre Merger Market Capitalization of Longitude Ltd. (₹ 120 × 15 Lakhs)	₹ 1,800 Lakhs
Pre Merger Market Capitalization of Latitude Ltd. (₹ 50 × 16 Lakhs)	₹ 800 Lakhs
Combined Market Capitalization	₹ 2,600 Lakhs
Current Market Price of share of Longitude Ltd.	₹ 120

Maximum number of shares to be exchanged of Longitude (surviving company) (₹ 2600 Lakhs/₹ 120)	21.67 Lakhs
Current Number of Shares of Longitude Ltd.	15.00 Lakhs
Maximum number of shares to be exchanged (Lakhs)	6.67 Lakhs

Maximum share exchange ratio 6.67:16 or 0.4169:1

TYK 14 *(PG NO 13.43)*

P Ltd. is considering take-over of R Ltd. by the exchange of four new shares in P Ltd. for every five shares in R Ltd. The relevant financial details of the two companies prior to merger announcement are as follows:

	P Ltd	R Ltd
Profit before Tax (₹ Crore)	15	13.50
No. of Shares (Crore)	25	15
P/E Ratio	12	9
Corporate Tax Rate 30%		

You are required to determine:

(i) Market value of both the company.

(ii) Value of original shareholders.

(iii) Price per share after merger.

(iv) Effect on share price of both the company if the Directors of P Ltd. expect their own pre-merger P/E ratio to be applied to the combined earnings.

Solution

	P Ltd.	**R Ltd.**
Profit before Tax (₹ in crore)	15	13.50
Tax 30% (₹ in crore)	4.50	4.05
Profit after Tax (₹ in crore)	10.50	9.45
Earning per Share (₹)	$\frac{10.50}{25}$ = ₹ 0.42	$\frac{9.45}{15}$ = ₹ 0.63
Price of Share before Merger (EPS x P/E Ratio)	₹ 0.42 x 12 = ₹ 5.04	₹0.63 x 9 = ₹ 5.67

(i) ∴ Market Value of company

P Ltd. = ₹ 5.04 x 25 Crore = ₹ 126 crore

R Ltd. = ₹ 5.67 x 15 Crore = ₹ 85.05 crore

Combined = ₹ 126 + ₹ 85.05 = ₹ 211.05 Crores

After Merger

	P Ltd.	**R Ltd.**
No. of Shares	25 crores	$15 \times \frac{4}{5}$ = 12 crores
Combined	37 crores	
% of Combined Equity Owned	$\frac{25}{37} \times 100 = 67.57\%$	$\frac{12}{37} \times 100 = 32.43\%$

(ii) ∴ Value of Original Shareholders

P Ltd.	R Ltd.
₹ 211.05 crore x 67.57%	₹ 211.05 crore x 32.43%
= ₹ 142.61	= ₹ 68.44

Alternatively, it can also be computed as follows:

Combined Value of Entity	211.05 crore
No. of shares after Merger	37 crore
Value of Per Share	₹ 5.70405
Value of P Ltd. Shareholders (25 crores x ₹ 5.70405)	₹ 142.60 crore
Value of R Ltd. Shareholders (12 crores x ₹ 5.70405)	₹ 68.45 crore

(iii) ∴ Price per Share after Merger

EPS = $\frac{₹\ 19.95\ \text{Crore}}{37\ \text{crore}}$ = ₹ 0.539 per share

P/E Ratio = 12

Market Value Per Share = ₹ 0.539 X 12 = ₹ 6.47

Total Market Value = ₹ 6.47 x 37 crore = ₹ 239.39 crore

Price of Share = $\frac{\text{Market Value}}{\text{Nyumber of shares}} = \frac{239.39\ \text{crore}}{37\ \text{crore}}$ = ₹ 6.47

(iv) Effect on Share Price

P Ltd.

Gain/loss (-) per share = ₹ 6.47 – ₹ 5.04 = ₹ 1.43

i.e. $\frac{6.47 - 5.04}{5.04} \times 100$ = 0.284 or 28.4%

∴ Share price would rise by 28.4%

R Ltd.

6.47 x $\frac{4}{5}$ = ₹ 5.18

Gain/loss (-) per share = ₹ 5.18 – ₹ 5.67 = (-₹ 0.49)

i.e. $\frac{5.18 - 5.67}{5.67} \times 100$ (-) 0.0864 or (-) 8.64%

∴ Share Price would decrease by 8.64%.

TYK 18 ***(PG NO 13.44)***

Abhiman Ltd. is a subsidiary of Janam Ltd. and 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	₹ 200 lacs	100 lacs
Free Reserves and surplus	₹ 900 lacs	600 lacs
Paid up value per share	₹ 100	10
Free float market capitalization	₹ 500 lacs	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

(i) The swap ratio.

(ii) The Book Value, Earning Per Share and Expected Market Price of Swabhiman Ltd., (assuming P/E Ratio of Abhiman remains the same and all assets and liabilities of Swabhiman Ltd. are taken over at book value.)

Solution

SWAP RATIO

	Abhiman Ltd. (₹)	**Swabhiman Ltd. (₹)**
Share capital	200 lacs	100 lacs
Free reserves & surplus	900 lacs	600 lacs
Total	1100 lacs	700 lacs
No. of shares	2 lacs	10 lacs
Book value for share	₹ 550	₹ 70
Promoters Holding	50%	60%
Non promoters holding	50%	40%
Free float market capitalization (Public)	500 lacs	₹ 156 lacs
Total Market Cap	1000 lacs	390 lacs
No. of shares	2 lacs	10 lacs
Market Price	₹ 500	₹ 39
P/E ratio	10	4
EPS	₹ 50.00	₹ 9.75

Calculation of SWAP Ratio

Book Value	1:0.1273	0.1273 □ 25%	0.031825
EPS	1:0.195	0.195 □ 50%	0.097500
Market Price	1:0.078	0.078 □ 25%	0.019500
Total			0.148825

(i) SWAP Ratio is 0.148825 shares of Abhiman Ltd. for every share of Swabhiman Ltd.

Total No. of shares to be issued = 10 lakh × 0.148825 = 148825 shares

(ii) Book value, EPS & Market Price.

Total No. shares = 2,00,000 +1,48,825 = 3,48,825

Total capital = ₹200 lakh + ₹148.825 lac = ₹ 348.825 lac Reserves = ₹ 900 lac + ₹ 551.175 lac = ₹ 1451.175 lac

$$\text{Book value Per Share} = \frac{₹\ 348.825\ \text{lac} + ₹1451.175\ \text{lac}}{3.48825\ \text{lac}} = ₹\ 516.02$$

or ₹ 516.02 x 0.148825 = ₹ 76.80

$$\text{or} = \frac{\text{Total Capital}}{\text{No.of Shares}} = \frac{1{,}100\ \text{lac} + 700\ \text{lac}}{3{,}48{,}825} = ₹\ 516.02$$

$$\text{EPS} = \frac{\text{Total Capital}}{\text{No.of Shares}} = \frac{₹100\ \text{lac} + ₹\ 97.50\ \text{lac}}{3.48825\ \text{lac}} = ₹\ 56.62$$

or ₹ 56.62 x 0.148825 = ₹ 8.43

Expected market price = ₹ 56.62 × PE Ratio= ₹ 56.62 × 10 = ₹ 566.20

or ₹ 566.20 x 0.148825 = ₹ 84.26

TYK 19 ***(PG NO 13.45)***

The following information is provided relating to the acquiring company E Ltd., and the target company H Ltd:

Particulars	E Ltd. (₹)	H Ltd. (₹)
Number of shares (Face value ₹ 10 each)	20 Lakhs	15 Lakhs
Market Capitalization	1000 Lakhs	1500 Lakhs
P/E Ratio (times)	10.00	5.00
Reserves and surplus in ₹	600.00 Lakhs	330.00 Lakhs
Promoter's Holding (No. of shares)	9.50 Lakhs	10.00 Lakhs

The Board of Directors of both the companies have decided to give a fair deal to the shareholders. Accordingly, the weights are decided as 40%, 25% and 35% respectively for earnings, book value and market price of share of each company for swap ratio.

Calculate the following:

(i) Market price per share, earnings per share and Book Value per share;

(ii) Swap ratio;

(iii) Promoter's holding percentage after acquisition;

(iv) EPS of E Ltd. after acquisitions of H Ltd;

(v) Expected market price per share and market capitalization of E Ltd.; after acquisition, assuming P/E ratio of E Ltd. remains unchanged; and

(vi) Free float market capitalization of the merged firm.

Solution

(i)

	E Ltd.	H Ltd.
Market capitalisation	1000 lakhs	1500 lakhs
No. of shares	20 lakhs	15 lakhs
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 100 lakh	₹ 300 lakh
Share capital	₹ 200 lakh	₹ 150 lakh
Reserves and surplus	₹ 600 lakh	₹ 330 lakh
Total	₹ 800 lakh	₹ 480 lakh
Book Value per share	₹ 40	₹ 32

(ii) Calculation of Swap Ratio

EPS	1 : 4 i.e.	4.0 × 40%	1.6
Book value	1 : 0.8 i.e.	0.8 × 25%	0.2
Market price	1 : 2 i.e.	2.0 × 35%	0.7
		Total	2.5

Swap ratio is for every one share of H Ltd., to issue 2.5 shares of E Ltd. Hence, total no. of shares to be issued 15 lakh × 2.5 = 37.50 lakh shares

(iii) Promoter's holding = 9.50 lakh shares + (10□ 2.5 = 25 lakh shares) = 34.50 lakh i.e. Promoter's holding % is (34.50 lakh/57.50 lakh) □ 100 = 60%.

(iv) Calculation of EPS after merger

Total No. of shares 20 lakh + 37.50 lakh = 57.50 lakh

$$\text{EPS} = \frac{\text{Total Profit}}{\text{No.of Shares}} = \frac{100 \text{ lakh} + 300 \text{ lakh}}{57.50 \text{ lakh}} = \frac{400}{57.50} = ₹.6.956$$

(v) Calculation of Market price and Market capitalization after merger

Expected market price: EPS 6.956 × P/E 10 = ₹ 69.56

Market capitalization: = ₹ 69.56 per share × 57.50 lakh shares

= ₹ 3,999.70 lakh or ₹ 4,000 lakh

(vi) Free float of market capitalization = ₹ 69.56 per share × (57.50 lakh × 40%) = ₹ 1,599.88 lakh

TYK 20 *(PG NO 13.46)*

The following information relating to the acquiring Company Abhiman Ltd. and 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 (₹)	200 lakh	100 lakh
Free Reserve and Surplus (₹)	800 lakh	500 lakh
Paid up Value per share (₹)	100	10
Free float Market Capitalisation (₹)	400 lakh	128 lakh
P/E Ratio (times)	10	4

Trident Ltd. is interested to do justice to the shareholders of both the 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%

(a) What is the swap ratio based on above weights?

(b) What is the Book Value, EPS and expected Market price of Abhiman Ltd. after acquisition of Abhishek Ltd. (assuming P.E. ratio of Abhiman Ltd. remains unchanged and all assets and liabilities of Abhishek Ltd. are taken over at book value).

(c) Calculate:

(i) Promoter's revised holding in the Abhiman Ltd.

(ii) Free float market capitalization.

(iii) Also calculate No. of Shares, Earning per Share (EPS) and Book Value (B.V.), if after acquisition of Abhishek Ltd., Abhiman Ltd. decided to :

(1) Issue Bonus shares in the ratio of 1 : 2; and

(2) Split the stock (share) as ₹ 5 each fully paid.

Solution

(a) Swap Ratio

	Abhiman Ltd.	Abhishek Ltd.
Share Capital	200 Lakh	100 Lakh
Free Reserves	800 Lakh	500 Lakh
Total	1,000 Lakh	600 Lakh
No. of Shares	2 Lakh	10 Lakh
Book Value per share	₹ 500	₹ 60
Promoter's holding	50%	60%
Non promoter's holding	50%	40%
Free Float Market Cap. i.e. relating to Public's holding	400 Lakh	128 Lakh
Hence Total market Cap.	800 Lakh	320 Lakh
No. of Shares	2 Lakh	10 Lakh
Market Price	₹ 400	₹ 32
P/E Ratio	10	4
EPS	40	8
Profits (₹ 2 X 40 lakh)	₹ 80 lakh	-
(₹ 8 X 10 lakh)	-	₹ 80 lakh

Calculation of Swap Ratio

Book Value	1 : 0.12 i.e.	0.12 x 25%	0.03
EPS	1 : 0.20.	20 x 50%	0.10
Market Price	1 : 0.08	0.08 x 25%	0.02
		Total	0.15

Swap ratio is for every one share of Abhishek Ltd., to issue 0.15 shares of Abhiman Ltd. Hence total no. of shares to be issued.

10 Lakh x 0.15 = 1.50 lakh shares

(b) Book Value, EPS & Market Price

Total No of Shares 2 Lakh + 1.5 Lakh = 3.5 Lakh

Total Capital ₹ 200 Lakh + ₹ 150 Lakh = ₹ 350 Lakh

Reserves ₹ 800 Lakh + ₹ 450 Lakh = ₹ 1,250 Lakh

Book Value ₹ 350 Lakh + ₹ 1,250 Lakh / 3.5 Lakh = ₹ 457.14 per share

EPS = Total Profit / No.of Shares = ₹ 80 Lakh + ₹ 80 Lakh / 3.50 lakh = ₹ 160 Lakh / 3.5 = ₹.45.71

Expected Market PriceEPS (₹ 45.71) x P/E Ratio (10) = ₹ 457.10

(c) (i) Promoter's holding

Promoter's Revised	Abhiman 50% i.e.	1.00 Lakh shares
Holding	Abhishek 60% i.e.	0.90 Lakh shares
	Total	1.90 Lakh shares

Promoter's % = 1.90/3.50 x 100 = 54.29%

(ii) Free Float Market Capitalisation

Free Float Market Capitalisation = (3.5 Lakh – 1.9 Lakh) x ₹ 457.10

= ₹ 731.36 Lakh

(iii) (a) & (b)

Revised Capital	₹ 350 Lakh + ₹ 175 Lakh = ₹ 525 Lakh
No. of shares before Split (F.V ₹ 100)	5.25 Lakh
No. of Shares after Split (F.V. ₹ 5)	5.25 x 20 = 105 Lakh
EPS	160 Lakh / 105 Lakh = 1.523
Book Value	Cap. ₹ 525 Lakh + ₹ 1075 Lakh / No. of Shares =105 Lakh = ₹ 15.238 per share

TYK 22 ***(PG NO 13.47)***

The following information is relating to Fortune India Ltd. having two division, viz. Pharma Division and Fast Moving Consumer Goods Division (FMCG Division). Paid up share capital of Fortune India Ltd. is consisting of 3,000 Lakhs equity shares of Re. 1 each. Fortune India Ltd. decided to de-merge Pharma Division as Fortune Pharma Ltd. w.e.f. 1.4.2009. Details of Fortune India Ltd. as on 31.3.2009 and of Fortune Pharma Ltd. as on 1.4.2009 are given below:

Particulars	Fortune Pharma Ltd. ₹	Fortune India Ltd. ₹
Outside Liabilities		
Secured Loans	400 lakh	3,000 lakh
Unsecured Loans	2,400 lakh	800 lakh
Current Liabilities & Provisions	1,300 lakh	21,200 lakh
Assets		
Fixed Assets	7,740 lakh	20,400 lakh
Investments	7,600 lakh	12,300 lakh
Current Assets	8,800 lakh	30,200 lakh
Loans & Advances	900 lakh	7,300 lakh
Deferred tax/Misc. Expenses	60 lakh	(200) lakh

Board of Directors of the Company have decided to issue necessary equity shares of Fortune Pharma Ltd. of Re. 1 each, without any consideration to the shareholders of Fortune India Ltd. For that purpose following points are to be considered:

(a) Transfer of Liabilities & Assets at Book value.

(b) Estimated Profit for the year 2009-10 is ₹ 11,400 Lakh for Fortune India Ltd. & ₹ 1,470 lakhs for Fortune Pharma Ltd.

(c) Estimated Market Price of Fortune Pharma Ltd. is ₹ 24.50 per share.

(d) Average P/E Ratio of FMCG sector is 42 & Pharma sector is 25, which is to be expected for both the companies.

Calculate:

1. The Ratio in which shares of Fortune Pharma are to be issued to the shareholders of Fortune India Ltd.
2. Expected Market price of Fortune India (FMCG) Ltd.
3. Book Value per share of both the Companies immediately after Demerger .

Solution

Share holders' funds **(₹ Lakhs)**

Particulars	Fortune India Ltd.	Fortune Pharma Ltd.	Fortune India (FMCG) Ltd.
Assets	70,000	25,100	44,900
Outside liabilities	25,000	4,100	20,900
Net worth	45,000	21,000	24,000

1. Calculation of Shares of Fortune Pharma Ltd. to be issued to shareholders of Fortune India Ltd.

	Fortune Pharma Ltd.
Estimated Profit (₹ in lakhs)	1,470
Estimated market price (₹)	24.5
Estimated P/E	25
Estimated EPS (₹)	0.98
No. of shares lakhs	1,500

Hence, Ratio is 1 share of Fortune Pharma Ltd. for 2 shares of Fortune India Ltd. OR for 0.50 share of Fortune Pharma Ltd. for 1 share of Fortune India Ltd.

2. Expected market price of Fortune India (FMCG) Ltd.

	Fortune India (FMCG) Ltd.
Estimated Profit (₹ in lakhs)	11,400
No. of equity shares (₹ in lakhs)	3,000
Estimated EPS (₹)	3.8
Estimated P/E	42
Estimated market price (₹)	159.60

3. Book value per share

	Fortune Pharma Ltd.	Fortune India (FMCG) Ltd.
Net worth (₹in lakhs)	21,000	24,000
No. of shares (₹ in lakhs)	1,500	3,000
Book value of shares	₹ 14	₹ 8

TYK 23 *(PG NO 13.48)*

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 ₹100 each	350.00	
-Equity Shares of ₹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:

(a) The weighted average post tax maintainable profits of H Ltd. and B Ltd. for the last 4 years are ₹ 300 crores and ₹ 10 crores respectively.

(b) Both the companies envisage a capitalization rate of 8%.

(c) H Ltd. has a contingent liability of ₹ 300 crores as on 31st March, 2012.

(d) H Ltd. to issue shares of ₹ 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

(iii) Exchange ratio of shares of H Ltd. to be issued to the shareholders of B Ltd. on a Fair value basis (taking into consideration the assumption mentioned in point 4 above.)

Solution

(i) Net asset value

H Ltd.	$\frac{₹\ 1300\ Crores - ₹\ 300\ Crores}{3.50\ Crores} = ₹\ 285.71$
B Ltd.	$\frac{₹\ 31.50\ Crores}{0.65\ Crores} = ₹\ 48.46$

(ii) Earning capitalization value

H Ltd.	$\frac{₹\ 300\ Crores / 0.08}{3.50\ Crores} = ₹\ 1071.43^*$
B Ltd.	$\frac{₹\ 10\ Crores / 0.08}{0.65\ rores} = ₹\ 192.31$

* Alternatively, Contingent Liability can also be deducted from this Valuation.

(iii) Fair value

H Ltd.	$\frac{₹\ 285.71 \times 1 + ₹\ 1071.43 \times 3}{4} = ₹\ 875$
B Ltd.	$\frac{₹\ 48.46 \times 1 + ₹\ 192.31 \times 3}{4} = ₹\ 156.3475$

Exchange ratio ₹156.3475/ ₹875 = 0.1787

H Ltd should issue its 0.1787 share for each share of B Ltd.

Note: In above solution it has been assumed that the contingent liability will materialize at its full amount.

TYK 24 ***(PG NO 13.49)***

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.
Earnings After Tax (EAT)	₹ 20,00,000	₹ 10,00,000
Equity shares O/s	10,00,000	10,00,000
Earnings per share (EPS)	2	1
PE Ratio (Times)	10	5

Required:

(i) What is the market value of each Company before merger?

(ii) Assume that the management of RIL estimates that the shareholders of SIL will accept an offer of one share of RIL for four shares of SIL. If there are no synergic effects, what is the market value of the Post-merger RIL? What is the new price per share? Are the shareholders of RIL better or worse off than they were before the merger?

(iii) Due to synergic effects, the management of RIL estimates that the earnings will increase by 20%. What are the new post-merger EPS and Price per share? Will the shareholders be better off or worse off than before the merger?

Solution

(i) Market value of Companies before Merger

Particulars	RIL	SIL
EPS	₹ 2	Re.1
P/E Ratio	10	5
Market Price Per Share	₹ 20	₹ 5
Equity Shares	10,00,000	10,00,000
Total Market Value	2,00,00,000	50,00,000

(ii) Post Merger Effects on RIL

	₹
Post-merger earnings	30,00,000
Exchange Ratio (1:4)	
No. of equity shares o/s (10,00,000 + 2,50,000)	12,50,000
EPS: 30,00,000/12,50,000	2.4
PE Ratio	10

Market Value 10 x 2.4	24
Total Value (12,50,000 x 24)	3,00,00,000

Gains From Merger:	₹
Post-Merger Market Value of the Firm	3,00,00,000
Less: Pre-Merger Market Value	
RIL 2,00,00,000	
SIL 50,00,000	2,50,00,000
Total gains from Merger	50,00,000

Apportionment of Gains between the Shareholders:

Particulars	RIL (₹)	SIL (₹)
Post-Merger Market Value:		
10,00,000 x 24	2,40,00,000	--
2,50,000 x 24	-	60,00,000
Less: Pre-Merger Market Value	2,00,00,000	50,00,000
Gains from Merger:	40,00,000	10,00,000

Thus, the shareholders of both the companies (RIL + SIL) are better off than before

(iii) Post-Merger Earnings: Increase in Earnings by 20%

New Earnings: ₹ 30,00,000 x (1+0.20)	₹ 36,00,000
No. of equity shares outstanding:	12,50,000
EPS (₹ 36,00,000/12,50,000)	₹ 2.88
PE Ratio	10
Market Price Per Share: = ₹2.88 x 10	₹ 28.80

∴ Shareholders will be better-off than before the merger situation.

TYK 25 ***(PG NO 13.50)***

AFC Ltd. wishes to acquire BCD Ltd. The shares issued by the two companies are 10,00,000 and 5,00,000 respectively:

(i) Calculate the increase in the total value of BCD Ltd. resulting from the acquisition on the basis of the following conditions:

Current expected growth rate of BCD Ltd.	7%
Expected growth rate under control of AFC Ltd., (without any additional capital investment and without any change in risk of operations)	8%
Current Market price per share of AFC Ltd.	₹ 100
Current Market price per share of BCD Ltd.	₹ 20
Expected Dividend per share of BCD Ltd.	₹ 0.60

(ii) On the basis of aforesaid conditions calculate the gain or loss to shareholders of both the companies, if AFC Ltd. were to offer one of its shares for every four shares of BCD Ltd.

(iii) Calculate the gain to the shareholders of both the Companies, if AFC Ltd. pays ₹22 for each share of BCD Ltd., assuming the P/E Ratio of AFC Ltd. does not change after the merger. EPS of AFC Ltd. is ₹8 and that of BCD is ₹2.50. It is assumed that AFC Ltd. invests its cash to earn 10%.

Solution

(i) For BCD Ltd., before acquisition

The cost of capital of BCD Ltd. may be calculated by using the following formula:

$$\frac{\text{Dividend}}{\text{Price}} + \text{Growth}\%$$

Cost of Capital i.e., Ke = (0.60/20) + 0.07 = 0.10
After acquisition g (i.e. growth) becomes 0.08
Therefore, price per share after acquisition = 0.60/(0 10-0.08) = ₹30
The increase in value therefore is = ₹(30-20) x 5,00,000 = ₹50,00,000/-

(ii) To share holders of BCD Ltd. the immediate gain is ₹100 – ₹20x4 = ₹20 per share

The gain can be higher if price of shares of AFC Ltd. rise following merger which they should undertake.

To AFC Ltd. shareholders	**(₹ (In lakhs)**
Value of Company now	1,000
Value of BCD Ltd.	150
	1,150
No. of shares	11.25
∴ Value per share	1150/11.25 = ₹102.22

Gain to shareholders of BCD Ltd. = ₹102.22 – ₹(4 x 20) = ₹22.22

Gain to shareholders of AFC Ltd. = ₹102.22 – ₹100.00 = ₹2.22

(iii) Gain to shareholders of AFC Ltd:-

Earnings of BCD Ltd. (5,00,000 x 2.50)	₹12,50,000/-
Less: Loss of earning in cash (5,00,000 x ₹ 22 x 0.10)	₹11,00,000/-
Net Earning	₹ 1,50,000/-
Number of shares	10,00,000
Net increase in earning per share	0.15

P/E ratio of AFC Ltd. = 100/8 = 12.50

Therefore, Gain per share of shareholders of AFC Ltd. = 0.15x12.50 = ₹1.88

Gain to the shareholders of BCD Ltd. ₹ (22-20) = ₹2/- per share

Alternatively, it can also be computed as follows:

Post-Merger Earnings (10,00,000 x ₹ 8 + 5,00,000 x ₹ 2.5 – 11,00,000)	₹ 81,50,000
EPS after Merger $\left(\frac{81,50,000}{10,00,000}\right)$	₹ 8.15
PE Ratio	12.50
Post Merger Price of Share (₹ 8.15 x 12.50)	₹ 101.875
Less: Price before merger	₹ 100.00
	₹ 1.875
Say	₹ 1.88

TYK 26 ***(PG NO 13.50)***

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 ₹10 each. The highest and the lowest market quotation during the last 6 months were ₹570 and ₹430. For the purpose of the exchange, the price per share is to be reckoned as the average of the h ighest 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:

	₹ lakhs
Sources	

Share Capital	
20 lakhs equity shares of ₹10 each fully paid	200
10 lakhs equity shares of ₹10 each, ₹5 paid	50
Loans	100
Total	350
Uses	
Fixed Assets (Net)	150
Net Current Assets	200
	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	₹ lakhs
31.3.07	after tax earnings for equity	105
31.3.08	Do	120
31.3.09	Do	125
31.3.10	Do	120
31.3.11	Do	100
	Terminal Value estimate	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:

(a) Calculate the total value of the business of XY Ltd.

(b) The number of shares to be issued by AB Ltd.; and

(c) 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

= (₹ 570 + ₹ 430)/2 = ₹ 500

Value of XY Ltd based on future cash flow capitalization (105x0.93)+(120x0.86)+(125x0.79)+(120x0.74)x(300x 0.68)	₹ lakhs	592.40
Value of XY Ltd based on net assets	₹ lakhs	250.00
Average value (592.40+250)/2		421.20
No. of shares in AB Ltd to be issued ₹ 4,21,20,000/500	Nos.	84,240
Basis of allocation of shares		
Fully paid equivalent shares in XY Ltd. (20+5) lakhs		25,00,000
Distribution to fully paid shareholders 84240x20/25		67,392
Distribution to partly paid shareholders 84240-67392		16,848

TYK 27 *(PG NO 13.51)*

R Ltd. and S Ltd. are companies that operate in the same industry. The financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	R. Ltd. (₹)	S. Ltd (₹)
Equity & Liabilities		
Shareholders Fund		
Equity Capital (₹ 10 each)	20,00,000	16,00,000
Retained earnings	4,00,000	-
Non-current Liabilities		
16% Long term Debt	10,00,000	6,00,000
Current Liabilities	14,00,000	8,00,000
Total	**48,00,000**	**30,00,000**
Assets		
Non-current Assets	20,00,000	10,00,000
Current Assets	28,00,000	20,00,000
Total	**48,00,000**	**30,00,000**

Income Statement

	Particulars	R. Ltd. (₹)	S. Ltd. (₹)
A.	Net Sales	69,00,000	34,00,000
B.	Cost of Goods sold	55,20,000	27,20,000
C.	**Gross Profit (A-B)**	13,80,000	6,80,00
D.	Operating Expenses	4,00,000	2,00,000
E.	Interest	1,60,000	96,000
F.	**Earnings before taxes [C-(D+E)]**	8,20,000	3,84,000
G.	Taxes @ 35%	2,87,000	1,34,400
H.	Earnings After Tax (EAT)	5,33,000	2,49,600

Additional Information:

No. of equity shares	2,00,000	1,60,000
Dividend payment Ratio (D/P)	20%	30%
Market price per share	₹ 50	₹ 20

Assume that both companies are in the process of negotiating a merger through exchange of Equity shares:

You are required to:

(i) Decompose the share price of both the companies into EPS & P/E components. Also segregate their EPS figures into Return On Equity (ROE) and Book Value/Intrinsic Value per share components.

(ii) Estimate future EPS growth rates for both the companies.

(iii) Based on expected operating synergies, R Ltd. estimated that the intrinsic value of S Ltd. Equity share would be ₹ 25 per share on its acquisition. You are required to develop a range of justifiable Equity Share Exchange ratios that can be offered by R Ltd. to the shareholders of S Ltd. Based on your analysis on parts (i) and (ii), would you expect the negotiated terms to be closer to the upper or the lower exchange ratio limits and why?

Solution

(i) Determination of EPS, P/E Ratio, ROE and BVPS of R Ltd. & S Ltd.

	R Ltd.	S Ltd.
EAT (₹)	5,33,000	2,49,600

N	2,00,000	1,60,000
EPS (EAT÷N)	2.665	1.56
Market Price Per Share	50	20
PE Ratio (MPS/EPS)	18.76	12.82
Equity Fund (Equity Value)	24,00,000	16,00,000
BVPS (Equity Value ÷ N)	12	10
ROE (EAT÷ EF) or	0.2221	0.156
ROE (EAT ÷ EF) x 100	22.21%	15.60%

(ii) Determination of Growth Rate of EPS of R Ltd.& S Ltd.

	R Ltd.	**S Ltd.**
Retention Ratio (1-D/P Ratio)	0.80	0.70
Growth Rate (ROE x Retention Ratio) or	0.1777	0.1092
Growth Rate (ROE x Retention Ratio) x 100	17.77%	10.92%

(iii) Justifiable equity share exchange ratio

(a) Market Price Based = MPS_S/MPS_R = ₹ 20/ ₹ 50 = 0.40:1 (lower limit)

(b) Intrinsic Value Based = ₹ 25/ ₹ 50 = 0.50:1 (max. limit)

Since R Ltd. has higher EPS, PE, ROE and higher growth expectations the negotiated term would be expected to be closer to the lower limit, based on existing share price.

TYK 28 *(PG NO 13.53)*

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.(₹)**	**DA Ltd.(₹)**
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 (₹10 each)	10,00,000	8,00,000
Retained earnings	2,00,000	--
14% long-term debt	5,00,000	3,00,00

Current liabilities	7,00,000	4,00,000
Total (₹)	**24,00,000**	**15,00,000**

Income Statement

	BA Ltd. (₹)	DA Ltd. (₹)
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	1,98,00
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 ratio (D/P)	40%	60%
Market price per share	₹40	₹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 required to:

(i) Decompose the share price of both the companies into EPS and P/E components; and also segregate their EPS figures into Return on Equity (ROE) and book value/intrinsic value per share components.

(ii) Estimate future EPS growth rates for each company.

(iii) Based on expected operating synergies BA Ltd. estimates that the intrinsic value of DA's equity share would be ₹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 in part (i) and (ii), would you expect the negotiated terms to be closer to the upper, or the lower exchange ratio limits and why?

(iv) Calculate the post-merger EPS based on an exchange ratio of 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.

(v) Based on a 0.4: 1 exchange ratio and assuming that BA Ltd.'s 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

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 BA Ltd. and DA Ltd.

		BA Ltd.	DA Ltd.
Earnings After Tax	(EAT)	₹ 2,10,000	₹ 99,000
No. of Shares	(N)	1,00,000	80,000
EPS	(EAT/N)	₹ 2.10	₹ 1.2375
Market price per share	(MPS)	40	15
P/E Ratio	(MPS/EPS)	19.05	12.12
Equity Funds	(EF)	₹ 12,00,000	₹ 8,00,000
BVPS	(EF/N)	12	10
ROE	(EAT/EF) × 100	17.50%	12.37%

(ii) Estimation of growth rates in EPS for BA Ltd. and DA Ltd.

Retention Ratio	(1-D/P ratio)	0.6	0.4
Growth Rate	(ROE × Retention Ratio	10.50%	4.95%

(iii) Justifiable equity shares exchange ratio

(a) Intrinsic value based = ₹20 / ₹40 = 0.5:1 (upper limit)

(b) Market price based = MPS_{DA}/MPS_{BA} = ₹15 / ₹40 =0.375:1(lower limit)

Since, BA 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.

(iv) Calculation of Post merger EPS and its effects

Particulars			BA Ltd.	DA Ltd.	Combined
EAT	(₹)	(i)	2,10,000	99,000	3,09,000
Share outstanding		(ii)	1,00,000	80,000	1,32,000*

EPS	(₹)	(i) / (ii)	2.1	1.2375	2.341
EPS Accretion (Dilution)	(Re.)		0.241	(0.301***)	

(v) Estimation of Post merger Market price and other effects

Particulars			BA Ltd.	DA Ltd.	Combined
EPS	(₹)	(i)	2.1	1.2375	2.341
P/E Ratio		(ii)	19.05	12.12	19.05
MPS	(₹)	(i) / (ii)	40	15	44.6
MPS Accretion	(₹)		4.6	2.84***	

* Shares outstanding (combined)	= 1,00,000 shares + (.40 × 80,000) =	1,32,000 shares
** EPS claim per old share	= ₹2.34 × 0.4	₹ 0.936
EPS dilution	= ₹1.2375 – ₹ 0.936	₹ 0.3015
***S claim per old share	(₹ 44.60 × 0.4)	₹ 17.84
Less: MPS per old share		₹ 15.00
		₹ 2.84

TYK 29 *(PG NO 13.54)*

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)	5	16	28
Total Capital/ Risk Weight Asset			
Market price per Share (MPS)	12	96	32
Book value			10
Trading on Stock Exchange	Irregular	Frequent	

Balance Sheet **(₹ in Lakhs)**

Particulars	Weak Bank (W)	Strong Bank (S)
Paid up Share Capital (₹ 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
Investments	1,100	19,000
Advances	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 x 30%	0.0375
CAR	5:16	5/16 x 28%	0.0875
Market Price	12:96	12/96 x 32%	0.0400
Book Value Per Share	12:120	12/120x 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 (₹ Lakhs)	150	500
Reserves & Surplus (₹ Lakhs)	80	5,500
	230	6,000
Less: Preliminary Expenses (₹ Lakhs)	50	--
Net Worth or Book Value (₹ Lakhs)	180	6,000

(b) No. of equity shares to be issued:

$\frac{150}{10} \times 0.1750 = 2.625$ lakh shares

(c) Balance Sheet after Merger

Calculation of Capital Reserve

Book Value of Shares	₹ 180.00 lac
Less: Value of Shares issued	₹ 26.25 lac
Capital Reserve	₹ 153.75 lac

Balance Sheet

	₹ lac		₹ lac
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	Advances	30,500.00
Other Liabilities	3,390.00	Other Assets	2,070.00
	57,570.00		**57,570.00**

(d) Calculation CAR & Gross NPA % of Bank 'S' after merger

$$\text{CAR/CRWAR} = \frac{\text{Total Capital}}{\text{Risky Weighted Assets}}$$

	Weak Bank	Strong Bank	Merged
	5%	16%	
Total Capital	₹ 180 lac	₹ 6,000 lac	₹ 6,180 lac
Risky Weighted Assets	₹ 3.600 lac	₹ 37,500 lac	₹ 41,100 lac

$$\text{CAR} = \frac{6{,}180}{41{,}100} \times 100 = 15.04\%$$

$$\text{GNPA Ratio} = \frac{\text{Gross NPA}}{\text{Gross Advances}} \times 100$$

	Weak Bank	Strong Bank	Merged
GNPA (Given)	0.40	0.05	
	$0.40 = \frac{GNPA_R}{₹\ 3,500\ lac}$	$0.05 = \frac{GNPA_S}{₹\ 27,000\ lac}$	
Gross NPA	₹ 1,400 lac	₹ 1,350 lac	₹ 2,750 lac

TYK 30 ***(PG NO 13.55)***

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	₹	Assets	₹
Equity Capital (70,000 shares)		Cash	50,000
Retained earnings	3,00,000	Debtors	70,000
12% Debentures	3,00,000	Inventories	2,00,000
Creditors and other liabilities	3,20,000	Plants & Eqpt.	13,00,000
	16,20,000		16,20,000

Additional Information:

(i) Shareholders of Leopard Ltd. will get one share in Tiger Ltd. for every two shares. External liabilities are expected to be settled at ₹ 5,00,000. Shares of Tiger Ltd. would be issued at its current price of ₹ 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 ₹ 2,00,000.

(ii) 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 ₹ 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 ₹ 2,00,000.

(iii) 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 ₹ 1 are as follows:

Years	1	2	3	4	5	6
PV	0.862	0.743	0.641	0.552	0.476	0.410

Solution

Calculation of Purchase Consideration

	₹
Issue of Share 35000 x ₹15	5,25,000
External Liabilities settled	5,00,000
13% Debentures	3,00,000
	13,25,000
Less: Realization of Debtors and Inventories	2,00,000
Cash	50,000
	10,75,000

Net Present Value = PV of Cash Inflow + PV of Demerger of Leopard Ltd. – Cash Outflow

= ₹ 5,00,000 PVAF(16%,6) + ₹ 2,00,000 PVF(16%, 6) – ₹ 10,75,000

= ₹ 5,00,000 x 3.684 + ₹ 2,00,000 x 0.410 – ₹ 10,75,000

= ₹ 18,42,000 + ₹ 82,000 – ₹ 10,75,000

= ₹ 8,49,000

Since NPV of the decision is positive it is advantageous to acquire Leopard Ltd.

TYK 31 ***(PG NO 13.56)***

The equity shares of XYZ Ltd. are currently being traded at ₹ 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 ₹ 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 ₹ 4,00,000 p.a. Top management with their families are promoters of XYZ Ltd. Present value of these savings would add ₹ 30,00,000 in value to the acquisition.

Following additional information is available regarding PQR Ltd.: Earnings per share : ₹ 4

Total number of equity shares outstanding : 15,00,000

Market price of equity share : ₹ 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

(i) 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 ₹ 24)	₹ 2,40,00,000
Synergy Gain	₹ 80,00,000
Saving of Overpayment	₹ 30,00,000
	₹ 3,50,00,000
Maximum Price (₹ 3,50,00,000/10,00,000)	₹ 35

Alternatively, it can also be computed as follows: Let

ER be the swap ratio then,

$$40 = \frac{24 \times 10,00,000 + 40 \times 15,00,000 + 80,00,000 + 30,00,000}{15,00,000 + 10,00,000 \times ER}$$

ER = 0.875

MP = PE x EPS x ER = $\frac{40}{4}$ x ₹ 4 x 0.875 = ₹ 35

(ii) 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 x ₹ 24)	₹ 96,00,000
Add: PV of loss of remuneration to top management	₹ 30,00,000
	₹ 1,26,00,000
No. of Shares	4,00,000
Minimum Price (₹ 1,26,00,000/4,00,000)	₹ 31.50