BENCHMARX

2025

CA FINAL

ADVANCED FINANCIAL MANAGEMENT

SUPER 90 QUESTIONS

7021953181/7977299310

Bhavik Chokshi

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CHAPTER 1 VALUATION OF SECURITIES (SECURITY ANALYSIS AND SECURITY VALUATION)

Question 1

(Practice Manual)

[Q.9 - AFM 8 (Fast Track) & 9, Q.9 - AFM 10]

Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

Credit Rating	Discount Rate
AAA	364 day T bill rate + 3% spread
AA	AAA + 2% spread
A	AAA + 3% spread

He is considering to invest in AA rated, ₹ 1,000 face value bond currently selling at ₹ 1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364 day T-bill rate to be 9%).

You are required to calculate the intrinsic value of the bond for Mr. Z. Should he invest in the bond? Also calculate the current yield and the Yield to Maturity (YTM) of the bond.

Summary

Detailed Solution

a. Discount Rate

AAA = 9% + 3% = 12%

AA = 12% + 2% = 14%

b. Intrinsic Value

B_o = 150 × 3.4331 + 1,000 × 0.5194

PVAF (14%, 5 Years) *PVF (14%, 5th Year)*

= **1,034.37**

c. Recommendation:

Mr Z should buy the bond as the Market Price of the bond (1,025.86) < Intrinsic Value (1,034.37)

d. Current Yield = $\frac{\text{Annual Interest}}{\text{Market Price}} \times 100$

= $\frac{150}{1,025.86} \times 100$

= **14.62%**

Reference Note: *If the MP was not given, intrinsic value would be considered as the Market price.*

e. Yield to Maturity

Using Trial & Error

PVCO = ₹ 1,025.86

At 14%, PVCI = 1,034.37 (part b)

At 15%, PVCI = 150 × 3.3522 + 1,000 × 0.4972

PVAF (15%, 5 Years) *PVF (15%, 5th Year)*

= ₹ 1,000.03

By Using Interpolation

$$\frac{x - 14\%}{15\% - 14\%} = \frac{1,025.86 - 1,034.37}{1,000.03 - 1,034.37}$$

$$\frac{x - 0.14}{0.01} = \frac{8.51}{34.34}$$

$x = 0.14 + 0.0025$

$x = 0.1425$ i.e. 14.25%

Question 2 *(ICAI Paper Jan 21)*

[Q.19 - AFM 8 (Fast Track) & 9, Q.19 - AFM 10]

Following are the yields on Zero Coupon Bonds (ZCB) having a face value of ₹ 1,000 :

Maturity (Years)	Yield to Maturity (YTM)
1	10%
2	11%
3	12%

Assume that the term structure of interest rate will remain the same.

You are required to

(i) Calculate the implied one year forward rates

(ii) Expected Yield to Maturity and prices of one year and two year Zero Coupon Bonds at the end of the first year.

Summary

Detailed Solution

1. Implied forward rate: The forward rate for year 1 would be the same as YTM for year 1 i.e 10%
2. Forward Rate for year 2

$(1 + YTM)^2 = (1 + r_1)(1 + r_2)$

$(1 + 0.11)^2 = (1 + 0.1)(1 + r_2)$

$1.2321 = 1.1r_2 + 1.1$

$0.1321 = 1.1r_2$

$r_2 = 0.1201$

i.e. **12.01%**

3. Forward Rate for Year 3

$(1 + 0.12)^3 = (1 + 0.11)^2 (1 + r_3)$

$1.4049 = 1.2321 + 1.2321r_3$

$1.2321r_3 = 0.1728$

$r_3 = 0.1402$

i.e. **14.02%**

Alternatively

$(1 + YTM_3)^3 = (1 + r_1)(1 + r_2)(1 + r_3)$

$(1 + 0.12)^3 = (1 + 0.1)(1 + 0.1201)(1 + r_3)$

$$\frac{1.4049}{1.2321} = 1 + r_3$$

$1 + r_3 = 1.1402$

$r_3 = 14.02\%$

ii. Actual Position at the end of Year 1:

Bond 1: Since the Original Maturity is 1 Year, this bond would have been redeemed & hence it would not be outstanding Bond at the end of Year 1.

Bond 2: Remaining Maturity is 1 Year

$r_2 = 12.01\% = YTM$

Since the expected interest rate in 2nd year (r_2) of 12.01% will actually prevail in 2nd year, the YTM for this bond would be the required return which a new investor would expect from this bond considering expected Interest Rate at the end of the first year for 1 year.

i.e YTM = r_2 = 12.01%

Price of Bond 2 at end of Year 1 = 1,000 × 0.8928

PVF (12.01%, 1st Year)

= **892.8**

Reference Note: *We take 1 year as the remaining maturity because we are at the end of the 1st Year and a 2 year bond would be redeemed after 1 more year.*

Bond 3: Remaining Maturity: 2 years

$(1 + YTM)^2 = (1 + r_2)(1 + r_3)$

$(1 + YTM)^2 = (1 + 0.1201)(1 + 0.1402)$

Let YTM be x

$(1 + x)^2 = 1.2771$

$1 + x = 1.1301$

$x = 0.1301$ i.e. 13.01%

Price of bond 3 at end of Year 1 = ₹ 1,000 × 0.7830

PVF (13.01%, 2nd year)

= ₹ 783

Question 3 *(ICAI Paper Nov 20)*

[Q.26 - AFM 8 (Fast Track) & 9, Q.26 - AFM 10]

The following data are available for a bond :

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

Coupon rate 8.5 per cent per annum

Years to Maturity 5 years

Years to maturity (YTM) 10 per cent

You are required to calculate :

(i) Current market price of the Bond,

(ii) Macaulay's Duration,

(iii) Volatility of the Bond,

(iv) Convexity of the Bond,

(v) Expected Market price, if there is a decrease in the YTM by 200 basis points

(a) By Macaulay's Duration based estimate

(b) By Intrinsic Value Method.

Given

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

Summary

Detailed Solution

(i) Duration and Price

Year (t)	CI	DF @ 10%	PVCI	t × PV of CI
1	850	0.909	772.65	772.65
2	850	0.826	702.10	1,404.2
3	850	0.751	638.35	1,915.05
4	850	0.683	580.55	2,322.2
5	10,850	0.621	6,737.85	33,689.25
			9,431.50	**40,103.35**

(ii) Macaulay Duration = $\frac{\sum t \times PV \text{ of } CI}{\sum PV \text{ of } CI}$

= $\frac{40,103.35}{9,431.50}$

= **4.25 Years**

(iii) Current Market Price = 9,431.50

(iv) Volatility = $\frac{\text{Macaulay Duration}}{1 + YTM}$

= $\frac{4.25}{(1 + 0.1)}$

= **3.864**

(v) Convexity

V_o = (₹ 9,431.50) At 10%

V_+ = (10% - 2%) At 8%

V_- = (10% + 2%) At 12%

Reference Note

As Sub point (v) requires the expected price if YTM changes by 2%, we have calculated V_+ and V_- taking difference of 2%

Alternatively, any other difference (of say 1%) can also be taken

V_+ (at 8%) = 850 × 3.993 + 10,000 × 0.681

PVAF (8%, 5 Years) *PVF (8%, 5th Year)*

V_+ (at 8%) = ₹ 10,204.05

V_- (at 12%) = 850 × 3.605 + 10,000 × 0.567

PVAF (12%, 5 Years) *PVF (12%, 5th Year)*

V_- = ₹ **8,734.25**

Convexity (C) = $\frac{V_+ + V_- - 2V_o}{2V_o \times (YTM)^2}$

$$= \frac{10,204.05 + 8,734.25 - (2 \times 9,431.50)}{(2 \times 9,431.50) \times (0.02)^2}$$

$$= \frac{75.3}{7.5452}$$

= **9.98**

Convexity Effect = $C \times (YTM)^2 \times 100$

= $9.98 \times (0.02)^2 \times 100$

= 998×0.0004

= **0.3992% i.e 0.40%**

Expected Market Price for 2% fall in YTM

a. Based on Duration

YTM	Price
- 1%	+ 3.864
- 2%	+ **7.73** (cross multiply)

Expected Price = 9,431.5 + 7.73% × 9,431.5

= **10,160.55**

b. Based on Intrinsic Value Method

(i.e PV of future CF @ 8%)

= ₹ 10,204.05 (From point iii)

Extra: ***Bond Value Based on Duration and Convexity***

= 9,431.50 + 7.73% × 9,431.50 + 0.40% × 9,431.5

= 9,431.5 + 729.05 + 37.73 = 10,198.28

Question 4 *(Practice Manual)*

[Q.36 - AFM 8 (Fast Track) & 9, Q.36 - AFM 10]

Seawell Corporation reported earnings per share of ₹ 2.10 in 2003, on which it paid Dividend per share of ₹ 0.69. As on 01 January, 2004 an analyst expects the earnings to grow at 15% p.a. from 2004 to 2008, and during this period the dividend payout ratio is expected to remain unchanged. After 2008, the earnings growth rate is expected to drop to a stable rate of 6% and the payout ratio is expected to increase to 65% of earnings. The firm has a beta of 1.40 currently, and is expected to have a beta of 1.10 after 2008. The market risk premium is 5.5% and the Treasury Bond (Risk free) rate is 6.25%.

(a) What is the expected price of the share at the end of 2008

(b) What is the value of the share today (01 Jan 04), using the two stage dividend discount model

Summary

Detailed Solution

1. **Given Data**

$E_0 = 2.10$, $D_0 = 0.69$

Earnings growth: 2004 to 2008 = 15%

After 2008 = 6%

Dividend pay-out: 2004 to 2008 = $\frac{0.69}{2.1} \times 100$ = 32.86%

2008 onwards = 65%

β: 2004 to 2008 = 1.4, After 2008 = 1.1

$R_M - R_F = 5.5\%$, $R_F = 6.25\%$

2. **Calculation of dividend & Earnings**

YEAR	EPS	DPS
1 (2004)	2.42	0.80 *(2.42 × 32.86%)*
2 (2005)	2.78	0.91
3 (2006)	3.20	1.05
4 (2007)	3.68	1.21
5 (2008)	4.23	1.39
6 (2009)	4.48 *(+6%)*	2.91 *(4.48 × 65%)*

3. **Calculation of K_e**

Using CAPM

$K_e = R_F + (R_M - R_F)\ \beta$

2004 to 2008

β = 1.4

$K_e = 6.25 + (5.5) \times 1.4$

$\boxed{K_e = 13.95\%}$

After 2008

$= 6.25 + (5.5) \times 1.1$

$\boxed{K_e = 12.3\%}$

4. P_0 = PV of $(D_1 + D_2 + D_3 + D_4 + D_5)$ + PV of $(D_6 + D_7 + \ldots\ldots D_\infty)$

= 3.55 + 24.04. (From WN 1 & WN 2)

= **27.59**

WN 1: PV of D_1-D_5

Years	Dividend	K_e @13.95%	PV of Dividend
1	0.8	0.8776	0.70
2	0.91	0.7701	0.70
3	1.05	0.6759	0.71
4	1.21	0.5931	0.72
5	1.39	0.5205	0.72
			3.55

WN 2: Terminal Value

$$\text{PV of } P_5 = \frac{D_6}{K_E - g} \times PVF(13.95\%, 5^{th}\ Year)$$

$$\text{PV of } P_5 = \frac{2.91}{0.123 - (0.06)} \times 0.5205$$

$$\text{PV of } P_5 = \frac{2.91}{0.063} \times 0.5205$$

$$\text{PV of } P_5 = 46.19 \times 0.5205$$

$$\text{PV of } P_5 = 24.04$$

Answer:

a. Expected price at year: 5 (2008) = ₹ **46.19**

b. Price Today (1/1/2004) = ₹ **27.59**

Question 5 *(ICAI Study Material [Modified])*

[Q.40 - AFM 8 (Fast Track) & 9, Q.40 - AFM 10]

A share with par value of ₹ 100 has current market price of ₹ 500. Annual dividend is 20%. Bonus shares are expected to be issued during the 5th year @ one share for 4 held. One shareholder intends to sell the shares at the end of 8th year. Price of a share is expected to be ₹ 900 at the end of the 8th year. Shareholders are required to bear incidental expenses on sale & purchase of shares @ 10% of Market Price of share. Dividend rate will remain same even after the bonus issue. Required rate of return is 10%. Ignore taxation. Should the share be purchased and if yes, at what maximum price?

Summary

Detailed Solution

P_0 = PV of (D_1 + D_2 + D_3 + D_4……+ D_8) + PV of Net Sale Proceeds

In this case, there is a bonus issue during the 5th year @ 1:4, that is one share held will get 1 × 1/4 = 0.25 bonus shares, thus the post bonus number of shares held = 1.25 shares.

a. PV of dividend from YR : 1 to 8

Year	Dividend	DF@10%	PV
1-4	20 *(100 × 1 × 20%)*	3.1699 *PVAF (10%;1 - 4)*	63.40
5-8	25 *(100 × 1.25 × 20%)*	2.165 *PVAF (10%;5-8)*	54.13
			₹ 117.52

b. PV of Net Sale Proceeds (900 × 1.25 shares) : ₹ 1,125
(-) Incidental Expense @10% (₹ 112.5)
Net Sale proceeds ₹ 1,012.5
* PVF (10%, 8th Year) 0.4665
PV of Net Sale proceeds **₹ 472.33**

c. PV of all cash inflows.
= 117.53 (a) + 472.33 (b)
= **₹ 589.86**

d. The above workings have not considered the incidental expense on purchase
Let purchase price be ₹ 100

Purchase price	100	? ₹ 536.24	*(Through cross multiplication)*
+ Incidental expense (10%)	10		
Total	**110**	**589.86**	

The maximum purchase price of the share (excluding purchase expenses) is ₹ 536.24.

As this price is greater than the current market price (excluding expenses) that is ₹ 500, the share is worth buying today.

Reference Note: *Alternatively, ₹ 589.86 can be compared with ₹ 550 (500 + 10%) in order to decide whether the share is worth investing today or not. However, the maximum purchase price needs to be the standalone price itself (i.e. without considering purchase expenses).*

Question 6 *(ICAI Study Material)*

[Q.49 - AFM 8 (Fast Track) & 9, Q.49 - AFM 10]

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

Summary

Detailed Solution

1. As all the information is given on a per share basis, we will try to find FCFE/share. In such a case, we need to calculate PAT/share (EPS).

   No. of shares = $\frac{₹\ 1,300\ Cr}{₹\ 40}$ = **32.5 Crore Shares**

2. EPS = $\frac{\text{Profit After Tax (PAT)}}{\text{No. of Shares}}$

   = $\frac{290}{32.5}$ = **₹ 8.92/share**

3. In this question, the debt ratio is given and hence an alternative formula can be used to calculate FCFE/share

   FCFE/Share

   = PAT/Share (EPS) + Depreciation/Share (I - D) - CAPEX/Share (I - D) - in WC/Share(I - D)

   = 8.92 + 39 (1 - 0.27) - 47 (1 - 0.27) - 3.45 (1 - 0.27)

   = 8.92 + 28.47 - 34.31 - 2.51 = **0.56/shares**

   In the absence of information, we have assumed that FCFE of 0.56 is for year 0 [in line with ICAI's solution] alternatively it can also be taken as FCFE for Year 1.

4. Using CAPM

$K_e = R_F + (R_M - R_F)$

$= 8.7 + (10.3\% - 8.7\%)\ 0.1$

$= 8.7\% + 0.16\%$

$\boxed{K_e = 8.86\%}$

5. $P_0 = \dfrac{\text{FCFE/Share}}{K_e - g}$

$= \dfrac{0.56 \times 1.08}{0.0886 - 0.08}$

$P_0 = \dfrac{0.6048}{0.0086}$

$P_0 = \boxed{70.33/\text{Share}}$

Question 7 *(ICAI Paper May 22)*

[Q.53 - AFM 8 (Fast Track) & 9, Q.53 - AFM 10]

Following information is available pertaining to ABC Ltd. which is expected to grow at a higher rate for 3 years after which growth rate will stabilize at a lower level.

Base year information is -

Revenues	EBIT (After Depreciation)	Capital Expenditure	Depreciation
₹ 1,000 Cr.	₹ 150 Cr.	₹ 140 Cr.	₹ 100 Cr.

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

Stable Growth

Particulars	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	1.00
Market Risk Premium	6%	5%
PreTax cost of Debt	13%	12.86%
Debt Equity Ratio	1:1	2:3

Working capital is 25% of Revenue for all time. Corporate Tax Rate is 30%.

You are requested to find out the value of ABC Ltd.

Summary

Detailed Solution

Particulars	High growth phase:	Stable growth phase:
k_e	0.10 + 1.15 x 0.06 = 0.169 or 16.9%.	0.09 + 1.0 x 0.05 = 0.14 or 14%.
k_d	0.13 x (1 - 0.3) = 0.091 or 9.1%.	0.1286 x (1 - 0.3) = 0.09 or 9%.
Cost of capital	0.5 x 0.169 + 0.5 x 0.091 = 0.13 or 13%.	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)

Particulars	Yr. 1	Yr. 2	Yr. 3	Terminal Year
Revenue	1200.00	1440.00	1728.00	1900.80
EBIT	180.00	216.00	259.20	285.12
EAT	126.00	151.20	181.44	199.58
Capital Expenditure	48.00	57.60	69.12	-
Less Depreciation				
Δ Working Capital	50.00	60.00	72.00	43.20
Free Cash Flow (FCF)	**28.00**	**33.60**	**40.32**	**156.38**

Alternatively, it can also be computed as follows:

(₹ in crores)

	Yr. 1	Yr. 2	Yr. 3	Terminal Year
Revenue	1200.00	1440.00	1728.00	1900.80
EBIT	180.00	216.00	259.20	235.12
EAT	126.00	151.20	181.44	199.58
Add: Depreciation	120.00	144.00	172.80	190.08
	246.00	295.20	354.24	389.66
Less: Capital Exp.	168.00	201.60	241.92	190.08
Δ WC	50.00	60.00	72.00	43.20
	28.00	**33.60**	**40.32**	**156.38**

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 13%	PV (₹ in crores)
28.00	0.885	24.78
33.60	0.783	26.31
40.32	0.693	27.94
		₹ **79.03**

Terminal Value of Cash Flow = $\frac{156.38}{0.12 - 0.10}$

= ₹ 7819 Crore

PV of the terminal value is = ₹ 7819 Crore × $\frac{1}{(1.13)^3}$

= ₹ 7819 Crore x 0.693 = ₹ 5418.57 Crore

The value of the firm is = ₹ 79.03 Crores + ₹ 5418.57 Crores = ₹ 5497.60 Crores

Question 8 *(ICAI Paper May 22)*

[Q.55 - AFM 8 (Fast Track) & 9, Q.55 - AFM 10]

Closing Values of NIFTY Index from 3rd to 12th day of the month of January 2022 were as follows:

Days	Date	Closing Values of NIFTY Index
1	03/01/2022	17626
2	04/01/2022	17805
3	05/01/2022	17925
4	06/01/2022	17746
5	07/01/2022	17813
6	10/01/2022	18003
7	11/01/2022	18056
8	12/01/2022	18212

The simple moving average of NIFTY Index for the month of December 2021 was 17174.

You are required to calculate

(i) The value of exponent for 15 days EMA.

(ii) The exponential moving average (EMA) of NIFTY during the above period. (Calculations to be done up to 2 decimals only)

(iii) Analyse the buy & sell signal on the basis of your calculations

Summary

Detailed Solution

(i) Value of Exponent for 15 days EMA

= $\frac{2}{n+1}$ = 0.125

(ii) EMAt = a X Pt + (1 – a) (EMA (t – 1)) Where, a = exponent, Pt = Price of today

Date	1 NIFTY	2 EMA for Previous day (EMA (t – 1))	3 1-2	4 3 × 0.125	5 EMA 2 + 4
03/01/2022	17626	17174	452	56.50	17230.50
04/01/2022	17805	17230.50	574.50	71.81	17302.31
05/01/2022	17925	17302.31	622.69	77.84	17380.15
06/01/2022	17746	17380.15	365.85	45.73	17425.88
07/01/2022	17813	17425.88	387.12	48.39	17474.27
10/01/2022	18003	17474.27	528.73	66.09	17540.36
11/01/2022	18056	17540.36	515.64	64.45	17604.82
12/01/2022	18212	17604.82	607.18	75.90	17680.71

(iii) A buy (bullish) signal is generated when actual price line (NIFTY in the give case) rises through the moving average, while a sell a (bearish) signal is generated when actual NIFTY level declines through the moving averages. In the case under consideration the price line of NIFTY never breaches the 15 -day EMA line. In-fact it is hovering around the 15-day EMA line only.

Question 9 *(ICAI SM)/(RTP May 23)/(MTP April 21)/ (MTP Oct 18)*

[Q.67 - AFM 8 (Fast Track) & 9, Q.67 - AFM 10]

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

Date Closing	Sensex Value
1.10.07	2800
3.10.07	2780
4.10.07	2795
5.10.07	2830
8.10.07	2760
9.10.07	2790
10.10.07	2880
11.10.07	2960
12.10.07	2990
15.10.07	3200
16.10.07	3300
17.10.07	3450
19.10.07	3360
22.10.07	3290

23.10.07	3360
24.10.07	3340
25.10.07	3290
29.10.07	3240
30.10.07	3140
31.10.07	3260

You are required to test the weak form of efficient market hypothesis by applying the run test at 5% and 10% level of significance.

Following value can be used :

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

Summary

Detailed Solution

Date	Closing Index	Sign of Price Charge
1.10.07	2,800	
3.10.07	2,780	-
4.10.07	2,795	+
5.10.07	2,830	+
8.10.07	2,760	-
9.10.07	2,790	+
10.10.07	2,880	+
11.10.07	2,960	+
12.10.07	2,990	+
15.10.07	3,200	+
16.10.07	3,300	+
17.10.07	3,450	+
19.10.07	3,360	-
22.10.07	3,290	-
23.10.07	3,360	+
24.10.07	3,340	-
25.10.07	3,290	-
29.10.07	3,240	-

30.10.07	3,140	-
31.10.07	3,260	+

1. N_1, N_2, r

   N_1: Number of *positive* sign changes = 11

   N_2: Number of *negative* sign changes = 8

   r: Number of runs = 8

2. Calculate μ and σ

$$\mu = \frac{(2N_1N_2)+1}{(N_1+N_2)}$$

$$\mu = \frac{(2 \times 11 \times 8)}{(11+8)} + 1$$

$$\mu = 10.26$$

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

$$\sigma = \sqrt{\frac{(2 \times 11 \times 8) \times [\,2 \times 11 \times 8 - 11 - 8)}{(11+8)^2 \times (11+8-1)}}$$

$$\sigma = \sqrt{\frac{27,632}{6,498}}$$

$$\sigma = 2.06$$

3. Limits

   Lower Limit: $\mu - t \times \sigma$

   Upper Limit: $\mu + t \times \sigma$

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

   Lower limit

   = 10.26 – 2.101 × 2.06

   = **5.93**

   Upper limit

   = 10.26 + 2.101 × 2.06

   = **14.59**

   Range at 5%: 5.93 – 14.59

Test at 10% level of significance at 18 degrees of freedom using t - table

Lower limit

= 10.26 – 1.734 × 2.06

= **6.69**

Upper limit

= 10.26 + 1.734 × 2.06

= 13.83

Range at 10%: 6.69 – 13.83

4. Conclusion

As r is 8 which is within the range of lower limit and the upper limit at both 5% and 10% level of significance, the market is considered to satisfy the weak form of efficient market hypothesis.

Reference Note:

A market is considered to be efficient if the price changes are random. In case there are too few runs or too many runs, then an investor can predict the price movements by merely looking at the past price data and hence the market would be inefficient. However, in case the number of runs are within the average range of randomness, it is a little difficult to predict the future price movements looking at the past data and hence in such a case, the markets are considered to be weak form efficient.

Question 10 *(ICAI SM [Modified])/(MTP April 18)/(RTP Nov 22)/ (ICAI Paper July 21)/(ICAI Paper May 19)*

[Q.71 - AFM 8 (Fast Track) & 9, Q.71 - AFM 10]

Abhishek has a surplus cash of ₹ 80 lakhs and wants to distribute 30% of it to the shareholders. The company decides to buy back shares. The finance manager of the Company estimates that its share price after repurchase 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 repurchased if the market capitalization of the company should be ₹ 180 lakhs after buyback
b. The number of shares that can be repurchased
c. The impact of share repurchase on the EPS, assuming the net income is same.

Summary

Detailed Solution

a. Let the Buyback price be '*x*'

Therefore, the post buy-back price would be 1:1*x*

$$\text{No. of shares bought back} = \frac{₹\ 80,00,000 \times 30\%}{x}$$

$$= \frac{₹\ 24,00,000}{x}$$

Post buy-back Market capitalisation = Post Buy Back price × Post Buy Back no. of shares

1,80,00,000 = 1.1x × [10,00,000 - 24,00,000/x]

1,80,00,000 = 11,00,000x - 26,40,000

2,06,40,000 = 11,00,000x

x = ₹ 18.76

Buyback Price = 18.76

b. $$\text{No. of shares bought back} = \frac{₹\ 24,00,000}{18.76}$$

= **1,27,932 shares**

c. $$\text{Pre-Buyback EPS} = \frac{\text{Pre - Buyback PAT}}{\text{Pre Buyback Shares}}$$

$$₹\ 3 = \frac{\text{Pre - Buyback PAT}}{10,00,000}$$

Pre-Buyback PAT = ₹ 30,00,000

As the PAT remains the same post Buyback

$$\text{Post Buyback EPS} = \frac{30,00,000}{10,00,000 - 1,27,932}$$

$$= \frac{30,00,000}{8,72,068}$$

Post Buyback EPS = ₹ 3.44

Question 11 *(Practice Manual)*

[Q.75 - AFM 8 (Fast Track) & 9, Q.75 - AFM 10]

The following data is relating 8.5% Fully convertible debentures issued by JAC Ltd at ₹ 1,000

Market Price of Debenture	₹ 900
Conversion Ratio	30
Straight Value of Debenture	₹ 700
Market Price of Equity Shares on date of conversion	₹ 25

Expected Dividend per share ₹ 1

Required:

(a) Conversion Value

(b) Market Conversion Price

(c) Conversion Premium per share

(d) Ratio of conversion premium

(e) Premium over straight value

(f) Favorable income differential per share

(g) Premium payback period

Summary

Detailed Solution

a. Conversion Value = Conversion Ratio × MPS

= 30 × 25

= **₹ 750**

b. Market Conversion Price / Conversion Parity Price = $\frac{\text{Market Price of debentures}}{30}$

= $\frac{900}{30}$

= **30**

c. Conversion Premium Per Share = $\frac{\text{Market Price of Bond - Conversion Value}}{\text{Conversion Ratio}}$

= $\frac{900 - 750}{30}$

= $\frac{150}{30}$

= **₹ 5/share**

d. Ratio of Conversion Premium = $\frac{\text{Market Price of Bond - Conversion Value}}{\text{Conversion Value}}$

= $\frac{900 - 750}{750}$

= **0.2:1**

e. Premium Over Straight Value = Market price - Straight Value

= 900 - 700

= **₹ 200**

f.

Favourable Income Differential/Share	Favourable Income Differential/Bond
$= \frac{\text{Annual Income - (Annual Dividend / Share} \times \text{Conversion Ratio)}}{\text{Conversion Ratio}}$	= Annual Income - (Annual Dividend Per Share × Conversion Ratio
$= \frac{(1,000 \times 8.5\%) - (1 \times 30)}{30}$	= (1,000 × 8.5%) - (1 × 30)
$= \frac{85 - 30}{30}$	= 85 - 30
= **₹ 1.83/share**	= **₹ 55/bond**

g. Premium payback period $= \frac{\text{Conversion Premium}}{\text{Favourable Income Differential}}$

$= \frac{900 - 750}{55}$

$= \frac{150}{55}$ = **2.73 years**

Question 12 *(RTP Nov 24)*

[Q.1 - Additional Question AFM 8 (Fast Track) & 9, Q.85 - AFM 10]

The Bank PK enters into a Repo for 9 days with Bank JJ in 6% Government Bonds 2022 for an amount of ₹ 20 crore. The other relevant details are as follows:

First Leg Payment (Start Proceed)	₹ 20,00,67,500
Second Leg Payment (Repayment Proceed)	₹ 20,03,17,590
Initial Margin	1.25%
Days of accrued interest	240

Assume 360 days in a year.

Calculate:

(a) Repo Rate

(b) Dirty Price and

(c) Clean Price

Summary

Detailed Solution

(a) Second Leg = Start Proceed $\times \left(1 + \text{Repo Rate} \times \frac{\text{No. of days}}{360}\right)$

₹ 20,03,17,590 = ₹ 20,00,67,500 $\times \left(1 + \text{Repo Rate} \times \frac{9}{360}\right)$

$1.00125 = \left(1 + \text{Repo Rate} \times \frac{9}{360}\right)$

Repo Rate = 0.05 = 5%

(b) First Leg (Start Proceed) = Nominal Value $\times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100}$

₹ 20,00,67,500 = ₹ 20,00,00,000 $\times \frac{\text{Dirty Price}}{100} \times \frac{100 - 1.25}{100}$

10003.375 = 98.75 x Dirty Price

Dirty Price = ₹ 101.30

(c) Dirty Price = Clean Price + Interest Accrued

₹ 101.30 = Clean Price + $100 \times \frac{240}{360} \times 6\%$

Clean Price = ₹ 97.30

Question 13 *(ICAI Paper Nov 23)*

[Q.2 - Additional Question AFM 8 (Fast Track) & 9, Q.86 - AFM 10]

The following information of AB Ltd., is available below:

Market Value per share – ₹ 20 per share

Equity Share Capital – 12,00,000 shares @ the face value of ₹ 10 per share.

The company is planning to issue Rights Shares of the existing shareholders and raise ₹ 60,00,000 to finance a new project.

You are required:

(i) To calculate the ex-right price of shares and the value of right, if

(a) The company offers one right share for every three shares held.

(b) The company offers two right shares for every five shares held.

(ii) To show the effect of the rights issue on the wealth of shareholder X, who has 1,500 share, when the company offers on right share for every three shares held assuming:

(a) He subscribes to the Rights issue

(b) He ignores the Rights issue

Summary

Detailed Solution

(i) Ex-right price of share and the value of right

(a) Number of shares to be issued : 4,00,000

Subscription price ₹ 60,00,000/4,00,000 = ₹ 15

$$Ex-\text{Right Price} = \frac{₹\,240\text{ Lakh} + ₹\,60\text{ Lakh}}{1.0202} = ₹\,18.75$$

Value of a Right = ₹ 18.75 – ₹ 15 = ₹ 3.75

$$\text{Value of a Right Per Share Basis} = \frac{₹\,3.75}{3} = ₹\,1.25$$

(b) Number of shares to be issued : 4,80,000

Subscription price ₹ 60,00,000/4,80,000 = ₹ 12.50

$$\text{Ex-Right Price} = \frac{₹\,240\text{ Lakh} + ₹\,60\text{ Lakh}}{16.80\text{ Lakh}} = ₹\,17.86$$

Value of a Right = ₹ 17.86 – ₹ 12.50 = ₹ 5.36

$$\text{Value of a Right Per Share Basis} = \frac{₹\,5.36 \times 2}{5}\ ₹\,2.14 \text{ or } \frac{₹\,5.36}{5} = ₹\,1.07$$

(ii) (a) Shareholder's wealth that is holding 1500 shares when firm offers one share for three shares held and subscribes the offer.

Value of Shares after right issue (2000 X ₹ 18.75)	₹ 37,500
Less: Amount paid to acquire right shares (500 x ₹ 15)	₹ 7,500
	₹ 30,000

Wealth before Right Issue = 1500 x 20 = ₹ 30,000 Thus, there is no change in the wealth

(b) Shareholder's wealth that is holding 1500 shares when firm offers one share for three shares held and does not subscribe the offer.

Value of Shares after right issue (1500 x ₹ 18.75) = ₹ 28,125

Thus, if shareholder does not subscribe right offer there will be loss of wealth of ₹ 1,875.

CHAPTER 2 MERGERS, ACQUISITIONS AND CORPORATE RESTRUCTURING

Question 1 *(ICAI Study Material [Modified])*

[Q.6 - AFM 8 (Fast Track) & 9, Q.6 - AFM 10]

Following are the financial statements for A Ltd. and B Ltd. for the current financial year. Both firms operate in the same industry.

Balance Sheet

Particulars	A Ltd.	B Ltd.
Total current assets	₹ 14,00,000	₹ 10,00,000
Total fixed assets (net)	10,00,000	5,00,000
Total Assets	24,00,000	15,00,000
Equity capital (of ₹ 10 each)	10,00,000	8,00,000
Retained earnings	2,00,000	-
14% Long term debt	5,00,000	3,00,000
Total current liabilities	7,00,000	4,00,000
Total Liabilities	24,00,000	15,00,000

Income Statement

Particulars	A Ltd.	B 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	1,98,000
Taxes (50%)	2,10,000	99,000
Earnings after taxes (EAT)	2,10,000	99,000
Additional Information:	1,00,000	80,000
Number of equity shares	40%	60%
Dividend payment ratio	₹ 40	₹ 15
Market price per share (MPS)		

Assume that the two firms 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:-

(a) Decompose the share prices of both the firms into EPS and PE components, and also segregate their EPS figures into return on equity (ROE) and book value / intrinsic value per share (BVPS) components.

(b) Estimate future EPS growth rates for each firm.

(c) Based on expected operating synergies A Ltd. estimates that the intrinsic value of B's equity share would be Rs A 20 per share on its acquisition. You are required to develop a range of justifiable equity share exchange ratios that can be offered by A Ltd. to the shareholders of B 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?

(d) Calculate the post - merger EPS based on an exchange ratio of 0.4: 1 being offered by A Ltd. indicate the immediate EPS accretion or dilution, if any that will occur for each group of shareholders.

(e) Based on a 0.4: 1 exchange ratio, and assuming that A's pre - merger PE ratio will continue after the merger, estimate the post - merger market price. Show the resulting accretion or dilution in pre - merger market prices.

Summary

Detailed Solution

(a) Calculation of EPS, P/E, ROE, BVPS

Particulars	A	B
EPS = PAT/Sales	₹ 2,10,000 / 1,00,000 ₹ **2.10**	₹ 99,000 / 80,000 ₹ **1.24**
MPS = EPS × P/E P/E = MPS	₹ 40 / 2.1 ₹ **19.05 Times**	₹ 15 / 1.24 **12.10 Times**
Equity Shareholders Funds (ESC + Reserves)	10,00,000 + 2,00,000 ₹ **12,00,000**	8,00,000 + 0 ₹ **8,00,000**
BVPS = ESHF/Shares	₹ 12,00,000 / 1,00,000 = ₹ **12**	₹ 8,00,000 / 80,000 ₹ **10**
ROE = $\frac{PAT}{ESHF} \times 100$	$\frac{2,10,000}{12,00,000} \times 100$ = ₹ **17.5%**	$\frac{99,000}{8,00,000} \times 100$ = ₹ **12.38%**
EPS = ROE x BVPS	= ₹ 12 × 17.5% = ₹ **2.10**	= ₹ 10 × 12.38% = ₹ **1.24**

(b) Calculation of Growth Rate

$g = r \times b$

Particulars	A	B
ROE (r)	0.175	0.1238
× Retention Ratio (b) (1 – pay out)	× 0.6 (1 – 0.4)	× 0.4 (1 – 0.6)
Growth Rate	**10.5%**	**4.95%**

(c) Range of Justifiable exchange Ratio

Exchange Ratio Based on MPS (Lower Limit)

$$= \frac{\text{MPS of B}}{\text{MPS of A}}$$

$$= \frac{₹\ 15}{₹\ 40}$$

= **0.375:1**

Exchange Ratio Based on intrinsic value (IV) (Upper Limit)

$$= \frac{\text{I.V of B}}{\text{I.V of A}}$$

$$= \frac{₹\ 20}{₹\ 40} \rightarrow \textbf{(assumed to be same as MP)}$$

= **0.5:1**

A has a higher EPS, P/E Ratio, BVPS and Growth rate as compared to B and hence is in a stronger bargaining position as compared to B. Therefore, it is Likely that the exchange ratio would be closer to the lower limits i.e 0.375:1

(d) Exchange Ratio – 0.4:1

$$\text{Post EPS} = \frac{2,10,000 + 99,000}{1,00,000 + (80,000 \times 0.4)}$$

$$= \frac{3,09,000}{1,32,000}$$

= **₹ 2.34**

Impact Analysis – EPS

Particulars	A	B
Post Merger EPS	2.34	0.936 (2.34 × 0.4)
(-) Pre Merger EPS	(2.10)	(1.24)
EPS Acceration/Dilution	0.24	(0.304)

(e) Post MPS and Accretion/ dilution

As given, pre-merger P/E (A) = Post-merger P/E = **19.05 times**

Post MPS = Post EPS × Post P/E

= 2.34 × 19.05

= **44.58**

Impact analysis MPS

	A	B
Post Merger MPS	44.58	17.83 *(44.58 × 0.4)*
- Post Merger MPS	(40)	(15)
MPS Accretion (dilution)	4.58	2.83

Question 2 *(Practice Manual)*

[Q.14 - AFM 8 (Fast Track) & 9, Q. 14 - AFM 10]

Bank 'R' was established in 2005 and doing banking in India. The bank is facing DO OR DIE situation. There are problems of Gross NPA (Non Performing Assets) at 40% & CAR/CRAR (Capital Adequacy Ratio/ Capital Risk Weight Assets Ratio) at 4%. The net worth of the bank is not good. Shares are not traded regularly. Last week, it was traded @ ₹ 8 per share.

RBI Audit suggested that bank has either to liquidate or to merge with other bank.

Bank 'P' is professionally managed bank with low gross NPA of 5%. It has net NPA as 0% and CAR at 16%. Its share is quoted in the market @ ₹ 128 per share. The board of directors of bank 'P' has submitted a proposal to RBI for take over of bank 'R' on the basis of share exchange ratio.

The Balance Sheet details of both the banks are as follows:

Particulars	Bank 'R'	Bank 'P'
	Amt. In ₹ Lac	Amt. In ₹ Lac
Paid up share capital (Face: ₹ 10)	140	500
Reserves & Surplus	70	5,500
Deposits	4,000	40,000
Other liabilities	890	2,500
Total Liabilities	5,100	48,500

Cash in hand & with RBI	400	2,500
Balance with other banks	-	2,000
Investment	1,100	15,000
Advances	3,500	27,000
Other Assets	100	2,000
Total Assets	5,100	48,500

It was decided to issue shares at Book Value of Bank 'P' to the shareholder of Bank 'R'. All assets and liabilities are to be taken over at book Value.

For the swap ratio, weights assigned to different parameters are as follows:

Gross NPA	30%
CAR	20%
Market price	40%
Book value	10%

(a) What is the swap ratio based on above weight?

(b) How many shares are to be issued?

(c) Prepare Balance Sheet after merger.

(d) Calculate CAR & Gross NPA of Bank 'P' after merger.

Summary

Detailed Solution

Given Data

	Bank R (Target)	Bank P (Acquirer)
Gross NPA	40%	5%
CAR	4%	16%
MPS	₹ 8	₹ 128
Net NPA	-	0%

(a) (i) Calculation of BVPS

Bank: R = 140 + 70 / 14 = ₹ **15**

Bank P = 500 + 5,500 / 50 = ₹ **120**

(ii) Agreed Swap Ratio

Factor	Ratio	Weight	Weight Average (Ratio * Weight)
1. Gross NPA (adverse)	= 5% / 40% = 0.125:1	30%	0.0375:1

2. CAR (Favourable)	= 4% / 16% = 0.25:1	20%	0.05:1
3. MPS (Favourable)	= ₹ 8 / ₹ 128 = 0.0625:1	40%	0.025:1
4. BVPS (Favourable)	= ₹ 15 / ₹ 120 = 0.125:1	10%	0.0125:1
	Agreed swap ratio		0.125:1

(b) Shares to be issued

= 14 Lakhs × 0.125

= 1.75 Lakhs shares

(c) Balance Sheet Acquisition

Purchase consideration (1.75 Lakhs × ₹ 120 (BVPS))	210 Lakhs
(-) Net assets of R (5,100 – 4,000 – 890)	(210 Lakhs)
Goodwill / Capital reserve	NIL

Reference Note: *ICAI has taken the issue price at ₹ 10 (Face Value) and hence there is Capital Reserve as per ICAI workings. This does not appear to be correct as we have been clearly told that shares of P will be issued at Book Value. Hence, as per our workings, there would be no Capital Reserve. Instead, we will have Securities Premium.*

Combined Entity (Bank P + Bank R)

Balance sheet after merger

Equity & Liabilities	₹ in Lakhs
Paid up share capital [500 + (1.75 × 10)]	517.5
Securities premium [1.75 × (120 – 10)]	192.5
Reserves (5,500)	5,500
Deposits (4,000 + 40,000)	44,000
Other liabilities (890 + 2,500)	3,390
	53,600
Assets	
Cash in hand (2,500 + 400)	2,900
Balance with other banks (2,000 + 0)	2,000
Investment (1,100 + 15,000)	16,100
Advances (3,500 + 27,000)	30,500
Other assets (100 + 2,000)	2,100
	53,600

(d) Post Merger CAR & Gross NPA %

$$CAR = \frac{\text{Share capital + Reserves and Share Capital} \times 100}{\text{Risk weighted assets (RWA)}}$$

$$\text{i.e. Risk Weighted Assets} = \frac{\text{Share capital + Reserves} \times 100}{CAR}$$

$$\text{BANK R} = \frac{140 + 70 \times 100}{4} = \boxed{\mathbf{5,250}}$$

$$\text{BANK P} = \frac{500 + 5,500 \times 100}{16} = \boxed{\mathbf{37,500}}$$

Therefore, Combined RWA = 5,250+37,500 = 42,750

$$\text{Combined CAR (after merger)} = \frac{517.5 + 192.5 + 5,500 \times 100}{42,750}$$

$$= \frac{6,210 \times 100}{42,750}$$

$$= \boxed{\mathbf{14.53\%}}$$

$$\text{Gross NPA \%} = \frac{\text{Gross NPA (₹)}}{\text{Advances}} \times 100$$

(Because NPAs are related to Advances)

Thus, Gross NPA (₹) = Gross NPA (%) × Advances

Bank R : - 40% × ₹ 3,500 = ₹ 1,400

Bank P :- 5% × ₹ 27,000 = ₹ 1,350

Combined Gross NPA ₹ 1,400 + ₹ 1,350 = ₹ 2,750

$$\text{Combined Gross NPA \%} = \frac{₹ 1,400 + ₹ 1,350 \times 100}{₹ 3,500 + ₹ 27,000}$$

$$= \frac{2,750 \times 100}{30,500}$$

$$= \boxed{\mathbf{9.02\%}}$$

Question 3 *(ICAI Study Material)/(RTP May 20)*

[Q.16 - AFM 8 (Fast Track) & 9, Q.16 - AFM 10]

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.:

Particulars	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 Rs 5 each fully paid.

Summary

Detailed Solution

1. Calculation of BVPS, EPS, MPS

Particulars	Abhimaan	Abhishek
1. Shares capital = Paid up capital/Shares	$\frac{200\ L}{100}$ = **2,00,000 Shares**	$\frac{100\ L}{10}$ = **10,00,000 Shares**

2. BVPS = Share capital + Reserves/ No.of shares	$\frac{200\ L + 800\ L}{2\ L\ shares}$ = ₹ **500**	$\frac{100\ L + 500\ L}{10\ L\ shares}$ = ₹ **60**
3. Non Promoter Holding%	100% – 50% = **50%**	100% – 60% = **40%**
4. Total Market Cap. = $\frac{\text{Free Float Market Cap.}}{\text{Free Float \%}}$	$\frac{400\ L}{50\%}$ = ₹ **800 Lakhs**	$\frac{128\ L}{40\%}$ = ₹ **320 Lakhs**
5. MPS = Market Cap./Total Share	$\frac{800\ L}{2\ L\ shares}$ = ₹ **400 Lakhs**	$\frac{320\ L}{10\ L\ shares}$ = ₹ **32 Lakhs**
6. MPS = EPS × P/E EPS = MPS/P/E	= 400/10 = ₹ **40**	= 32/4 = ₹ **8**

2. SWAP Ratio

Particulars	Exchange Rate	Weight	Weighted Average
Book Value (Favourable)	0.12:1 *(60/500)*	25%	0.03:1
EPS (Favourable)	0.2:1 *(8/40)*	50%	0.1:1
MPS (Favourable)	0.08:1 *(32/40)*	25%	0.02:1
	Agreed Swap Ratio (Part a)		**0.15:1**

3. Post EPS $= \frac{₹ (40 \times 2) + ₹ (8 \times 10\ Lakhs\ Shares)}{2\ Lakhs\ Shares + (10\ Lakhs\ Shares \times 0.15)}$

$= \frac{₹\ 80\ Lakhs + ₹\ 80\ Lakhs}{2\ Lakhs\ Shares + 1.5\ Lakhs\ Shares}$

$= \frac{160}{3.5\ L\ Shares}$

= ₹ **45.71**

4. Post MPS = EPS × P/E

= 45.71 × 10

₹ **457.1**

5. Post BVPS

Post BVPS	Abhimaan	Abhishek
Net Assets (S.C + Reserves)	200 + 800 = 1,000	100 + 500 = 600

Combined Net Assets = 1,000 + 600 = 1,600

$$\text{Post BVPS} = \frac{1600}{3.5 \text{ L Shares}}$$

= **457.14**

6. Promoter Holding (Post Acquisition)

$$= \frac{(2{,}00{,}000 \times 50\%) + (10{,}00{,}000 \times 60\%) \times 0.15}{2{,}00{,}000 + (10{,}00{,}000 \times 0.15)}$$ (Abhimaan & Abhishek)

$$= \frac{1{,}00{,}000 + 90{,}000}{3{,}50{,}000}$$

= **54.29%**

Non Promoter Holding = 100% – 54.29%

= **45.71%**

Free Float Market Capitalisation = (3.5 × ₹ 457.1) × 45.71%

= **₹ 731.29**

No. of shares post bonus and post-split

Post-Acquisition Shares	3,50,000
(+) Bonus Shares (3.5 x $\frac{1}{2}$)	1,75,000
Post Bonus Shares	**5,25,000**
(Face Value = ₹ 100)	
x Split (₹ 100/5)	20
Post Bonus and Post-Split Shares	1,05,00,000

Bonus / Split have no impact on post-acquisition combined profit (160 lakhs) and combined Net Assets (1,600 Lakhs). However as the number of shares increase all else remaining constant the revised EPS and BVPS are:

$$\text{Post Bonus and Split EPS} = \frac{₹ 160 \text{ Lakhs}}{105 \text{ Lakhs Shares}}$$

= ₹ 1.52

Post Bonus and split BVPS = $\frac{₹ 1,600 \text{ Lakhs}}{₹ 105 \text{ Lakhs}}$

= 15.24

Question 4 *(ICAI SM)/(ICAI Paper May 24)/(MTP Sept 22)*

[Q.24 - AFM 8 (Fast Track) & 9, Q.24 - AFM 10]

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?

Summary

Detailed Solution

(i) MPP for XYZ Ltd

Particulars	Per Share	Total
MPS/Share	₹ 24	2,40,00,000
(+) PV of synergies/share (80,00,000/10,00,000)	₹ 8	80,00,000
(+) PV of cost savings [30,00,000/10,00,000]	₹ 3	30,00,000
MPP	₹ 35	₹ 3,50,00,000

Reference Note:

We are not given the cash inflows that XYZ generates each year. Instead, we are given the market price. Market price can be derived using Gordon formula i.e. $D_1/K_e - g$. Assuming the market price is fairly determined, it will represent the PV of all future Dividends and hence MPS is considered in the absence of information.

(ii) Minimum Purchase Price expected by promoters/top management

In case the merger goes through, the management will give up 40% stake as well as settle for a lower compensation assuming they continue with the company. Therefore, the management will at least (minimum) expect to be compensated for both. Further, the shares held by promoters are 40% i.e. 10,00,000 x 40% = 4,00,000 shares. Hence, the evaluation should be done for 4,00,000 shares only.

Particulars	Per Share	Total
MPS/Share	₹ 24	96,00,000
(+) Remuneration lost $\left[\frac{30,00,000}{4,00,000}\right]$	₹ 7.5	30,00,000
Minimum price/share for promoter's stake	₹ 31.5	1,26,00,000

Extra: Incase minimum purchase price is asked for non-promoter shareholders of XYZ, then it would be ₹ 24 (MPS) as they are not foregoing any additional compensation.

Question 5 *(ICAI SM)/(MTP Nov 21)/(RTP May 20)/ (MTP April 19)/(MTP Nov 18)*

[Q.27 - AFM 8 (Fast Track) & 9, Q.27 - AFM 10]

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 4th 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.

Summary

Detailed Solution

Reference Note

1. *Value of Strategy = Value of ABC under New Strategy – Value of ABC under Existing Strategy*

   The value of the company (under any strategy) can be calculated as the PV of all future cash flows upto perpetuity.
2. *We have been given that under the new strategy (which is applicable for 4 years), growth = 20% for the first 3 years and cash flows stabilize from year 4 onwards. Therefore, in order to find the Terminal Value at the end of Year 3, we will need to predict the free cash flows at Year 4 as well.*
3. *Looking at the current capital structure, assets have been fully financed by equity (8,000+4,000 = 12,000) and hence there is no debt. Therefore, FCFF = FCFE and Value of Firm = Value of Equity.*

Calculation of Free Cash Flow

PV of FCF

Particulars	Y1	Y2	Y3	Y4
PAT (WN : 1)	1,680	2,016	2,419.2	2,419.2
(+) Depreciation (WN : 2)	800	960	1152	1,382.4
(-) Investment in FA (WN : 2)	(2,400)	(2,880)	(3,456)	(1,382.4)
(-) Investment in WC (WN : 3)	(800)	(960)	(1,152)	NIL
FCF	(720)	(864)	(1,036.8)	2,419.2

Valuation of ABC under the new strategy

Year	FCF	DF@15%	PV of FCF
1	(720)	0.8696	(626.11)
2	(864)	0.7561	(653.27)
3	(1,036.8)	0.6575	(681.7)

3	16,128 $\left[\frac{2,419.2(1)}{0.15 - 0}\right]$	0.6575	10,604.16
			8,643.08

Working Note 1: Calculation of PAT

Existing PAT Margin = 1,400/20,000 × 100 = 7%

As the gross margin, admin expense % and tax rate remain constant, PAT Margin:

= (20% - 10%) (1-0.3) = 7%

Profit After Tax

Particulars	Y1	Y2	Y3	Y4
Sales	24,000 *(20,000 + 20%)*	28,800 *(24,000 + 20%)*	34,560 *(28,800 + 20%)*	34,560 *+0%*
PAT @7%	1,680	2,016	2,419.2	2,419.2

Reference Note: *PAT is calculated after deducting all expenses (including depreciation) and hence deprecation would have been implicitly deducted while calculating the above PAT and hence no separate deduction is done for depreciation.*

Working Note: 2: Investment in Fixed Assets (FA)

Reference Note: *We have been given that the assets turnover ratio remains the same. This is interpreted to mean that the Fixed Assets Turnover as well as the Current Assets Turnover will respectively continue to remain unchanged i.e.*

$$\text{FA Turnover} = \frac{Sales}{FA}$$

$$= \frac{20,000}{8,000}$$

$$= \mathbf{2.5}$$

$$\text{i.e. FA} = \frac{Sales}{FA\ Turnover}$$

Since the fixed assets turnover remains unchanged at 2.5, closing fixed assets in each year can be predicted by substituting sales of each year as follows:

FA for YR1 to YR4

Particulars	Y1	Y2	Y3	Y4
FA = $\frac{Sales}{FA\ Turnover}$	$\frac{24,000}{2.5}$	$\frac{28,800}{2.5}$	$\frac{34,560}{2.5}$	$\frac{34,560}{2.5}$
Closing FA	**9,600**	**11,520**	**13,824**	**13,824**

In order to calculate depreciation and investment in FA we can prepare a draft FA a/c

Fixed Assets a/c

Y1	Balance	8,000	By Depreciation (10%)	800
	To Bank*	2,400	By Balance	9,600
		10,400		**10,400**
Y2	Balance	9,600	By Depreciation (10%)	960
	To Bank*	2,880	By Balance	11,520
		12,480		**12,480**
Y3	Balance	11,520	By Depreciation (10%)	1,152
	To Bank*	3,456	By Balance	13,824
		14,976		**14,976**
Y4	Balance	13,824	By Depreciation (10%)	1,382.4
	To Bank*	1,382.4	By Balance	13,824
		15,206.4		**15,206.4**

* Bank is taken as the balancing figure

Working Note : 3 CA investment

$$CA\ turnover = \frac{Sales}{CA}$$

$$= \frac{20,000}{4,000} = 5$$

$$CA = \frac{Sales}{CA\ turnover\ (5)}$$

Current Assets Y1 to Y4

Particulars	Y1	Y2	Y3	Y4
CA = $\frac{Sales}{CA\ turnover}$	$\frac{24,000}{5}$	$\frac{28,800}{5}$	$\frac{34,560}{5}$	$\frac{34,560}{5}$
Current Assets	4,800	5,760	6,912	6,912
Additional Investment	800 *(4,800-4,000)*	960 *(5,760-4,800)*	1152 *(6,912-5,760)*	NIL *(6,912-6,912)*

Valuation of ABC under existing Strategy

Since there is no growth, the PAT would remain the same i.e 1,400 from year 1 to perpetuity. Further, as the asset turnover ratios need to be maintained, CA at the end of each year would be 20,000/5 = 4000 and hence no additional investment is needed in CA . Similarly, FA at the end of each year would be 20,000/2.5 = 8,000.

Depreciation on FA = 8,000 × 10% = 800

There would be an increase in FA by 800 in each year.

Fixed Assets a/c

Particulars	Amount	Particulars	Amount
To Balance	8,000	By Depreciation	800
To Bank	800	By Balance	8,000

The value of FCF under the existing Strategy from year 1 to perpetuity would be

Particulars	Amount
PAT	1,400 *(20,000 × 7%)*
(+) Depreciation	800 *(8,000 × 10%)*
(-) Investment in FA	(800)
(-) Investment in CA	NIL
FCF	1,400

Value (F) = $\frac{1400}{0.15-0}$ = **9,333.33**

Incremental value of the new strategy = 8,643.08 – 9,333.33

= (690.25)

Question 6 *(ICAI Study Material)/(RTP Nov 22)*

[Q.30 - AFM 8 (Fast Track) & 9, Q.30 - AFM 10]

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	8%
(without any additional capital investment and without any change in risk of operations)	
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%.

Summary

Detailed Solution

(i) BCD

1. Existing Ke $= \frac{D_1}{P_0} + g$

$= \frac{0.6}{20} + 0.07$

$= 0.1$ i.e., 10%

2. In absence of information, Ke remains constant i.e., 10%

3. $P_0 = \frac{D_1}{K_e - g}$ (revised)

$= \frac{0.6}{0.10 - 0.08}$

$P_0 = ₹ 30$

4. Increase in value BCD = ₹ 30 - ₹ 20
   × No of shares. = ₹ 10/ share × 500,000
   Increase in value. = ₹ 50,00,000

(ii) (a) Post merger MPS

Particulars	Amount
Expected value of AFC'S Business post-merger *(10,00,000 × 100)*	10,00,00,000
Expected value of BCD'S Business post-merger *(5,00,000 × 30)*	1,50,00,000
Expected Market Value (combined) ÷ No of Shares *(10,00,000 + 5,00,000 × $\frac{1}{4}$)*	11,50,00,000 ÷ 11,25,000
Post-merger MPS	₹ **102.22**

(b) Impact of Analysis [Gain / Loss]

Particulars	AFC	BCD
Post-merger MPS	102.22	25.56 (102.22 × $\frac{1}{4}$)
(-) Pre merger	(100)	(20)
Gain/Share	₹ 2.22	5.56
× No of shares	10,00,000	5,00,000
Total Gain to Shareholders	22,20,000	27,80,000
	Total 50,00,000	

Cash Acquisition

Reference Note: *As the acquisition is in cash, no additional shares of AFC need to be issued. However, if cash is paid we would lose interest (income) on the cash already invested. However, we would get the earnings of BCD. Considering this we will have to calculate the post merger EPS for AFC which can be multiplied by post-merger PE ratio in absence of growth rates of AFC in order to find the post merger MPS*

(a) Post-merger EPS (AFC)

Particulars	AFC
Pre-merger PAT *(10,00,000 × ₹ 8)*	80,00,000
(-) Loss of interest *[(500,000 × 22) × 10%]*	(11,00,000)
(+) Pre merger PAT - BCD *(500,000 × 2.5)*	12,50,000
Post-merger PAT ÷ Post-merger shares (10,00,000 + 0) Post EPS	81,50,000 ÷ 10,00,000 ₹ **8.15**

(b) Pre-merger PE of AFC

$$PE = \frac{MPS}{EPS}$$

$$= \frac{100}{8} = \boxed{12.5 \text{ times}}$$

(c) As given, pre-merger PE Ratio of AFC continues to remain same post-merger

Post-merger MPS = ₹ 8.15 × 12.5

= ₹ **101.875**

Gain For Shareholders

Particulars	AFC	BCD
Post-merger value	101.875	₹ 22 (Cash)

(-) Pre merger value	(100)	(20)
Gain / Share	1.875	2
X No of shares	10,00,000	5,00,000
Total Gain	₹ 18,75,000	₹ 10,00,000

Question 7 *(ICAI Paper Nov 20)*

[Q.38 - AFM 8 (Fast Track) & 9, Q.38 - AFM 10]

ICL is proposing to take over SVL with an objective to diversify. ICL's profit after tax (PAT) has grown @ 18 per cent per annum and SVL's PAT is grown @ 15 per cent per annum. Both the companies pay dividend regularly. The summarised Profit & Loss Account of both the companies are as follows:

₹ in Crores

Particulars	ICL	SVL
Net Sales	4,545	1,500
PBIT	2,980	720
Interest	750	25
Provision for Tax	1,440	445
PAT	790	250
Dividends	235	125

Particulars	ICL		SVL	
Fixed Assets				
Land & Building (Net)	720		190	
Plant & Machinery (Net)	900		350	
Furniture & Fixtures (Net)	30	1,650	10	550
Current Assets		775		580
Less: Current Liabilities				
Creditors	230		130	
Overdrafts	35		10	
Provision for Tax	145		50	
Provision for dividends	60	470	50	240
Net Assets		1,955		890
Paid up Share Capital (₹ 10 per share)	250		125	
Reserves and Surplus	1,050	1,300	660	785
Borrowing		655		105
Capital Employed		1,955		890
Market Price Share (₹)	52		75	

ICL's Land & Buildings are stated at current prices. SVL's Land & Buildings are revalued three years ago. There has been an increase of 30 per cent per year in the value of Land & Buildings.

SVL is expected to grow @ 18 per cent each year, after merger.

ICL's Management wants to determine the premium on the shares over the current market price which can be paid on the acquisition of SVL. You are required to determine the premium using:

(i) Net Worth adjusted for the current value of Land & Buildings plus the estimated average profit after tax (PAT) for the next five years.

(ii) The dividend growth formula.

(iii) ICL will push forward which method during the course of negotiations?

Period (t)	1	2	3	4	5
FVIF (30%, t)	1.300	1.690	2.197	2.856	3.713
FVIF (15%, t)	1.15	2.4725	3.9938	5.7424	7.7537

Summary

Detailed Solution

1. Calculation of Adjusted Net Worth

WN-1: PAT adjustment:

Reference Note: *We have been given that the net worth derived needs to be adjusted by adding an estimated average PAT for next 5 years. SVL has been growing at 15% p.a and hence irrespective of the merger, SVL's PAT will grow at 15% p.a.The above adjustment may be similar to compensating SVL for its goodwill using super profit method.*

PAT Estimated

Year	₹
1	287.500
2	330.625
3	380.219
4	437.252
5	502.839
Total (Next 5 Years)	1,938.435 [Alternatively, 250 × 7.753]
÷ No of Years	5
Average PAT (Next 5 Years)	387.687

WN 2: Land and Building

Adjusted Value = $190 \times (1 + 0.30)^3$ = ₹ **417.43** *(Alternatively 190 × 2.197)*

Adjusted Net Worth – SVL

Particulars	₹ Crs
Land and Building (WN – 2)	417.43
Plant and Machinery	350
Furniture	10
Current Assets	580
(-) Current Liability *(130 + 10 + 50 +50)*	(240)
(-) Borrowings	(105)
(+) Average Estimated PAT adjustment	387.69
Adjusted Net Worth	1,400.12
(-) Pre Merger Market capital of SVL *(12.5 Cr × ₹ 75)*	(937.50)
Premium	462.62

Reference Note: *We have assumed that the PAT given of ₹ 250 is the PAT of last year. Alternatively, we can also assume it to be the PAT for the next year.*

2. Valuation using Dividend growth method i.e., Gordon method.

i. Calculation of K_e

Reference Note: *We have not been given the data relating to CAPM. Hence K_e should be calculated using Gordon formula. The existing price of ₹ 75 is based on the existing growth rates of 15% and hence K_e should be calculated based on 15% growth rate i.e*

$$K_e = \frac{D_1}{P_o} + g$$

Note: *We've assumed that given dividends are D_o, Alternatively, they can be taken as D_1*

Further, DPS = 125/12.5

= ₹ 10/share (D_o)

$$K_e = \frac{10 \times 1.15}{75} + 0.15$$

= **30.33%**

ii. Calculation of expected price at 18% growth

$$P_o = \frac{D_1}{K_e - g}$$

$$= \frac{10 \times 1.18}{0.3033 - 0.18}$$

= **₹ 95.70**

3. Premium Analysis

Total value as per dividend growth model *(95.70 × ₹ 12.5)*	1,196.25
(-) Pre Merger Market Capital of SVI *(12.5 × ₹ 75)*	(937.50)
Premium	258.75

iii. Conclusion: ICL (acquirer) will push forward the dividend growth method during negotiations as it results in a lower payout and lower premium.

Current Assets Y:1 to Y : 4

Particulars	Y1	Y2	Y3	Y4
$CA = \frac{Sales}{CA\ turnover}$	$\frac{24,000}{5}$	$\frac{28,800}{5}$	$\frac{34,560}{5}$	$\frac{34,560}{5}$
Current Assets	4,800	5,760	6,912	6,912
Additional Investment	800 *(4,800-4,000)*	960 *(5,760-4,800)*	1152 *(6,912-5,760)*	NIL *(6,912-6,912)*

Valuation of ABC under existing Strategy

Since there is no growth, the PAT would remain the same i.e 1,400 from year 1 to perpetuity. Further, as the asset turnover ratios need to be maintained, CA at the end of each year would be 20,000/5 = 4000 and hence no additional investment is needed in CA. Similarly, FA at the end of each year would be 20,000/2.5 = 8,000.

Depreciation on FA = 8,000 × 10% = 800

There would be an increase in FA by 800 in each year.

Fixed Assets a/c

Particulars	Amount	Particulars	Amount
To Balance	8,000	By Depreciation	800
To Bank	800	By Balance	8,000

The value of FCF under the existing Strategy from year 1 to perpetuity would be

Particulars	Amount
PAT	1,400 *(20,000 × 7%)*
(+) Depreciation	800 *(8,000 × 10%)*
(-) Investment in FA	(800)
(-) Investment in CA	NIL
FCF	1,400

Value (F) = $\frac{1400}{0.15-0}$ = **9,333.33**

Incremental value of the new strategy = 8,643.08 – 9,333.33

= (690.25)

Question 8 *(ICAI Paper May 19)*

[Q.46 - AFM 8 (Fast Track) & 9, Q.46 - AFM 10]

Compute Economic Value Added (EVA) of Good luck Ltd. from the following information:

Profit & Loss Statement

Particulars	(₹ in Lakh)
(a) Income -	
Revenue from Operations	2000
(b) Expenses -	
Direct Expenses	800
Indirect Expenses	400
(c) Profit before interest & tax(a-b)	800
(d) Interest	30
(e) Profit before tax (c - d)	770
(f) Tax	231
(g) Profit after tax (e - f)	539

Balance Sheet

Particulars	(₹ in Lakh)
Equity and Liabilities :	
(a) Shareholder's Fund -	
Equity Share Capital	1000
Reserve and Surplus	600
(b) Non- Current Liabilities -	
Long Term Borrowings	200
(c) Current Liabilities	800
Total	2600
Assets :	
(a) Non - Current Assets	2000
(b) Current Assets	600
Total	2600

Other Information:

(1) Cost of Debts is 15%.

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

(3) Tax Rate is 30%.

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

Summary

Detailed Solution

***Reference Note**: As per ICAI workings, in case a provision for bad debt is created, we should add back the provision while calculating NOPAT as well as invested capital.*

EVA = NOPAT - (Invested Capital × WACC)

= 600 - (1,840 × 11.84%)

= **382.14**

Working Note 1: NOPAT

NOPAT = EBIT (1 – t) + Provision for bad debt

= 800 (1 – 0.3) + 40

= 560 + 40 = **600**

Alternative = PAT + Interest (1 –t) + provision for bad debts

= 539 + 30 (1 – 0.3) + 40 = 600

Working Note 2: Invested Capital & WACC

ESC	1,000
(+) Reserves (600 + 40)	640
(+) Long Term Debt	200
Invested Capital	1,840

$$WACC = K_D \times \frac{D}{D+E} + K_e \times \frac{E}{D+E}$$

$$= 15\% \times (1 - 0.3) \times \frac{200}{1,840} + 12\% \times \frac{1,640}{1,840}$$

= **11.84%**

***Reference Note:** ICAI has ignored 40 while calculating weights i.e., weights are 200/1,800 and 1,600/1,800. We have reversed 40 of provision for bad debts from profit and therefore, we have added in Reserves*

Question 9 *(ICAI Paper Dec 21)*

[Q.47 - AFM 8 (Fast Track) & 9, Q.47 - AFM 10]

Following is the information of M/s. DY Ltd. for the year ending 31/03/2021:

Particulars	₹
Sales	₹ 1000 Lakh
Operating Expenses Including Interest	₹ 620 Lakh
8% Debentures	₹ 250 Lakh
Equity Share Capital (Face value of ₹ 10 each)	₹ 250 Lakh
Reserves and Surplus	₹ 250 Lakh
Market Value of DY Ltd	₹ 900 Lakh
Corporate Tax Rate	30%
Risk free Rate of Return	7%
Market Rate of Return	12%
Equity Beta	1.4

You are required to-

i. Calculate Weighted Average Cost of Capital of DY Ltd.

ii. Calculate Economic Value Added

iii. Calculate Market Value Added

Summary

Detailed Solution

(i) Weighted Average Cost of Capital of DY Ltd.

Cost of Equity as per CAPM

ke = Rf + β x Market Risk Premium

= 7% + 1.4 x [12% - 7%]

= 7% + 7% = 14%

Cost of Debt kd = 8% (1 – 0.30) = 5.60%

$$WACC\ (k_o) = k_e \times \frac{E}{E+D} + k_g \times \frac{D}{E+D} = 14.00 \times \frac{500}{750} + 5.60 \times \frac{250}{750}$$

= 9.33% + 1.87% = 11.20%

(ii) Economic Value Added (EVA) of DY Ltd.

Particulars		₹ Lakhs
Sales	₹ 620	₹ 1,000
Operating Expenses (excluding interest)	₹ 20	₹ 600
		₹ 400

Less: Tax @ 30%		₹ 120
Net Operating Profit after Tax (NOPAT)		₹ 280

Calculation of Capital Employed

Particulars	₹ Lakhs
Equity Share Capital	250
Reserves & Surplus	250
8% Debentures	250
Total Capital Employed	**750**

EVA = NOPAT – (WACC × Total Capital)

EVA = ₹ 280 Lakh – 0.1120 × ₹ 750 lakhs

EVA = 196.00 lakhs

(iii) Determination of Market Value Added (MVA)

Particulars	₹ Lakh
Market value of Equity Stock [₹ 900 Lakh - ₹ 250 Lakh]	650
Equity Fund [₹ 250 Lakh + ₹ 250 Lakh]	500
Market Value Added	**150**

Alternatively, it can also be computed as follows:

Particulars	₹ Lakh
Market value of DY Ltd.	900
Capital employed [₹ 250 Lakh + ₹ 250 Lakh + ₹ 250 Lakh]	750
Market Value Added	**150**

RESTRUCTURING

Question 10 *(RTP Nov 20)/(MTP Aug 18)/(Practice Manual)*

[Q.48 - AFM 8 (Fast Track) & 9, Q.48 - AFM 10]

The following is the Balance-sheet of Grape Fruit Company Ltd as at March 31st, 2011.

Liabilities	(₹ in lakhs)	Assets	(₹ in lakhs)
Equity shares of ₹ 100 each	600	Land and Building	200
14% preference shares of ₹ 100/- each	200	Plant and Machinery	300
13% Debentures	200	Furniture and Fixtures	50
Debenture interest accrued and payable	26	Inventory	150
Loan from bank	74	Sundry debtors	70
Trade creditors	340	Cash at bank	130
		Preliminary expenses	10

		Cost of issue of debentures	5
		Profit and Loss account	525
	1440		**1440**

The Company did not perform well and has suffered sizable losses during the last few years. However, it is felt that the company could be nursed back to health by proper financial restructuring. Consequently the following scheme of reconstruction has been drawn up :

(i) Equity shares are to be reduced to ₹ 25/- per share, fully paid up;

(ii) Preference shares are to be reduced (with coupon rate of 10%) to equal number of shares of ₹ 50 each, fully paid up.

(iii) Debenture holders have agreed to forgo the accrued interest due to them. In the future, the rate of interest on debentures is to be reduced to 9 percent.

(iv) Trade creditors will forego 25 percent of the amount due to them.

(v) The company issues 6 lakh of equity shares at ₹ 25 each and the entire sum was to be paid on application. The entire amount was fully subscribed by promoters.

(vi) Land and Building was to be revalued at ₹ 450 lakhs, Plant and Machinery was to be written down by ₹ 120 lakhs and a provision of ₹ 15 lakhs had to be made for bad and doubtful debts.

Required:

(i) Show the impact of financial restructuring on the company's activities.

(ii) Prepare the fresh balance sheet after the reconstructions is completed on the basis of the above proposals.

Summary

Detailed Solution

Reference Note: *The restructuring case given is very similar to an internal reconstruction scenario. In order to assess the impact of restructuring, we need to prepare a capital reduction/ restructuring account. The impact can be shown in the form of a ledger or can also be shown as a statement. Further, the Balance Sheet needs to be prepared in this case. It need not be in schedule 3 format. As a general rule, we use the format given in question to prepare our Balance Sheet in AFM.*

Working Note 1: Journal entries for items not affecting capital reduction account.

13% Debentures A/c	Dr.	200	
To 9% Debentures			200
Bank A/c (6 × 25)	Dr.	150	
To Equity Share Capital A/c			150

1. Impact of Restructuring

Capital Reduction/Restructuring A/c

To Plant and Machinery	120	By equity share capital *(6,00,000 × (100 – 25)*	450
To Sunday Debtors (Provision for bad debts)	15	By Preference share capital *(2,00,000 × (100 – 50)*	100
To Preliminary Expense	10	By debentures interest Accrued	26
To cost of issue of Debentures	5	By trade creditors *(340 × 25%)*	85
To Profit & Loss A/c	525	By land and building (450 – 200)	250
To Capital Reserve	**236**		
	911		**911**

Reference Note: *The objective of restructuring scheme is to write off accumulated losses and fictitious assets. Thus, even if it is not separately given, we will write off the fictitious assets and accumulated losses.*

Balance Sheet of Grapefruit Co Ltd & Reduced as at 1/1/12

Capital and liabilities		Assets	
Equity share capital of 25 each (600 – 450 + 150)	300	Land and building (200 + 250)	450
Capital Reserves	236	Plant and machinery (300 – 120)	180
10% Preference Share Capital	100	Furniture	50
9% Debentures	200	Inventory	150
Trade Creditors (840 – 85)	255	Sundry debtors (70 – 15)	55
Loan From Bank	74	Cash at bank (130 + 150)	280
	1,165		**1,165**

GEARED BETA

Question 11 *(Practice Manual)*

[Q.49 - AFM 8 (Fast Track) & 9, Q.49 - AFM 10]

ABC, a large business house is planning to sell its wholly owned subsidiary KLM. Another large business entity XYZ has expressed its interest in making a bid for KLM. XYZ expects that after acquisition the annual earning of KLM will increase by 10%.

Following information, ignoring any potential synergistic benefits arising out of possible acquisitions, are available:

Profit after tax for KLM for the financial year which has just ended is estimated to be ₹ 10 crore.

KLM's after tax profit has an increasing trend of 7% each year and the same is expected to continue.

Estimated post tax market return is 10% and risk free rate is 4%. These rates are expected to continue.

Corporate tax rate is 30%.

Particulars	XYZ	ABC	Proxy entity for KLM in the same line of business
No. of shares	100 lakhs	80 lakhs	--
Current share price	₹ 287	₹ 375	--
Dividend pay out	40%	50%	50%
Debt : Equity at market values	1 : 2	1 : 3	1 : 4
P/E ratio	10	13	12
Equity beta	1	1. 1	1.1

Assume gearing level of KLM to be the same as for ABC and a debt beta of zero.

You are required to calculate:

(a) Appropriate cost of equity for KLM based on the data available for the proxy entity.

(b) A range of values for KLM both before and after any potential synergistic benefits to XYZ of the acquisition.

Summary

Detailed Solution

1. Cost of Equity (K_e) for KLM

(a) Proxy Company

$$\beta_A = \beta_E \times \frac{E}{D(1-t)+e}$$

$$= 1.1 \times \frac{4}{1(1-0.3)+4}$$

$$= \frac{4.4}{4.7}$$

$$= \boxed{0.936}$$

Assuming β_A = 0.936 for KLM

$$\beta_A = \beta_E \times \frac{E}{D(1-t)+e} \quad \text{[KLM]}$$

$$0.936 = \beta_E \times \frac{3}{1(1-0.3)+3}$$

$$\frac{0.936 \times 3.7}{3} = \beta_E$$

$$\boxed{\beta_E = 1.15}$$

Using CAPM,

K_e = $R_F + (R_M - R_F)\ \beta_E$

= 4% + (10% - 4%) × 1.15 **= 10.9%**

b. Valuation:

2. Using Gordon's Formula

- In this case, we have not been given the pay-out ratio for KLM. Hence the range of values have been calculated considering both pay-out ratios i.e., 40% and 50%.
- Further, the synergy benefits are 10% and hence the adjusted profits considering the synergies would be 10 Cr + 10% = 11 Cr. In any case, going forward the growth rate would be 7%

$$\text{Value} = \frac{\text{Total Divided}}{K_e - g}$$

Particulars	Pay-out – 40%	Pay-out – 50%
1. Pre Synergy	$\frac{(10 \times 40\%) \times 1.07}{0.109 - 0.07}$ $= \frac{4.28}{0.039}$ = ₹ 109.74	$\frac{(10 \times 50\%) \times 1.07}{0.109 - 0.07}$ $= \frac{5.35}{0.039}$ = ₹ 137.18

2. Post Synergy	$\frac{(11\times 40\%)\times 1.07}{0.109-0.07}$ $= \frac{4.708}{0.039}$ = ₹ 120.72	$\frac{(11\times 50\%)\times 1.07}{0.109-0.07}$ $= \frac{5.885}{0.039}$ = ₹ 150.90

Valuation Using P/E Multiple Approach

In some cases, the P/E ratio of the acquirer (XYZ) remains the same. However, it is also possible that KLM's business is different from XYZ in which case its valuation should be done based on the proxy company's P/E Ratio. The range of values can be found as follows:

Particulars	XYZ P/E (10×)	Proxy P/E (12×)
1. Pre-synergy	10 × ₹ 10 = ₹ 100	= 12 × ₹ 10 = ₹ 120
2. Post synergy	= 10 × ₹ 11 = ₹ 110	= 12 × ₹ 11 = ₹ 132

Range (Lowest – Highest)

Pre – Synergy : 100 – 137.18

(P/E) (Gordon)

Post – Synergy : 110 - 150.90

(P/E) (Gordon)

CHAPTER 3 PORTFOLIO MANAGEMENT

Question 1 *(ICAI Study Material)*

[Q.4 - AFM 8 (Fast Track) & 9, Q.4 - AFM 10]

X Co. Ltd., invested on 1.4.2005 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, 2005, 10% dividend was paid out by M Ltd. and in October, 2005, 30% dividend paid out by N Ltd. On 31.3.2006 market quotations showed a value of ₹ 220 and ₹ 290 per share of M Ltd. and N Ltd. respectively. On 1.4.2006, investment advisors indicate (a) that the dividends from M Ltd. and N Ltd. for the year ending 31.3.2007 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.3.2007 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 31.3.2006;

(ii) Calculate the expected average return from the portfolio for the year 2006-07; and

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

Summary

Detailed Solution

(i) Portfolio Return (R_{MN}) for 2005-06

$R_{MN} = W_M R_M + W_N R_N$

Where,

a. $R_M = \frac{P_1 - P_0 + D}{P_0} \times 100$

$= \frac{220 - 200 + (100 \times 10\%)}{200} \times 100$ (P_0 = 2,00,000/1,000 = ₹ 200)

$= \boxed{15\%}$

b. $R_N = \frac{P_1 - P_0 + D}{P_0} \times 100$

$= \frac{290 - 300 + (10 \times 30\%)}{300} \times 100$ (P_0 = 1,50,000/500 = ₹ 300)

$=$ **(2.33%)**

c. Weight

Particulars	Amounts (01/04/05)	Weights
M	2,00,000	20/35
N	1,50,000	15/35
	3,50,000	

d. $R_{MN} = W_M R_M + W_N R_N$

$= \frac{20}{35} \times 15\% + \frac{15}{35} \times (2.33\%)$

$=$ **7.57%**

(ii) Portfolio Return (R_{MN}) for 2006-07

a. $R_M = \frac{P_2 - P_1 + D}{P_1} \times 100$

Where P_2 = 220 × 0.2 + 250 × 0.5 + 280 × 0.3
= 253

Thus, $\frac{253 - 220 + (100 \times 20\%)}{220} \times 100$ = 24.09%

b. $R_N = \frac{P_2 - P_1 + D}{P_1} \times 100$

Where P_2 = 290 × 0.2 + 310 × 0.5 + 330 × 0.3
= 58 + 155 + 99
= **312**

$R_N = \frac{312 - 290 + (10 \times 35\%)}{290} \times 100$

$=$ **8.79%**

c. Calculation of weights

Share	Value at start of the year(p1)	Weights
M	2,20,000 (1,000 shares × ₹ 220)	220/365
N	1,45,000 (500 shares × ₹ 290)	145/365
	3,65,000	

d. $R_{MN} = W_M R_M + W_N R_N$

$$= \frac{220}{365} \times 24.09 + \frac{145}{365} \times 8.79$$

$$= 14.52 + 3.49$$

$$= \boxed{18.01\%}$$

(iii) Standard Deviation

Reference Note:

1. *Standard Deviation can be calculated by either using a range of historic data or based on expectation of future scenarios. We cannot mix the two. In this case, we only have the past data of 05-06 and hence range of past data is not available. However, we have a range of expected return in the future. Therefore, we have calculated standard deviations based on expected data of 2006-2007.*
2. *Standard deviation can be calculated based on share price or based on % return. The calculation based on share price ignores dividend. Hence, it is more appropriate to calculate the Standard deviation based on % return (share price + dividend).*

1. Calculation of % Returns under each scenario

Probalitiy	Return (M)	Return (N)
0.2	$\frac{220 - 220 + 20}{220}$ = 9.09%	$\frac{290 - 290 + 3.5 \times 100}{290}$ = 1.21%
0.5	$\frac{250 - 220 + 20 \times 100}{220}$ = 22.73%	$\frac{310 - 290 + 3.5 \times 100}{290}$ = 8.10%
0.3	$\frac{280 - 220 + 20 \times 100}{220}$ = 36.36%	$\frac{330 - 290 + 3.5 \times 100}{290}$ = 15%

$\overline{M}$ (R_M) = 9.09 × 0.2 + 22.73 × 0.5 + 36.36 × 0.3

= **24.09%**

$\overline{N}$ (R_N) = 1.21 × 0.2 + 8.1 × 0.5 + 15 × 0.3

= **8.79%**

Calculation of Standard deviations

Probability	Return (M) M%	P (M – 24.09)²	Return (N) N%	P (N – 8.79)²
0.2	9.09	45.00	1.21	11.49
0.5	22.73	0.92	8.10	0.24
0.3	36.36	45.17	15.00	11.57

$\sum P (M - \overline{M}) = 91.09$ $\sum P (N- \overline{N})^2 = 23.30$

$\sigma_M = \sqrt{\sum P\left(M - \overline{M}\right)^2}$

$= \sqrt{91.09}$

σ_M = **9.54%**

$\sigma_N = \sqrt{\sum p\left(N - \overline{n}\right)^2}$

$= \sqrt{23.30}$

= **4.83%**

Conclusion: Based on the standard deviations only : M has a higher risk as it has the higher derivation as compared to N.

Question 2 *(ICAI SM)/(ICAI Paper May 24)/(RTP May 24)/ (RTP May 19)*

[Q.19 - AFM 8 (Fast Track) & 9, Q.19 - AFM 10]

An investor has decided to invest ₹ 100,000 in the shares of the 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 (%)
0.20	12	16
0.25	14	10
0.25	-7	28
0.30	28	-2

You are required to

a. Comment on return and risk of investment in individual securities

b. Compare the risk and return of these two shares with a portfolio of these shares in equal

proportions

c. Find out the proportion of each of the above shares to formulate a minimum risk portfolio.

Summary

Detailed Solution

Calculation of σ Covar

Probability	R (A)%	R(x)%	P(A – 12.55) (X – 12.1)	$P(A-\overline{A})^2$	$P(X-\overline{X})$
0.2	12	16	0.2 × (0.55) × 3.9 = (0.429)	0.06	3.04
0.25	14	10	0.25 × 1.45 × (2.1) = (0.761)	0.53	1.10
0.25	-7	28	0.25 ×(19.55) × 15.9 = (77.71)	95.55	63.2
0.3	28	-2	0.3 × 15.45 × (14.1) =(65.35)	71.61	59.64
			(144.25)	167.75	126.98

$\overline{A}$ = Σ pA = 12 × 0.2 + 14 × 0.25 + (7) × 0.25 + 0.3 × 28 + = 12.55%

$\overline{X}$ = Σ pX = 16 × 0.2 + 10 × 0.25 + 28 × 0.25 + (2) × 0.3 = 12.1%

σ A = $\sqrt{\Sigma P\left(A-\overline{A}\right)^2} = \sqrt{167.75}$ = ***12.95%***

σ X = $\sqrt{\Sigma P\left(X-\overline{X}\right)^2}$

= $\sqrt{126.98}$

= ***11.27%***

Solution

Particulars	ABC	XYZ
Expected Return	12.55%	12.10%
Risk	12.95%	11.27%

ABC has a higher risk and a higher return as compared to XYZ

$B.W_a$ = 50% W_x = 50%

R_{ax} = $W_aR_a + W_xR_x$

= 0.5 x 12.55+ 0.5 x 12.1

= ***12.325%***

$Covar_{(ax)}$ = Σp (A – $\overline{A}$) (X – $\overline{X}$)

= (144.25)

$COR_{(AX)} = \frac{Covar_{(AX)}}{\sigma_{AX}\sigma_X} = \frac{(144.25)}{12.95 \times 11.27}$

$= \boxed{(0.99)}$

$\sigma_{AX} = \sqrt{WA^2 x \sigma A^2 + Wb^2 + 2W_A W_X \sigma_A \sigma_X COR_{(AX)}}$

$= \sqrt{(0.5)^2 \times (12.95)^2 + (0.5)^2 \times (11.27)^2 + 2 \times 0.5 \times 0.5 \times (0.99) x 12.95 \times 11.27}$

$= \sqrt{1.44}$

$= \boxed{1.20\%}$

On combining XYZ & ABC, the return remains almost the same i.e 12.32% but the risk reduces significantly i.e it becomes 1.2%

Minimum Risk Portfolio

$$W_{abc} = \frac{\sigma_X^2 - Covar_{AX}}{\sigma_A^2 + \sigma_X^2 - 2\,Covar_{AX}}$$

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

$$= \frac{271.26}{583.21}$$

$= \boxed{0.4651}$

$W_{abc} = 46.51\%$

$W_{xyz} = 1 - W_{abc} = 1 - 0.4651$

$= \boxed{53.49\%}$

In order to get the minimum risk portfolio, we should invest 46.51% in ABC and 53.49 in XYZ

Question 3 *(ICAI Study Material [Modified])*

[Q.22 - AFM 8 (Fast Track) & 9, Q.22 - AFM 10]

You are given following information about ABC Ltd.

Year	ABC Ltd.		Market India	Market Dividend %	IRF
	Average Price	Dividend Per Share			
2000	242	20	1812	4	6%
2001	279	25	1950	5	5%
2002	305	30	2258	6	4%
2003	322	35	2220	7	5%

Calculate the Beta and the expected Return for ABC Ltd using CAPM.

Summary

Detailed Solution

Reference Note:

1. *Whenever share prices and dividends are given, we should always convert them into % return using* $\frac{P_1 - P_0 + D}{P_0} \times 100$ *and we should try to calculate* β *based on % returns only*
2. *Market (NIFTY/SENSEX) is an index which is a combination of various securities. The market does not have a separate Face Value and incase a market dividend % is given, it should be a % of the opening market price only i.e dividend % for a market is interpreted as dividend yield i.e* $\frac{D_1}{P_0}$

In such case, the return formula can be broken up as follows:

$$R_M = \frac{P_1 - P_0}{P_0} \times 100 + \frac{D_1}{P_0}(given)$$

(i) Calculation of returns ABC

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

$$2001 = \frac{279 - 242 + 25}{242} \times 100 = 25.62\%$$

$$2002 = \frac{305 - 279 + 30}{279} \times 100 = 20.07\%$$

$$2003 = \frac{322 - 305 + 35}{305} \times 100 = 17.05\%$$

Market

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

$$2001 = \frac{1950 - 1812}{1812} \times 100 + 5\% = 7.62\% + 5\% = 12.62\%$$

$$2002 = \frac{2258 - 1950}{1950} \times 100 + 6\% = 15.79\% + 6\% = 21.79\%$$

$$2003 = \frac{2220 - 2258}{2258} \times 100 + 7\% = -1.68\% + 7\% = 5.32\%$$

Year	ABC	M	$\sum(A-\bar{A})(M-\bar{M})$	$\sum(M-\bar{M})^2$
01	25.62	12.62	4.71 × (0.62) =(2.92)	0.38
02	20.07	21.79	(0.84) × 8.55 =(7.18)	73.10
03	17.05	5.32	(3.86) × (7.92) =30.57	62.73
	62.74	**39.73**	**20.47**	**136.21**

(a) $\bar{A} = \frac{\sum A}{N} = \frac{62.74}{3} = 20.91\%$

(b) $\bar{M} = \frac{\sum M}{N} = \frac{39.73}{3} = 13.24\%$

(c) $COVAR_{AM} = \frac{\sum(A-\bar{A})(M-\bar{M})}{N} = \frac{20.47}{3} = 6.82$

(d) $\sigma_M^2 = \frac{\sum(M-\bar{M})^2}{N} = \frac{136.21}{3} = 45.40$

(iii) β & Expected Return

$\beta = \frac{COVAR_{AM}}{\sigma_M^2} = \frac{6.82}{45.40} = 0.15$

Expected Return Using CAPM

$K_e = R_F + (R_M - R_F)\,\beta$

Where, $R_M = 13.24$ *(average return 2001, 2002 & 2003)*

$\beta = 0.15$

$R_F = \frac{5\%+4\%+5\%}{3} = 4.667 \cong 4.67\%$

Reference Note:

Market return is based on the years 2001, 2002 and 2003. Further β is also calculated by comparing the returns of ABC and the market during 2001, 02 & 03. Hence, R_F should be calculated as the average R_F for a comparable period i.e 2001,2002 & 2003.

K_e = *4.67 + (13.24 - 4.67) 0.15*

= ***5.96%***

Question 4 *(Practice Manual)*

[Q.35 - AFM 8 (Fast Track) & 9, Q.35 - AFM 10]

The rates of return on the security of Company X and market portfolio for 10 periods are given below:

Period	Return of Security X (%)	Return on Market Portfolio (%)
1	20	22
2	22	20
3	25	18
4	21	16
5	18	20
6	-5	8
7	17	-6
8	19	5
9	-7	6
10	20	11

(i) What is the beta of Security X?

(ii) What is the characteristic line for Security X?

Summary

Detailed Solution

i. Calculation of β

YEAR	R_X %	R_M %	$\Sigma(X-\bar{X})(M-\bar{M})$ $(x-15)(M-12)$	$(M-\bar{M})^2$ $(M-12)^2$
1	20	22	5 × 10 = 50	100
2	22	20	7 × 8 = 56	64
3	25	18	10 × 6 = 60	36
4	21	16	6 × 4 = 24	16
5	18	20	3 × 8 = 24	64
6	(5)	8	(20) × (4) = 80	16
7	17	(6)	2 × (18) = (36)	324
8	19	5	4 × (7) = (28)	49
9	(7)	6	(22) × (6) =132	36
10	20	11	5 × (1)= (5)	1
	150	**120**	**357**	**706**

$$\bar{X} = \frac{\sum x}{n} = \frac{150}{10} = 15\%$$

$$\bar{M} = \frac{\sum M}{n} = \frac{120}{10} = 12\%$$

$$COVAR_{(XM)} = \frac{\sum(X-\bar{X})(M-\bar{M})}{N} = \frac{357}{10} = 35.7$$

$$\sigma_M^2 = \frac{\sum(M-\bar{M})^2}{N} = \frac{706}{10} = 70.6$$

$$\beta = \frac{COVAR_{XM}}{\sigma_M^2} = \frac{35.7}{70.6} = 0.51$$

ii. Characteristic line

$X = \alpha + \beta M$

Where, $\alpha = \bar{X} + \beta\bar{M}$

α = 15 - 0.51 × 12

= 15 – 6.12

= **8.88**

Characteristic Line : x = 8.88 + 0.51M

***Reference Note*:**

Characteristic line is plotted taking the market (m) on the x-axis and the security (X) on y –axis. This line measures the characteristic (quality) of β i.e., how well the β can predict the past returns.

Let M = 10

Therefore, X = 8.88 + 0.51M

= 8.88 + 0.51 (10)

= 8.88 + 5.1

= (10,13.98)

Let M = 0

Therefore, X = 8.88 + 0.51M

= 0.88 + 0.51 (0)

= (0,8.88)

We can try to find the values of X at any two random values of M. For example, we have taken M as 10 and 0. We can draw a line connecting the above points which is called as characteristic line. Subsequently, we can plot the actual value of X.

In case the plotted points are very close to the characteristic line, it shows a good predictive capability of β, whereas, if these are points are dispersed widely, it shows poor predictive capability of β.

CAPM – SYSTEMATIC & UNSYSTEMATIC RISK

Question 5 *(ICAI Study Material)*

[Q.38 - AFM 8 (Fast Track) & 9, Q.38 - AFM 10]

The following details are given for X and Y companies' stocks and the Bombay Sensex for a period of one year. Calculate the systematic and unsystematicrisk for the companies' stocks. If equal amount of money is allocated for the stocks what would be the portfolio risk ?

Particulars	X Stock	Y Stock	Sensex
Average return	0.15	0.25	0.06
Variance of return $(\sigma)^2$	6.30	5.86	2.25
β	0.71	0.27	
Correlation Co-efficient with Sensex	0.424		
Co-efficient of determination $(r)^2$	0.18		

Summary

Detailed Solution

1. Systematic & Unsystematic risk

   Stock X

   Systematic Risk = $COR_{XM}^2 \times \sigma_X^2$

   = 0.18 × 6.3

   = 1.134

   Or $\beta_X^2 \times \sigma_M^2 = (0.71)^2 \times 2.25$

   = 1.134

   Total Risk = $\sigma_X^2 = 6.3$

   Unsystematic Risk (E_X^2)= 6.3 – 1.134 = 5.166

   Stock Y

   Systematic Risk = $\beta_y^2 \times \sigma_M^2 = (0.27)^2 \times 2.25$ = 0.164

   Unsystematic Risk $\left[E_y^2\right] = \sigma_y^2 - \beta_y^2\sigma_M^2$

   = 5.86 – 0.164 = 5.696

2. Calculation of Portfolio Risk (X : 0.5 & Y: 0.5)

   In this case, r_{xy} is not available, we need to either calculate, r_{xy} or covar (x,y)

   COV(x,y) = $\beta_X\beta_y\sigma_M^2$

   = 0.71 × 0.27 × 2.25 = 0.4313

   $\sigma_{xy} = \sqrt{w_X^2\sigma_X^2 + w_y^2\sigma_y^2 + 2W_XW_y\,cov(X,Y)}$

$= \sqrt{(0.5)^2\ 6.3 + (0.5)^2\ 5.86 + 2(0.5)(0.5)0.4313}$

$= \sqrt{3.2556}$

$\sigma_{XY} = 1.80\%$

Question 6 *(ICAI Study Material)/(RTP Nov 20)*

[Q.41 - AFM 8 (Fast Track) & 9, Q.41 - AFM 10]

A study by a mutual fund has revealed the following data in respect of 3 securities

Security	Std deviation (%)	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%

1. what is the sensitivity of the returns of each stock with respect to the market
2. what are the co variances among the various stocks
3. what would be the risk of portfolio consisting of all the three stocks equally
4. what is the beta of the portfolio consisting of equal investments in each stock
5. what is the total, systematic and unsystematic risk of the portfolio in 4

Summary

Detailed Solution

1. Sensitivity to Market (β)

$\beta_A = COR_{AM} \times \frac{\sigma_A}{\sigma_M} = 0.6 \times \frac{20}{15} = 0.8$

$\beta_B = COR_{BM} \times \frac{\sigma_B}{\sigma_M} = 0.95 \times \frac{18}{12} = 1.14$

$\beta_C = COR_{CM} \times \frac{\sigma_c}{\sigma_M} = 0.75 \times \frac{12}{15} = 0.6$

2. Covariance among stocks (and not with the market)

Reference Note: *Usually we would have used the formula*

$Covar_{AB} = COR_{ab} \times \sigma_A \times \sigma_B$

However in this question we have been given COR_{am} and not COR_{AB} and hence we can't use the above formula. Instead $Covar_{AB}$ can be calculated using 3rd formula since β as well as σ m is available.

$COVAR_{AB}$ = $\beta_A \times \beta_B \times \sigma_M^2$

= $0.8 \times 1.14 \times 15^2 = 205.2$

$COVAR_{AC}$ = $\beta_A \times \beta_C \times \sigma_M^2$

= $0.8 \times 0.6 \times 15^2 = 108$

$COVAR_{BC}$ = $\beta_B \times \beta_C \times \sigma_M^2$

= $1.14 \times 0.6 \times 15^2$

= 153.90

3. σ_{ABC}

$$= \sqrt{W_A^2\sigma_A^2 + W_B^2\sigma_B^2 + W_C^2\sigma_C^2 + 2W_AW_BCOVAR_{AB} + 2W_AW_CCOVAR_{AC} + 2W_BW_cCOVAR_{BC}}$$

$$= \sqrt{\left(\frac{1}{3}\right)^2 \times 20^2 + \left(\frac{1}{3}\right)^2 \times 18^2 + \left(\frac{1}{3}\right)^2 \times 12^2 + 2 \times \frac{1}{3} \times \frac{1}{3} \times 205.2 + 2 \times \frac{1}{3} \times \frac{1}{3} \times 108 + 2 \times \frac{1}{3} \times \frac{1}{3} \times 153.9}$$

$= \sqrt{200.24}$

= **14.15%**

4. β_{ABC} = $W_A \beta_A + W_A \beta_B + W_C \beta_c$

= $1/3 \times 0.8 + 1/3 \times 1.14 + 1/3 \times 0.6$

= **0.85**

5. Portfolio (with equal weight of A,B,C)

Systematic Risk = $\beta_{ABC}^2 \times \sigma_M^2$

= $(0.85)^2 \times 15^2$

= **162.56**

Total risk = σ_{abc} = 14.15 i.e., σ_{ABC}^2 = 200.2

Unsystematic Risk (Portfolio ABC) (E_{ABC}^2)

= Total Risk (Squared) - Systematic Risk (Squared Term)

= 200.22 – 162.56

= **37.66**

Extra: Random Error = $\sqrt{37.66}$

= **6.14**

Question 7 *(ICAI Study Material)*

[Q.45 - AFM 8 (Fast Track) & 9, Q.45 - AFM 10]

Mr X owns a portfolio with the following characteristics

Particulars	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 2 factor model

a. 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 2 factors

b. If Mr. X borrows ₹ 1,00,000 at the risk free rate and invests the amount he borrows along with the original ₹ 1,00,000 in A and B in the same proportion as described in part 1 what is the sensitivity of the portfolio to the 2 factors

c. What is the expected return premium if factor 2?

Summary

Detailed Solution

(a) Portfolio β [β_{AB}^{F1} and β_{AB}^{F2}]

1. Calculation of Weights

Security	Amount	₹	Weight
A	1,00,000 + 50,000	1,50,000	1.5
B	(50,000)	(50,000)	(0.5)
R_F	0	0	0
		1,00,000	1

2. Sensitivity of Portfolio (A,B) to each factor

AB	A	B
β_{AB}^{F1}	$W_A\beta_A^{F1} + W_B\beta_B^{F1}$	
	= 1.5 × 0.8 + (0.5) × 1.5 = **0.45**	

AB	A	B
β_{AB}^{F2}	$W_A\beta_A^{F2} + W_B\beta_B^{F2}$	
	= 1.5 × 0.6 + (0.5) × 1.2 = 0.3	

(b) Sensitivity of Portfolio (A,B, R_F) to each factor (F1, F2)

Reference Note: *Borrowing money usually involves issuing debentures which is equivalent to selling the debentures. In case we had invested in a risk free security (purchased), then it would have been a part of our portfolio. Similarly, if we borrow (equivalent to selling risk free security) it should also be considered to be a part of our portfolio with the weights being negative as security is being sold.*

Additionally, we have been told to maintain the same proportion as part (a). Hence another 50,000 of B should be short sold and the additional amount generated would also be invested in A in a manner similar to part (a).

i. Calculation of Weights

Securities	Amount	₹	Weight
A	1,00,000 + 50,000 + 1,00,000 + 50,000	3,00,000	3
B	(50,000) + (50,000)	(1,00,000)	(1)
R_F	(1,00,000)	(1,00,000)	(1)
		1,00,000	1

ii. $\beta_{ABR}^{F1} = W_A\beta_A^{F1} + W_B\beta_B^{F1} + W_R\beta_R^{F1}$

$= 3 \times 0.8 + (1) \times 1.5 + (1) \times 0$

$= \mathbf{0.9}$

$\beta_{ABR}^{F2} = W_A\beta_A^{F2} + W_B\beta_B^{F2} + W_R\beta_R^{F2}$

$= 3 \times 0.6 + (1) \times 1.2 + (1) \times 0$

$= \mathbf{0.6}$

(c) Calculation of return/risk premium of factor-2 (λ_{F2})

We have been given that the returns are generated by a 2 factor model and hence the expected return for each security would be similar to the required return generated by a 2 factor model i.e.,

$K_e = R_F + \lambda_{F1}\beta_{F1} + \lambda_{F2}\beta_{F2}$

Thus, A : $15 = 10 + \lambda_{F1}\,0.8 + \lambda_{F2}\,0.6$

i.e $5 = 0.8\,\lambda_{F1} + 0.6\,\lambda_{F2}$

B : $20 = 10 + \lambda_{F1}\,1.5 + \lambda_{F2}\,1.2$

i.e., $10 = 1.5\,\lambda_{F1} + 1.2\,\lambda_{F2}$

Multiplying equation 1 by 2 then subtracting equation 2 from 1

$10 = 1.6\,\lambda_{F1} + 1.2\,\lambda_{F2}$

$10 = 1.5\,\lambda_{F1} + 1.2\,\lambda_{F2}$

$0 = 0.1\,\lambda_{F1}$

Thus, $\lambda_{F1} = 0$

Thus, Substituting $\lambda_{F1} = 0$ in equation 2

$10 = 1.5 \times 0 + 1.2\,\lambda_{F2}$

Thus, $10 = 1.2\,\lambda_{F2}$

$\lambda_{F2} = 10/1.2$

$\lambda_{F2} = 8.33\%$

(Return / Risk premium of factor-2)

Question 8 *(ICAI Study Material)/(Practice Manual)*

[Q.46 - AFM 8 (Fast Track) & 9, Q.46 - AFM 10]

Mr. Nirmal Kumar has categorized all the available stock in the market into the following types:

(i) Small cap growth stocks

(ii) Small cap value stocks

(iii) Large cap growth stocks

(iv) Large cap value stocks

Mr. Nirmal Kumar also estimated the weights of the above categories of stocks in the market index. Further, more the sensitivity of returns on these categories of stocks to the three important factor are estimated to be:

Category of Stocks	Weight in the Market Index	Factor I (Beta) [Market]	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				
[λ]		6.85%	-3.5%	0.65%

The rate of return on treasury bonds is 4.5% Required:

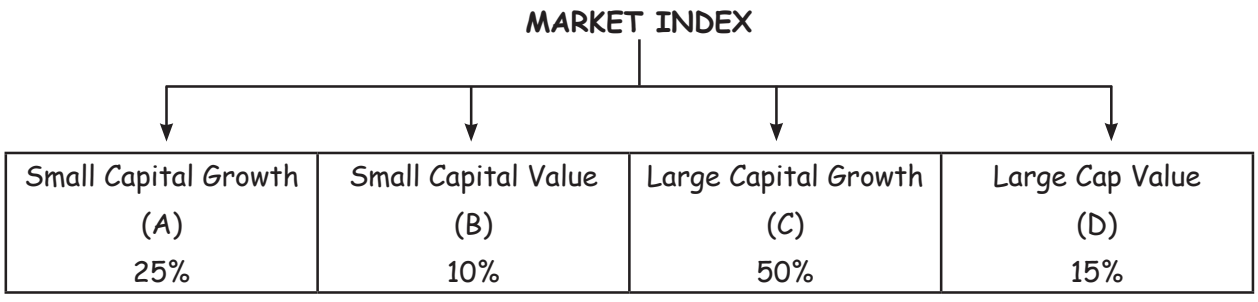
(a) Using Arbitrage Pricing Theory, determine the expected return on the market index.

(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.

Summary

Detailed Solution



(a) Expected Return for Market using APT.

$Ke = R_F + \lambda_{F1}\beta_{F1}^{ABCD} + \lambda_{F2}\beta_{F2}^{ABCD} + \lambda_{F3}\beta_{F3}^{ABCD}$

Reference: *Where R_F, λ_{F1}, λ_{F2}, λ_{F3} are given in Question. Thus we need to calculate portfolio beta for each of the three factors separately and then substitute it in the*

above formula in order to find the required return for the market portfolio.

Factor 1: Market

$$\beta_{F1}^{ABCD} = W_A\beta_{F1}^{A} + W_B\beta_{F1}^{B} + W_C\beta_{F1}^{C} + W_D\beta_{F1}^{D}$$

= 0.25 × 0.8 + 0.10 × 0.9 + 0.5 × 1.165 + 0.15 × 0.85

= **1**

Factor 2: Book Price

$$\beta_{F2}^{ABCD} = W_A\beta_{F2}^{A} + W_B\beta_{F2}^{B} + W_C\beta_{F2}^{C} + W_D\beta_{F2}^{D}$$

= 0.25 × 1.39 + 0.1 × 0.75 + 0.5 × 2.75 + 0.15 × 2.05

= **2.105**

Factor 3: Inflation

$$\beta_{F3}^{ABCD} = W_A\beta_{F3}^{A} + W_B\beta_{F3}^{B} + W_C\beta_{F3}^{C} + W_D\beta_{F3}^{D}$$

= 0.25 × 1.35 + 0.1 × 1.25 + 0.5 × 8.65 + 0.15 × 6.75

= **5.8**

Using APT

$$K_e = R_F + \lambda_{F1}^{ABCD}\beta_{F1}^{ABCD} + \lambda_{F2}^{ABCD}\beta_{F2}^{ABCD} + \lambda_{F3}^{ABCD}\beta_{F3}^{ABCD}$$

= 4.5 + 6.85 × 1 + (3.5) × 2.105 + 0.65 × 5.8

= **7.7525%**

(b) Expected return of market (ABCD) using CAPM

In this case Market is F1, hence the risk premium would be (R_M – R_F) i.e 6.85% and portfolio β will be 1 as calculated above for F1. Alternatively, we can directly take β of market to itself as 1 under CAPM.

Using CAPM

$K_e = R_F + (R_M - R_F) \times \beta$

= 4.5% + 6.85% × 1

= **11.35%**

(c) Factor 1: Market

As given, Mr. Nirmal Kumar only wants to hold small capital value (B) and large capital growth (C) in his portfolio. Further, the target β is against the market (F1) only growth.

$W_B + W_C = 1$

Thus, $W_C = 1 - W_B$

Using Formula for portfolio β

$$\beta_{BC}^{F1} = W_B\beta_{B}^{F1} + W_C\beta_{C}^{F1}$$

$1 = W_B \times 0.9 + (1-W_B) \times 1.165$

$1 = 0.9\ W_B + 1.165 - 1.165\ W_B$

$(0.165) = (0.265\ W_B)$

$W_B = 0.6226$

i.e 62.26%

$W_C = 1 - 0.6226 = 0.3774$

i.e 37.745%

Question 9

(RTP May 21)/(MTP May 20)

[Q.52 - AFM 8 (Fast Track) & 9, Q.52 - AFM 10]

Equity of ABC Ltd. (ABCL) is ₹ 500 Crores, its debt, is worth ₹ 290 Crores. Printer Division segments value is attributable to 64%, which has an Asset Beta (βp) of 1.55, balance value is applied on Spares and Consumables Division, which has an Asset Beta (β_{SC}) of 1.40 ABCL Debt beta (β_D) is 0.28.

You are required to calculate:

(i) Equity Beta (β_E),

(ii) Ascertain Equity Beta (β_E), if ABC Ltd. decides to change its Debt Equity position by raising further debt and buying back of equity to have its Debt to Equity Ratio at 1.50. Assume that the present Debt Beta (β_{D1}) is 0.45 and any further funds raised by way of Debt will have a Beta (β_{D2}) of 0.50.

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

Summary

Detailed Solution

(i) ABC LTD

The business of ABC Ltd Comprises of the printer Division and spares and consumable division. Hence, the asset beta should also comprise of both the division i.e.,

$\beta_A = 64\% \times 1.55 + 36\% \times 1.4$

$= \boxed{1.496}$

Further, $\beta_D = 0.28$ (Given)

Thus, $\beta_A = \beta_D \times \frac{D}{D+E} + \beta_E \times \frac{D}{D+E}$

$1.496 = 0.28 \times \frac{290}{290+500} + \beta_E \times \frac{500}{290+500}$

$$1.496 = \frac{81.2}{790} + \beta_E \times \frac{500}{790}$$

$$1.496 = 0.103 + 0.633\ \beta_E$$

$$\beta_E = \frac{1.393}{0.633}$$ **β_E = 2.20**

(ii) Revised Equity Beta

We have been told, that some additional debt would be raised. However, the proceeds generated from additional debt are not separately added to the investment in the business. Instead they have been used to buyback existing equity. Thus, in case, debt to equity ratio needs to be 1.5:1

Particulars		Total	Existing	Add/Buyback
Debt	1.5	474 ?	290	184 (474- 290)
Equity	1	316 ?	500	(184) (316 - 500)
Total	2.5	790	790	

β_A = 1.496 $\rightarrow$ From 1

Since, ABC is still in the printer's business (64%) and spares business (36%), the asset β continues to be 1.496. Further we have been given that the existing debt (D_1) has a β of 0.45 and additional debt (D_2) has β of 0.5

$$\beta_A = \beta_E \times \frac{E}{D_1 + D_2 + E} + \beta_{D_1} \times \frac{D_1}{D_1 + D_2 + E} + \beta_{D_2} \times \frac{D_2}{D_1 + D_2 + E}$$

$$1.496 = \beta_E \times \frac{316}{790} + 0.45 \times \frac{290}{790} + 0.5 \times \frac{184}{790}$$

$1.496 = 0.4\ \beta_E + 0.2817$

$1.2143 = 0.4\ \beta_E$

β_E = 3.036

(iii) In case the price per share of equity increase due to increase in Beta, then the higher leverage (debt) in justified, else not.

Question 10 *(RTP May 22)*

[Q.53 - AFM 8 (Fast Track) & 9, Q.53 - AFM 10]

Mr. A is holding 1000 shares of face value of ₹ 100 each of M/s. ABC Ltd. He wants to hold these shares for long term and have no intention to sell. On 1st January 2020, M/s XYZ Ltd. has made short sales of M/s. ABC Ltd.'s shares and approached Mr. A to lend his shares under Stock Lending Scheme with following terms:

(i) Shares to be borrowed for 3 months from 01-01-2020 to 31-03-2020,

(ii) Lending Charges/Fees of 1% to be paid every month on the closing price of the stock quoted in Stock Exchange and

(iii) Bank Guarantee will be provided as collateral for the value as on 01-01-2020.

Other Information:

(a) Cost of Bank Guarantee is 8% per annum,

(b) M/s ABC Ltd.'s share quoted in Stock Exchange on various dates are as follows:

Date	Share Price in Scenario - 1 Bullish	Share Price in Scenario - 2 Bearish
01-01-2020	1000	1000
31-01-2020	1020	980
29-02-2020	1040	960
31-03-2020	1050	940

(c) On 29-02-2020, ABC declares a dividend of 25%

You are required to find out:

(i) Earning of Mr. A through Stock Lending Scheme in both the scenarios,

(ii) Total Earnings of Mr. A during 01-01-2020 to 31-03-2020 in both the scenarios,

(iii) What is the Profit or loss to M/s. XYZ by shorting the shares using through Stock Lending Scheme in both the scenarios?

Summary

Detailed Solution

(i) Earning of Mr. A from stock lending scheme

Scheme

PARTICULARS	BULLISH	BEARISH
Leading Fees		
January	10.2 (1,020 × 1%)	9.8 (980 × 1%)
February	10.4 (1,040 × 1%)	9.6 (960 × 1%)
March	10.5 (1,050 × 1%)	9.4 (940 × 1%)
Total Lending fees per share	31%	28.8
× Share lent	1,000	1,000
Total lending Fees (earnings) for Mr.A from stock lending	31,100	28,800

Note:

Apart from the lending fees, Mr.A continues to have the right of an owner and hence dividend earned during the 3 months will also be enjoyed by Mr. A. However, this dividend would be earned, irrespective of the stock lending scheme and hence dividend is not considered in Part – 1. However, it is considered while calculating total earnings in Part-2.

(ii) Total Earnings:

Particulars	BULLISH	BEARISH
Lending Fees	31,100	28,800
+ Dividend Income [(₹ 100 × 25%) × 1000]	25,000	25,000
Total Earning	56,100	53,800

(iii) Profit / Loss to M/s XYZ

Particulars	BULLISH	BEARISH
Lending Charges	(31,100)	(28,800)
Bank Guarantee Charges [1000 × 8% × 3/12] × 1000 1/1/20 p.a. shares	(20,000)	(20,000)
Gain/loss on short sold position	(50,000) [1,000 – 1,050] × 1000 S.P 01/01/20 C.P 31/03/20	60,000 [1,000 – 940] × 1000 S.P 01/01/20 C.P 31/03/20
Overall gain /(loss)	(1,01,100)	11,200

CHAPTER 4 ADVANCED CAPITAL BUDGETING DECISIONS

Question 1

[Q.7 - AFM 8 (Fast Track) & 9, Q.7 - AFM 10]

Following are the estimates of the net cash flows and probability of a new project of M/s X Ltd.:

Particulars	Year	P = 0.3	P = 0.5	P = 0.2
Initial investment	0	4,00,000	4,00,000	4,00,000
Estimated net after tax cash inflows per year	1 to 5	1,00,000	1,10,000	1,20,000
Estimated salvage value (after tax)	5	20,000	50,000	60,000

Required rate of return from the project is 10%. Find:

(i) The expected NPV of the project.

(ii) The best case and the worst case NPVs.

(iii) The probability of occurrence of the worst case if the cash flows are perfectly dependent overtime and independent overtime.

(iv) Standard deviation and coefficient of variation assuming that there are only three streams of cash flow, which are represented by each column of the table with the given probabilities.

(v) Coefficient of variation of X Ltd. on its average project which is in the range of 0.95 to 1.0. If the coefficient of variation of the project is found to be less risky than average, 100 basis points are deducted from the Company's cost of Capital Should the project be accepted by X Ltd?

Summary

Detailed Solution

(i) Expected cash flows:

Year		Net cash flows	P.V.	PV. @ 10%
0	(4,00,000 x 1)	(-)4,00,000	1.000	(-)4,00,000
1 to 4	(1,00,000x0.3+1,10,000x0.5	1,09,000	3.170	3,45,530
	+ 1,20,000 x 0.2)			
5	[1,09,000 + (20,000 x 0.3 +	1,52,000	0.621	94,392
	50,000 x 0.5 + 60,000 x 0.2)]			
		NPV =		39,922

(ii) ENPV of the worst case

1,00,000 x 3.790 = ₹ 3,79,000 (Students may have 3.791 also the values will change accordingly)

20,000 x 0.621 = ₹ 12,420/-

ENPV = (-) 4,00,000 + 3,79,000 + 12,420 = (-) ₹ 8,580/-

ENPV of the best case

ENPV = (-) 4,00,000 + 1,20,000 x 3.790 + 60,000 x 0.621 = ₹ 92,060/-.

(iii) (a) Required probability = 0.3

(b) Required probability = $(0.3)^5$ = 0.00243

(iv) The base case NPV = (-) 4,00,000 + (1,10,000 x 3.79) + (50,000 x 0.621)

= ₹ 47,950/-

ENPV = 0.30 x (-) 8580 + 0.5 x 47950 + 92060 x 0.20 = ₹ 39,813/-

Therefore,

$\sigma_{ENpv} = \sqrt{0.3(-8580-39,813)^2 + 0.5(47950-39813)^2 + 0.2(92060-39813)^2}$ = ₹ 35800 /-

Therefore, CV = 35,800/39,813 = 0.90

(v) Risk adjusted out of cost of capital of X Ltd. = 10% - 1% = 9%. NPV

Year	Expected net cash flow	PV @ 9%	
0	(-) 4,00,000	1.000	(-) 4,00,000
1 to 4	1,09,000	3.240	3,53,160
5	1,52,000	0.650	98,800
		ENPV =	51,960

Therefore, the project should be accepted.

Question 2

[Q.12 - AFM 8 (Fast Track) & 9, Q.12 - AFM 10]

The Easygoing Company Limited is considering a new project with initial investment, for a product "Survival". It is estimated that IRR of the project is 16% having an estimated life of 5 years. Financial Manager has studied that project with sensitivity analysis and informed that annual fixed cost sensitivity is 7.8416%, whereas cost of capital (discount rate) sensitivity is 60%.

Other information available are:

Profit Volume Ratio (P/V) is 70%, Variable cost ₹ 60/- per unit Annual Cash Flow ₹ 57,500/-

Ignore Depreciation on initial investment and impact of taxation.

Calculate

(i) Initial Investment of the Project

(ii) Net Present Value of the Project

(iii) Annual Fixed Cost

(iv) Estimated annual unit of sales

(v) Break Even Units

Cumulative Discounting Factor for 5 years

8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127

Summary

Detailed Solution

(i) Initial Investment

IRR = 16% (Given)

At IRR, NPV shall be zero, therefore

Initial Cost of Investment = PVAF (16%,5) x Cash Flow (Annual)

= 3.274 x ₹ 57,500

= ₹ 1,88,255

(ii) Net Present Value (NPV)

Let Cost of Capital be X, then $\frac{16-x}{x}$ = 60% x = 10%

Thus NPV of the project

= Annual Cash Flow x PVAF (10%, 5) – Initial Investment

= ₹ 57,500 x 3.791 – ₹ 1,88,255

= ₹ 2,17,982.50 – ₹ 1,88,255 = ₹ 29,727.50

(iii) Annual Fixed Cost

Let change in the Fixed Cost which makes NPV zero is X. Then,

₹ 29,727.50 – 3.791X = 0 Thus X = ₹ 7,841.60

Let original Fixed Cost be Y then, Y × 7.8416% = ₹ 7,841.60

Y = ₹ 1,00,000

Thus Fixed Cost is equal to ₹ 1,00,000

(iv) Estimated Annual Units of Sales

$$\text{Selling price per unit} = \frac{₹60}{100\% - 70\%} = ₹200$$

$$\frac{\text{Annual cash flow} + \text{Fixed Cost}}{P/V \text{ Ratio}} = \text{Sales Value}$$

$$\frac{₹57500 + ₹100000}{0.70} = ₹225000$$

$$\text{Sales in units} = \frac{₹225000}{₹200} = ₹1125 \text{ units}$$

(v) Break Even Units

$$\frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{100000}{140} = 714.285 \text{ Units}$$

Question 3

[Q.16 - AFM 8 (Fast Track) & 9, Q.16 - AFM 10]

XYZ Ltd. requires ₹ 8,00,000 for an unit. Useful life of project - 4 years. Salvage value - Nil. Depreciation Charge ₹ 2,00,000 p.a. Expected revenues & costs (excluding depreciation) ignoring inflation.

Year	1	2	3	4
Revenues	₹ 6,00,000	₹ 7,00,000	₹ 8,00,000	₹ 8,00,000
Costs	₹ 3,00,000	₹ 4,00,000	₹ 4,00,000	₹ 4,00,000

Tax Rate 60% cost of capital 10% (including inflation premium).

Calculate NPV of the project if inflation rates for revenues & costs are as follows:

Year	Revenues	Costs
1	10%	12%
2	9%	10%
3	8%	9%
4	7%	8%

Summary

Detailed Solution

Computation of Annual Cash Flow

(i) Inflation adjusted Revenues

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	6,00,000	6,00,000(1.10) = 6,60,000
2	7,00,000	7,00,000(1.10)(1.09) = 8,39,300
3	8,00,000	8,00,000(1.10)(1.09)(1.08) = 10,35,936
4	8,00,000	8,00,000(1.10)(1.09)(1.08)(1.07) = 11,08,452

(ii) Inflation adjusted Costs

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	3,00,000	3,00,000(1.12) = 3,36,000
2	4,00,000	4,00,000(1.12)(1.10) = 4,92,800

3	4,00,000	4,00,000(1.12)(1.10)(1.09) = 5,37,172
4	4,00,000	4,00,000(1.12)(1.10)(1.09)(1.08) = 5,80,124

(iii) Tax Benefit on Depreciation = ₹ 2,00,000 x 0.60 = ₹ 1,20,000

(iv) Net Profit after Tax

Year	Revenues (Inflation Adjusted) (₹)(1)	Costs (Inflation Adjusted) (₹)(2)	Net Profit (₹) (3) = (1) - (2)	Tax (₹) (4) = 60% of (3)	Net after Profit (₹) (3) - (4)
1	6,60,000	3,36,000	3,24,000	1,94,400	1,29,600
2	8,39,300	4,92,800	3,46,500	2,07,900	1,38,600
3	10,35,936	5,37,172	4,98,764	2,99,258	1,99,506
4	11,08,452	5,80,124	5,28,328	3,16,997	2,11,331

Present Value of Cash Inflows

Year	Net after profit (₹)	Tax Benefit on Depreciation (₹)	Cash Inflow (₹)	PVF @10%	PV (₹)
1	1,29,600	1,20,000	2,49,600	0.909	2,26,886
2	1,38,600	1,20,000	2,58,600	0.826	2,13,604
3	1,99,506	1,20,000	3,19,506	0.751	2,39,949
4	2,11,331	1,20,000	3,31,331	0.683	2,26,299
					9,06,738

NPV = ₹ 9,06,738 – ₹ 8,00,000 = ₹ 1,06,738

Question 4

[Q.19 - AFM 8 (Fast Track) & 9, Q.19 - AFM 10]

A company has an old machine having book value zero – which can be sold for ₹ 50,000. The company is thinking to choose one from following two alternatives:

(i) To incur additional cost of ₹ 10,00,000 to upgrade the old existing machine.

(ii) To replace old machine with a new machine costing ₹ 20,00,000 plus installation cost ₹ 50,000.

Both above proposals envisage useful life to be five years with salvage value to be nil. The expected after tax profits for the above three alternatives are as under:

Year	Old existing Machine (₹)	Upgraded Machine (₹)	New Machine (₹)
1	5,00,000	5,50,000	6,00,000
2	5,40,000	5,90,000	6,40,000
3	5,80,000	6,10,000	6,90,000
4	6,20,000	6,50,000	7,40,000
5	6,60,000	7,00,000	8,00,000

The tax rate is 40 per cent.

The company follows straight line method of depreciation. Assume cost of capital to be 15 percent.

P.V.F. of 15%, 5 = 0.870, 0.756, 0.658, 0.572 and 0.497. You are required to advise the company as to which alternative is to be adopted.

Summary

Detailed Solution

(A) Cash Outflow

Particulars		₹
(i)	In case machine is upgraded:	
	Upgradation Cost	10,00,000
(ii)	In case new machine installed:	
	Cost	20,00,000
	Add: Installation cost	50,000
	Total Cost	**20,50,000**
	Less: Disposal of old machine	
	₹ 50,000 – 40% tax	30,000
	Total Cash Outflow	**20,20,000**

Working Note:

(i) Depreciation – in case machine is upgraded

₹ 10,00,000 ÷ 5 = ₹ 2,00,000

(ii) Depreciation – in case new machine is installed

₹ 20,50,000 ÷ 5 = ₹ 4,10,000

(iii) Old existing machine – Book Value is zero. So, no depreciation.

(B) Cash Inflows after Taxes (CFAT)

Year	Old Existing Machine	Upgraded Machine			
	(i) EAT/CFAT ₹	(ii) EAT ₹	(iii) DEP ₹	(iv) CFAT ₹	= (iv)-(i) Incremental CFAT ₹
1	5,00,000	5,50,000	2,00,000	7,50,000	2,50,000
2	5,40,000	5,90,000	2,00,000	7,90,000	2,50,000
3	5,80,000	6,10,000	2,00,000	8,10,000	2,30,000
4	6,20,000	6,50,000	2,00,000	8,50,000	2,30,000
5	6,60,000	7,00,000	2,00,000	9,00,000	2,40,000

Cash Inflows after Taxes (CFAT)

Year		New Machine		
	(vi) EAT ₹	(vii) DEP ₹	(viii) CFAT ₹	(ix) = (viii) – (i) Incremental CFAT (₹)
1	6,00,000	4,10,000	10,10,000	5,10,000
2	6,40,000	4,10,000	10,50,000	5,10,000
3	6,90,000	4,10,000	11,00,000	5,20,000
4	7,40,000	4,10,000	11,50,000	5,30,000
5	8,00,000	4,10,000	12,10,000	5,50,000

P.V. at 15% - 5 Years – on Incremental CFAT

*Acquisition Cost (including installation cost) ₹ 20,50,000

Less: Salvage Value of existing machine net of Tax ₹ 30,000

₹ **20,20,000**

Year	Upgraded Machine			New Machine		
	Incremental CFAT ₹	PVF	Total P.V. ₹	Incremental CFAT	PVF	Total PV ₹
1	2,50,000	0.870	2,17,500	5,10,000	0.870	4,43,700
2	2,50,000	0.756	1,89,000	5,10,000	0.756	3,85,560
3	2,30,000	0.658	1,51,340	5,20,000	0.658	3,42,160
4	2,30,000	0.572	1,31,560	5,30,000	0.572	3,03,160
5.	2,40,000	0.497	1,19,280	5,50,000	0.497	2,73,350
Total P.V. of CFAT			8,08,680			17,47,930
Less: Cash Outflows			10,00,000			20,20,000*
N.P.V. =			-1,91,320			- 2,72,070

As the NPV in both the new (alternative) proposals is negative, the company should continue with the existing old Machine.

OPTIMUM REPLACEMENT TIME

Question 5 *(ICAI SM)/(ICAI Paper May 24)*

[Q.22 - AFM 8 (Fast Track) & 9, Q.22 - AFM 10]

A machine used on a production line must be replaced at least every four years. Costs incurred to run the machine according to its age are:

	Age of the Machine (years)				
	0	1	2	3	4
Purchase price (in ₹)	60,000				

Maintenance (in ₹)		16,000	18,000	20,000	20,000
Repair (in ₹)		0	4,000	8,000	16,000
Scrap Value (in ₹)		32,000	24,000	16,000	8,000

Future replacement will be with identical machine with same cost. Revenue is unaffected by the age of the machine. Ignoring inflation and tax, determine the optimum replacement cycle. PV factors of the cost of capital of 15% for the respective four years are 0.8696, 0.7561, 0.6575 and 0.5718.

Summary

Detailed Solution

Working Notes

First of all, we shall calculate cash flows for each replacement cycle as follows:

One Year Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	32,000	16,000

Two Years Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	24,000	2,000

Three Years Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	-	(22,000)
3	-	(28,000)	16,000	(12,000)

Four Years Replacement Cycle

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	-	(22,000)
3	-	(28,000)	-	(28,000)
4	-	(36,000)	8,000	(28,000)

Now we shall calculate NPV for each replacement cycles

		1 Year		2 Years		3 Years		4 Years	
Year	PVF@ 15%	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV
0	1	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000
1	0.8696	16,000	13,914	-16,000	-13,914	-16,000	-13,914	-16,000	-13,914
2	0.7561	-	-	2,000	1,512	-22,000	-16,634	-22,000	-16,634
3	0.6575	-	-	-	0	-12,000	-7,890	-28,000	-18,410
4	0.5718	-	-	-	0		0	-28,000	-16,010
			-46,086		-72,402		-98,438		-1,24,968

Replacement Cycles		EAC (₹)
1 Year	$\frac{46086}{0.8696}$	52,997
2 Years	$\frac{72402}{1.6257}$	44,536
3 Years	$\frac{98438}{2.2832}$	43,114
4 Years	$\frac{124968}{2.855}$	43,772

Since EAC is least in case of replacement cycle of 3 years hence machine should be replaced after every three years.

Note: *Alternatively, Answer can also be computed by excluding initial outflow as there will be no change in final decision.*

Question 6

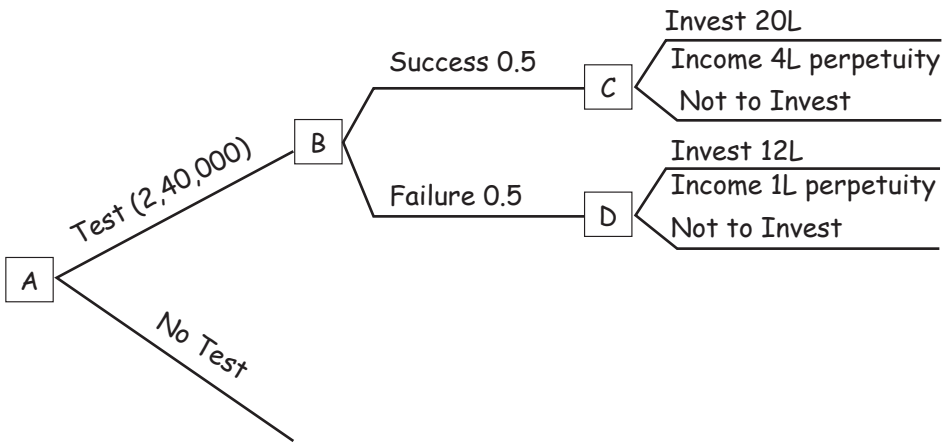
[Q.25 - AFM 8 (Fast Track) & 9, Q.25 - AFM 10]

L & R Limited wishes to develop new virus-cleaner software. The cost of the pilot project would be ₹ 2,40,000. Presently, the chances of the product being successfully launched on a commercial scale are rated at 50%. In case it does succeed. L&R can invest a sum of ₹ 20 lacs to market the product. Such an effort can generate perpetually, an annual net after tax cash income of ₹ 4 lacs. Even if the commercial launch fails, they can make an investment of a smaller amount of ₹ 12 lacs with the hope of gaining perpetually a sum of ₹ 1 lac. Evaluate the proposal, adopting decision tree approach. The discount rate is 10%.

Summary

Detailed Solution

Decision tree diagram is given below:



Evaluation

At Decision Point C: The choice is between investing ₹ 20 lacs for a perpetual benefit of ₹ 4 lacs and not to invest. The preferred choice is to invest, since the capitalized value of benefit of ₹ 4 lacs (at 10%) adjusted for the investment of ₹ 20 lacs, yields a net benefit of ₹ 20 lacs.

At Decision Point D: The choice is between investing ₹ 12 lacs, for a similar perpetual benefit of ₹ 1 lac. and not to invest. Here the invested amount is greater than capitalized value of benefit at ₹ 10 lacs. There is a negative benefit of ₹ 2 lacs. Therefore, it would not be prudent to invest. At Outcome Point B: Evaluation of EMV is as under (₹ in lacs).

Outcome	Amount (₹)	Probability	Result (₹)
Success	20.00	0.50	10.00
Failure	0.00	0.50	00.00
Net result			10.00

EMV at B is, therefore, ₹ 10 lacs.

At A: Decision is to be taken based on preferences between two alternatives. The first is to test, by investing ₹ 2,40,000 and reap a benefit of ₹ 10 lacs. The second is not to test, and thereby losing the opportunity of a possible gain.

The preferred choice is, therefore, investing a sum of ₹ 2,40,000 and undertaking the test.

CHAPTER 5 MUTUAL FUNDS

Question 1

(ICAI Paper May 22)

[Q.8 - AFM 8 (Fast Track) & 9, Q.8 - AFM 10]

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

Particulars	MF 'A'	MF 'B'	MF 'C'
Amount of Investment	2,00,000	5,00,000	4,00,000
NAV at the time of purchase	10.00	25.00	20.00
Dividend Yield up to 31.03.2022	3%	5%	4%
NAV as on 31.03.2022	10.50	22.80	20.80
Annualized Yield as on 31.03.2022	9.733%	- 11.185%	15%

Assume 1 Year = 365 Days.

Mr. D has misplaced the documents of his investments. You are required to help Mr. D to find out the following:

(i) Number of units allotted in each scheme,

(ii) Value of his investments as on 31.03.2022,

(iii) Holding period of his investments in number of days as on 31.03.2022

(iv) Dates of original investments

(v) Total Return on investments,

(vi) Assuming past performance of all three schemes will continue for next one year, what action the investor should take? What will be the expected return for the next one year after the above action?

(vii) Will your answer as above point no. (vi) changes if the Mutual fund charges exit load of 5% if the investment is redeemed within one year? If so, advise the investor what and when the action to be taken to optimise the returns.

Summary

Detailed Solution

(i) Number of Units in each Scheme

Scheme		Amount
MF 'A'	$\frac{₹\,2,00,000}{₹\,10.00}$	20,000
MF 'B'	$\frac{₹\,5,00,000}{₹\,25.00}$	20,000
MF 'C'	$\frac{₹\,4,00,000}{₹\,20.00}$	20,000

(ii) Value of Investment on 31.03.2022

Scheme		Amount
MF 'A'	= 20,000 x ₹ 10.50	₹ 2,10,000
MF 'B'	= 20,000 x ₹ 22.80	₹ 4,56,000
MF 'C'	= 20,000 x ₹ 20.80	₹ 4,16,000
Total		**₹ 10,82,000**

(iii) Yield on each Fund

Scheme	Capital Yield	Dividend Yield	Total	Yield (%)
MF 'A'	₹ 2,10,000 - ₹ 2,00,000 = ₹ 10,000	₹ 6,000	₹ 16,000.00	8.00
MF 'B'	₹ 4,56,000 - ₹ 5,00,000 = - ₹ 44,000	₹ 25,000	- ₹ 19,000.00	-3.80
MF 'C'	₹ 4,16,000 - ₹ 4,00,000 = ₹ 16,000	₹ 16,000	₹ 32,000.00	8.00
Total			₹ **29,000.00**	

No. of Days Investment Held

	MF 'A'	MF 'B'	MF 'C'
Period of Holding (Days)	$\frac{8.00}{9.733} \times 365$ = 300 Days	$\frac{-3.80}{-11.185} \times 365$ = 124 Days	$\frac{8.00}{15.00} \times 365$ = 195 Days

(iv) Date of Original Investment 04.06.21 27.11.21 17.09.21

(v) Total Yield = $\frac{₹ 29,000}{₹ 11,00,000} \times 100 = 2.636\%$

(vi) If past of all three schemes will continue for next one year, the investor should redeem the units of MFs 'A' and 'B' and invest the proceeds in MF 'C'. The expected return next will be 15%.

(vii) If the Mutual funds are charging exit load of 5%, if investment is redeemed within one year, then investor should get redeemed units of MF 'B' now and units of MF 'A' after 65 days.

Question 2 *(ICAI SM)/(Practice Manual)*

[Q.11 - AFM 8 (Fast Track) & 9, Q.11 - AFM 10]

Mr. X on 1.7.2000 during the initial offer of some Mutual Fund invested in 10,000 units having face value of ₹ 10 for each unit. On 31.3.2001 the dividend offered by the M.F. was 10% and

Mr. X found that his annualised yield was 153.33%. On 31.3.2002, 20% dividend was given. On 31.3.2003 Mr. X redeemed all his balance of 11,296.11 units when his annualised yield was 73.52%. What are the NAVs as on 31.3.2001, 31.3.2002 and 31.3.2003?

Summary

Detailed Solution

Reference Note: *In this Question, we can infer that the given plan is the dividend re-investment plan because we have originally invested in 10,000 units only. However, on 31/3/03 - 11,296.11 units have been redeemed. In absence of information about fresh investment or bonus issue, the increase in numbers of units can be attributed to dividend re investment plan.*

2001

Let NAV as on 31/3/01 be ₹ x per unit

Dividend is distributed on 31/3/01 and in case of dividend re-investment plan, new units would be allotted based on NAV as on 31/3/01 i.e., x

$$\text{Thus, Additional units} = \frac{\text{Total dividend}}{\text{NAV on date of distribution}}$$

$$= \frac{₹\ 1,00,000 \times 10\%}{x}$$

$$= \frac{₹\ 10,000}{x}$$

Thus, Annualized yield (01/07/2000 – 31/03/2001) i.e., 9 months

$$153.33 = \frac{\left(10,000 + \frac{10,000}{x}\right) \times x - 1,00,000] \times 100 \times 12/9}{1,00,000}$$

$$\frac{153.33 \times 9}{100 \times 12} = \frac{10,000\,x - 90,000}{1,00,000}$$

$$1.15 = \frac{10,000x - 90,000}{1,00,000}$$

1,15,000 = 10,000x – 90,000

10,000x = 2,05,000

X = ₹ **20.50 (NAV as on 31/03/01)**

New units = ₹ 10,000 / ₹ 20.5 = **487.80 units**

Thus units as on 31/3/01 = 10,000 + 487.80

= **10,487.80 units**

2002

There is no dividend distribution in year 3 (2003). Hence, any additional units will have to be attributable to the dividend of year 2002.

New units (2002) = 11,296.11 – 10,487.80

= **808.31**

$$\text{New units (2002)} = \frac{\text{Total Dividend}}{\text{NAV on 31/3/02}}$$

Let NAV (31/3/02) be ₹ y

$$808.31 = \frac{(10,487.80 \times ₹10) \times 20\%}{y}$$

y = ₹ 25.95 (NAV as on 31/03/02)

2003

Annualized yield = 73.52% p.a

Ref: Return for the entire holding period i.e., 01/07/00 to 31/3/03 i.e., 33 months recorded on % p.a basis

$$73.52 = \frac{(11,296.11 \times z) - 1,00,000}{1,00,000} \times 100 \times \frac{12}{33}$$

2,02,180 = 11,296.11z – 1,00,000

3,02,180 = 11,296.11z

Therefore, z = ₹ 26.75/unit

Question 3 *(RTP May 23)/(ICAI Paper Nov 20)*

[Q.14 - AFM 8 (Fast Track) & 9, Q.14 - AFM 10]

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

Date	Dividend (%)	Bonus Ratio	NAV	
			Dividend Plan	Bonus Plan
1.04.2015			?	?
31.12.2016		1 :4 (One unit on 4 units held)	47	40
31.03.2017	12		48	42

31.03.2018	10		50	39
31.12.2018		1 :5 (One unit on 5 units held)	46	43
31.03.2019	15		45	42
31.03.2020	-	-	49	44

Additional details

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

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

Summary

Detailed Solution

(i) Dividend Plan

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

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

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

= ₹ 46

* Let the units issued be X

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

(ii) Bonus Plan

(a)	Average Yield	0.064
(b)	Investment	₹ 10,00,000
(c)	Gain over a period of 5 years (a × b × 5)	₹ 3,20,000
(d)	Market Value as on 31.03.2019 (b + c)	₹ 13,20,000

(e)	NAV as on 31.03.2020	₹ 44
(f)	Total units as on 31.03.2020 (d/e)	30,000
(g)	No of units as on 31.12.2018 Pre bonus = 30,000 × 5/(5 + 1)	25,000
(h)	No of units as on 31.12.2016 Pre bonus = 25,000 × 4/(4 + 1)	20,000
(i)	Issue Price as on 01.04.2015 Investment 10,00,000/Units purchased 20000 (b/h)	₹ 50

Question 4 *(ICAI SM)/(ICAI Paper Dec 21)/(RTP May 24)/ (RTP Nov 20)/(RTP May 19)/(MTP April 23)/ (MTP Nov 21)*

[Q.20 - AFM 8 (Fast Track) & 9, Q.20 - AFM 10]

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:

Particulars	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.

Summary

Detailed Solution

1. D Mutual Fund

   NAV_0 = ₹ 70.71 (31/12/14)

   NAV_1 = ? (31/01/15)

   In order to find the change in the value of equity investments, we need to find the β i.e

2. Sharpe ratio = $\frac{R_D - R_F}{\sigma_D}$

$2 = \frac{R_D - R_F}{11.25}$

$R_D - R_F = 22.5$

Treynor's Ratio = $\frac{R_D - R_F}{\beta_D}$

$15 = \frac{22.5}{\beta_D}$

$\beta_D = 1.5$

3. Break – up of NAV

Equity Investments: 70.71 × 99%

= **₹ 70**

Cash: ₹ 70.71 × 1%

= **₹ 0.71**

4. Expected NAV

Equity Investments: ₹ 70 – (₹ 70 × 7.5%)

= **₹ 64.75**

Cash: 0.71 – (3/12) = 0.71 – 0.25

= **₹ 0.46**

Expected NAV_1 = ₹ 65.21

***Reference Note**: We have been given that the market falls by 5%. The Equity portfolio of the DMF has a β of 1.5 and hence the fall in D mutual fund's equity component equals = 5% × 1.5 = 7.5%*

Further, the cash component Changes as the expenses of ₹ 3 is the expense per annum per unit, hence the monthly expense = ₹ 3 × $\frac{1}{12}$ = ₹ 0.25

Question 5 *(RTP Nov 20)/(MTP March 19)/(Practice Manual)*

[Q.22 - AFM 8 (Fast Track) & 9, Q.22 - AFM 10]

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

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

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

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

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

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

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

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

Summary

Detailed Solution

Given data

Particulars	MF- X	MF-Y	Market (MFX)
Return	15%	14%	12%

COVAR (X Y): 4.3 (Intersection of X and Y in table)

COVAR (X M): 3.37

COVAR (Y M): 2.80

Variance

σ_X^2 = 4.80 (Intersection of x with itself)

σ_Y^2 = 4.25

σ_M^2 = 3.10

Solution:

(i) Variance

Reference: In this question, COVAR (X,X), COVAR (Y,Y) and COVAR (M,M) is given

Thus, COVAR (x,x) $= \frac{\Sigma(x-\bar{x})(x-\bar{x})}{N}$

$= \frac{\Sigma(x-\bar{x})^2}{N}$

$= \boxed{\sigma_X^2}$

From the given table

Covar (X,X) = σ_X^2 = 4.80

Covar (Y,Y) = σ_Y^2 = 4.25

Covar (M,M) = σ_M^2 = 3.10

(ii) Alternative 1: 100% MF - X

Portfolio Return = R_X = 15%

Portfolio β = β_x = COVAR (XM) σ_M^2

$= \frac{3.37}{3.10}$

β_X = **1.087**

Portfolio variance = $^2\sigma_x$ = 4.8 (given)

Portfolio standard deviation = σ_x = $\sqrt{4.8}$ = $\sqrt{2.19}$

Alternative 2: 100% MF-Y = 2.19

Portfolio Return = RY = 14%

Portfolio β = βy = $COVAR_{ym}/\sigma_M^2$ = 2.8/3.1 = 0.903

Portfolio variance = $^2\sigma_y$ = **4.25** (given)

Portfolio standard deviation = σ_y = $\sqrt{4.472}$ = **2.06**

Alternative 3: MF – X: 60% (1,20,000/2,00,000) and MFY = 40% (80,000/2,00,000)

Portfolio Return = RXY = WxRx + WyRy

= 0.6 × 15% + 0.4 × 14%

= **14.6%**

Portfolio β = βXy = WXβX + WYβy

= 0.6 × 1.087 + 0.4 × 0.903

= **1.013**

Portfolio Variance = $^2\sigma xy$ = $W^2X\ \sigma^2X + W^2Y\sigma^2y + 2WX\ WYCOVAR\ XY$

= $0.6^2 \times 4.8 + 0.4^2 \times 4.25 + 2 \times 0.6 \times 0.4 \times 4.3$

= **4.472**

Portfolio Standard Deviation = σ_{XY} = $\sqrt{4.472}$ = **2.11**

(iii) Alternative 1: 100% X

a. **Expected return: (Using CAPM)**

Ke = RF + (RM – RF) × βx

= 10% + (12% – 10%) × 1.087

= **12.174%**

b. Systematic Risk = $\beta^2 x\ \sigma^2_M$

= $(1.087)^2$ × 3.10

= 3.663

c. Un-systematic Risk (E^2x) = Total Variance (σ^2_x)– Systematic Risk (E^2_x)

= 4.8 – 3.663

= 1.137

Alternative 2: 100% Y

a. Expected return (using CAPM)

$K_e = R_F + (R_M - R_F)\ \beta_y$

K_e = 10% + (12% - 10%) × 0.903

= **11.806%**

b. Systematic Risk

= $\beta^2_y \times \sigma^2_M$

= $(0.903)^2$ × 3.10

= 2.528

c. Unsystematic Risk

Unsystematic Risk = Total Variance (σ^2_y) – System Risk (E^2_y)

= 4.25 – 2.528

= 1.722

Alternative 3

Ke = 10% + (12% -10%) × 1.013 (β_{XY}) = **12.026%**

Systematic Risk

= $(1.013)^2$ × 3.10

= **3.181**

Unsystematic Risk

= 4.472 – 3.181

= **1.291**

Particulars	Share Ratio $R_X - R_F/\sigma_X$	Treynor's Ratio $R_x - R_F/\beta_X$	Jensen's Alpha $R_x - K_E$
MF - X	15 - 10/2.19 = **2.283**	15 - 10/1.087 = **4.600**	15 - 12.174 = **2.826**
MF - Y	14 - 10/2.06 = **1.942**	14 - 10/0.903 =**4.430**	14 - 11.806 = **2.194**
Portfolio	14.6 – 10/2.11 = **2.180**	14.6 - 10/1.013 = **4.541**	14.6 - 12.026 = **2.574**
MTX(Market)	12 - 10/$\sqrt{3.10}$ = **1.136**	12-10/1 = **2.000**	12 - 12 = **0**

Question 6 *(RTP May 19)/(MTP April 23)/(MTP Oct 23)/(RTP Nov 23)/(Practice Manual)*

[Q.26 - AFM 8 (Fast Track) & 9, Q.26 - AFM 10]

Indira has a fund of ₹ 3 lakhs which she wants to invest in share market with rebalancing target after every 10 days to start with for a period of one month from now. The Present NIFTY is 5326. The minimum NIFTY within a month can at most be 4793.4. She wants to know as to how she should rebalance her portfolio under thefollowing situations, according to the theory of constant proportion portfolio insurance policy, using "2" as the multiplier:

(i) Immediately to start with

(ii) 10 days later being the 1st day of rebalancing if NIFTY falls to 5122.96. 10 days further from the above date if NIFTY touches 5539.04

For the sake of simplicity, assume that the value of her equity component will change in tandem with that of the NIFTY and the risk free securities in which she is going to invest will have no Beta.

Summary

Detailed Solution

Immediate Allocation (Day 0)

1. Investment horizon = 1 Month

   The Maximum fall (%) = $\frac{4,793.4 - 5,326.0}{5,326.0} \times 100$

   = **(10%)**

2. Floor Value = ₹ 3,00,000 – 10% × 3,00,000

   = **2,70,000**

Ref → Since the equity changes in tandem with Nifty, the fall in Nifty would help us calculate the fall in the equity component as well.

3. Cushion = 3,00,000 – 2,70,000

   = **₹ 30,000**

4. Allocation to equity (Day 0)

   = 30,000 × 2

   = **60,000**

   Thus allocation to debt

   = 3,00,000 - 60,000

   = **2,40,000**

Day 10

1. Revised Portfolio

Equity $\begin{pmatrix} 60,000 \rightarrow 5,326 \\ ? \leftarrow 5,122.96 \end{pmatrix}$ = **₹ 57,713**

Debt (same)	₹ 2,40,000
Revised Portfolio	₹ 2,97,713

2. Revised Cushion = ₹ 2,97,713 – ₹ 2,70,000 = **₹ 27,713**
3. Rebalancing Portfolio

Equity (27,713 × 2)	55,426	For Reference : [-2,287]
Debt (balancing) (2,97,713 – 55,426)	**2,42,287**	For Reference : [+2,287]
Portfolio	2,97,713	

Day 20

1. Revised Portfolio

Equity $\begin{pmatrix} 55,426 \rightarrow 5,122.96 \\ ? \leftarrow 5,539.04 \end{pmatrix}$ = **₹ 59,928**

Debt	₹ 2,42,287
Portfolio	₹ 3,02,215

2. Revised Cushion

= ₹ 3,02,215 – ₹ 2,70,000

= **₹ 32,215**

3. Rebalancing Portfolio

Equity (32,215 × 2)	64,430	(Ref + 4,502 - 4,502)
Debt (balance figure)	2,37,785	
Portfolio	3,02,215	

Ref - CPPI method allocates more to equity in a rising market (Day 20) and allocates less to equity in the falling market (Day 10).

Question 7 *(ICAI SM)/(MTP Aug 18)/(MTP April 19)/ (RTP May 22)/(ICAI Paper Jan 21)*

[Q.28 - AFM 8 (Fast Track) & 9, Q.28 - AFM 10]

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:

Particulars	₹ 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 net asset value (NAV) as on 30th June.

Summary

Detailed Solution

(i) Income available for distribution

Particulars	₹
Income of April	22.950
Income of May	34.425
Income of June	45.450
Dividend Equalisation Received (April)	0.459
Dividend Equalisation Paid (May)	(0.567)
Income available for distribution	**102.717**

Income distributed = 102.717 x 70% = 71.9019

Ref: Assuming 100% distribution

$$\text{Dividend} = \frac{102.717}{303} = ₹\ 0.339/u$$

Income available for distribution will also include adjustments for dividend equalisation received/paid. However, unlike NAV, the amount available for distribution is based on realised income only and hence portfolio appreciation (unrealised) is not a part of the income available for calculation.

(ii) Issue price at end of April

Opening NAV	18.750
(+) Entry load (2% × 18.75)	0.375

(+) Dividend equalisation (WN - 1) 0.0765

Issue Price **19.2015**

WN – 1: April: $\frac{22.95}{300}$ = 0.0765

***Ref**: Gross proceeds received in April from new unit holders = (₹ 19.2015 × 6)*

= ₹ **115.209**

Out of which, proceeds attributable to dividend equalisation = ₹ 0.0765 x 6 = ₹ 0.459

(iii) Redemption/repurchase price at the end of May:

Opening NAV 18.75

(-) Exit Load at 2% (0.375)

(+) Dividend equalisation 0.189

$\left[\frac{22.95}{300}+\frac{34.425}{306}=0.189\right]$

April	May
Redemption Price	**18.564**

Ref: Gross proceeds paid to redeeming unit holders in May

= 3,00,000 × ₹ 18.564

= ₹ **55.692 Lakhs**

Out of which, proceeds attributable to dividend equalisation

= 3 × ₹ 0.189

= ₹ **0.567 Lakhs**

Extra: There had been no new issue/redemption in June. Hence, we don't need to find issue price/redemption price in June. However, in case the dividend equalisation per unit was to be calculated for June, it would be:

$\frac{22.95}{300}+\frac{34.425}{306}+\frac{45.45}{303}$

(iv) NAV on 30th June

Opening Net Asset (300 lakh × ₹ 18.75)	5,625.00
Add: Portfolio Appreciation	425.47
Add: Issue Proceeds (6 lakh × ₹ 19.2015)	115.209
Less: Redemption proceeds (3 lakh × ₹ 18.564)	(55.692)

Add: **Income**	
April	22.95
May	34.42
June	45.45
Less: Dividend distributed (102.717×70%)	(71.90)
Net Assets (30/6)	6,140.91
÷ Units (30/6)	303
NAV (30/6)	₹ 20.27

Reference Note:

1. We have taken the issue price and redemption price of the new units issued and units redeemed including dividend equalisation and load adjustments. Therefore, no separate adjustment needs to be done for dividend equalisation/load at the time of NAV calculation on 30th June.
2. NAV includes all possible changes in net assets which can arise due to portfolio appreciation, incomes earned and dividend distribution and also changes in cash balances due to issue/redemption.

CHAPTER 6 RISK MANAGEMENT

Question 1 *(ICAI Paper May 23)*

[Q.4 - AFM 8 (Fast Track) & 9, Q.4 - AFM 10]

Mr. Bull is a rational risk taker. He takes his position in a single stock for 4 days in a week. He does not take a position on Friday to avoid weekend effect and takes position only for four days in a week i.e. Monday to Thursday. He transfers the amount on Monday morning and withdraws the balance on Friday morning. He desires to make a maximum investment where Value At Risk (VAR) should not exceed the balance lying in his bank account. The position by his manager, as per standing instructions, is taken on the free balance lying in the bank account in the morning on each Monday.

On Monday morning (before opening of the capital market) he has transferred an amount of ₹ 11 Crore to his bank account. A fixed deposit also matured on this Monday. The maturity amount of ₹ 63,42,560 was also credited to his account by the bank in the morning of the Monday. However, Mr. Bull received the intimation of the same in the evening. The bank needs a minimum balance of ₹ 1,000 all the time. The value of Z score, at the required confidence level of 99 percent is 2.33.

The other information with respect to stocks X and Y, which are under consideration for this week, is as under:

The other information with respect to stocks X and Y, which are under consideration for this week, is as under:

X		Y	
Return	Probability	Return	Probability
6	0.10	4	0.10
7	0.25	6	0.20
8	0.30	8	0.40
9	0.25	10	0.20
10	0.10	12	0.10

You are required to recommend a single stock, where maximum investment can be made

Summary

Detailed Solution

Working Notes:

(1) Security X

Return (1)	Prob. (2)	(1) x (2)	Deviation²	Deviation²	Deviation² x Prob.
6	0.10	0.60	-2	4	0.40
7	0.25	1.75	1	1	0.25
8	0.30	2.40	0	0	0
9	0.25	2.25	1	1	0.25
10	0.10	1.00	2	4	0.40
		8.00			1.30

Expected Return (R_x) = 8.00% Variance (σ_x) = 1.30

Standard Deviation (σ_x) = $\sqrt{1.30}$ = 1.14

(2) Security Y

Return (1)	Prob. (2)	(1) x (2)	Dev.	Dev.2	Dev.2 x Prob.
4	0.10	0.40	-4	16	1.60
6	0.20	1.20	-2	4	0.80
8	0.40	3.20	0	0	0
10	0.20	2.00	2	4	0.80
12	0.10	1.20	4	16	1.60
		8.00			4.80

Expected Return (R_y) = 8.00%

Variance (σ^2) = 4.80

Standard Deviation (σ_y) = $\sqrt{4.80}$ = 2.19

Particulars	No. of days	X	Y
Amount Transferred		₹ 11,00,00,000	₹ 11,00,00,000
Maturity Proceeds of Fixed Deposit		₹ 63,42,560	₹ 63,42,560
Amount available in bank account		₹ 11,63,42,560	₹ 11,63,42,560
Minimum balance to be kept		₹ 1,000	₹ 1,000
Available amount which can be used for potential investment for 4 days		₹ 11,63,41,560	₹ 11,63,41,560
Maximum loss for 4 days at 99% level	4	₹ 11,63,41,560	₹ 11,63,41,560
Maximum loss for 1 day at 99% level			
Maximum loss for 4 days/ No. of days = 116341560/4	1	₹ 5,81,70,780	₹ 5,81,70,780
Z Score at 99% level		2.33	2.33
Volatility in terms of ₹ (Maximum Loss/Z Score at 99% Level)		₹ 2,49,66,000	₹ 2,49,66,000
Standard Deviation		0.0114	0.0219
Maximum Investment (Volatility in terms of ₹/SD)		₹ 2,19,00,00,000	₹ 1,14,00,00,000

Recommendation: Position should be taken in X.

CHAPTER 7 BUSINESS VALUATION

Question 1 *(ICAI SM)/(Practice Manual)*

[Q.5 - AFM 8 (Fast Track) & 9, Q.5 - AFM 10]

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)**

Particulars	H. Ltd	B. Ltd.
Liabilities		
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:

(1) 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.

(2) Both the companies envisage a capitalization rate of 8%.

(3) H Ltd. has a contingent liability of ₹ 300 crores as on 31st March, 2012.

(4) 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.)

Summary

Detailed Solution

1. Net Asset Value (NAV)

Particulars	H (₹ In crores)	B (₹ In crores)
Net Fixed Assets	220	0.5
Net Current Assets	1,020	29
Deferred tax Assets	60	2
Less: Contingent Liabilities (Note – 1)	(300)	-
Net Assets	1,000	31.5
Divided: Shares	÷ 3.5 (₹ 350 ÷ 100)	0.65 (₹ 6.5 ÷ 10)
NAV	₹ 285.71	₹ 48.46

Note – 1:

We have assumed that the contingent liability will settle in full i.e., 300 and hence considered while calculating NAV. (In line with ICAI's solution)

Alternatively, it can be assumed that the contingent is not expected to be settled in which case we can take NIL in the above workings.

2. Earning Capitalization Method.

H	$\frac{₹\ 300\ Cr}{0.08}$	= **3,750**
B	$\frac{₹\ 10\ Cr}{0.08}$	= **125**

Value per Share (V.P.S)

H	$\frac{3,750}{3.5}$	= **1,071.43**
B	$\frac{125}{0.65}$	= **192.31**

3. Fair Value Per Share

$$\text{Fair Value} = \frac{V.P.S\ (NAV) \times 1 + V.P.S\ (Earnings) \times 3}{1 + 3}$$

$$H = \frac{285.71 \times 1 + 1,071.43 \times 3}{1 + 3}$$

$$= \frac{3,500}{4}$$

$$= \boxed{875}$$

$$B = \frac{48.46 \times 1 + 192.31 \times 3}{1 + 3}$$

$$= \frac{625.39}{4}$$

$$= \boxed{156.35}$$

$$\text{Exchange Ratio (Based on fair value)} = \frac{\text{Fair value of B}}{\text{Fair value of H}}$$

$$= \frac{156.35}{875}$$

$$= \boxed{0.1787:1}$$

Question 2 *(MTP Nov 24)*

[Q.1 - Additional Question AFM 8 (Fast Track) & 9, Q.11 - AFM 10]

The ABC Startup has the following expected profits under different scenarios along respective probabilities:

Year	Best Case		Base Case		Worst Case	
	Revenue	Expenses	Revenue	Expenses	Revenue	Expenses
1	₹ 100,00,000	₹ 80,00,000	₹ 100,00,000	₹ 90,00,000	₹ 100,00,000	₹ 95,00,000
2	₹ 120,00,000	₹ 92,40,000	₹ 110,00,000	₹ 95,70,000	₹ 102,00,000	₹ 98,94,000
3	₹ 144,00,000	₹ 108,00,000	₹ 121,00,000	₹ 102,85,000	₹ 104,04,000	₹ 101,95,920
Probability		30%		60%		10%

You are required to suggest the value of ABC Startup using First Chicago Method assuming that:

(i) Applicable discounting rate is 20%.

(ii) Startup is located in Tax-free Zone.

(iii) The multiple for Terminal is 10.

(iv) No depreciable assets are held by the ABC Startup.

Note: 1. Present Value Factor (PVF)

Year	1	2	3
PVF@20%	0.8333	0.6944	0.5787

2. Round off the calculation to whole numbers.

Summary

Detailed Solution

Valuation of Startup under different scenarios:

(i) Best Case Scenario

Particulars	Year 1	Year 2	Year 3	
Revenue	₹ 100,00,000	₹ 120,00,000	₹ 144,00,000	
Expenses	₹ 80,00,000	₹ 92,40,000	₹ 108,00,000	
Cash Flow/ Earnings	₹ 20,00,000	₹ 27,60,000	₹ 36,00,000	
Terminal Value				₹ 3,60,00,000
PVF @ 20%	0.8333	0.6944	0.5787	0.5787
PV	₹ 16,66,600	₹ 19,16,544	₹ 20,83,320	₹ 2,08,33,200
Value of Startup				₹ 2,64,99,664

(ii) Best Case Scenario

Particulars	Year 1	Year 2	Year 3	
Revenue	₹ 100,00,000	₹ 110,00,000	₹ 121,00,000	
Expenses	₹ 90,00,000	₹ 95,70,000	₹ 102,85,000	
Cash Flow/ Earnings	₹ 10,00,000	₹ 14,30,000	₹ 18,15,000	
Terminal Value				₹ 181,50,000
PVF @ 20%	0.8333	0.6944	0.5787	0.5787
PV	₹ 8,33,300	₹ 9,92,992	₹ 10,50,341	₹ 105,03,405
Value of Startup				₹ 133,80,038

(iii) Worst Case Scenario

Particulars	Year 1	Year 2	Year 3	
Revenue	₹ 100,00,000	₹ 102,00,000	₹ 104,04,000	
Expenses	₹ 95,00,000	₹ 98,94,000	₹ 101,95,920	
Cash Flow/ Earnings	₹ 5,00,000	₹ 3,06,000	₹ 2,08,080	
Terminal Value				₹ 20,80,800
PVF @ 20%	0.8333	0.6944	0.5787	0.5787
PV	₹ 4,16,650	₹ 2,12,486	₹ 1,20,416	₹ 12,04,159
Value of Startup				₹ 19,53,711

Value of ABC Startup as per First Chicago Method

= 0.30 x ₹ 2,64,99,664 + 0.60 x ₹ 133,80,038 + 0.10 x ₹ 19,53,711

= ₹ 79,49,899 + ₹ 80,28,023 + ₹ 1,95,371

= ₹ 1,61,73,293

CHAPTER 8 FOREIGN EXCHANGE EXPOSURE AND RISK MANAGEMENT

Question 1 *(Practice Manual)*

[Q.6 - AFM 8 (Fast Track) & 9, Q.6 - AFM 10]

The following table shows interest rates for the United States dollar and Frenchfrancs. The spot exchange rate is 7.05 francs/$. Complete the missing entries:

	3 Months	6 Months	12 Months
Dollar interest rate (annually compounded)	11 $\frac{1}{2}$ %	12 $\frac{1}{4}$ %	?
Franc interest rate (annually compounded)	19 $\frac{1}{2}$	?	20 %
Forward franc per dollar	?	?	7.5200
Forward discount per franc p.a.	?	- 6.3 %	?

Summary

Detailed Solution

$$\frac{F}{S} = \frac{\left(1 + r_F \times {}^{M}/_{12}\right)}{\left(1 + r_{\$} \times {}^{M}/_{12}\right)}$$

Forward discount on French Francs (Non – Base) = $\frac{S-F}{F} \times 100 \times \frac{12}{M}$

(i) 3 Months

Using IRP = $\frac{F}{FF7.05/\$} = \frac{\left(1 + 0.195 \times 3/12\right)}{\left(1 + 0.1150 \times 3/12\right)}$

$F = FF7.05/\$ \times \frac{1.04875}{1.02875}$

FF 7.1871/$

∴ Forward Discount on FF

$= \frac{FF7.05/\$ - FF7.1871/\$}{FF7.1871/\$} \times 100 \times 12/3$

= (7.63% p.a.) discount on French Franc

(ii) 6 Months

Forward Discount

$$(6.3) = \frac{FF\ 7.05/\$ - x}{X} \times 100 \times \frac{12}{6}$$ [Let forward rate be x]

$$\therefore (6.3) \times \frac{6}{12} \times \frac{1}{100} = \frac{FF\ 7.05/\$ - x}{x}$$

$\therefore$ (0.0315 x) = FF 7.05 / \$ - x

$\therefore$ 0.9685 x = FF 7.05 / \$

$\therefore$ **x = FF 7.2793/\$**

Using IRP,

$$\frac{FF\ 7.2793/\$}{FF\ 7.05/\$} = \frac{\left(1 + x \times {}^{6}/_{12}\right)}{\left(1 + 0.1225 \times {}^{6}/_{12}\right)}$$ [Let the French interest rate p.a. be x]

$$\therefore 1.0325 = \frac{1 + 0.5x}{1.06125}$$

$\therefore$ 1.0957 = 1+0.5 x

$\therefore X$ = 0.1914

i.e. = 19.14% p.a.

(iii) 12 Months

Using IRP,

$$\frac{FF\ 7.52/\$}{FF\ 7.05/\$} = \frac{\left(1 + 0.2 \times {}^{12}/_{12}\right)}{(1 + x \times {}^{12}/_{12})}$$

Thus, 1.0667 = 1.2 / 1 + x

Thus, 1 + x = 1.1250

Thus, x = 0.1250

i.e., 12.5% p.a.

Forward discount on franc.

$$= \frac{S - F}{F} \times 100$$

$$= \frac{7.05 - 7.52}{7.52} \times 100$$

= **(6.25% p.a) discount on French franc**

Question 2 *(ICAI SM)/(RTP Nov 18)/(Practice Manual [Modified])*

[Q.10 - AFM 8 (Fast Track) & 9, Q.10 - AFM 10]

On December 27, 2002 a customer in Bombay requested a bank to remit DG 2,50,000 to Holland in payment of import of diamonds under an irrevocable LC. However due to bank strikes, the bank could effect the remittance only on January 3, 2003. The inter-bank market rates were as follows:

	December 27	January 3
Bombay	$/₹ 100 : 3.15 - 3.10	3.12 - 3.07
London	$/£ : 1.7250/60	1.7175/85
	DG/£ : 3.9575/90	3.9380/90

The bank wishes to retain an exchange margin of 0.125%. How much does the customer stand to gain or lose due to the delay?

Summary

Detailed Solution

Re-Stated Rates

Rate	Dec 27	Jan 3
$/₹ (Divide by 100)	0.0310/0.0315	0.0307/0.0312
$/£	1.7250/1.7260	1.7175/1.7185
DG/ £	3.9575/3.9590	3.9380/3.9390

Reference Note:

1. We have been given $/₹ 100 rate. This can be re-stated as the $/ ₹ rate by dividing it by 100. As a general rule, we should try to write the bid rate (lower rate) on left hand side and the ask rate (higher rate) would be written on right hand side.
2. Base: DG, Customer: Buy, Bank: Sell

   Therefore, ASK

   December 27

$$\left(\frac{₹}{DG}\right)_{ASK} = \left(\frac{₹}{\$}\right)_A \times \left(\frac{\$}{£}\right)_A \times \left(\frac{£}{DG}\right)_A$$

$$= \frac{1}{\$0.0310/₹} \times \$1.7260 / £ \times 1/DG\ 3.9575/ £$$

= ₹ 14.0688/DG

		₹
1.	Remittance (DG 2,50,000 × ₹ 14.0688/DG)	35,17,200
	Add: Exchange margin at 0.125%	4,396.5
	Total cost of remittance (27/12)	35,21,596.5

January 03

$$\left(\frac{Rs}{DG}\right)_A = \left(\frac{Rs}{\$}\right)_A \times \left(\frac{\$}{£}\right)_A \times \left(\frac{£}{DG}\right)_A$$

$$= \frac{1}{\$0.0307\ /₹} \times \$\ 1.7185 / £ \times \frac{1}{DG3.9380 / £}$$

= **₹ 14.2146/DG**

		₹
2.	Remittance (DG 2,50,000 × ₹ 14.2146/DG)	35,53,650
	Add: exchange margin @ 0.125%	4,442.06
	Total cost of remittance (03/01)	35,58,092.06

Therefore, The total loss due to the bank strike = 35,58,092.06 – 35,21,596.5

= ₹ **36,495.56**

Reference Note / Extra point:

In case the given question pertains to an exporter, then the transaction would be at the BID rate. Further, exchange margin represents transaction cost and it will need to be deducted in order to find the net cash inflow for the exporter.

Question 3 *(RTP Nov 20 [Modified])/(Practice Manual)/(RTP Nov 23)*

[Q.15 - AFM 8 (Fast Track) & 9, Q.15 - AFM 10]

Suppose you are a treasurer of XYZ plc in the UK. XYZ have two overseas subsidiaries, one based in Amsterdam and one in Switzerland. The Dutch subsidiary has surplus Euros in the amount of 725,000 which it does not need for the next three months but which will be needed at the end of that period (91 days). The Swiss subsidiary has a surplus of Swiss Francs in the amount of 998,077 that, again, it will need on day 91. The XYZ plc in UK has a net balance of £75,000 that is not needed for the foreseeable future.

Given the rates below, what is the advantage of swapping Euros and Swiss Francs into Sterling?

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

Interest rates for the Deposits

Amount of Currency	91 day Interest Rate % pa		
	£	€	CHF
0 – 100,000	1	$\frac{1}{4}$	0
100,001 – 500,000	2	$1\frac{1}{2}$	$\frac{1}{4}$
500,001 – 1,000,000	4	2	$\frac{1}{2}$
Over 1,000,000	5.375	3	1

Note: For calculation purpose use 360 Days a year.

Summary

Detailed Solution

Individual Basis

Particulars	Interest	Amt. after 91 days	Conversion in £
Holland € 725,000 x 0.02 x 91/360	€ 3,665.28	€ 728,665.28	£502,414.71 (728,665.28 x 0.6895)
Switzerland CHF 998,077 x 0.005 91/360	CHF 1,261.46	CHF 999,338.46	£432,651.51 (999,338.46÷2.3098)
UK £ 75,000 x 0.01 x 91/360	£ 189.58	£ 75,189.58	£ 75,189.58
Total GBP at 91 days			£ 1,010,255.80

Swap to Sterling

Particulars	Amount
Sell € 7,25,000 (Spot at 0.6858) buy £	£ 4,97,205.00
Sell CHF 9,98,077(Spot at 2.3326) buy £	£ 4,27,881.76
Independent GBP amount	£ 75,000.00
	£ 1,000,086.76
Interest (£ 1,000,086.76 x 0.05375 x 91/360)	£ 13,587.98
Total GBP at 91 days	£ 1,013,674.74
Less: Total GBP at 91 days as per individual basis	£ 1,010,255.80
Net Gain	**£ 3,418.94**

Reference Note:

1) In all such questions, ICAI always converts the currency balances into a single currency (usually parent's currency) and then compares the cash balance at a single date in a single currency.

This is irrespective of whether money is needed by the subsidiary or not at a later date and hence we will also follow the same.

2) The interest rates given will be applicable to the entire principal and hence we will take the applicable interest rate based on the deposit made.

We should not use the Slab Method like done in Income tax.

Question 4 *(RTP May 20)/(Practice Manual)*

[Q.18 - AFM 8 (Fast Track) & 9, Q.18 - AFM 10]

A inc and B inc intend to borrow $ 2,00,000 and $ 2,00,000 in yen respectively for a time horizon of one year. The prevalent interest rates are as follows:

Company	Yen Loan	$ Loan
A Inc	5%	9%
B Inc	8%	10%

The Prevalent exchange rate is $1 = Yen 120

They entered in a currency swap under which it is agreed that B inc will pay A inc @ 1% over the yen loan interest rate which the latter 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.

Summary

Detailed Solution

Reference Note: ***Initial***

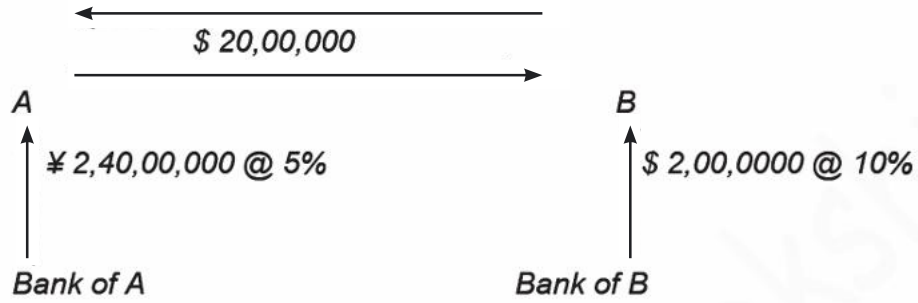
Option – 1: (Direct)

A: Borrow $ 2,00,000 @ 9% p.a

B: Borrow ¥ 2,40,00,000

($ 2,00,000 × ¥ 120 / $) @ 8% p.a

Option - 2: Swap



At interest payment Date B

Option 1 :

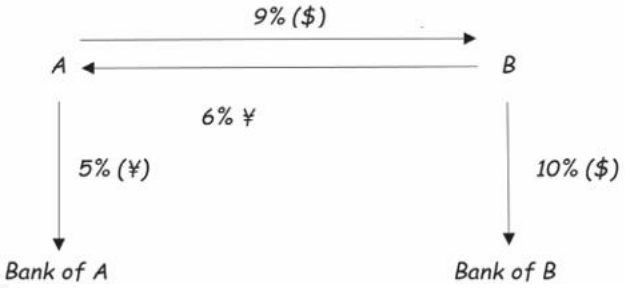
A : $ 2,00,000 × 9%

= **$ 18,000**

B: ¥ 2,40,00,000 × 8%

= **¥ 19,20,000**

Option 2:



Solution:

Net cost to A under the swap

C.O to bank of A	¥ 12,00,000
(¥ 2,40,00,000 × 5%)	
C.I from B swap	(¥ 14,40,000)
(¥ 2,40,00,000 × 6%)	
Net C.I	(¥ 2,40,000)
÷ Exchange rate (Year – 1)	÷ ¥ 120/$
Net C.I (in $)	($ 2,000)
C.O to B – swap ($2 L × 9%]	$ 18,000
NET C.O.	**$ 16,000**

Net cost to A in case of a direct		
Borrowing = $ 2,00,000 × 9%		**$ 18,000**
Thus, Ultimate gain to A		
= $ 18,000 - $ 16,000 =		**$ 2,000**
Net Cost to B (SWAP)		
C.O to bank of B		$ 20,000
[$ 2,00,000 × 10%]		
C.I from A – SWAP		($ 18,000)
[$ 2,00,000 × 9%]		
Net C.O		$ 2,000
× Exchange rate (year – 1)		× ¥ 120/$
Net C.O		¥ 2,40,000
Add: C.O to A – SWAP		¥ 14,40,000
[¥ 2,40,00,000 × 6%]		
Net C.O		¥ 16,80,000
Net cost to B in case of a direct borrowing	=	¥ 2,40,00,000 × 8%
	=	**¥ 19,20,000**
Thus, Ultimate gain to B	=	¥ 19,20,000 - ¥ 16,80,0000
	=	**¥ 2,40,000**

Question 5 *(ICAI SM)/(ICAI Paper Nov 20)/(MTP March 23)*

[Q.29 - AFM 8 (Fast Track) & 9, Q.29 - AFM 10]

ZX Ltd. has made purchases worth USD 80,000 on 1st May 2020 for which it has to make a payment on 1st November 2020. The present exchange rate is INR/USD 75. The company can purchase forward dollars at INR/USD 74. The company will have to make an upfront premium @ 1 per cent of the forward amount purchased. The cost of funds to ZX Ltd. is 10 per cent per annum.

The company can hedge its position with the following expected rate of USD in foreign exchange market on 1st May 2020:

	Exchange Rate	Probability
(i)	INR/USD 77	0.15
(ii)	INR/USD 71	0.25
(iii)	INR/USD 79	0.20
(iv)	INR/USD 74	0.40

You are required to advise the company for a suitable cover for risk.

Summary

Detailed Solution

ZX Indian Co. —— $ 80,000 (After 6 Months) ——→

Reference Note: *The rates are given in 3 alphabet terms and hence we can consider applying the market convention. However, USD is stronger as compared to INR and the given rates already reflect that. Hence, we are directly taking INR/USD to be ₹/$*

Solution:

1. C.O after 6 months under forward hedge.

	Particulars	₹
A	Upfront premium (fees) [$80,000 × ₹ 74/$ × 1%]	59,200
	Add: Time value adjustment (Interest)) [₹ 59,200 × 10% × $^{6}/_{12}$]	2,960
	Effective cost after 6 months (A)	62,160
B	Cash outflow after 6 months at forward rate (B) [$ 80,000 × ₹ 74/$]	59,20,000

∴ Total cash outflow after 6 months = 62,160 + 59,20,000

(A + B) = **59,82,160**

2. C.O after 6 months if unhedged

C. Expected Spot = 77 × 0.15 + 71 × 0.25 + 79 × 0.20 + 74 × 0.40

= **₹ 74.7/$**

D. Cash outflow expected after 6 months = $ 80,000 × ₹ 74.7/$

= **₹ 59,76,000**

It is advised that ZX Ltd should keep the transaction unhedged as it results in a lower cash outflow after 6 months.

Question 6 *(ICAI SM)/(Practice Manual)*

[Q.35 - AFM 8 (Fast Track) & 9, Q.35 - AFM 10]

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 Mumbai-New York	₹ 74.3000 ₹ 49.2500	₹ 74.3200 ₹ 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, andwhat will be the exchange profit or loss on the transaction? Ignore brokerages.

Summary

Detailed Solution

Original Transaction: Sell –DKK 10,00,000 at ₹ 6.575/ DKK (S.P)

Cover Transaction: Spot buy – DKK 10,00,000 at ?

Reference Note:

The cover in this question can happen through any of the following modes.

1. London: ₹ → £ → DKK
2. NY: ₹ → $ → DKK

We can cover in the market where the rates are lower.

Solution:

1. **London: Intermediate currency (£)**

$$\left(\frac{₹}{DKK}\right)_{ASK} = \left(\frac{₹}{£}\right)_{A} \times \left(\frac{£}{DKK}\right)_{A}$$

$$= ₹\ 74.32/£ \times \frac{1}{DKK\,11.42\ /\ £}$$

$$= \boxed{₹\ 6.5079/DKK}$$

2. **New York: Intermediate currency ($)**

$$\left(\frac{₹}{DKK}\right)_{ASK} = \left(\frac{₹}{\$}\right)_{A} \times \left(\frac{\$}{DKK}\right)_{A}$$

$$= ₹\ 49.2625\ /\ \$ \times \frac{1}{DKK\,7.5670\ /\ \$}$$

$$= \boxed{₹\ 6.5102/DKK}$$

As it is cheaper to cover (buy) through London, we will use the London market to cover our transaction.

Thus, gain / (loss) on covering	=	[(₹ 6.5150 / DKK – ₹ 6.5079) × DKK 10,00,000
	=	₹ 0.0071 / DKK × DKK 10,00,000
	=	**₹ 7,100** (Gain)

Reference Note:

In this question, we can see that the entity covering is the bank itself. However, in case the banker wants to cover, they will have to approach another banker and hence for the purpose of such a question, our banker who is approaching the other bankers for covering is treated as the customer.

Question 7 *(RTP May 21)/(RTP May 19)/(MTP March 19)/ (Practice Manual)*

[Q.46 - AFM 8 (Fast Track) & 9, Q.46 - AFM 10]

XYZ Ltd. is an export oriented business house based in Mumbai. The Company invoices in customers' currency. Its receipt of US $ 1,00,000 is due on September 1, 2005. Market information as at June 1, 2005.

Exchange Rates		Currency Futures	
US $/₹		US $/₹	Contact size ₹4,72,000
Spot	0.02140	June	0.02126
1 Month Forward	0.02136	September	0.02118
3 Months Forward	0.02127		

	Initial Margin	Interest Rates in India
June	₹ 10,000	7.50%
September	₹ 15,000	8.00%

On September 1, 2005 the spot rate US $/₹ is 0.02133 and currency future rate is 0.02134. Comment which of the following methods would be most advantageous for XYZ Ltd.

(a) Using forward contract

(b) Using currency futures

(c) Not hedging currency risks.

It may be assumed that variation in margin would be settled on the maturity of the future contract.

Summary

Detailed Solution

XYZ Indian Co ← $ 1,00,000 (3m) (01/09/05) — US Co.

a. Forward Contracts

C.I after 3 months = $ 1,00,000 × $\frac{1}{\$0.02127/₹}$ = **₹ 47,01,457**

b. Futures

Invoice : $ 1,00,000

Contract : ₹ 4,72,000

∴ Invoice currency ($) is different from contract currency (₹)

1. Strategy : Buy ₹ futures (i.e. equivalent to selling $) (Base: ₹)
2. Maturity : Sept at $ 0.02118/₹ (C.P.)
3. No. of contracts

Particulars	₹
Invoice ($)	$ 1,00,000
Divide: September Future Rate	÷ $ 0.02118/₹
Equivalent Invoice (₹)	₹ 47,21,435
Divide: Contract Size	÷ ₹ 4,72,000
No of Contracts	10.003

i.e., 10 Contracts

4. On 01/06/05, buy 10 contracts (September) ₹ futures at $ 0.02118/₹ (C.P)
5. Settlement (01/09)

C.I at spot (01/09/05) ₹ 46,88,233

$\left[\$1,00,000 \times \frac{1}{\frac{\$0.02133}{₹}}\right]$

+ Gain/loss in futures ₹ 35,406 [C.I.]

($ 0.02134/₹ - $ 0.02118/₹) × ₹ 4,72,000 × 10

0.02133/₹

Less: Interest forgone on margin ₹ (3,000) [C.O.]

[₹ 15,000 (sept) × 10 contracts × 8% × 3/12]

Net C.I on 01/09/05 ₹ 47,20,639

Reference Note: Margin (Deposit)

Unless given, margin (deposit) is required to be paid on futures only and not on forward. Margin is like a deposit which is used by the exchange to adjust losses if any and in case there is a gain, the exchange would refund the entire margin along with the gain. In case there is a loss, the exchange would adjust the loss and refund the balance.

As the margin is refundable/adjustable, the margin in itself is not a cost. However, the relevant cost to consider is the opportunity cost on account of the margin.

c. Unhedged

C.I on 01/09/05 = $ 1,00,000 × $\frac{1}{\$0.02133/₹}$ = ₹ 46,88,233

(i.e. After 3 months)

As the Cash Inflow under the futures contract is the highest, XYZ limited is suggested to opt for the futures contract.

Question 8 *(ICAI SM [Modified])/(RTP May 20)/ (RTP May 21 [Modified])/(Practice Manual [Modified])*

[Q.47 - AFM 8 (Fast Track) & 9, Q.47 - AFM 10]

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.

a. Invoice the German firm in Sterling using the current exchange rate to calculate the invoice amount,

b. Alternative of invoicing the German firm in € and using a forward foreign exchange contract to hedge the transaction risk,

c. 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	0.60-0.55 Euro Cents
6 months future contract is currently trading at	€1.1760/£
6 months future contact size is	£ 62500
Spot rate and 6 months future rate	€1.1785/£

Required:

a. Calculate to the nearest £ the receipt for Nitrogen Ltd, under each of the three proposals.

b. In your opinion, which alternative would you consider to be the most appropriate and the reason there of.

Summary

Detailed Solution

Nitrogen UK Co ← € 4 Million, 6 months (b and c) 6 Months — German Co.

Exporter

Nitrogen (UK Co) ← £ Equivalent to € 4 Millions, 6 months (b and c) 6 Months — **German Co.**

a. Invoice in £ (Using current spot rate)

Reference Note: Nitrogen (Sell) ← € — Bank (Buy)

i.e., Nitrogen (Buy) → £ — Bank (Sell)

With £ base currency, we take £ ASK

Alternatively, since the rates are given in Indirect quotes, we can convert them into direct quotes and then solve taking € as base currency.

Solution:

Equivalent invoice (in £) at current spot rate

$$= € 40,00,000 \times \frac{1}{€1.1770 / £}$$

$$= \boxed{£ 33,98,471}$$

As the invoice is in £ under this alternative, there is no requirement for hedging and hence the cash inflow after 6 months will be £ 33,98,471 (credit period of 6 months)

Reference Note: *As per the deal, the customer has agreed to pay us € 4 millions. If we notionally receive € 4 million today and go to the banker to sell the €, the transaction would happen at the € BID rate since the banker will be buying the €. However, since the base currency is in £, evaluation would be based on pounds. Banker is buying the € which is equivalent to selling the £ and hence the £ ASK rate is selected.*

b. Invoice in € and take the forward hedge

$$\text{C.I after 6 months} = € 40,00,000 \times \frac{1}{€1.1715 / £}$$

= **£ 34,14,426**

Working Note – 1 Forward Rates

Spot Rate	€ 1.1750/£/€ 1.1770/£
Swap points Descending and Hence deduct	(€ 0.0060/£)/(€0.0055/£)
(1€ = 100 cents)	(0.6 ¢ = € 0.0060)/(0.55 ¢ = € 0.0055)
6 months forward	€ 1.1690/£ € 1.1715/£

Reference Note: *Nitrogen sells € to bank i.e., Bank Buys €, Base currency is £. Banker buys € and at the same time sells £. Therefore, £ ASK Rate.*

General Reference:

In case we are not confident in the bid/ask selection, we can adopt the trial-and-error method i.e., calculate the cash flow using both rates. In case the entity gets a cash inflow, the rate which gives us a lower cash inflow should be selected and in case there is a cash outflow, the rates that gives us a higher cash outflow should be selected.

c. Invoice in € and futures hedging

1. Strategy: BUY £ futures [Equivalent to selling €]
2. Maturity: 6 months @ 1.1760 / £ (C.P)
3. No. of contracts.

Invoice (€)	€ 40,00,000
Divide: Future rate	÷ € 1.1760/ £
Invoice (£)	£ 34,01,361
Divide: Future Contract size	÷ 62,500
No. of Contracts	54.42
	i.e. 54 Contracts

1. Today, Nitrogen will buy 54 contracts, 6 months futures @ € 1.1760/£ (C.P)
2. Settlement (6 months later)

Particulars	₹
C.I at spot (after 6 months) $[€\ 40,00,000 \times \frac{1}{€1.1785/£}$	£ 33,94,145
± Gain/(Loss) on futures $\left[\left(€1.1785/£ - \frac{€1.1760}{£}\right) \times £62,500 \times 54\right]$ $€1.1785/£$	£ 7,160
C.I after 6 months	£ 34,01,305

Conclusion:

Nitrogen Ltd should invoice in € and take the forward hedge as it results in the highest cash inflow after 6 months.

Question 9 *(ICAI SM)/(MTP Oct 2023)*

[Q.51 - AFM 8 (Fast Track) & 9, Q.51 - AFM 10]

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		1.5415/1.5545

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. Exchange margin to be adjusted in ₹/$ rate only.

Summary

Detailed Solution

From the exporter's stand point

Original: Forward sell @ ₹ 32.4000/CHF (S.P)

(25/4)

Cancel: Forward Buy (1 Month) @ ?

(25/3)

Thus: Cancellation rate

$$\left(\frac{Rs}{CHF}\right)_{ASK}^{1M(April)} = \left(\frac{Rs}{\$}\right)_{ASK}^{1M(April)} \times \left(\frac{\$}{CHF}\right)_{ASK}^{1M(April)}$$

Thus, Working Note - **Forward rate (₹/$)$_{ASK}^{1\ Month\ (April)}$**

Particulars	₹
Spot (ASK)	₹ 49.4455/$
Add: 1 Month premium (Ascending : Add)	₹ 0.4200/$
1 Months forward (ASK)	₹ 49.8655/$
Add : Exchange margin (₹ 49.8655/$ × 0.10 %)	₹ 0.0499/$
Adjusted $(₹/\$)^{1M(April)}_{ASK}$	₹ 49.9154/$

***Reference Note**: The above rate is going to be used to calculate the C.P and hence the margin will effectively increase the cost and hence it is to be added. Further, in line with ICAI's Solution, we have modified the question and considered the exchange margin to be applicable on ₹/$ rate and not CHF/$ rate.*

$$\left(\frac{₹}{CHF}\right)^{1M}_{ASK} = \left(\frac{₹}{\$}\right)^{1M}_{ASK} \times \left(\frac{\$}{CHF}\right)^{1M}_{ASK}$$

$$= ₹\ 49.9154/\$ \times \frac{1}{CHF.1.5150/\$}$$

= ₹ 32.9475/CHF (C.P)

Gain/(Loss) for customer on cancellation (After 1m)

= (₹ 32.40)/CHF - (₹ 32.9475)/chf) × CHF 1,00,000

= **(₹ 54,750) [Loss to customer]**

Therefore, the cancellation charge payable by the customer would be ₹ 54,750 after 1 month.

Question 10 *(ICAI SM)/(Practice Manual)*

[Q.53 - AFM 8 (Fast Track) & 9, Q.53 - AFM 10]

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 – 1 US$ = ₹ 42.32

The US dollar quoted on 30/10/2010

Spot – 41.5000/41.5200

3 months premium (flat) – 0.87% / 0.93%

Margin money for buying and selling rate is 0.075% and 0.20% respectively. Compute:

a. The cost to the importer in respect of extension of the forward contract,and

b. The rate of the new forward contract

Summary

Detailed Solution

a. From the importer's standpoint

Original: Forward buy for $ 20,000 @ ₹ 42.32/$

Cancel: Spot sell for $ 20,000 @ ₹ 41.50 – 0.075%

Thus, Net Cancellation rate (Net S.P)

= ₹ 41.50/$ - 0.075%

= **₹ 41.4689/$**

Thus, Gain / (Loss) on cancellation

= (₹ 41.4689/$ - ₹ 42.32/$) × $ 20,000

= **(₹ 17,022)** [Loss to importer]

Reference Note:

1. *Transaction cost (margin money) will always increase the cost/reduce the sale proceeds for the customer. Further the buying / selling rate given in the question will always be the buying / selling rate from the banker's perspective.*
2. *At the time of cancellation, the banker buys (customer sells) and hence margin money for buying rate i.e., 0.075% should be applied. Further as the customer is selling, this margin money would reduce his sale proceeds and hence needs to be deducted from the cancellation rate of ₹ 41.50/$.*

b. New Forward Rate:

Reference Note: *The importer originally intended to buy $. Thus, on extension, the importer would still continue to take a forward buy contract i.e. the customer buys / banker sells i.e. ask rate.*

The swap points (%) are given in the ascending order and hence we add. Further margin money is at the banker's selling rate i.e. 0.2% will also be added (as it is a cost, it will increase the customer's purchase rate)

Spot ($ Ask) (on 30/10/10)	₹ 41.5200/$
Add: 3 month Forward premium (₹ 41.52 × 0.93%)	₹ 0.3861/$
3 month Forward ($ Ask)	₹ 41.9061/$
Add: Margin (41.9061 × 0.2%)	₹ 0.0838/$
New forward rate (Under extension)	₹ 41.9899/$

Reference Note:

We have been told that the customer agrees to pay the required margin money on extension. An extension implies a cancellation + a new forward. Therefore, the transaction charges will be levied on both the cancellation rate as well as the new forward rate.

Question 11 *(MTP Oct 18)/(MTP April 21)*

[Q.56 - AFM 8 (Fast Track) & 9, Q.56 - AFM 10]

On 1 October 2019 Mr. X an exporter enters into a forward contract with a BNP Bank to sell US$ 1,00,000 on 31 December 2019 at ₹ 70.40/$ and bank simultaneously entered into a cover deal at ₹ 70.60/$. However, due to the request of the importer, Mr. X received amount on 28 November 2019. Mr. X requested the bank the take delivery of the remittance on 30 November 2019 i.e. before due date. The inter-banking rates on 28 November 2019 were as follows:

Spot	₹ 70.22/70.27
One Month Swap Points	15/10

If bank agrees to take early delivery, then determine the net inflow to Mr. X assuming that the prevailing prime lending rate is 10% and deposit rate is 5%.

Note:

(i) While exchange rates to be considered upto two decimal points the amount to be rounded off to Rupees i.e. no paisa shall be involved in computation of any amount.

(ii) Assume 365 days a year.

Summary

Detailed Solution

Mr. X (Exporter)

Original: Forward sale after 3 months @ ₹ 70.40/$ (S.P → Customers)

for $ 1,00,000

Cancel the cover forward

Forward Buy @ ₹ 70.17/$

= $ 1,00,000 × ₹ 70.17/$

= ₹ 70,17,000

Solution:

Particulars	₹
1. Forward settled (Cash outflow)	$ 1,00,000 × ₹ 70.40/$ = ₹ 70,40,000
2. Spot sale (Cash inflow)	$ 1,00,000 × ₹ 70.22/$ = ₹ 70,22,000
3. Cover forward cancelled (No cash flow)	$ 1,00,000 × ₹ 70.17/$* = ₹ 70,17,000
1 Month forward	= ₹ 70.22/$ - ₹ 0.15/$/₹ 70.27/$ - ₹ 0.1 / $
	= ₹ 70.07/$ / **₹ 70.17/$**

1. Thus, Swap gain to be paid to the customers = Spot sell (S.P) – Forward buy (C.P)

[Reference Note: Additional actions which BNP Bank had to take to honour the early delivery]

= ₹ 70,22,000 – ₹ 70,17,000

= **₹ 5,000 [A]**

(Gain to Bank paid to customer)

2. Interest on Outlay [Difference of 1 and 2 × interest rate]

$$\text{(Cash outflow – Cash inflow)} \times \text{Borrowing rate} \times \frac{31}{365}$$

(1) (2) (Since cash outflow)

$$= (₹\ 70,40,000 - ₹\ 70,22,000) \times 10\%\ \text{p.a} \times \frac{31}{365}$$

$$= ₹\ 18,000 \times 10\% \times \frac{31}{365}$$

(Net cash outflow)

= ₹ 153 [B] (To be recovered from customer)

3. Thus, Net amount to be paid to the customer by BNP Bank

= ₹ 5,000 (Paid) – ₹ 153 (Recovered)

= **₹ 4,847**

(Net paid to customer on early delivery)

4. Thus, Net inflow to Mr. X = ₹ 70,40,000 + ₹ 4,847
[On early delivery] [Charge/gain on early delivery]
= **₹ 70,44,847**

Question 12 *(ICAI SM)/(RTP May 18)/(Practice Manual)*

[Q.57 - AFM 8 (Fast Track) & 9, Q.57 - AFM 10]

An importer booked a forward contract with his bank on 10th April for USD 2,00,000 due on 10th June @ ₹ 64.4000. The bank covered its position in the market at ₹ 64.2800.

The exchange rates for dollar in the interbank market on 10th June and 13th June were:

Particulars	10th June	13th June
Spot USD 1	₹ 63.8000/8200	₹ 63.6800/7200
Spot/June	₹ 63.9200/9500	₹ 63.8000/8500
July	₹ 64.0500/0900	₹ 63.9300/9900
August	₹ 64.3000/3500	₹ 64.1800/2500
September	₹ 64.6000/6600	₹ 64.4800/5600

Exchange Margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 13th June for extension of contract with due date on 10th August.

Rates rounded to 4 decimal in multiples of 0.0025.

On 10th June, Bank Swaps by selling spot and buying one month forward.

Calculate:

(i) Cancellation rate

(ii) Amount payable on $ 2,00,000

(iii) Swap loss

(iv) Interest on outlay of funds, if any

(v) New contract rate

(vi) Total Cost

Summary

Detailed Solution

Original: Forward Buy $ 2,00,000 @ ₹ 64.4000/$

(i.e,. Bank : Forward sell $ 2,00,000 @ ₹ 64.4000/$)

Bank's original off-setting contracts: Forward Buy $ 2,00,000 @ ₹ 64.2800/$

Date of original maturity = 10/6

Actual date of maturity / cancellation = 13/6

(i) Cancellation Rate:

Cancellation happens on 13/6. Hence, the relevant rate would be spot sell @ ₹ 63.68/$ (Gross S.P)

Thus, cancellation rate = ₹ 63.68/$ - 0.1 % × ₹ 63.68 / $

= **₹ 63.6163/$**

***Reference Note**: Ideally, as given this rate should be rounded off to the nearest 0.0025 i.e., ₹ 63.6175/$. However, ICAI has ignored the rounding – off in subsequent workings and hence we have also ignored the same.*

(ii) Amount payable (Exchange difference) on $ 2,00,000

= (₹ 63.6163/$-₹ 64.4000/$)×$ 2,00,000

= (₹ 1,56,740) (A) Loss i.e. amount payable due to exchange difference to Bank.

(iii) Swap Loss (on 10/6)

Spot Sell [SP]	$\$2,00,000 \times \left(₹ \frac{63.8000}{\$}\right)$	₹ 1,27,60,000
Forward Buy [CP]	$\$2,00,000 \times \left(₹ \frac{63.9500}{\$}\right)$	(₹ 1,27,90,000)
Swap loss payable to bank (B)		(₹ 30,000)

(iv) Interest

Cash outflow on original off – setting contract

[$ 2,00,000 × ₹ 64.2800 / $] (10/6)

₹ 1,28,56,000

Cash inflow on spot sale (10/6)

[$ 2,00,000 × ₹ 63.8000/$] (10/6)

₹ 1,27,60,000

Net cash outflow (on 10/6)

(₹ 96,000)

Thus, Interest on Net C.O = Rs 96,000 × 12% × $\frac{3}{365}$

= **₹ 95** [C]

Total cost = ₹ 1,56,740 + ₹ 30,000 + ₹ 95

(A + B + C) = **₹ 1,86,835**

New contract rate

On 13/6, customer would enter into a new forward buy contract of August

@ ₹ $\frac{64.2500}{\$}$ + 0.1 % $\frac{₹64.2500}{\$}$

= **₹ 64.3143/$**

Question 13 *(ICAI SM)/(MTP Oct 19)*

[Q.62 - AFM 8 (Fast Track) & 9, Q.62 - AFM 10]

NP and Co has imported goods for US $ 7,00,000. The amount is payable after 3 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 rupees and dollars are as under:

Spot	₹ 48.50/70
Two Months	25/30 points
Three Months	40/45 points

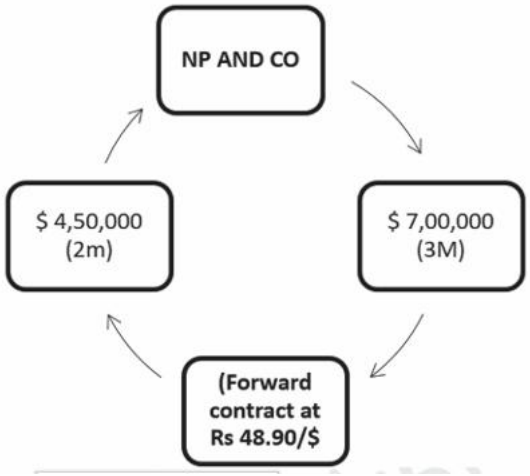
The company wants to cover the risk and it has two options as under:

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 cost of rupee funds is 12%?

Summary

Detailed Solution



(a) Option – 1: (i) Forward cover for payables

3 month forward rate (₹/$)

= ₹ 48.5/$ + 0.4/₹ 48.70/$ + 0.45

= ₹ 48.90/$/₹ 49.15/$

Particulars	Rupees
C.O after 3m ($ 7,00,000 × ₹ 49.15/$)(A)	(3,44,05,000)
C.I after 2m ($ 4,50,000 × ₹ 48.90)	2,20,05,000
(+) Time value adjustment (Interest) [2,20,05,000 × 12% × $^1/_{12}$]	2,20,050
Effective C.I after 3 months (B)	₹ 2,22,25,050

Thus, Net C.O after 3 months (A - B)

= ₹ 3,44,05,000 – ₹ 22,225,050

= **₹ 1,21,79,950 C.O**

(b) Option-2: Lag receivables (without interest) and take forward for net payable.

Reference Note:

If we lag the receivables by 1 month, we will have to first cancel the original forward contract which we have already taken. Further, there is no extension required for this contract as we will net off the $4,50,000 cash inflow with the amount payable.

Since we have been specifically given that no interest is earned for delaying the receivables, time value adjustment is not needed and hence time value adjustment is ignored on lagging.

Net C.O after 3 months (c) (₹ 1,22,87,500)

[($7,00,000-$ 4,50,000) × ₹ 49.15/$]

Cancellation of existing forward

Original: Forward sell (2 months) at ₹ 48.90/$ (S.P)

Cancel: Forward Buy (2 months) at ₹ 49/$ (C.P)

Thus, 2-month forward Rate:

= ₹ 48.50/$ + ₹ 0.25/$/₹ 48.70/$ + ₹ 0.30/$

= ₹ 48.75/$/**₹ 49.00/$** $ Ask

Thus, Cancellation rate = ₹ 49.00/$ (CP)

Gain/(loss) on cancellation (₹ 48.90/$ - ₹ 49/$) × $ 4,50,000	(₹ 45,000)
Add: Time value adjustment (Interest) [₹ 45,000 × 12% × $^1/_{12}$]	(₹ 450)
Effective C.O (Loss) after 3 months (C + D)	(₹ 45,450)
C.O after 3 months = ₹ 1,22,87,500 + ₹ 45,450	₹ 1,23,32,950

Conclusion:

It is advised to go with option – 1 i.e, take forward cover for $ 7,00,000 as it results in a lower cash outflow after 3 months.

Question 14 *(ICAI SM)/(ICAI Paper May 19 [Modified])/ (MTP April 18)/(Practice Manual)*

[Q.70 - AFM 8 (Fast Track) & 9, Q.70 - AFM 10]

XYZ Ltd. a US firm will need £ 3,00,000 in 180 days. In this connection, the following information is available:

Spot rate 1 £ = $ 2.00

180 days forward rate of £ as of today = $1.96

Interest rates are as follows :

	U.K	US
180 days deposit rate	4.5%	5%
180 days borrowing rate	5%	5.5%

A call option on £ that expires in 180 days has an exercise price of $ 1.97 and a premium of $ 0.04.

XYZ Ltd. has forecasted the spot rates 180 days hence as below:

Future rate	Probability
$ 1.91	25%
$ 1.95	60%
$ 2.05	15%

Which of the following strategies would be most preferable to XYZ Ltd.?

(a) A forward contract;

(b) A money market hedge;

(c) An option contract;

(d) No hedging.

Show calculations in each case

Summary

Detailed Solution

XYZ (US Firm) —— £ 3,00,000 ——→ (180 Days)

a. Forward Contract

C.O after 180 days = £ 3,00,000 × 1.96 / £

= **$ 5,88,000**

b. Money Market (Question modified, % interest rates are flat rates and not % p.a)

Borrow $ —— $2/£ ——→ Invest £

↓ 5.5 % (flat) ↓ 4.5 % (Flat)

£ 3,00,000 → £ 3,00,000 (Liability)

Leg 1:

Particulars	₹
Investment in £ today [£ 3,00,000/1.045 × 1]	£ 2,87,081
× Spot rate	× $ 2/£
Borrowing in $ today	$ 5,74,162
Add: Interest @ 5.5% (flat)	$ 31,579
C.O after 180 days	$ 6,05,741

Leg 2:

Particulars	₹
Investment in £ today	£ 2,87,081
Add: Interest @ 4.5% (flat)	£ 12,919
Investment after 180 days	£ 3,00,000
Less: paid for £ liability	(£ 3,00,000)

Thus, C.O after 180 days under money market = £ 6,05,741

c. Option Contract

In this case, we have been given the contract size and hence we will assume that the options are available for the entire £ 3,00,000 and hence there will be no unhedged portion.

1. Strategy: Long (BUY) call.
2. Maturity: 180 days @ $ 1.97 / £
3. C.O after 180 days.

Spot	Exercise	Expected	Probability	Weighted average cash outflow
$ 1.91 / £	No	$ 5,73,000 (£ 3,00,000 × $ 1.91/ £)	0.25	$ 1,43,250
$ 1.95 / £	No	$ 5,85,000 (£ 3,00,000 × $ 1.95 / £)	0.60	$ 3,51,000

$ 2.05 / £	Yes	$ 5,91,000 (£ 3,00,000 × $ 1.97 / £)	0.15	$ 88,650
			Expected C.O after 180 days [A]	$ 5,82,900

Expected C.O after 180 days	$ 5,82,900
Add: Premium [£ 3,00,000 × $ 0.04/£]	$ 12,000
Add: Time value adjustment	$ 660
[$ 12,000 × 5.5%] US Borrowing	
Effective C.O after 180 days [B]	$ 12,660
Unhedged portion	-
Effective C.O after 180 days (A + B)	$ 5,95,560

Reference Note:

1. *In this case, we need to pay the premium in $ today and hence we need to do a time value adjustment for the premium. In the absence of information about surplus funds, we have assumed that the entity will borrow £ 12,000 and hence the interest rate will be 5.5%.*
2. *In case of options, we need to calculate the cash outflow at each rate independently and then apply the probabilities. We should not calculate the average rate as it will wrongly assume that the rate after 6 months is $ 1.955/£. Instead the rates would either be 1.91 or 1.95 or 2.05.*

d. No Hedging

Spot	Expected C.O after 180 days	Probability	Weighted Average cash outflow
$ 1.91/£	$ 5,73,000	0.25	$ 1,43,250
$ 1.95/£	$ 5,85,000	0.60	$ 3,51,000
$ 2.05/£	$ 6,15,000	0.15	$ 92,250
			$ 5,86,500

Alternatively:

Expected spot rate

= $ 1.91/£ × 0.25 + $ 1.95/£ × 0.60 + $ 2.05/£ × 0.15

= **$ 1.955/£**

C.O = $ 1.955/£ × £ 3,00,000

= **$ 5,86,500**

Conclusion:

It is advisable to keep the transaction unhedged as it results in the lowest possible cash outflow after 6 months.

Question 15 *(ICAI SM)/(MTP March 19)/(Practice Manual)*

[Q.75 - AFM 8 (Fast Track) & 9, Q.75 - AFM 10]

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?

Summary

Detailed Solution

Reference Note:

1. *The exchange rate quotes are given in capital (and not currency symbols) hence we need to check for the application of market convention.*
   GBP and USD are commonly traded currencies and the GBP is stronger than the USD. Based on the exchange rate quotes, the GBP /USD rate is implied to be the $/£ rate. The same bank is also quoting USD/CHF rate and hence for consistent application, this rate will also be inferred to be CHF/$ rate (treatment consistent with ICAI solution).
2. *As a customer, we intend to buy 1 million £ and hence the banker would sell the pound. Hence the transaction would happen at CHF/£ ask rate(£ base currency).*
3. *Since the customer needs 1 million £ Spot, the forward rates are irrelevant in the 1st part.*
4. *The intermediate currency ($) is the same in both the Banks. Therefore, we can individually take each of the currency needed from the bank where it is the cheapest. For eg: the 1st rate $\left(\frac{CHF}{\$}\right)$ is lower in Bank A and hence we can buy $ in bank A whereas the 2nd rate $\left(\frac{\$}{£}\right)$ is lower in Bank B and hence we can use the $ purchased from Bank A to buy the £ from Bank B. There is no need to do the entire transaction from a single Bank Only. The above actions will result in the lowest CHF to be paid for 1 million £.*

Solution:

(i) $\left(\frac{CHF}{£}\right)_A = \left(\frac{CHF}{\$}\right)_A \times \left(\frac{\$}{£}\right)_A$

= CHF 1.4655 / $ × $ 1.7650/£

= **CHF 2.5866/£**

Thus, in order to buy 1million £

= £ 10,00,000 × CHF 2.5866/£

= **CHF 25,86,600.**

(ii) CHF/£ : 3 Month forward points (Bank –A)

a. $\left(\frac{CHF}{£}\right)^{spot} = \left(\frac{CHF}{\$}\right)^{spot} \times \left(\frac{\$}{£}\right)^{spot}$

$\left(\frac{CHF}{£}\right)^{SPOT} = \left(\frac{CHF}{\$}\right)_{BID}^{SPOT} \times \left(\frac{\$}{£}\right)_{BID}^{SPOT} - \left(\frac{CHF}{\$}\right)_{ASK}^{SPOT} \times \left(\frac{\$}{£}\right)_{ASK}^{SPOT}$

= CHF 1.4650 /$ × $1.7645/£ - CHF 1.4655/$ × 1.7660/£

= **CHF 2.5850/£ - CHF 2.5881/£**

b. $\left(\frac{CHF}{£}\right)^{3M} = \left(\frac{CHF}{\$}\right)^{3M} \times \left(\frac{\$}{£}\right)^{3M}$

$(CHF/\$)^{3M}$ = CHF 1.4650/$ + CHF 0.0005/$ / CHF 1.4655 /$ + CHF 0.0010/$

= **CHF 1.4655/$ - CHF 1.4665/$**

c. $(\$ / £)^{3M}$ = $ 1.7645/£ - $ 0.0025/£ / $ 1.7660/£ - $ 0.0020/£

= **$ 1.7620/£ - $ 1.7640/£**

d. $\left(\frac{CHF}{£}\right)^{3M} = \left(\frac{CHF}{\$}\right)_{BID}^{3M} \times \left(\frac{\$}{£}\right)_{BID}^{3M} - \left(\frac{CHF}{\$}\right)_{ASK}^{3M} \times \left(\frac{\$}{£}\right)_{ASK}^{3M}$

= CHF 1.4655/$ × $ 1.7620/£ - CHD 1.4665/$ × $1.7640/£

CHF 2.5822/£ - CHF 2.5869/£

e. Implied swap point (3 months) (CHF/£) = Forward rate – Spot Rate

= CHF 2.5822/£ - CHF 2.5850/£/CHF 2.5869/£ - CHF 2.5881/£

= CHF 0.0028/£/- CHF 0.0012/£

i.e., **28/12 Points**

Question 16 *(ICAI SM)/(Practice Manual)*

[Q.76 - AFM 8 (Fast Track) & 9, Q.76 - AFM 10]

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

(1) You are required to calculate loss/gain due to transaction exposure

(2) Based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of air conditioners is ₹ 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.

Summary

Detailed Solution

1. Calculation of transaction exposure

Profit Calculation

Particulars	Today Current	Spot rate after 6 months
Selling price per unit	₹ 25,750 (€ 500 × 51.50)	₹ 26,000 (500 € × 52)
Less: Cost of Imported components	₹ (21,800) [S $ 800 × ₹ 27.25/S $]	(₹ 22,200) [S$ 800 × ₹ 27.75/S $]
Less: Fixed costs per unit	(₹ 1,000)	(₹ 1,000)
Less: Variable costs per unit	(₹ 1,500)	(₹ 1,500)
Profit per unit	₹ 1,450	₹ 1,300
× no. of units	× 2,400	× 2,400
Total Profit	₹ 34,80,000	₹ 31,20,000

Loss due transaction exposure = 31,20,000 – 34,80,000

= **(₹ 3,60,000)**

Alternative: C.I:

Cash Inflow = (₹ 52/€ - ₹ 51.5/€) × €500 × 2,400 = **(₹ 6,00,000)** (gain)

Cash Outlfow = (₹ 27.25/S$ - ₹ 27.75/S$) × S$800 × 2400 = **(₹ 9,60,000)** (loss)

Thus, net transaction exposure (loss) = (₹ 9,60,000) + ₹ 6,00,000

= **(₹ 3,60,000)**

2. Transaction exposure

a. Profit Calculation

Particulars	Current spot rate	Spot rate after 6 months
Selling Price per unit	₹ 25,000	₹ 25,000
Less: Cost of Importer component	(₹ 21,720) (S$ 800 × ₹ 27.15/S$)	(₹ 22,200) (S$ 800 × ₹ 27.75/S$)
Less: Fixed Cost per unit	(₹ 1,000)	(₹ 1,000)
Less: Variable Cost per unit	(₹ 1,500)	(₹ 1,500)
Profit per unit	₹ 780	₹ 300
× No. of units	× 2,400	× 2,400
Total Profit	₹ 18,72,000	₹ 7,20,000

Loss due to transaction exposure = (₹ 7,20,000 – ₹ 18,72,00)

= **(₹ 11,52,000)** (loss)

Alternative: Cash Outflow

[₹ 27.75/S$ – ₹ 27.15/S$] × S$800 × 2,400 Units = **(₹ 11,52,000)**

Reference Note:

Note – 1: Transaction exposure is based on the transaction that has already happened i.e., 2,400 units. A change in the quantity demanded will be expected in the future and hence will not impact the exposure for the transaction already done.

b. Profit/loss due to expected changes in demand

(i) Equivalent price for European Customers

Based on current spot rate

= ₹ 25,000/₹ 51.75/€ (€ BID)

= **€ 483.09**

Based on spot rate after 6 months

= ₹ 25,000/ ₹ 52/€ (€ BID)

= **€ 480.77**

(ii) % fall in price = $\frac{€480.77 - € 483.09}{€ 483.09} \times 100$

= **€ 483.09**

= **- 0.48%**

(iii) % increase in quantity demanded

= (0.48 %) × – 1.5 (Inverse relationship. Hence negative)

= **0.72%**

(iv) Change in units

= 2,400 u × 0.72%

= 17.28

= **17 units** (increase)

(v) Increase in profit expected due to increase in demand

= 17 units × ₹ 300 (note 2)

= **₹ 5,100 (Gain)**

(vi) Operating exposure = Transaction exposure ± Changes in profit due to changes in Quantity demanded.

= (₹ 11,52,000) + ₹ 5,100

= **₹ 11,46,900)** (loss)

***Note – 2** : The incremental profit on 17 units would be earned after 6 months once the demand changes. Hence, the relevant profit is to be considered after 6 months. However, fixed cost will not ideally be incurred for the additional 17 units and hence the incremental profit per unit can also be calculated as 300 + 1,000 = 1,300*

Thus, Alternative solution:

Op Exposure = (₹ 11,52,000) + (1,300 × 17)

= (₹ 11,52,200) + 22,100

= **(₹ 11,29,900)**

ICAI has shown both the methods. However, the 2nd method is more appropriate.

Question 17 *(ICAI SM)/(MTP Oct 20)/(MTP March 22)/ (Practice Manual)*

[Q.77 - AFM 8 (Fast Track) & 9, Q.77 - AFM 10]

You as a dealer in foreign exchange have the following position in Swiss Francs on 31st October, 2009:

Particulars	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?

Summary

Detailed Solution

NOSTRO A/C

Cash position as on 31/10/2009 (in CHF)

Particulars	Debit (withdrawal)	Credit (Deposit)
Opening	-	1,00,000
Spot Remittance (paid)	75,000	
Total	**75,000**	**1,00,000**
Add: Spot deposit (Note :1)		5,000
Closing balance (Cr)	30,000	
Total	**105,000**	**1,05,000**

Exchange Position on 31/10/09 (in CHF)

Particulars	Buy	Sell
Opening	50,000	-
Purchased bill on Zurich	80,000	-
Sold Forward	-	60,000
Forward purchase cancelled	-	30,000
Remitted by TT Spot	-	75,000
Draft on Zurich cancelled	30,000	-
Spot deposit (Note-1)	5,000	-
	1,65,000	1,65,000
Add: Forward purchase (Note-2)	10,000	-
Net overbought position	-	10,000
	1,75,000	**1,75,000**

Note: 1

The balances in the cash A/c is CHF 25,000. In order to attain a credit balance of CHF 30,000, we need to buy in the spot market (30,000 – 25,000 = 5,000). Forward purchases do not affect the cash position and hence in order to alter the cash position, we need to do a spot deposit.

Note: 2

The cash deposit of 5,000 will also alter the exchange position. After considering the 5,000 deposit, the exchange position becomes NIL (1,65,000 – 1,65,000 = 0). However, in order to ensure an overbought balance of CHF 10,000, we need to enter into a forward purchase contract of CHF 10,000. We should not do a spot CHF deposit as it would affect the cash position as well.

Question 18

(RTP May 22)/(MTP Oct 22)

[Q.79 - AFM 8 (Fast Track) & 9, Q.79 - AFM 10]

Mr. Mammen, an Indian investor invests in a listed bond in USA. If the price of the bond at the beginning of the year is USD 100 and it is USD 103 at the end of the year. The coupon rate is 3% payable annually.

Find the return on investment in terms of home country currency if:

(i) USD is Flat.

(ii) USD appreciates during the year by 3%.

(iii) USD depreciates during the year by 3%.

(iv) Indian Rupee appreciates during the year by 5%.

(v) Will your answer differ if Mr. Mammen invests in the bond just before the interest payable.

Summary

Detailed Solution

i. **USD is flat:**

Therefore, the USD value remains the same, the return for an investor is the returns generated from the bond only i.e.

Return from Bond investment $= \frac{(\$103 - \$100) + \$3}{\$100} \times 100$

(Assume face value = $ 100, ∴ interest = 3) = **6% p.a.**

ii. **USD appreciates by 3%**

Reference:

The return for an Indian investor is made up of return from the bond and the return from the currency.

If we invest an amount of ₹ 1, the return of end of year would be calculated as the

composite return from the bond as well as currency because we are investing in the bond as well as currency.

Therefore, the return can be calculated as: $[(1 \pm r)\ (1 \pm\ r) - 1]$

Therefore, $(1 + 0.06_{BOND})\ (1 + 0.03_{\$}) - 1$

= 0.0918

i.e. **9.18%**

Alt: We can assume notional rates, say the spot today equals ₹ 100/$. Therefore, after 1 year, the expected spot would be ₹ 103/$. In such a case, the return can be calculated as

$$\frac{\left[\$103 \times ₹\ 103/\$\right] - \left[\$100 \times ₹\ 100/\$\right] + \left(\$3 \times ₹\ 103/\$\right)}{\left[\$100 \times ₹\ 100/\$\right]}$$

$$= \frac{10,600 - 10,000 + 309}{10,000} \times 100$$

= **9.18%**

(iii) USD depreciates by 3%

$\{(1 + 0.06)_B\ (1\ - 0.03)_{\$} - 1\}$

= 1.0282 – 1

= 0.282

i.e. **2.82%**

(iv) INR appreciates by 5%

Reference:

We have invested in a USD based bond and hence we want to check whether the $ appreciates/depreciates. In case INR appreciates by 5%, it implies that the $ depreciates by 5% i.e. Return :

= [(1+0.06) (1-0.05)] – 1

= 0.007 i.e. **0.7 %**

(v) As long as the amount invested remains the same, the above return calculations will remain the same as well; because we will continue to receive the interest since the investment is happening before interest is paid.

Question 19 *(ICAI Paper May 18)/(RTP May 22)/(MTP April 22)*

[Q.80 - AFM 8 (Fast Track) & 9, Q.80 - AFM 10]

M/s. Raghu Ltd. is interested in expanding its operation and planning to install manufacturing plant at US. It requires 8.82 million USD (net of issue expenses/floatation cost) to fund the proposed project. GDRs are proposed to be issued to finance this project. The estimated floatation cost of GDRs is 2%.

Additional information:

(i) Expected market price of share at the time of issue of GDR is ₹ 360 (Face Value ₹ 100)

(ii) Each GDR will represent two underlying Shares.

(iii) The issue shall be priced at 10% discount to the market price.

(iv) Expected exchange rate is INR/USD 72.

(v) Dividend is expected to be paid at the rate of 20% with growth rate of 12%.

(1) You, as a financial consultant, are required to compute the number of GDRs to be issued and cost of the GDR.

(2) What is your suggestion if the company receives an offer from a US Bank willing to provide an equivalent loan with an interest rate of 12%?

(3) How much company can save by choosing the option as recommended by you?

Summary

Detailed Solution

(i) (a) Issue size = $\frac{8.82}{98} \times 100 = 9m$

Issue price = $\frac{2 \times (360 - 10\%)}{₹72 / \$}$ = 9 m

$\therefore$ No. of GDR = $\frac{\$9}{\$9}$ = **1 mill**

(b) K_{GDR} = $\frac{₹100 \times 20\%) \times 2}{\$9 \times ₹72 / \$) - 2\%} + 0.12$

= 0.1829

= **18.30%**

(ii) In case a bank is offering the funds @ 12%, we should accept the offer from the bank since it is cheaper as compared to GDR keeping all other factors constant.

(iii) If the offer from the bank is accepted, there would be a Net saving of 6.3% (18.3% - 12%)

Question 20 *(ICAI Paper Nov 23)*

[Q.2 - Additional Question AFM 8 (Fast Track) & 9, Q.84 - AFM 10]

A Japanese company imports hi-tech printer cartridges from US worth $ 1 million. The chief financial officer of the company wishes to know the best strategy for protection against uncertainty, for the payment that has to be made at the end of 3 months. Financial team of the

company has collected the following options for evaluation:

Table 1: Exchange rates quoted in FOREX Market:

¥/$ Quotations	Bid Price	Offer/Ask Price
Spot Rates	146.03	146.63
3M-Forward Rates	144.03	145.00
3M-Forward Rates	146.35	146.70

Table 2: Options Market rates for European options with 3 months expiry.

Type of Option	Strike Price (X) (¥/$)	Premium (%) for Call & Put Options
Call & Put	145.20	1.6766% (Call) & 1.7414% (Put)
Call & Put	146.00	1.3505% (Call) & 2.1006% (Put)

The expected spot price at expiry is ¥/$: 144.90/145.05

Suggest the best strategy for CFO of the Japanese Company to protect against uncertainty, with respect to the following alternatives:

(i) Forward Hedge

(ii) Buy 3 months call, X = 145.20

(iii) Sell 3 months put, X = 145.20

(iv) Buy call & sell put both having X = 146.00

Summary

Detailed Solution

(i) Forward Hedge

Amount payable after 3 months $ 1000000

3 month applicable buying rate ¥ 145/$ Amt. payable in Yen ¥145 million

(ii) Buy 3 month call option X = ¥ 145.20

If expected spot price after 3 month is ¥ 145.05

Then company would not exercise its option. Accordingly the cost of import will be

Buying Yen in spot Market after 3 month	¥ 145.05 million
Add: Premium Paid ¥ 145.20 x 1.6766%x $ 1 million	¥ 2.43 million
	¥ 147.48 million

(iii) Selling 3 month Put at X = ¥ 145.20

If expected spot price after 3 month ¥ 144.90 , then Put Option buyer will exercise his/her option.

Accordingly the import Bill will be :

(iv) Buying Call and selling Put at X = ¥ 146 Net Premium receipt

Premium paid on call option = ¥ 146.00 x 1.3505%	¥ 1.9717 million
Premium Receipt on Put option = ¥ 146.00 x 2.1006%	¥ 3.0669 million
	¥ 1.0952 million

If expected spot Rate expiry happens to be ¥ 144.90/145.05, then call option will be lapsed and Put option by buyer will be exercised. Accordingly, the import bill will be:

Buying US$ under Put Option	¥ 146.00 million
Less: Receipt of Net Premium	¥ 1.09520 million
	¥ 144.905 million

Decision: Since expected outflow is least in case of selling Put option, the same strategy is recommended.

CHAPTER 9 INTERNATIONAL FINANCIAL MANAGEMENT

Question 1 *(ICAI SM)/(MTP Aug 18)/(Practice Manual)*

[Q.3 - AFM 8 (Fast Track) & 9, Q.3 - AFM 10]

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 (for the combined operating project), in real terms, in India as well as African country for the first three years of the project are as follows:

	Year – 0	Year – 1	Year – 2	Year – 3
Cash flows in Indian ₹ (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 discountingrate. The present exchange rate is African Rand 6 to Rs 1.

You are required to calculate the net present value of the proposed investment considering thefollowing:

(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

Summary

Detailed 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	-2000	-2500
Nominal (1)	-50,000	-1,650	-2420	-3327.50
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	9167	14117	19,965
Net Cash Flow in ₹ '000 (1)+(2)	-83,333	7517	11697	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)

Question 2 *(ICAI SM)/ICAI Paper Nov 19 [Modified])/(RTP Nov 18)/(MTP Oct 18)/(MTP May 20)/(MTP Oct 22/ (Practice Manual)*

[Q.7 - AFM 8 (Fast Track) & 9, Q.7 - AFM 10]

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

Summary

Detailed 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

Particulars	$ 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

Particulars	$ 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
Cash flow at the end of the 5 years (Release of Working Capital)	35.00

(b) Cash generation by exports (Opportunity Cost)

Particulars	$ Million
Sales Revenue (1.5 Million x $80)	120.00
Less: Variable Cost (1.5 Million x $40)	60.00
Contribution before tax	60.00
Tax@35%	21.00
CFAT (1-5 years)	39.00

(c) Additional CFAT attributable to Foreign Investment

	$ Million
Through setting up subsidiary in India	210.50
Through Exports in India	39.00
CFAT (1-5 years)	171.50

III. Determination of NPV

Year	CFAT ($ Million)	PVF@12%	PV ($ Million)
1-5	171.50	3.6048	618.2232
5	35	0.5674	19.8590
			638.0822
Less: Initial Outflow			535.0000
			103.0822

Since NPV is positive the proposal should be accepted.

Question 3 *(RTP May 24)*

[Q.1 - Additional Question AFM 8 (Fast Track) & 9, Q.13 - AFM 10]

Mr. Vishwas, a friend of Mr. Pramod who is one of the Directors of Ashirwad Limited, is a citizen of Mauritius. His immediate family members including his parents, born in India are residing in India. He has many friends in different parts of India, due to which he happens to visit India on frequent basis. He along with Mr. Pramod evince interest in setting up business in India and formally incorporate a company to commence their operations. Accordingly, a company is called "Aerious Private Ltd." got incorporated in Mumbai.

To start with he received a business proposal from one of his friends Nimish a consultant It is estimated that in equivalent terms the business shall require an initial investment of MUR 100 Million and thereafter MUR 2 Million each year will be needed as working capital fund.

He wished to evaluate whether the business proposal is viable or not. The information related to exchange rate and inflation rate is as follows:

Spot Rate for 1 Mauritian Dollar (MUR) = 1.88 Indian Rupee (INR) The inflation in India is 6% and in Mauritius is 5%.

It is expected that this inflation rate will remain unchanged for the next 4 years.

INR 8 Crore out of initial investment shall be required for setting up a plant. The useful life of the plant is 4 years. At the end of 4th year estimated salvage value of this plant shall be INR

80 lakhs. Depreciation of the plant shall be charged on the basis of straight-line method.

40% of the investment shall be through debt funds from Mauritius at the cost of 10% (post tax) while remaining funds shall be arranged by him and his friends. They expect a rate of return of 12% on their funds.

Expected revenues & costs (excluding depreciation) in real term are as under:

Year	1	2	3	4
Revenues (₹ Crore)	6.00	7.00	8.00	8.00
Costs (₹ Crore)	3.00	4.00	4.00	4.00

Assume that applicable tax rate in India is 30%. Since there is Double tax avoidance agreement between India and Mauritius, the company is not required to pay tax in Mauritius if tax has been paid in India.

The applicable inflation rates for revenues & costs are as follows:

Year	Revenues	Costs
1	10%	12%
2	9%	10%
3	8%	9%
4	7%	8%

He wants an expert opinion for the same investment proposal. Demonstrate whether investment in this project is viable option or not.

Note: 1. Round off calculations upto 4 decimal points.

2. Show INR calculations in Crore and MUR calculations in Million.

Summary

Detailed Solution

(1) Calculation of Discount Factor (WACC)

In this question, discount rate is not given. We can calculate the same based on WACC.

ie WACC = $K_D \times \frac{D}{D+E} + K_E \times \frac{E}{D+E}$

= 10% × 0.4 + 12% × 0.6

= 11.2%

We have been given that the debt funds are raised in Mauritius and Mr. Vishwas is also based in Mauritius and hence the equity funds are also likely to be raised in Mauritius.

Hence, the above WACC would be the Mauritian WACC and hence we should ultimately find the Mauritian cash flows to be discounted at this WACC.

Further, unless given the WACC would be nominal and hence we will convert the real cash flows into nominal and then solve.

(2) Calculation of Forward Rates

Using IRP,

$$\frac{F}{S} = \frac{(1 + i_{IND})}{(1 + i_{MUR})}$$

End of Year	INR	INR/MUR
1	$F = ₹ 1.88 / MUR \times \frac{1.06}{1.05}$	₹ 1.8979
2	$F = ₹ 1.8979 / MUR \times \frac{1.06}{1.05}$	₹ 1.9160
3	$F = ₹ 1.9169 / MUR \times \frac{1.06}{1.05}$	₹ 1.9343
4	$F = ₹ 1.9343 / MUR \times \frac{1.06}{1.05}$	₹ 1.9537

(3) Calculation of Inflation Adjusted Revenue and Cost

a) Revenue

Year	Revenue (Inflation Adjusted) (₹)	₹ in cr
1	6.00 × 1.1	= 6.6
2	7.00 × 1.1 × 1.09	= 8.393
3	8.00 × 1.1 × 1.09 × 1.08	= 10.359
4	8.00 × 1.1 × 1.09 × 1.08 × 1.07	= 11.084

b) Cost (Excluding Depreciation)

Year	Cost (Inflation Adjusted) (₹)	₹ in cr
1	3.00 × 1.12	= 3.36
2	4.00 × 1.12 × 1.1	= 4.928
3	4.00 × 1.12 × 1.1 × 1.09	= 5.372
4	4.00 × 1.12 × 1.1 × 1.09 × 1.08	= 5.801

(4) Initial Investment and Working Capital

Initial Investment: MUR 100M × ₹ 1.88/MUR	= ₹ 188M
	= ₹ 18.8 cr

Working Capital

Y1 – MUR 2M × ₹ 1.8979/MUR = ₹ 8.7958 M = ₹ 0.37958 cr

Y2 - MUR 2M × ₹ 1.9160/MUR = ₹ 3.832 M = ₹ 0.3832 cr

Y3 – MUR 2M × ₹ 1.9343/MUR = ₹ 3.8686 M = ₹ 0.38686 cr

Y4 – MUR 2M × ₹ 1.9527/MUR = ₹ 3.9054 M = ₹ 0.39054 cr

Release of Working Capital (Y4)

= 0.37958 + 0.3832 + 0.38686 + 0.39054

= ₹ 1.54 cr

Reference Note:

(1) We have been given that the initial investment is effectively ₹ 18.8 crores out of which ₹ 8 crore is for plant.

The remaining ₹ 8 crore of investment maybe in any other asset. It is not assumed to be working capital (ICAI).

(2) We were given the above values in MUR. However, the release would happen in rupees and hence we need the calculate the above cash flows is rupees.

(3) Calculation of NPV

	Y0	Y1	Y2	Y3	Y4
Initial Investment (A)	(18.80)	-	-	-	-
Revenue (3a)	-	6.6	8.393	10.359	11.684
(-) Cost (3b)	-	(3.36)	(4.928)	(5.372)	(5.801)
(-) Depreciation $\left(\frac{8-0.8}{4}\right)$	-	(1.8)	(1.8)	(1.8)	(1.8)
		1.44	1.665	3.187	3.483
(-) Tax @ 30%		(0.432)	(0.4995)	(0.9561)	(1.0449)
PAT @ 70%		1.008	1.1655	2.2309	2.4381
(+) Depreciation		1.8	1.8	1.8	1.8
Annual CI (B)		2.808	2.9655	4.6309	4.2381
(-) Working Capital Investment		(0.37958)	(0.3832)	(0.38686)	(0.39054)
(+) Release of Working Capital		-	-	-	1.54
(+) Salvage	-	-	-	-	0.8
	(18.8)	2.42842	2.5823	3.64404	6.18756
(÷) Exchange Rate (₹/MUR)	1.88	1.8979	1.9160	1.9343	1.9343
CF MUR × 10 (MUR Million)	(100)	12.796	13.478	18.839	31.688
DF @ 11.2%		0.8993	0.8087	0.7273	0.654
	(100)	11.50	10.90	13.70	20.72

NPV = MUR 43.18 Million

Therefore, project should be rejected.

Reference Note:

Additional Requirement in each year given and hence no adjustment for inflation. No specific additional working capital given, but revenue and cost are growing by 5% and hence working capital also assumed to grow by 5%. No inflation/No additional working capital requirement given.

Question 4 *(MTP March 24)*

[Q.2 - Additional Question AFM 8 (Fast Track) & 9, Q.14 - AFM 10]

DK Ltd. is considering an investment proposal in Sri Lanka involving an initial investment of LKR 25 billion. The current spot exchange rate is INR/LKR 0.370. The risk free rate in India is 6% and the same in Sri Lanka is 5.02%.

The project will generate a cash flow of LKR 5 billion in the first year. The cash flow will increase by LKR 1 billion each year for the next 4 years. The project will wind up on completion of 5 years with no salvage value. The required rate of return for the project is 8%

(i) You are required to find out the investment worth of the project by using

(1) Home Currency Approach (2) Foreign Currency Approach

(ii) Compare the outcome under both the approaches

Given:

PVIF (8%, t)	0.92593	0.85734	0.79383	0.73503	0.68058
PVIF (7%, t)	0.93457	0.87344	0.81630	0.76290	0.71299

Note: Excepts rates show all calculations in Billion upto four decimal points.

Summary

Detailed Solution

Working Notes:

Calculation of Forward Exchange Rates

End of Year	₹	₹/LKR
1	$0.37 \times \frac{1.06}{1.052}$	0.373
2	$0.373 \times \frac{1.06}{1.052}$	0.376
3	$0.376 \times \frac{1.06}{1.052}$	0.379

4	$0.379 \times \frac{1.06}{1.052}$	0.382
5	$0.382 \times \frac{1.06}{1.052}$	0.385

1. Home Currency Approach

Year	Cash Flow Billion LKR	₹/LKR	Cash flow Billion ₹	PVF @ 8%	PV Billion ₹
1	5	0.373	1.865	0.92593	1.7269
2	6	0.376	2.256	0.85734	1.9342
3	7	0.379	2.653	0.79383	2.1060
4	8	0.382	3.056	0.73503	2.2463
5	9	0.385	3.465	0.68058	2.3582
					10.3716
Less: Investment	25	0.37			9.2500
				NPV	1.1216

2. Foreign Currency Approach

(1 + 0.06) (1 + Risk Premium) = 1.08

1 + Risk Premium = 1.08/1.06 = 1.01887

Therefore, Risk adjusted LKR Rate = 1.01887 × 1.0502 – 1 = 0.07 i.e. 7%

Calculation of NPV

Year	Cash Flow (Billion LKR)	PVF @ 7%	PV (Billion LKR)
1	5	0.93457	4.6729
2	6	0.87344	5.2406
3	7	0.81630	5.7141
4	8	0.76290	6.1032
5	9	0.71299	6.4169
			28.1477
Less: Investment			25.0000
		NPV	3.1477

Thus, Rupee NPV of the Project = ₹ 0.37 × 3.1477 = ₹ 1.1646 billion

Decision: NPV is positive in the approach so, project will worth investment.

CHAPTER 10 DERIVATIVES ANALYSIS AND VALUATION

Question 1

[Q.1 - AFM 8 (Fast Track) & 9, Q.1 - AFM 10]

On Aug. 2, Mr. Tandon buys 5 contracts of December Reliance futures at 840. Each contract covers 50 shares. Initial margin was set at ₹ 2400 per contract while maintenance margin was fixed at ₹ 2000 per contract. Daily settlement prices are as follows:

Aug. 2	818
Aug. 3	866
Aug. 4	830
Aug. 5	846

Mr. Tandon meets all margin calls. Whenever he is allowed to withdraw money from the Margin Account, he withdraws half the maximum amount allowed. Compute for each day:

1. Margin call;
2. Profit & (Loss) on the contracts;
3. The balance in the Account at the end of the day.

Assume that Mr. Tilak sells the same 5 contracts at the same price. If the same margins and same conditions are applicable, what is the margin call, profit and loss and balance in the account for Mr. Tilak? Verify buyer's gain is seller's loss. i.e. prove futures are zero sum games.

Summary

Detailed Solution

Mr. Tandon (Long reliance futures)

Initial deposit = 2,400/contract × 5 = 12,000

Maintenance margin = 2,000/contract × 5 = 10,000

As given, the amount can be withdrawn from the margin account whenever there is a gain and the amount to be withdrawn (if any) = 50% of gain.

Date	Opening Balance	Profit/loss	Withdrawal	Closing Balance	Margin Call	Adjusted Closing
Aug 2	12,000	(818-840) × 50 × 5 = **(5,500)**	-	6,500	5,500 (12,000-6,500)	12,000
Aug 3	12,000	(866-818) × 50 × 5 = **12,000**	(6,000)	18,000	-	18,000

Aug 4	18,000	(830-866) x 50 x 5 = **(9,000)**	-	9,000	3,000 (12,000-9,000)	12,000
Aug 5	12,000	(846-830) x 50 x 5 = **4,000**	(2,000) (50% of 4000)	14,000	-	14,000
		1,500 Net Gain *Or* [(846-840) × 50] × 5				

Mr Tilak (Short 5 reliance futures)

Initial : 12,000 (same)

Maintenance : 10,000 (same)

Date	Opening Balance	Profit/loss	Withdrawal	Closing Balance	Call	Adj Closing
Aug 2	12,000	(840-818) × 50 × 5 = **5,500**	(2,750)	14,750	-	14,750
Aug 3	14,750	(818-866) × 50 × 5 = **(12,000)**	-	2,750	9,250 (12,000-2,750)	12,000
Aug 4	12,000	(866-830) x 50 x 5 = **9,000**	(4,500)	16,500	-	16,500
Aug 5	16,500	(830-846) x 50 x 5 = **(4,000)**	-	12,500	-	12,500
		1,500 Net Loss *Or* [(840-846)*50]*5				

As can be seen the overall loss of Mr. Tilak (1,500) is the same as the overall gain of Mr. Tandon i.e. (1,500).

Question 2 *(RTP May 21)*

[Q.3 - AFM 8 (Fast Track) & 9, Q.3 - AFM 10]

The Following data relate to A Ltd.'s Portfolio:

Shares	X Ltd.	Y Ltd.	Z Ltd.
No. of Shares (lakh)	6	8	4
Price per share (₹)	1000	1500	500
Beta	1.50	1.30	1.70

The CEO is of opinion that the portfolio is carrying a very high risk as compared to the market risk and hence interested to reduce the portfolio's systematic risk to 0.95. Treasury Manager has suggested 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, currently trading at 8250 and each Nifty points multiplier is 210.

You are required to:

(a) Interpret the opinion of CEO, whether it is correct or not.

(b) Calculate the existing systematic risk of the portfolio,

(c) Advise the value of risk-free securities to be acquired,

(d) Advise the number of shares of each company to be disposed off,

(e) Advise the position to be taken in Nifty Futures and determine the number of Nifty contracts to be bought/sold; and

(f) Calculate the new systematic risk of portfolio if the company has taken position in Nifty Futures and there is 2% rise in Nifty.

Note: Make calculations in Rs lakh and upto 2 decimal points.

Summary

Detailed Solution

(a) Calculation of Portfolio β

Shares	Amount Invested No of shares × MP	Weights	B	β × Weights
X	6,000 (6 × ₹ 1,000)	0.3	1.5	0.45
Y	12,000 (8 × ₹ 1,500)	0.6	1.3	0.78
Z	2,000 (4 × ₹ 500)	0.1	1.7	0.17
	20,000			1.40

The β of the market is always 1. The portfolio of A Ltd has a β of 1.4 and hence has a higher risk as compared to the market. Therefore, the opinion of the CEO is correct.

(b) The systematic risk of the portfolio is 1.4 times that of the market

(***Reference Note***: *Usually, the systematic risk can be calculated as* $\beta^2 \times \sigma^2 m$) *σm is not available in the question and hence we have commented that the systematic risk will be 1.4 times that of the market. Further, we square the terms in order to calculate the unsystematic risk. Unsystematic risk is not asked in the question and hence we ignore.*

(c) Risk free securities in order to have a target β of 0.45:

Reference Note:

In this question, we have been clearly given to dispose off a part of the existing investment in order to acquire the risk-free securities. Hence, the total portfolio value will continue to be ₹ 20,000 Lakhs.

Let the proportion of risk-free securities in the total portfolio be x. Therefore, the weights of the portfolio of existing securities will be 1 – x

Thus, 0.95 = 0 × x + 1.4 x (1 – x) [β of risk free securities = 0]

0.95 = 0 + 1.4 – 1.4x

1.4x = 0.45

Thus, x = 0.32

i.e., 32%

Thus, 1 – x = 1 – 0.32 = 0.68

i.e., 68%

Thus, value of risk-free Securities to be acquired = ₹ 20,000 Lakhs × 32%

= **₹ 6,400 Lakhs**

(d) No of shares to be disposed.

We have assumed that X,Y,Z will be disposed proportionately i.e., in the ratio of 0.3 : 0.6 : 0.1 . In order to purchase risk free securities worth 6,400 Lakhs, we will have to dispose the existing shares worth 6,400 lakhs (in the ratio of 0.3 : 0.6 : 0.1)

Shares	Value to be disposed	Market price / shares	No. of shares
X	1,920 L (6,400 × 0.3)	1,000	1.92 Lakhs
Y	3,840 L (6,400 × 0.6)	1,500	2.56 Lakhs
Z	640 L (6,400 × 0.1)	500	1.28 Lakhs
	6,400		

(e) In order to hedge using the NIFTY futures (instead of the risk-free rate) we need to short the Nifty futures (i.e., take an off-setting portion)

Thus, the strategy would be to SHORT Nifty futures.

No of contracts to be shorted

Reference Note:

In case a complete hedge was to be taken, we would determine the no. of Nifty futures to be shorted based on adjusting the portfolio value by 1.4. However, under a complete hedge, the entire loss/gain on the underlying portfolio will be off-set by the Nifty futures. Hence, the overall portfolio sensitivity would come down to 0. However, we want the sensitivity to come down to 0.95 and hence we want the sensitivity to move from 1.4 to 0.95 and hence we should adjust the portfolio value by 1.4 – 0.95. This will ensure that the excess movement beyond 0.95 will be hedged.

No. of contracts to be shorted

$$= \frac{20{,}000\ Lakhs \times (1.4 - 0.95)}{}$$

$$= \frac{20{,}000\ Lakhs \times 0.45}{17.325\ Lakhs}$$

$$= \frac{20{,}000\ Lakhs \times 0.45}{17.325\ Lakhs}$$

= 519.48

i.e., 519 Contracts

(f) Portfolio position if Nifty rises by 2%

Ignoring the Nifty futures, the existing 20,000 Lakhs portfolio has a β of 1.4. Therefore, if the Nifty rises by 2% the portfolio will rise by 2% × 1.4 = 2.8%

Thus, gain on underlying portfolio (20,000 Lakhs × 2.8%)	560 Lakhs
Less: Loss on Nifty futures [(8,250 – 8,415*) × 210] × 519	(179.83 Lakhs)
S.P C.P	
1,00,000 (in order to show answer in lakhs)	
*8,250 + 2% × 8,250	
Net gain on overall position [Long portfolio + Short Nifty futures]	380.17 Lakhs
Amount invested	**20,000 Lakhs**

$$\text{Thus, Net Return} = \frac{380.17}{20{,}000} \times 100 = 1.90\%$$

Nifty return 2%

$$\text{Thus, } \beta = \frac{1.9\%}{2\%}\left[\frac{\text{Portfolio Movement}}{\text{Nifty movement}}\right]$$

= **0.95**

The new systematic risk 0.95

Reference Note:

On shorting a nifty future (or even stock future), we don't get any immediate cash inflow and hence the investment continues to remain 20,000 Lakhs. In case we buy/sell in the spot market, there is an immediate cash outflow/cash inflow. However, in case of futures, there would be no immediate cash flow.

Question 3 *(ICAI SM)/(Practice Manual)*

[Q.14 - AFM 8 (Fast Track) & 9, Q.14 - AFM 10]

On April 1, 2015, an investor has a portfolio consisting of eight securities as shown below:

Security	Market Price	No. of Shares	β Value
A	29.40	400	0.59
B	318.70	800	1.32
C	660.20	150	0.87
D	5.20	300	0.35
E	281.90	400	1.16
F	275.40	750	1.24
G	514.60	300	1.05
H	170.50	900	0.76

The cost of capital 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:

(i) The current NIFTY value is 8500.

(ii) NIFTY futures can be traded in units of 25 only

(iii) Futures for May are currently quoted at 8700 and Futures for June are being quoted at 8850.

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

Summary

Detailed Solution

1. Portfolio β

Security	Amount Invested	β Value	Weight Average
A (29.4 × 400)	11,760	0.59	0.0069

B (318.70 × 800)	2,54,960	1.32	0.3384
C (660.20 × 150)	99,030	0.87	0.0866
D (5.2 × 300)	1,560	0.35	0.0005
E (281.90 × 400)	1,12,760	1.16	0.1315
F(275.4 × 750)	2,06,550	1.24	0.2576
G (514.60 × 300)	1,54,380	1.05	0.1630
H (170.50 × 900)	1,53,450	0.76	0.1173
	9,94,450	**Portfolio β**	**1.1018**

2. Theoretical Futures price

a. June Futures (3 months) [01/04/15 – 30/06/15]

As per cost of carry model

$F = S (e)^{rN}$

$= 8,500 \times e^{0.2 \times 3/12}$ (N = 3)

$= 8,500 \times e^{0.05}$

$= 8,500 \times 1.05127$

(given)

F = ₹ 8935.80

b. May Futures (2 months) [1/4/15 – 31/5/15]

$F = S \times e^{rN}$

$= 8,500 \times e^{0.2 \times 2/12}$ (N = 2)

$= 8,500 \times e^{0.03333}$

$= 8,500 \times 1.03387$ (From WN:1)

F = ₹ 8,787.9

WN 1 - $e^{0.03333}$

We are not given the value for $e^{0.0333}$. However, we are given the values for $e^{0.03}$ and $e^{0.04}$. $e^{0.03333}$ lies in between these 2 values and hence we can use interpolation in order to find these values.

$e^{0.04} - e^{0.03} = 1.04081 - 1.03045$

$e^{0.01} = 0.01036$

e	Difference
0.01	0.01036
0.0033	?

(0.0333 – 0.03)

$e^{0.0033} = 0.01036 \times 0.0033 / 0.01$

$= 0.00342$

$e^{0.0333} = e^{0.03} + e^{0.0033}$

$= 1.03045 + 0.00342$

$e^{0.0333} = 1.03387$

3. No. of Contracts

Strategy : Sell

Maturity : June futures @ 8,850

Reference Note:

In order to hedge, we need to sell the futures on the exchange and the actual price prevailing on the exchange is 8,850. In case the actual price was not given, we can take the theoretical price assuming it to be the same as actual i.e.,

Contract Size

= ₹ 8,850 × 25

₹ 2,21,250

a. No. of Contracts for fully hedging (100%)

$$= \frac{9,94,450 \times 1.1}{2,21,250} \times 100$$

= **4.94** i.e **5 Contracts**

b. 50% Hedging

$$= \frac{9,94,450 \times 1.1}{2,21,250} \times 50\%$$

= 2.47

i.e **2 Contracts**

c. 120% Hedging

$$= \frac{9,94,450 \times 1.1}{2,21,250} \times 120\%$$

= 5.93 i.e. **6 Contracts**

Question 4 *(ICAI Paper May 19)/(RTP Nov 20)*

[Q.18 - AFM 8 (Fast Track) & 9, Q.18 - AFM 10]

A Rice Trader has planned to sell 22000 kg of Rice after 3 months from now. The spot price of the Rice is ₹ 60 per kg and 3 months Future on the same is trading at ₹ 59 per kg. Size of the contract is 1000 kg. The price is expected to fall as low as ₹ 56 per kg, 3 months hence.

Required:

(i) to interpret the position of trader in the Cash Market.

(ii) to advise the trader should take in Future Market to mitigate its risk of reduced profit.

(iii) to demonstrate effective realized price for its sale if he decides to make use of future

market and after 3 months, spot price is ₹ 57 per kg and future contract price for closing the contract is ₹ 58 per kg.

Summary

Detailed Solution

(i) Since the trader has planned to sell rice in the futures market after 3 months, it implies that he needs to have the rice in order to sell it and hence he should be long in the cash (Spot) market.

(ii) In case the trader wants to sell the rice after 3 months, it is advisable to use the futures market and sell at ₹ 59/kg instead of keeping it unhedged, in which case the expected selling price would only be ₹ 56/kg.

(iii) A future's contract can be settled by taking an off-setting position in a similar futures contract for the balance unexpired period. In this case, the trader has originally shorted the rice futures i.e 22 contracts of 1,000 kg each.

On the date of settlement, the futures contract price for closing the contract is ₹ 58/ Kg and hence,

Gain on futures (Net settlement)	=	(₹ 59/kg – ₹ 58/kg) × 1,000 kg × 22 (contracts)
		(S.P) (C.P)
	=	₹ 22,000 C.I
Sell 22,000 kg in spot market (22,000 kg × ₹ 57/kg)	=	₹ 12,54,000 C.I
Total C.I		₹ 12,76,000
÷ Quantity		÷ 22,000 Kg
Sale price per kg		₹ 58/kg

Question 5 *(Practice Manual)*

[Q.20 - AFM 8 (Fast Track) & 9, Q.20 - AFM 10]

X Baking company's equity share has a present market price per share of ₹ 28. A 6 month call option has been written on the stock with an exercise price of ₹ 30. Presently the option has a market value of ₹ 3. At the end of 6 months, you estimate themarket price of the stock to be ₹ 24 per share with a probability of .1, ₹ 28 with aprobability of .2, ₹ 32 with a probability of .4, ₹ 37 with a probability of .2, and ₹ 43 with a probability of. 1.

(a) What is the expected value of share price 6 months hence? What is the expiration value of the option if that expected value of share price should prevail?

(b) What is the expected value of option price at expiration, assuming that the option is

held to this time?

(c) Presently, what is the theoretical value of the option?

Summary

Detailed Solution

a. Expected share price after 6 months

(Based on probability based weighted average)

= 24 (0.1) + 28 (0.2) + 32 (0.4) + 37 (0.2) + 43 (0.1)

= **₹ 32.5**

If expected value of 32.5 is to prevail at expiry, then the holder of the call option would exercise his right to buy at ₹ 30 and hence the payoff would be:

= 32.5 – 30

= **₹ 2.5**

Therefore, at expiration the holder will receive 2.5.

Reference note: Premium is to be paid upfront and hence is not considered in the above working.

b. Spot at expiry

Spot Price	Exercise (S_x > 30)	Option payoff	Probability
24	No	Nil (24 - 30)	0.1
28	No	Nil (28 - 30)	0.2
32	Yes	2 (32 - 30)	0.4
37	Yes	7 (37 - 30)	0.2
43	Yes	13 (43 - 30)	0.1

Expected pay off = 0 × 0.1 + 0 × 0.2 + 2 × 0.4 + 7 × 0.2 + 13 × 0.1

= **₹ 3.5**

Reference Note:

The value of the option is dependent on the pay-off generated in each scenario at expiry. The weighted average of the option pay-off will give us the actual value of the option.

c. Theoretical value of option:

= S_O – PV of X_p

= 28 – 30

= Nil

Exam Notes:

1. *In the absence of information on interest rates, we have ignored the present value calculation in order to determine theoretical value.*
2. *The value of an option can be minimum 0 and it cannot be negative.*

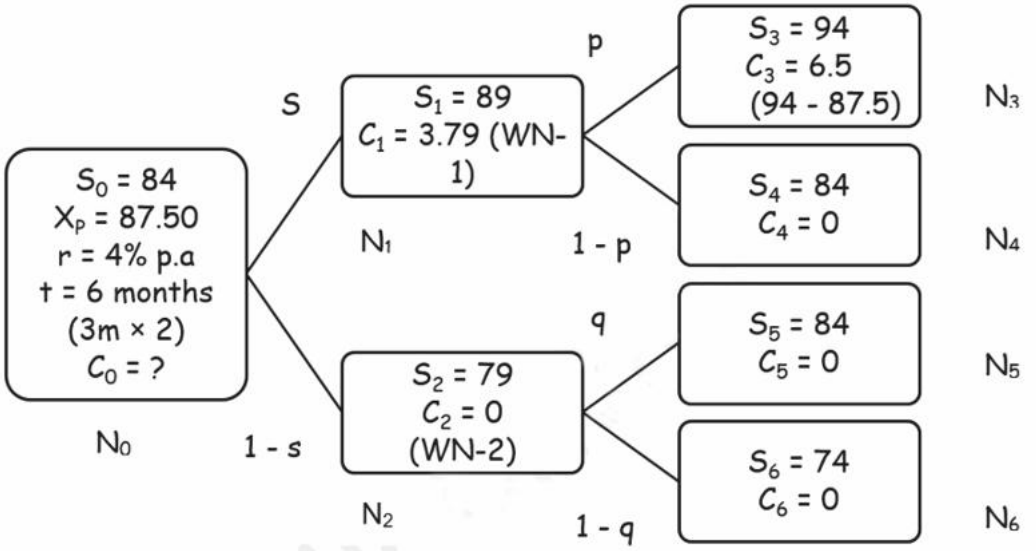
Question 6 *(Practice Manual)*

[Q.33 - AFM 8 (Fast Track) & 9, Q.33 - AFM 10]

Consider a stock which is quoted at ₹ 84. A call option on this available at a strike price of ₹ 87.50. The stock can take values of ₹ 89 or ₹ 79 in 3 months. If it takes a value of ₹ 89, it can go to either ₹ 94 or ₹ 84 in another 3 months and if it takes the value of ₹ 79 after 3 months, it can go to either ₹ 84 or ₹ 74 in another 3 months. The stock is not expected to pay any dividend. It is given that the risk free rate is 4%. Find the price of the call option using binomial model. Using the value of put option, verify the put call parity theorem.

Summary

Detailed Solution



WN-1

At N_1, N_3, N_4

$$S_1 = \frac{S_3 \times P + S_4 \times (1-P)}{\left(1 + r \times \frac{3}{12}\right)}$$

$$89 = \frac{94 \times p + 84 \times (1-p)}{1 + \left(0.04 \times \frac{3}{12}\right)}$$

$$89 = \frac{94p + 84 - 84p}{1.01}$$

89.89 = 10p + 84

5.89 = 10p

P = 0.589

1 – p = 1 – 0.589 = **0.411**

$$C_1 = \frac{C_3 \times P + C_4 (1-P)}{\left(1 + r \times \frac{3}{12}\right)}$$

$$C_1 = \frac{6.5 \times 0.589 + 0(0.411)}{1.01}$$

$$C_1 = \frac{3.83 + 0}{1.01}$$

C_1 = 3.79

Working Note – 2 - At N_2 N_5 and N_6

$$79 = \frac{84q + 74(1-q)}{\left(1 + 0.04 \times \frac{3}{12}\right)}$$

79 × 1.01 = 84q + 74 – 74q

79.79 = 10q + 74

5.79 = 10q

q = 0.579

1 – q = 1 – 0.579

= **0.421**

$$C_2 = \frac{0 \times 0.579 + 0 \times 0.421}{1.01}$$

$$C_2 = \frac{0}{1.01}$$

C_2 = 0

Reference Note:

The above calculation for C_2 Can be avoided and C_2 can directly be taken as 0 irrespective of the probabilities as C_5 and C_6 are both 0.

WN - 3. At N_0, N_1, and N_2

$$84 = \frac{89 \times s + 79 \times (1 - s)}{\left(1 + 0.04 \times \frac{3}{12}\right)}$$

$$84 = \frac{89s + 79 - 79s}{1.01}$$

$84.84 = 10s + 79$

$5.84 = 10s$

$\boxed{S = 0.584}$

$1 - S = 1 - 0.548$

$= \boxed{0.416}$

$$C_O = \frac{3.79 \times 0.584 + 0 \times 0.416}{1 + 0.01}$$

$$C_O = \frac{2.21 + 0}{1 + 0.01}$$

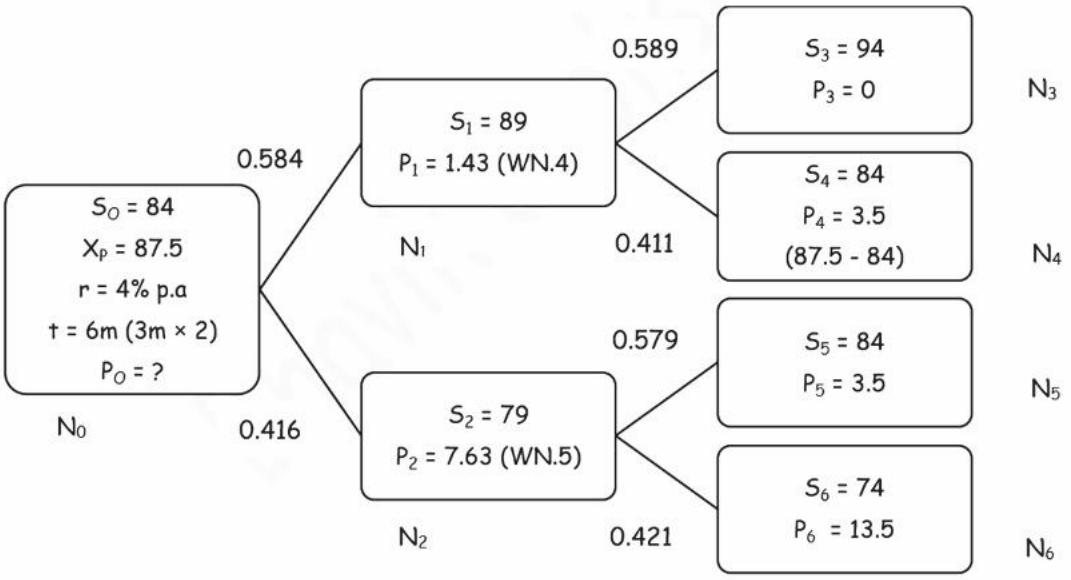
$\boxed{C_O = 2.19}$

Put Option Valuation

Reference Note:

The process remains the same for the put option. However, the pay-offs at the final nodes can be calculated as $X_P - S_X$ and hence pay-off values would change.

Further, since the probabilities are based on spot prices, they would remain the same irrespective of whether it is a call option or a put option.



WN-4. At N_1, N_3, and N_4

$$P_1 = \frac{P_3 \times P + P_4 \times (1-p)}{\left(1 + r \times \frac{3}{12}\right)}$$

$$P_1 = \frac{0 \times 0.589 + 3.5 \times 0.411}{1 + \left(0.04 \times \frac{3}{12}\right)}$$

$$P_1 = \frac{0 + 1.44}{1.01}$$

$$\boxed{P_1 = 1.43}$$

WN - 5. At N_2, N_5, N_6

$$P_2 = \frac{3.5 \times 0.579 + 13.5 \times 0.421}{1 + \left(0.04 \times \frac{3}{12}\right)}$$

$$P_2 = \frac{2.03 + 5.68}{1.01}$$

$$P_2 = \frac{7.71}{1.01}$$

$$\boxed{P_2 = 7.63}$$

WN - 6. Alt N_0, N_1 and N_2

$$P_0 = \frac{1.43 \times 0.584 + 7.63 \times 0.416}{1 + \left(0.04 \times \frac{3}{12}\right)}$$

$$P_0 = \frac{0.84 + 3.17}{1.01}$$

P_0 = ₹ 3.97

Call put parity theory (Discussed after the question)

$P_0 + S_0 = C_0 + PV \text{ of } X_P$

LHS : $P_0 + S_0$

= 3.97 + 84

= **87.97**

RHS : $C_0 + PV \text{ of } X_P$

$$= 2.19 + \frac{87.50}{(1 + 0.04 \times 6/12)} \rightarrow \text{Alternative} : \left(1 + \frac{0.04}{4}\right)^{4 \times 0.5}$$

= 2.19 + 85.78

= **87.97**

Since LHS = RHS, call put parity theory applies.

Exam Reference:

In case the value of both call and put are asked in the question, we can solve for the call option using binomial and directly calculate the value of the put option using call-put parity theory.

$P_0 + 84 = 2.19 + 87.5/1.02$

$P_0 = 2.19 + 85.78 - 84$

P_0 = 3.97

[Instead of doing the entire workings)

Question 7 *(ICAI Paper Nov 19)*

[Q.36 - AFM 8 (Fast Track) & 9, Q.36 - AFM 10]

AB Ltd.'s equity shares are presently selling at a price of ₹ 500 each. An investor is interested in purchasing AB Ltd.'s shares. The investor expects that there is a 70% chance that the price

will go up to ₹ 650 or a 30% chance that it will go down to ₹ 450, three months from now. There is a call option on the shares of the firm that can be exercised only at the end of three months at an exercise price of ₹ 550.

Calculate the following:

(i) If the investor wants a perfect hedge, what combination of the share and option should he select ?

(ii) Explain how the investor will be able to maintain identical position regardless of the share price.

(iii) If the risk-free rate of return is 5% for the three months period, what is the value of the option at the beginning of the period?

(iv) What is the expected return on the option?

Summary

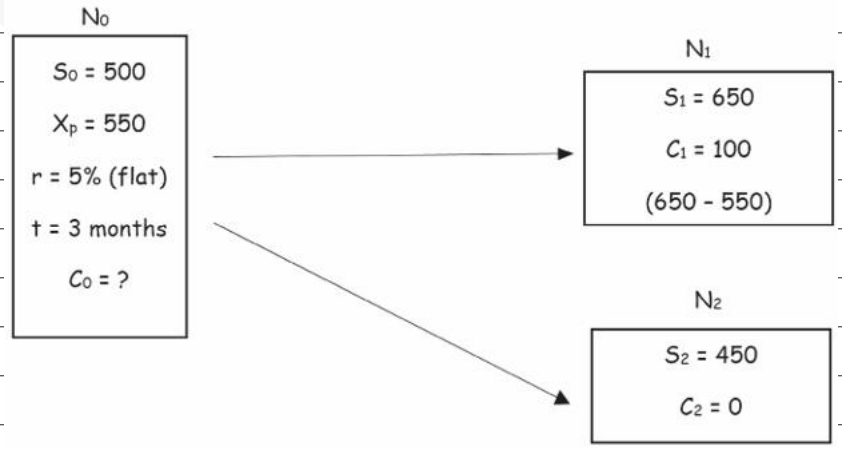
Detailed Solution

Reference Note:

1. *We are asked to find the ratio of the share and the options in order to achieve a perfect hedge. Hence, we solve considering the riskless hedge approach. Further, we can show identical position regardless of the share price only under the riskless hedge approach and hence we have solved accordingly.*
2. *The probabilities are given in the question. However, they need to be ignored since we are solving using the riskless hedge method. The probabilities of 70% and 30% are the probabilities as expected by AB. These may be different as compared to the risk neutral probabilities which we calculate by applying the methods solved in the earlier question.*

Solution:

1. Riskless Hedge



2. **Hedged Portfolio**: Buy shares and short call options

Let no. of shares be x and the premium on call options be ₹ C_0

Thus, amount invested in hedged portfolio today

$= 500x - C_0$ .....(1)

3. Since position is hedged , outcome at N_1 and N_2 will be the same i.e.,

$650x - 100 = 450x - 0$

Thus, $200x = 100$

Thus, x = 0.5…..Part (i)

$$\left(\frac{C_1 - C_2}{S_1 - S_2} = \frac{100 - 0}{650 - 450} = 0.5\right)$$

4. Substituting $x = 0.5$ at

$N_1 = 650 \times 0.5 - 100 = 225$

$N_2 = 450 \times 0.5 - 0 = 225$ (Part ii)

5. Since position is risk-free, we will earn a risk-free rate and hence,

$$\text{PV of position today} = \frac{225}{(1 + 0.5\ (flat))}$$

$$= 214.29$$

6. Amount invested today $500x - C_0$ (Step – 2) = 214.29 (step – 5)

Thus, $250 - C_0 = 214.29$

Thus, $C_0 = 35.71$ (Part iii)

Answers:

(i) In order to have a perfect hedge, we should hold the shares and the options in the ratio of 0.5:1 i.e., 0.5 shares to be bought for every call option sold.

(ii) As can be seen, irrespective of whether the price is 650 or 450, the hedged position is worth ₹ 225 (N_1 and N_2)

(iii) Value of call option (C_0) = ₹ 35.71

Expected return on the option

An option holder will have to pay ₹ 35.71 today in order to purchase the call option. In case this option is held up to maturity, there is a possibility of earning ₹ 100 (70% probability) or ₹ 0 (30% probability)

Thus, expected pay-off for the option

$= 100 \times 0.70 + 0 \times 0.30$

= **70**

Thus return (%) for 3 months

= (70 – 35.71)/35.71 × 100

= **96.02%**

[Like, $P_1 - P_0/P_0 \times 100$ of portfolio]

Extra: In case % p.a return to be calculated, we will multiply by $^{12}/_{3.}$

Question 8 *(ICAI SM)/(MTP Oct 22)*

[Q.38 - AFM 8 (Fast Track) & 9, Q.38 - AFM 10]

(i) The shares of TIC Ltd. are currently priced at ₹ 415 and call option exercisable in three month's time has an exercise rate of ₹ 400. Risk free interest rate is 5% p.a. and standard deviation (volatility) of share price is 22% and assuming there is no dividend over the next three months, is the option worth buying for ₹ 25?

(ii) Calculate value of aforesaid call option based on Black-Scholes valuation model if the current price is considered as ₹ 380.

(iii) What would be the worth of put option if current price is considered ₹ 380?

(iv) If TIC Ltd. share price at present is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two month's time, then, calculate value of the call option.

Summary

Detailed Solution

1. Given S_0 = ₹ 415

Xp = 400

σ = 22% i.e., 0.22

r = 5% p.a

t = 3/12 = 0.25 years = 0.25 years

(i) $$\frac{l_n\left(\frac{S_0}{X_p}\right)}{\text{i.e., } l_n\left[\frac{415}{400}\right]}$$

l_n [1.0375]

i.e., $\log_e$ 1.0375

Applying the change of base rule,

$$l_n [1.0375] = \frac{\log_{10} 1.0375}{\log_{10} e}$$

$$= \frac{0.01598}{0.4343}$$

$$= \boxed{0.0368}$$

2. $D_1 = \dfrac{I_n\left[\dfrac{S_o}{X_p}\right] + \left[r + \dfrac{\acute{o}^2}{2}\right] \times t}{\sqrt{t} \times \sigma}$

$$= \frac{0.0368 + \left(0.05 + \frac{0.22^2}{2}\right) \times 0.25}{\sqrt{0.25} \times 0.22}$$

$$= \frac{0.05535}{0.11}$$

$$= \boxed{0.50}$$

Therefore, $D_2 = D_1 - (\sqrt{t} \times \sigma)$

$= 0.50 - (\sqrt{0.25} \times 0.22)$

$= 0.50 - 0.11$

$= \boxed{0.39}$

3. $N(D_1) = N(0.50)$

$= 0.5 + 0.1915$

$= \boxed{0.6915}$

$N(D_2) = N(0.39)$

$= 0.5 + 0.1517$

$= \boxed{0.6517}$

4. e^{rt}:

$= e^{0.05 \times 0.25}$

$= e^{0.0125}$

Let $x = e^{0.0125}$

Taking log on both sides

$\log x = 0.0125 \log e$

$= 0.0125 \times 0.4343$

$= \boxed{0.0054}$

x = Antilog 0.0054

$\boxed{x = 1.0125}$

5. $C_0 = S_0 \times N(D_1) - [X_p / e^{rt} \times N(D_2)]$

$= 415 \times 0.6915 - [400/1.0125 \times 0.6517]$

$= 286.97 - 257.46$

$= \boxed{29.51}$

The option is worth buying at ₹ 25 since it is under-valued.

(ii) $I_n\left(\frac{S_0}{X_p}\right)$:

$= I_n\left(\frac{380}{400}\right)$

$= I_n (0.9500)$

Applying changes of base rule,

1. $I_n (0.9500) = \frac{log_{10} 0.95}{Log_{10} e}$

$= \frac{-0.0223}{0.4343}$

$= \boxed{\mathbf{(0.0513)}}$

2. $D_1 = \frac{I_n\left(\frac{S_0}{X_p}\right) + \left(r + \frac{\sigma^2}{2}\right) \times t}{\sqrt{t} \times \sigma}$

$= \frac{(0.0513) + 0.01855}{0.11}$

$= \frac{(0.03275)}{0.11}$

$= \boxed{\mathbf{(0.2977)}}$

Thus, $D_2 = D_1 - \left(\sqrt{t} \times \sigma\right)$

$= (0.2977) - 0.11$

$= \mathbf{(0.41)}$

3. $N (D_1) = N (- 0.30)$

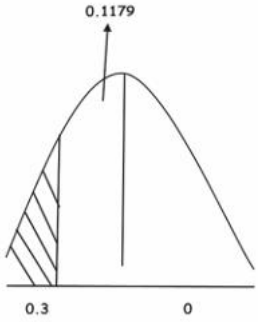
$= 0.5 - 0.1179$

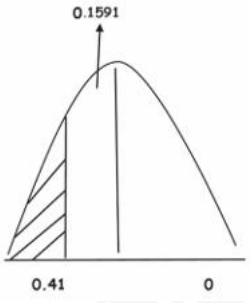
$= \mathbf{0.3821}$

$N (D_2) = N (-0.41)$

$= 0.5 - 0.1591$

$= \mathbf{0.3409}$





4. e^{rt} = $e^{0.05 \times 0.25}$ = 1.0125 (same as part i)

5. C_0 = $S_0 \times N(D_1) - \left[\frac{X_p}{e^{rt}} \times N(D^2)\right]$

= $380 \times 0.3821 - \left[\frac{400}{1.0125} \times 0.3409\right]$

= 145.198 – 134.68

= **10.52**

(iii) <u>Using call put parity theory</u>

S_0 = 380

X_p = 400

C_0 = 10.52

P_0 = ?

R = 5% p.a

t = 3 months

$P_0 + S_0 = C_0 + Xp / e^{rt}$

[Since C_0 based on continuous compounding, PV of X_p should also be based on continuous compounding]

Thus, $P_0 + 380 = 10.53 + 400/e^{0.05 \times 0.25}$

Thus, P_0 = 10.52 + 400/1.0125 - 380

Thus, P_0 = 25.58

(iv) Black Scholes Model with dividend

In case the dividend is paid before expiry of the call option, then instead of taking the spot price directly, we will take the ex-dividend spot price i.e., adjusted S_0.

Adjusted S_0 = S_0 – PV of dividend

= $S_0 - D / e^{rt}$

[Black Scholes Model : Continuous compounding]

Where,

t = No. of years (Months / 12) after which dividend is going to be received.

Adjusted S_0 = S_0 – PV of dividend

= $S_0 - D/e^{rt}$

= $408 - 10/e^{0.05 \times 2/12}$

= $408 - 10/e^{0.00833}$

= 408 – 10/1.0083 (WN – 1)

= 408 – 9.92

= **398.08**

Working Note – 1: $e^{0.00833}$:

Let x = 0.00833 log e

= 0.00833 × 0.4343

= **0.0036**

Thus x = Antilog (0.0036)

Thus, x = 1.0083

Reference Note: *Wherever S_0 was used, we will use adjusted S_0*

1. l_n (Adjusted S_0/X_P)

$$l_n\left[\frac{398.08}{400}\right]$$

l_n (0.9952)

Applying the change of base rule,

$\log_e 0.9952 = \log_{10} 0.9952 / \log_{10} e$

= - 0.0021/0.4343

= **(0.0048)**

2. $D_1 = l_n + \dfrac{ln + (Adjusted\ S_0/Xp) + (r + \frac{\sigma^2}{2}) \times t}{\sqrt{t} \times \sigma}$

$$= \frac{(0.0048) + \left[0.05 + \frac{0.22^2}{2}\right] \times 3/12}{\sqrt{\frac{3}{12}} \times 0.22}$$

$$= \frac{(0.0048) + 0.01855}{0.11}$$

$$= \frac{0.01375}{0.11}$$

$$= 0.125$$

i.e 0.13

Thus $D_2 = D_1 - \sqrt{t} \times \sigma$

$= 0.13 - \sqrt{0.25} \times 0.22$

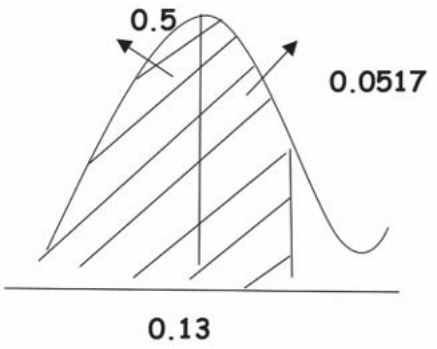
$= 0.13 - 0.11$

$=$ **0.02**

3. $N(D_1) = N(0.13)$

$= 0.5 + 0.0517$

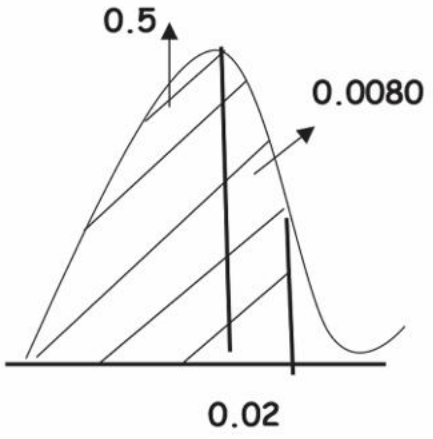
$=$ **0.5517**



$N(D_2) = N(0.02)$

$= 0.5 + 0.0080$

$=$ **0.5080**



4. $e^{rt} = e^{0.05 \times 0.25} = e^{0.0125} = 1.0126$

5. C_0 = Adjusted $S_0 \times N(D_1) - \left(\frac{X_p}{e^{rt}}\right) \times N(D_2)$

= 398.08 × 0.5517 – 400/1.0125 × 0.5080

= 219.62 – 200.69

= **18.93**

Question 9 *(ICAI SM)*

[Q.49 - AFM 8 (Fast Track) & 9, Q.40 - AFM 10]

Suppose MIS Ltd. is considering installation of solar electricity generating plant for light the staff quarters. The plant shall cost ₹ 2.50 crore and shall lead to saving in electricity expenses at the current tariff by ₹ 21 lakh per year forever.

However, with change in Government in state, the rate of electricity is subject to change. Accordingly, the saving in electricity can be of ₹ 12 lakh or ₹ 35 lakh per year and forever.

Assuming WACC of MIS Ltd. is 10% and risk-free rate of rate of return is 8%.

Decide whether MIS Ltd. should accept the project or wait and see.

Summary

Detailed Solution

Note: In this case we have not been told the time horizon for a possible change in the government. We have assumed it to be 1 year.

At the current level (Year 0)

Particulars	Amount
PVCI (As per Gordon's formula) = $\frac{₹\ 21\ Lakhs}{0.10 - 0}$	₹ 210 Lakhs
(-) PVCO	(₹ 250 Lakhs)
NPV	(₹ 40 Lakhs)

Therefore at the current level, if there is no expected change in the government, the NPV is negative and it is not worth accepting the project.

Evaluation after 1 year

(a) In case the saving in electricity is ₹ 35 Lakhs p.a, then the present value of savings after 1 year

$= \frac{35 Lakh}{0.10 - 0} = ₹ 350 \text{ Lakhs}$

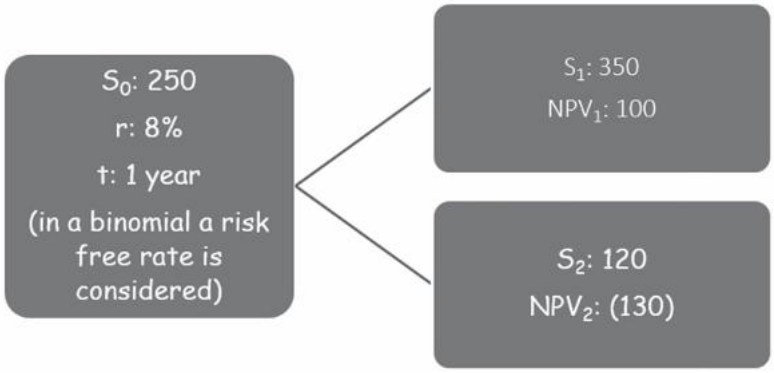
Therefore, NPV = 350 - 250 = 100

(b) Similarly, if the savings are ₹ 12 Lakhs p.a, then the present value of these savings after 1 year

$= \frac{12 Lakh}{0.10 - 0} = ₹ 120 Lakhs$

Therefore, NPV = 120 – 250 = (130) lakhs

Reference Note: The evaluation is done in a manner similar to binomial since there are 2 possibilities. It is like saying that on an investment is a share worth 250 today, the share may possibly become either 350 or 120 after 1 year



Reference Note: The binomial evaluation is based on a risk less / risk neutral set up and hence the relevant rate is binomial would be the risk free rate.

Let the probability of up move be 'p' and the probability of downmove would be '1-p'

Therefore, $250 = \frac{350 \times p + 120 \times (1 - p)}{1 + 0.08}$

$270 = 350p + 120 - 120p$

Therefore, $150 = 230p$

Therefore, $p = 0.652$

Therefore, $1 - p = 1 - 0.652 = 0.348$

Expected NPV $= \frac{100 \times 0.652 + (130) \times 0.348}{1 + 0.08}$

$= \frac{65.2 - 45.24}{1.08}$

$= \frac{19.96}{1.08}$

= 18.48

Since the expected NPV is positive, it is advisable to wait for 1 year

Reference Note: In this Question, there is no separate option given to us by any party. However, the decision to be made is whether it is worth waiting for a year or not. Hence, if the cash flows were 12 lakhs, the NPV would be negative. We should not write 0 like we do in case there were options. Further, the project starts after 1 year and hence the relevant discount rate would be to compensate for the time value i.e. 8%.

Question 10 *(ICAI SM)*

[Q.48 - AFM 8 (Fast Track) & 9, Q.50 - AFM 10]

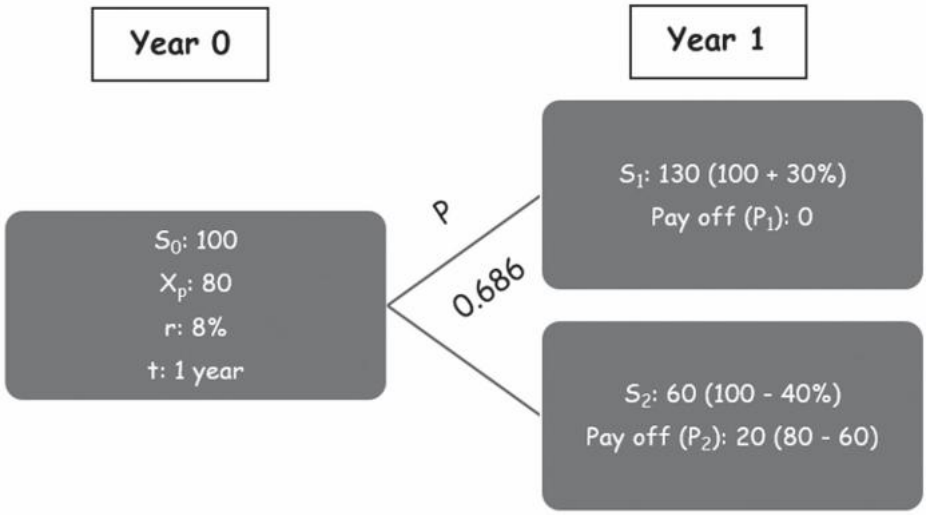
IPL already in production of Fertilizer is considering a proposal of building a new plant to produce pesticides. Suppose the PV of proposal is ₹ 100 crore without the abandonment option. However, if market conditions for pesticide turns out to be favourable the PV of proposal shall increase by 30%. On the other hand, market conditions remain sluggish the PV of the proposal shall be reduced by 40%. In case company is not interested in continuation of the project it can be disposed of for ₹ 80 crore.

If the risk-free rate of interest is 8% then what will be value of abandonment option.

Summary

Detailed Solution

Reference Note: In this case, the date when uncertainty pertaining to market condition is resolved is not given. Further, the date when abandonment option would be available has also not been given. In line with ICAI solutions, we have assumed that the uncertainty is likely to be resolved after 1 year and the abandonment option is also available for exercise after 1 year. Alternatively, any other time horizon can also be assumed. Further, since there are, exactly 2 possibilities, we can use binomial method. (Since Standard deviation is not available, Black Scholes method is not possible.)



Reference Note: *An abandonment option gives us a right to sell (exit) and hence is similar to a put option. After 1 Year if the project is given us 130, we will not exercise the put option which gives us only 80 and hence the payoff will be nil. However, in case the project is likely to give only 60, it is advisable to exercise the option and get ₹ 80 instead of 60 thereby resulting in a payoff of ₹ 20.*

Let the probability of up move be P

Therefore, the probability of downmove be 1 – p

$$100 = \frac{130p + 60(1-p)}{(1+0.08)}$$

Therefore, 108 = 130p + 60 - 60p

48 = 70p

Therefore, p = 0.686

Therefore, 1 - p = 1 - 0.686 = 0.314

$$P_0 = \frac{0 \times 0.686 + 20 \times 0.314}{1.08}$$

$$= \frac{0 + 6.28}{1.08} = 5.81$$

Question 11 *(ICAI SM)*

[Q.49 - AFM 8 (Fast Track) & 9, Q.51 - AFM 10]

Suppose MIS Ltd. is considering installation of solar electricity generating plant for light the staff quarters. The plant shall cost ₹ 2.50 crore and shall lead to saving in electricity expenses at the current tariff by ₹ 21 lakh per year forever.

However, with change in Government in state, the rate of electricity is subject to change. Accordingly, the saving in electricity can be of ₹ 12 lakh or ₹ 35 lakh per year and forever.

Assuming WACC of MIS Ltd. is 10% and risk-free rate of rate of return is 8%.

Decide whether MIS Ltd. should accept the project or wait and see.

Summary

Detailed Solution

Note: In this case we have not been told the time horizon for a possible change in the government. We have assumed it to be 1 year.

At the current level (Year 0)

Particulars	Amount
PVCI (As per Gordon's formula) = $\frac{₹\ 21\ Lakhs}{0.10-0}$	₹ 210 Lakhs
(-) PVCO	(₹ 250 Lakhs)
NPV	(₹ 40 Lakhs)

Therefore at the current level, if there is no expected change in the government, the NPV is negative and it is not worth accepting the project.

Evaluation after 1 year

(a) In case the saving in electricity is ₹ 35 Lakhs p.a, then the present value of savings after 1 year

$= \frac{35 Lakh}{0.10-0} = ₹\ 350\ Lakhs$

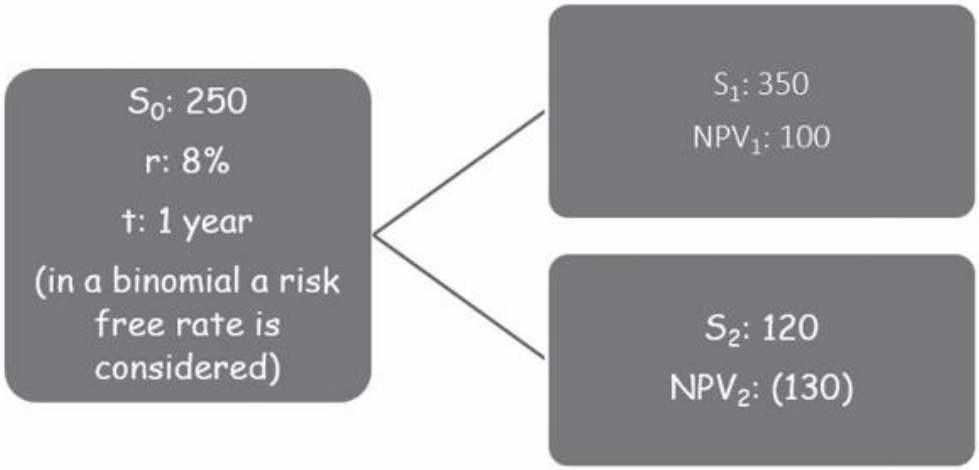
Therefore, NPV = 350 - 250 = 100

(b) Similarly, if the savings are ₹ 12 Lakhs p.a, then the present value of these savings after 1 year

$= \frac{12 Lakh}{0.10-0} = ₹\ 120 Lakhs$

Therefore, NPV = 120 – 250 = (130) lakhs

Reference Note: The evaluation is done in a manner similar to binomial since there are 2 possibilities. It is like saying that on an investment is a share worth 250 today, the share may possibly become either 350 or 120 after 1 year



Reference Note: The binomial evaluation is based on a risk less/risk neutral set up and hence the relevant rate in binomial would be the risk free rate.

Let the probability of up move be 'p' and the probability of downmove would be '1-p'

Therefore, $250 = \frac{350 \times p + 120 \times (1-p)}{1+0.08}$

$270 = 350p + 120 - 120p$

Therefore, $150 = 230p$

Therefore, $p = 0.652$

Therefore, $1 - p = 1 - 0.652 = 0.348$

Expected NPV $= \frac{100 \times 0.652 + (130) \times 0.348}{1+0.08}$

$= \frac{65.2 - 45.24}{1.08}$

$= \frac{19.96}{1.08} = 18.48$

Since the expected NPV is positive, it is advisable to wait for 1 year

Reference Note - 1

1) *In this Question, there is no separate option given to us by any party. However, the decision to be made is whether it is worth waiting for a year or not. Hence, if the cash flows were 12 lakhs, the NPV would be negative. We should not write 0 like we do in case there were options. Further, the project starts after 1 year and hence the relevant discount rate would be to compensate for the time value i.e. 8%.*
2) *ICAI has calculated probabilities in road option questions (Q48,Q49) using percentage return method.*

i.e. Rf = Ru. P Rd (1-p) , Alternative Method are possible giving same assurer

Reference Note - 2

Ideally if there was a timing option, then after 1 year if the NPV was negative, we would not enter into the project and hence the result ant NPV would be nil.However, ICAI has ignored this and taken the NPV as negative 1.3 and hence we have solved accordingly. This is probably because ICAI is considering that there are no separate option after 1 year ie we have to go ahead with the project after 1 year, if we don't go ahead with the project today. If we necessarily go ahead with the project we will get +1 cr (65% chance) or – 1.3 cr (35% chance).

Question 12 *(ICAI Paper Nov 23)*

[Q.63 - AFM 8 (Fast Track) & 9, Q.52 - AFM 10]

Following is the information available pertaining to shares of Omni Ltd.:

Current Market Price (₹)	₹ 420.00
Strike Price (₹)	₹ 450.00
Maximum Price (₹) expected in next 3 months' time	₹ 525.00
Minimum Price (₹) expected in next 3 months' time	₹ 378.00
Continuously Compounded Rate of Interest (p.a) (%)	8.00%
e^{rt}	1.0202

From the above :

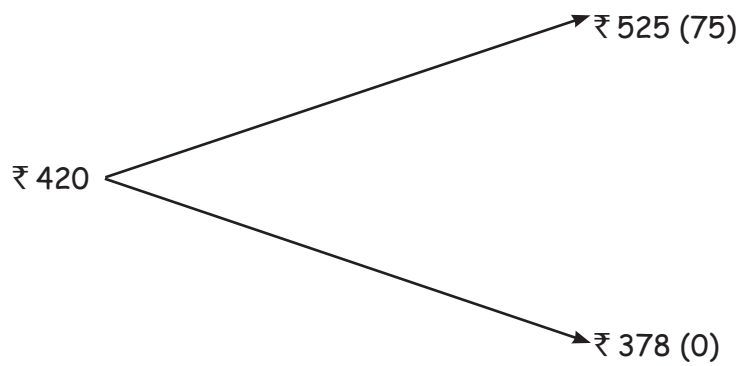
(i) Calculate the 3 months call option by using Binomial Method and Risk Neutral Method. Are the calculated values under both the models are same?

(ii) State also clearly the basis of Valuation of option under these models.

Summary

Detailed Solution

(i) (1) Call Option value using Binomial Model



$$\Delta = \frac{₹525 - ₹378}{₹75 - 0} = 0.51$$

Initial Investment = 0.51 x 420 = 214.20

Value of Portfolio if Price goes down to ₹ 378 Value of holding 0.51 x ₹ 378 = 192.78 Accordingly Let 'P' be the option price, then

₹ 214.20 - P = ₹ 192.78/1.0202 = ₹ 188.96

P = ₹ 25.24

(2) Value of Call Option using Risk Neutral Method

Let "P' be the probability of Price increase, then p x 525 + (1 - p) x 378 = 420(1.0202)

147p = 50.48

p = 0.34

Probability of Price increase = 0.34 Probability of Price decrease= 0.66

$$\frac{0.34 \times 75 + 0.66 \times 0}{1.0202} = ₹25.24$$

Yes, the value of option under both Models is same

(ii) Basis of valuation of options:

- Binomial model uses an approach called " Risk less Hedge Approach" to find the price of the option, by creating a portfolio which will have same value at expiration irrespective of any price. Hedge means to create an equal and opposite position for protecting the value of portfolio.
- In Risk Neutral Model, valuation of options is based on arbitrage and is therefore independent of risk preferences; one should be able to value options assuming any set of risk preferences and get the same answer.

CHAPTER 11 INTEREST RATE RISK MANAGEMENT

Question 1 *(ICAI SM)/(MTP March 19)*

[Q.4 - AFM 8 (Fast Track) & 9, Q.4 - AFM 10]

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)

Summary

Detailed Solution

TM Fincorp

FRA : 01/01/09

Actual borrowing : 01/07/09 (fixing date)

Repayment : 30/09/09

FRA : 6 × 9 : Buy interest @ 5.25% C.P

On 01/07/09 : Actual borrowing: 3 months @ 5.50%

Reference Note:

Fixing date refers to the date when the actual borrowing is intended to be taken i.e. assuming that the FRA is entered on 01/01/09 and in case of 6 × 9 FRA the fixing date would be 01/07/09 and the borrowing along with interest is to be repaid within 3 months from the date of fixing i.e. 30/09/09.

Solution

a. The original strategy : Bought FRA [i.e., buy 6 × 9 FRA @ 5.25% (C.P)]

On the fixing date (after 6 months) the spot rate for a 3 months borrowing comes to 5.5%. An existing buy FRA position would be settled through a sell FRA position i.e. we would take the settlement rate at 5.5% (S.P) i.e.,

Gain/loss (in basis points)

= 5.5% - 5.25%

= **0.25%**

i.e. 25 basis points

Reference Note:

On 01/07, the actual borrowing is taken and hence the gain/loss is fixed. Since interest will subsequently accrue over the next 3 months, the next settlement for interest should ideally happen after 3 months from the fixing date.

b. Settlement Amount

(i) Settlement amount at the end of borrowing term (i.e., 9th month)

= 100 Crs × (5.50% – 5.25%) % × 3/12

= **₹ 6,25,000**

(ii) On fixing date (i.e., 6th month)

$$= \frac{(5.00\% - 5.25\%) \times ₹\ 100\ Crs \times 3/12}{(1 + 0.055 \times 3/12)}$$

$$= \frac{6,25,000}{1.01375}$$

= **₹ 6,16,523**

Question 2 *(RTP May 18)/(Practice Manual)*

[Q.5 - AFM 8 (Fast Track) & 9, Q.5 - AFM 10]

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

It is expected that firm shall borrow a sum of €50 million for the entire period of slack season in about 3 months.

A Bank has given the following quotations:

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

3 month €50,000 future contract maturing in a period of 3 months is quoted at 94.15 (5.85%).

You are required to determine:

(a) How a FRA, shall be useful if the actual interest rate after 3 months turnout to be:
(i) 4.5% (ii) 6.5%

(b) How 3 months Future contract shall be useful for company if interest rate turns out as mentioned in part (a) above.

Summary

Detailed Solution

Electra Space : Borrower

a. FRA:

1. Strategy: Buy interest rate FRA
2. Maturity: 3 × 9 FRA at 5.94%

Reference Note:

The slack season is expected to start after 3 months and is expected to continue for 6 more months and hence the entity needs to borrow for a period of 6 months after 3 months i.e., 3 × 9 FRA is appropriate

Settlement	4.5%	6.5%
Interest cost on spot borrowing	(€ 1.125 m) (€ 50 m × 4.5% × $^{6}/_{12}$)	(€ 1.625m) (€50m × 6.5% × $^{6}/_{12}$)
± Gain/loss on FRA	(€ 0.36 m) ((4.5 – 5.94)% × € 50m × $^{6}/_{12}$)	€ 0.14 m [(6.5 – 5.94)% × 50m × $^{6}/_{12}$)
Net Interest cost	(€ 1.485)	(€ 1.485)

Reference Note:

Effective Interest Rate = $\frac{€1.485}{€50} \times 100 \times \frac{12}{6}$

= **5.94% p.a**

As can be seen, irrespective of the spot rate, the effective interest rate is € 1.485 million (5.94%).

b. Interest rate futures:

1. Strategy : Sell bond futures
2. Maturity : 3 months futures contract maturing after 3 m at 94.15 SP

3. No of contract = € 5,00,00,000 / € 50,000 × 6/3

   = **2,000 Contracts**

4. Today: Electra space would sell 2,000 3 months futures at 94.15 (S.P)

5. On settlement

Particulars	4.5% (i.e. 100 – 4.5 = 95.5)	6.5% (i.e. 100 – 6.5 = 93.5)
Interest on actual borrowing	(€ 1.125 m) (€ 50m x 4.5% x $^{6}/_{12}$)	(€ 1.625 m) (€ 50 m × 6.5% x $^{6}/_{12}$)
± Gain/loss on futures	(€ 0.3375 m) [(94.15-95.5)% x $^{3}/_{12}$ x € 50,000] × 2,000	€ 0.1625 m [(94.15-93.5)% x $^{3}/_{12}$ x € 50,000] × 2,000
Net Interest Cost	(€ 1.4625)	(€ 1.4625)

Reference Note:

Effective interest rate

$$= \frac{€1.4625}{€50} \times 100 \times \frac{12}{6} = \mathbf{5.85\%}$$

Irrespective of the spot rate, the interest cost continues to be € 1.4625 (5.85%).

It is advisable to hedge using futures as it results in a lower interest cost.

Question 3 *(ICAI SM)/(RTP Nov 22)/(MTP April 18)/(MTP Aug 18)/(MTP Oct 19)/(MTP May 20)/(Practice Manual)*

[Q.9 - AFM 8 (Fast Track) & 9, Q.9 - AFM 10]

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 andamount nearest to £. It should be part of working notes.

Summary

Detailed Solution

Reference Note:

Premium is paid upfront whereas the settlement happens at the end of each reset period. In order to make the settlement amount at each reset date comparable with the premium, they need to be brought at the same point of time. This can be done by bringing the payoffs to the present value or taking the premium to the future value.

ICAI usually converts the upfront premium into the future value by converting it into an annuity i.e. hypothetically if instead of an upfront premium, the premium was payable in equal instalments over the settlement period, then what would be the equal instalment payable in each period for such a premium. This can be calculated as follows:

Premium (upfront) = Z × PVAF (x %, y years)

Where, the discount factor is to be the fixed rate of interest on the date when cap is taken.

If the reset periods are at one year intervals then we will take the discount factor on a per annum basis and years. However, in case the reset periods are at 6 months intervals then we will take the half yearly interest and also the number of half years.

Upfront premium = £ 1,50,00,000 × 1%

= **£ 1,50,000**

Interest is payable 6 monthly and the loan is for 24 months.

Thus, no of half yearly payments = $\frac{\text{24 months}}{\text{6 months}}$ = 4

Fixed interest rate (half yearly) = $7 \times {}^{6}/_{12}$

= **3.5%**

Let the equal half yearly premium be £ *x*

£ 1,50,000 = *x* × 3.6731 PVAF (3.5%; 4 Half years)

$x = \frac{£1,50,000}{3.6731}$

x = **£ 40,837**

Reference Note: *This implies that an entity should be indifferent paying £ 150,000 upfront or £ 40,837 pounds over 4 half years.*

Calculation of the effective pay off under cap (LIBOR > 8%)

Reset Period	LIBOR	Cap Exercise	Cap Pay off	Half yearly premium	Effective Pay-off
1	9%	Yes	**75,000** $\left[£1,50,00,000 \times (9\% - 8\%) \times 6/12\right]$	(£40,837)	34,163
2	9.5%	Yes	**1,12,500** $\left[£1,50,00,000 \times (9.5\% - 8\%) \times 6/12\right]$	(£40,837)	71,663
3	10%	Yes	**1,50,000** $\left[£1,50,00,000 \times (10\% - 8\%) \times 6/12\right]$	(£40,837)	109,163
			£ 3,37,500		£ 214,989

Reference Note:

1. The above workings for annualised premium needs to be done if:
   a. Premium is paid upfront (Q8 Premium NIL)
   b. Fixed rate of interest on the date when cap is taken is given (this rate was not given on 01/10/12 in Q 15)
2. Unless given, the strike rate (8%) needs to be compared to LIBOR (and not LIBOR +10%)
3. In this case, the reference rate is 6 months LIBOR and hence for a 24 month loan, there would be 4 reset periods. However, in absence of LIBOR on fourth reset date we have assumed that the fourth reset date has not yet arrived and the position cannot be determined. Hence the calculation is done for 3 reset periods only.
4. In case effective interest at each reset period was asked, it can be calculated as follows:

Reset period	Interest	Capital net pay-off	Net interest
1	14,25,000 $\left[19\% \times £1,50,00,000 \times \frac{6}{12}\right]$ ↓ (9% + 10%)	(34,163)	13,90,837

5. In this case, the additional interest of £ 3,37,500 can be effectively reduced by £ 2,14,989 using the CAP option.

Question 4 *(ICAI Paper May 23)/(MTP March 23)/(MTP March 21/MTP Oct 21)*

[Q.18 - AFM 8 (Fast Track) & 9, Q.19 - AFM 10]

IF an Indian firm has its subsidiary in Singapore and SF a Singapore firm has its subsidiary in India and face the following interest rates:

Company	IF	SF
INR Floating Rate	BPLR + 0.5%	BPLR + 1.5%
SGD (fixed rate)	3%	3.50%

SF wishes to borrow Rupee loan at a floating rate and IF wishes to borrow SGD at a fixed rate. The amount of loan required by both the companies is same at the current exchange rate. A Bank arranges a swap and requires 50 basis points as its commission, which is to be shared equally. IF requires a minimum gain of 20 basis points and SF requires a minimum gain of 10 basis points for structuring the deal. The Bank is very keen to structure the deal, even if, it has to forego a part of its commission.

You are required to find out:

(i) Whether there are any advantages available to IF and SF?

(ii) Whether a swap can be arranged which may be beneficial to both the firms

(iii) What rate of interest will they end up paying? Show detailed working.

Summary

Detailed Solution

(i) If seems to be the relatively stronger party as it can barrow at a cheaper rate in both the markets.

However, for the possibility of swap, we need to check whether there exists interest saving which can be shared after considering banker's commission

	IF	SF
Desired	Fixed	Floating
INR Floating	BPLR + 0.5%	BPLR + 1.5%
SGD Fixed	3%	3.5%

Combined

Desired: 3% + BPLR + 1.5% = BPLR +4.5%

Alternative: BPLR + 0.5% +3.5% = BPLR +4.0%

Savings = 0.5%

Incase the banker is given 0.5% commission there would be no further interest savings left for IF and Sf – If requires a minimum 0.2% and SF requires a minimum 0.1%. The banker is willing to forego some of its commission.

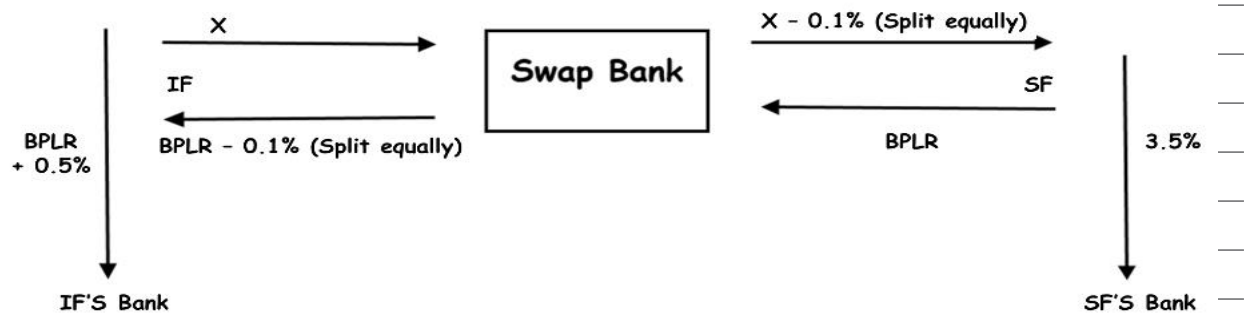
Therefore, incase IF gets 0.2% & SF gets 0.1% there is still 0.5 -0.2- 0.1 = 0.2%

Remaining for the banker.

Hence, the swap can be structured.

(ii) Ultimate cost of borrowing

	Desired	-	Int saving	
IF:	3%		0.2%	= 2.8%
SF:	BPLR + 1.5%	-	0.1%	= BPLR +1.4%



Assume SF pays BPLR & IF pays x (Fixed)

We have been told that the banker's commission of 0.2% will be shared equally.

i.e. 0.1 – 1 each – borne by IF & SF

Hence, while SF pays "BPLR", IF will receive "BPLR – 0.1% and when IF pays " x SF will receive " x - 0.1%"

∴ Net cost of financing:

IF (2.8%) = Pay to bank – Receives from swap + Pay under swap

2.8% = BPLR + 0.5% - (BPLR – 0.1%) + x

x = 2.2%

SF (BPLR + 1.4%)

Verification Pay to Bank – Receives under swap + Pay under swap

= 3.5% - (|x| – 0.1-1%) + BPLR

= 3.5% - (2.2- 0.1)% + BPLR

= BPLR + 3.5% - 2.1%

= BPLR + 1.4%

= LHS = RHS

As can be seen, the ultimate cost of financing for IF is 2.8% and for SF is BPLR + 1.4% under the swap IF agrees to Pay fixed 2.2% and SF agrees to pay BPLR.

Any other alternative arrangement which gives the same ultimate cost can also apply.

ICAI has assumed that SF reimburse exactly IF'S borrowing cost i.e. BPLR + 0.5% and hence our x would proportionately adjust to 2.7% (2.2 % + 0.5%)

Ultimate cost of financing would remain the same.