

Extra Sums
Ch – 13 Mergers & Acq.

1.

The total values both equity and debt of two companies, Sun Ltd. and Moon Ltd. are expected to fluctuate according to the state of the economy:

Particulars	Economic state		
	Recession	Slow growth	Rapid growth
Probability			0.20
Total values (Rs. lakhs):	0.15	0.65	
Sun Ltd.			225
Moon Ltd.	126	165	360
	189	240	

Currently, Sun Ltd. has Rs. 135 lakhs of debt, and Moon Ltd. Rs. 30 lakhs of debt.

If the two companies were to merge and assuming that no operational synergy occurs as a result of the merger, calculate the expected value of debt and equity of the merged company.

Explain the reasons for any difference that exists from the expected values of debt and equity if they do not merge. (I.C.W.A. Final Dec. 2006)

Solution

Calculation of value of Equity of S Ltd. (Rs. lakhs)

Particulars	Recession	Slow growth	Rapid growth
Total value	126	165	225
Less: Debt	135	135	135
Value of equity	(9)	30	90

The above calculation shows that value of equity is negative under recession. But this will not happen, since the public limited company will have its liability limited by shares. Therefore, the value of equity would be nil. Then, the expected values can now be computed as below:

		(Rs. lakhs)	
Value of Equity			
Recession	= 0×0.15	= 0	
Slow growth	= 30×0.65	= 19.5	
Rapid growth	= 90×0.20	= 18.0	37.5
Value of Debt			
Recession	= 126×0.15	= 18.90	
Slow growth	= 135×0.65	= 87.75	
Rapid growth	= 135×0.20	= 27.00	133.65
Total expected value			171.15

Calculation of Equity of Moon Ltd. (Rs. lakhs)

Particulars	Recession	Slow growth	Rapid growth
Total value	189	240	360
Less: Debt	30	30	30
Equity	159	210	330

Calculation of Expected value of Moon Ltd. (Rs. lakhs)

Value of Equity			
Recession	= 159×0.15	= 23.85	
Slow growth	= 210×0.65	= 136.50	
Rapid growth	= 330×0.20	= 66.00	226.35
Value of Debt			
Recession	= 30×0.15	= 4.50	
Slow growth	= 30×0.65	= 19.50	
Rapid growth	= 30×0.20	= 6.00	30.00
Total expected value			256.35

Effect of Merger
Calculation of value of Merged company (Rs. lakhs)

Particulars	Recession	Slow growth	Rapid growth
Combined Equity	150	240	420
Combined Debt	165	165	165
Combined total value	315	405	585

Calculation of Expected value of Merged company (Rs. lakhs)

Value of Equity			
Recession	= 150×0.15	= 22.50	
Slow growth	= 240×0.65	= 156.00	
Rapid growth	= 420×0.20	= 84.00	262.50
Value of Debt			
Recession	= 165×0.15	= 24.75	
Slow growth	= 165×0.65	= 107.25	
Rapid growth	= 165×0.20	= 33.00	165.00
Total expected value of Merged company			427.50

Loss in equity value after combination = $262.50 - 37.50 - 226.35$ = -Rs. 1.35 lakhs

Gain in debt after combination = $165 - 133.65 - 30$ = Rs. 1.35 lakhs

The total economic value of merged company remains at Rs. 427.50 lakhs in the absence of synergy.

2.

In 2010 AT&T acquired NCR after a hotly contested takeover for approximately \$110 per share. The free cash flows of the two firms - before and after merger - were projected as follows:

Free Cash Flow (\$ million)						
Year/Firm	1	2	3	4	5	Terminal value*
AT&T	4,684	4,918	5,164	5,422	5,693	82,756
NCR	471	509	550	594	641	8,102
Combined (post-merger)	5,195	5,558	5,948	6,364	6,809	97,672

* Terminal value as at the end of the 5th year.

Cost of equity and debt of the individual firms and the combined firm (after merger) were estimated as given under:

	AT&T	NCR	Combined
Cost of equity	14.23%	15.33%	14.34%
Cost of debt	5.40%	6.00%	5.42%
Debt/(Debt + Equity)	21%	9%	20%

At the time of merger deal NCR had 70.6 million outstanding shares and \$537 million worth of outstanding debt.

- (a) What is the minimum price per share AT&T could have offered to NCR ?
 - (b) Do you think that the price paid by AT&T was justifiable ? Give reasons.
- (Support your answer in (a) and (b) above with necessary calculations).

Note : You may use the formula : $1/(1+r)^n$ for determining PVIF at 'r' (rate for cost of capital).

TRUECEPT

Solution

Calculation of weighted average cost of capital

$$\begin{aligned}
 \text{AT \& T} &= (14.23 \times 0.79) + (5.40 \times 0.21) \\
 &= 11.24 + 1.13 &= 12.37\% \\
 \text{NCR} &= (15.33 \times 0.91) + (6 \times 0.09) \\
 &= 13.95 + 0.54 &= 14.49\% \\
 \text{Combined} &= (14.34 \times 0.80) + (5.42 \times 0.20) \\
 &= 11.472 + 1.084 &= 12.56\%
 \end{aligned}$$

Calculation of Present Value of Free Cashflows

AT & T	(\$ million)		
Year	Free cashflows	P.V. factor @ 12.37%	Present values
1	4,684	0.8899	4,168.29
2	4,918	0.7919	3,894.56
3	5,164	0.7048	3,639.59
4	5,422	0.6272	3,400.68
5	5,693	0.5581	3,180.05
5*	82,756	0.5581	46,186.12
Total present value			64,469.29

* Terminal value at the end of 5th year

NCR	(\$ million)		
Year	Free cashflows	P.V. factor @ 14.49%	Present values
1	471	0.8734	411.37
2	509	0.7629	388.32
3	550	0.6663	366.47
4	594	0.5820	345.71
5	641	0.5083	325.82
5*	8,102	0.5083	4,118.25
Total present value			5,955.94

* Terminal value at the end of 5th year.

Synergy	(\$ million)		
Year	Free cashflows	P.V. factor @ 12.55%	Present values
1	40	0.8884	35.54
2	131	0.7893	103.40
3	234	0.7012	164.08
4	348	0.6230	216.80
5	475	0.5534	262.86
5*	6,814	0.5534	3,770.87
Total present values			4,553.55

* Terminal value at the end of 5th year:

Stand-alone value of NCR

$$= \frac{5,956 - 537}{70.60} = \$ 76.76$$

Maximum price

$$= \frac{5,956 + 4,554 - 537}{70.60} = \$ 141.26$$

Analysis - The price paid by AT & T for acquiring NCR is justified in terms of the value of synergy.

3.

You work in AB Ltd. Your Finance Director plans for acquiring YZ Ltd. You are provided with the following data:

	AB Ltd.	YZ Ltd.
Expected earning per share	Rs. 12	Rs. 5
Expected dividend per share	Rs. 8	Rs. 2
No. of shares	20,00,000	12,00,000
Current market price	Rs. 180	Rs. 50

Your estimates about YZ indicate expected steady growth of earnings and dividend to the tune of 6% per annum. However, under the new Management the growth rate is likely to go up to 8% per annum without additional investment.

- You are asked to calculate the cost of acquisition by AB Ltd. if Rs. 60 is paid for each share of YZ Ltd.
- If the agreed exchange ratio is one share of AB Ltd. for every three shares of YZ Ltd., in lieu of the cash acquisition as per (a) above, what will be the net cost?
- Compute the gain from acquisition.
- If the expected growth rate continues to be 6% p.a., how will the new share price as well as cost be different?

(I.C.W.A. Final June 2004)

Solution

(a) Calculation of cost of acquisition by AB Ltd. if Rs. 60 is paid for each share of YZ Ltd. (Rs.)

Cash payable to YZ Ltd.	(12,00,000 shares × Rs. 60)	7,20,00,000
Market value of YZ Ltd.	(12,00,000 shares × Rs. 50)	6,00,00,000
Net cost of acquisition		1,20,00,000

- (b) Net cost of acquisition based on issue of shares for acquisition
 Exchange ratio = 1 share of AB Ltd. for every 3 shares of YZ Ltd.
 Number of shares to be issued in AB Ltd.

$$= \frac{12,00,000}{3} = 4,00,000$$

Total number of shares in AB Ltd. after merger
 = 20,00,000 + 4,00,000 = 24,00,000 shares

Calculation of Cost of Equity of YZ Ltd.

$$= \frac{D_1}{P_0} + g = \frac{\text{Rs. } 2}{\text{Rs. } 50} + 0.06 = 0.10 \text{ or } 10\%$$

Growth rate under new management after acquisition = 8%

Value of merged company assuming perpetual growth

$$= (\text{Rs. } 180 \times 20,00,000) + \left[\left(\frac{\text{Rs. } 2}{0.10 - 0.08} \right) \times 12,00,000 \right]$$

$$= \text{Rs. } 36,00,00,000 + \text{Rs. } 12,00,00,000 = \text{Rs. } 48,00,00,000$$

Value per share of a merged company

$$= \text{Rs. } 48,00,00,000 / 24,00,000 \text{ shares} = \text{Rs. } 200 \text{ per share}$$

Calculation of Net Cost of Acquisition

	(Rs.)
Gross cost of acquisition (4,00,000 shares × Rs. 200)	8,00,00,000
Less : Current market price	6,00,00,000
Net cost of acquisition	2,00,00,000

(c) Computation of Gain from acquisition

Gain from acquisition

$$= \text{Value of merged company} - (\text{P.V. of AB Ltd.} + \text{P.V. of YZ Ltd.})$$

$$= \text{Rs. } 48,00,00,000 - (\text{Rs. } 36,00,00,000 + \text{Rs. } 6,00,00,000) = \text{Rs. } 6,00,00,000$$

(d) If the expected growth rate continues to be 6% p.a., now will the new share price as well as cost be different ?

When the acquisition is based on share exchange, then variation will occur in cost of acquisition as under :

The new share price will be

$$= \frac{(20,00,000 \times \text{Rs. } 180) + (12,00,000 \times \text{Rs. } 50)}{20,00,000 + 4,00,000}$$

$$= \frac{\text{Rs. } 36,00,00,000 + \text{Rs. } 6,00,00,000}{24,00,000} = \text{Rs. } 175 \text{ per share}$$

Calculation of Net cost of acquisition

	(Rs.)
Gross cost of acquisition (4,00,000 × Rs. 175)	7,00,00,000
Current market value (12,00,000 × Rs. 50)	6,00,00,000
Net cost of acquisition	1,00,00,000

4.

Question 6

(a) C Ltd. & D Ltd. are contemplating a merger deal in which C Ltd. will acquire D Ltd. The relevant information about the firms are given as follows:

	C Ltd.	D Ltd.
Total Earnings (E) (in millions)	₹ 96	₹ 30
Number of outstanding shares (S) (in millions)	20	14
Earnings per share (EPS) (₹)	4.8	2.143
Price earnings ratio (P/E)	8	7
Market Price per share (P)(₹)	38.4	15

- (i) What is the maximum exchange ratio acceptable to the shareholders of C Ltd., if the P/E ratio of the combined firm is 7?
- (ii) What is the minimum exchange ratio acceptable to the shareholders of D Ltd., if the P/E ratio of the combined firm is 9? **(12 Marks)**

Answer

(a) (i) Maximum exchange ratio acceptable to the shareholders of C Ltd.

Market Price of share of C Ltd. (₹ 4.8 x 8)	₹ 38.40
No. of Equity Shares	20 Million
Market Capitalisation of C Ltd. (₹ 38.40 x 20 Million)	₹ 768 Million
Combined Earnings (₹ 96 + ₹ 30) Million	₹ 126 Million
Combined Market Capitalisation (₹ 126 Million x 7)	₹ 882 Million
Market Capitalisation of C Ltd. (₹ 38.40 x 20 Million)	₹ 768 Million
Balance for D Ltd.	₹ 114 Million

Let D be the no. of equity shares to be issued to D Ltd. then,

$$\frac{\text{₹ 114 Million}}{\left(\frac{126 \text{ Million}}{D + 20}\right) \times 7} = D$$

D = 2.96875 Million Shares

Exchange Ratio = 2.96875 / 14 = 0.212:1

(ii) Minimum exchange ratio acceptable to the shareholders of D Ltd.

Market Price of share of D Ltd.	₹ 15.00
No. of Equity Shares	14 Million
Market Capitalisation of D Ltd. (₹ 15.00 x 14 Million)	₹ 210 Million
Combined Earnings (₹ 96 + ₹ 30) Million	₹ 126 Million
Combined Market Capitalisation (₹ 126 Million x 9)	₹ 1134 Million
Balance for C Ltd.	₹ 924 Million

Let D be the no. of equity shares to be issued to D Ltd. then,

$$\frac{\text{₹ 210 Million}}{\left(\frac{126 \text{ Million}}{D + 20}\right) \times 9} = D$$

D = 4.54545 Million Shares

Exchange Ratio = 4.54545 / 14 = 0.325:1

TRUE

5.

The summarized balance sheet of R Co. Ltd. as on 31st March, 2010 is given below:

Liabilities	Rs.	Assets	Rs.
Equity share capital (2,00,000 @ Rs. 10 each)	20,00,000	Fixed assets	19,00,000
13% Preference share capital	1,00,000	Investments	1,00,000
Retained earnings	4,00,000	Current assets:	
12% Debentures	3,00,000	Inventories	5,00,000
Current liabilities	2,00,000	Debtors	4,00,000
	<u>30,00,000</u>	Bank	1,00,000
			<u>10,00,000</u>
			30,00,000

Negotiations for takeover of R Ltd. result in its acquisition by A Ltd.

The purchase consideration consists of-

- (i) Rs. 3,30,000, 13% debentures of A Ltd. for redeeming the 12% debentures of R Ltd.
- (ii) Rs. 1,00,000, 12% convertible preference shares in A Ltd. for the payment of the preference share capital of R Ltd.,
- (iii) 1,50,000 equity shares of A Ltd. to be issued at its current market price of Rs. 15, and (iv) A Ltd. would meet dissolution expenses of Rs. 30,000.

The breakup figures of eventual disposition by A Ltd. of unrequired assets and liabilities of R Ltd. are investments Rs. 1,25,000, debtors Rs. 3,50,000, inventories Rs. 4,25,000, and payment of current liabilities Rs. 1,90,000.

The project is expected to generate yearly operating CFAT of Rs. 7,00,000 for 6 years. It is estimated that fixed assets of R Ltd. would fetch Rs. 3,00,000 at the end of 6th year. The firm's cost of capital is 15%. As a Company Secretary, comment on the financial prudence of merger decision of A Ltd.

(PV at 15% rate of discount is - 1st year : 0.870, 2nd Year : 0.756, 3rd year : 0.658, 4th year : 0.572, 5th year : 0.496 and 6th year : 0.432). (C.S. Final Dec. 1994)

TRUECEPT

Solution

Statement Showing Cost of Acquisition of R Ltd. to A Ltd. (under breakup value method) (Rs.)

Sale-proceeds of assets:		
Investments		1,25,000
Debtors		3,50,000
Inventories		4,25,000
		9,00,000
Add: Bank balance of R Ltd.	(a)	1,00,000
		10,00,000
Proposed Payments:		
Dissolution expenses		30,000
Current liabilities		1,90,000
13% Debentures		3,30,000
12% Convertible preference shares		1,00,000
Equity share capital (1,50,000 × Rs. 15)		22,50,000
	(b)	29,00,000
Net cost of acquisition	(b) - (a)	19,00,000

Calculation of NPV after Merger (Rs.)

Year	Cash flow after tax	Discount factor @ 15%	Present value
1	7,00,000	0.870	6,09,000
2	7,00,000	0.756	5,29,200
3	7,00,000	0.658	4,60,600
4	7,00,000	0.572	4,00,400
5	7,00,000	0.496	3,47,200
6	7,00,000	0.432	3,02,400
6	3,00,000 (disposal value)	0.432	1,29,600
			27,78,400
	Less: Cost of acquisition		19,00,000
	Net present value (NPV)		8,78,400

Analysis - The NPV of merger proposal is positive and hence, it is recommended.



Ch – 7 Mutual Funds

1.

On 01-07-2010, Mr. X Invested ₹ 50,000/- at initial offer in Mutual Funds at a face value of ₹ 10 each per unit. On 31-03-2011, a dividend was paid @ 10% and annualized yield was 120%. On 31-03-2012, 20% dividend and capital gain of ₹ 0.60 per unit was given. Mr. X redeemed all his 6271.98 units when his annualized yield was 71.50% over the period of holding. Calculate NAV as on 31-03-2011, 31-03-2012 and 31-03-2013.

For calculations consider a year of 12 months.

Answer

Yield for 9 months (120% x 9/12) = 90%

Market value of Investments as on 31.03.2011 = ₹ 50,000/- + (₹ 50,000 x 90%) = ₹ 95,000/

Therefore, NAV as on 31.03.2011 = (₹ 95,000 - ₹ 5,000)/5,000 = ₹ 18.00

Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹ 5,000}{₹ 18} = 277.78$ unit

Therefore, units as on 31.03.2011 = 5,000 + 277.78 = 5,277.78

Alternatively, units as on 31.03.2011 = (₹ 95,000/₹18) = 5,277.78

Dividend as on 31.03.2012 = 5,277.78 x ₹ 10 x 0.2 = ₹10,555.56

Capital Gain (5277.78 x ₹ 0.60) = ₹ 3,166.67

₹13,722.23

Let X be the NAV on 31.03.2012, then number of new units reinvested will be ₹13,722.23/X.

Accordingly, 6,271.98 units shall consist of reinvested units and 5277.78 (as on 31.03.2011).

Thus, by way of equation it can be shown as follows:

$$6,271.98 = \frac{₹ 13,722.23}{X} + 5,277.78$$

Therefore, NAV as on 31.03.2012 = ₹ 13,722.23/(6,271.98 – 5,277.78) = ₹ 13.80

NAV as on 31.03.2013 = ₹ 50,000 (1+0.715x33/12)/6,271.98 = ₹ 23.65

2.

Indira has a fund of ₹ 3 lacs which she wants to invest in share market with rebalancing target after every 10 days to start with for a period of one month from now. The present NIFTY is 5326. The minimum NIFTY within a month can at most be 4793.4. She wants to know as to how she should rebalance her portfolio under the following situations, according to the theory of Constant Proportion Portfolio Insurance Policy, using "2" as the multiplier:

- (1) Immediately to start with.
- (2) 10 days later-being the 1st day of rebalancing if NIFTY falls to 5122.96.
- (3) 10 days further from the above date if the NIFTY touches 5539.04.

For the sake of simplicity, assume that the value of her equity component will change in tandem with that of the NIFTY and the risk free securities in which she is going to invest will have no Beta.

Answer

$$\text{Maximum decline in one month} = \frac{5326 - 4793.40}{5326} \times 100 = 10\%$$

(1) Immediately to start with

$$\begin{aligned} \text{Investment in equity} &= \text{Multiplier} \times (\text{Portfolio value} - \text{Floor value}) \\ &= 2 (3,00,000 - 2,70,000) = ₹ 60,000 \end{aligned}$$

Indira may invest ₹ 60,000 in equity and balance in risk free securities.

(2) After 10 days

$$\text{Value of equity} = 60,000 \times 5122.96/5326 = ₹ 57,713$$

$$\text{Value of risk free investment} = ₹ 2,40,000$$

$$\text{Total value of portfolio} = ₹ 2,97,713$$

$$\text{Investment in equity} = \text{Multiplier} \times (\text{Portfolio value} - \text{Floor value})$$

$$= 2 (2,97,713 - 2,70,000) = ₹ 55,426$$

Revised Portfolio:

$$\text{Equity} = ₹ 55,426$$

$$\text{Risk free Securities} = ₹ 2,97,713 - ₹ 55,426 = ₹ 2,42,287$$

(3) After another 10 days

$$\text{Value of equity} = 55,426 \times 5539.04/5122.96 = ₹ 59,928$$

$$\text{Value of risk free investment} = ₹ 2,42,287$$

$$\text{Total value of portfolio} = ₹ 3,02,215$$

$$\text{Investment in equity} = \text{Multiplier} \times (\text{Portfolio value} - \text{Floor value})$$

$$= 2 (3,02,215 - 2,70,000) = ₹ 64,430$$

Revised Portfolio:

$$\text{Equity} = ₹ 64,430$$

$$\text{Risk Free Securities} = ₹ 3,02,215 - ₹ 64,430 = ₹ 2,37,785$$

The investor should off-load ₹ 4502 of risk free securities and divert to Equity.

1.

True value Ltd. is planning to raise funds through issue of common stock for the first time. However, the management of the company is not sure about the value of the company and therefore it attempts to study similar companies in the same line which are comparable to True value in most of the aspects.

From the following information, you are required to compute the value of True value Ltd. using the comparable firms approach. (Rs. crores)

Company	True value Ltd.	Jewel value Ltd.	Real value Ltd.	Unique value Ltd.
Sales	250	190	210	270
Profit after tax	40	30	44	50
Book value	100	96	110	128
Market value		230	290	440

The valuer feels that 50% weightage should be given to earnings in the valuation process; sales and book value may be given equal weightages. (I.C.W.A. Final June 2008)

Solution

Valuation multiples of comparable firms

Particulars	Jewel value Ltd.	Real value Ltd.	Unique value Ltd.	Average
Price/Sales ratio	1.21	1.38	1.62	1.403
Price/Earning ratio	7.67	6.59	8.80	7.69
Price/Book value ratio	2.39	2.63	3.43	2.82

Estimation of Value of True Value Ltd.

Particulars	Multiple average	Parameter (Rs. crores)	Value (Rs. crores)
Price/Sales	1.403	250	350.75
Price/Earning	7.69	40	307.60
Price/Book value	2.82	100	282.00

Weighted average value of True Value Ltd. using the comparable firm approach

$$= (350.75 \times 0.25) + (307.60 \times 0.50) + (282 \times 0.25) = \text{Rs. 311.99 crores}$$

TR

2.

Novelty Ltd., a consumer durable manufacturer, reported earnings per share of Rs. 3.20 in 2010 and paid dividends per share of Rs. 1.70 in that year. The firm reported depreciation of Rs. 350 lakh in 2010 and capital expenditure of Rs. 475 lakh. There were 160 lakh outstanding shares traded at Rs. 51 per share. The ratio of capital expenditure to depreciation is expected to be maintained in the long term. The working capital needs are negligible. Novelty had a debt outstanding of Rs. 1,600 lakh and intends to maintain its current financing mix of debt and equity to finance future investment needs. The firm in the steady state, and earnings are expected to grow at 7% per year. The stock had a Beta of 1.05, the Treasury bill rate is 6.25% and the market premium is 5.5%.

Requirements:

- (i) Estimate the value per share using the dividend discount model.
- (ii) Estimate the value per share, using the FCFE model (Free Cash Flow to Equity).
- (iii) How would you explain the difference between the two models, and which one would you use as a benchmark to compare with the market price? (I.C.W.A. Final Dec. 2007)

Solution

Working Notes

Earnings per share	=	Rs. 3.20
Dividend per share	=	Rs. 1.70
Depreciation	=	Rs. 350 lakhs
Capital expenditure	=	Rs. 475 lakhs
Number of shares	=	160 lakhs
Market price per share	=	Rs. 51

Calculation of Cost of Equity under CAPM

$$\begin{aligned}
 K_e &= R_f + \beta_i (R_m - R_f) \\
 &= 6.25 + 1.05 (5.5) = 12.025\%
 \end{aligned}$$

TRUECEPT

(i) Estimation of value per share using Dividend Discount model

$$\text{Value of Equity} = \frac{D_1}{K_c - g}$$

$$D_1 = D_0(1 + g)$$

$$\text{Value of Equity} = \frac{1.7(1.07)}{0.12025 - 0.07}$$

$$= \frac{1.819}{0.05025} = \text{Rs. } 36.20$$

(ii) Estimation of value per share using FCFE model

FCFE = Net income - (Capital expenditure - Depreciation) (1 - Debt financing ratio) - Change in working capital (1 - Debt financing ratio)

$$\text{Depreciation per share} = \frac{\text{Rs. } 3,50,00,000}{1,60,00,000 \text{ shares}} = \text{Rs. } 2.1875$$

$$\text{Capital expenditure per share} = \frac{\text{Rs. } 4,75,00,000}{1,60,00,000 \text{ shares}} = \text{Rs. } 2.969$$

$$\begin{aligned} \text{Debt financing ratio} &= \frac{\text{Debt}}{\text{Debt} + \text{Equity}} = \frac{1,600}{1,600 + (160 \times 51)} \\ &= \frac{1,600}{9,760} = 0.1639 \text{ or } 16.39\% \end{aligned}$$

$$\begin{aligned} \text{FCFE} &= 3.2 - (2.969 - 2.1875) (1 - 0.1639) - 0 \\ &= 3.2 - (0.7815)(0.8361) \\ &= 3.2 - 0.6534 = \text{Rs. } 2.5466 \end{aligned}$$

$$\text{Value per share} = \frac{2.5466(1.07)}{(0.12025 - 0.07)} = \frac{2.7249}{0.05025} = \text{Rs. } 54.23$$

(iii) It is observed that FCFE is greater than the dividend paid. The higher value under FCFE model reflects the additional value from the cash accumulated in the firm. The FCFE is a more realistic and suitable model than dividend discount model.

3.

Banana Leaf is a popular restaurant in South India, owned and run by Radhaswamy, a star chef specializing in South Indian cuisine. You are interested in buying the restaurant and have been provided the following data:

The restaurant can seat 100 diners. It has two seatings for lunch and one seating for dinner. It fills 80% of its seats at lunch and 70% of its seats at dinner. The restaurant remains open for 340 days a year for the public. The average price of a lunch is Rs. 40 and the average price of a dinner is Rs. 50. The cost of food is approximately 30% of the price of the meal. There are 25 employees on the staff of the restaurant and the payroll amounts to Rs. 10 lakhs a year. The annual rent for the space used by Banana Leaf is Rs. 2,40,000.

The restaurant is expected at present to grow 6% a year for 3 years and 3% a year after that. You estimate the unlevered beta of publicly traded restaurants to be 0.70. The average debt to capital ratio for these firms is 10%. The risk free rate is 8% and the market risk premium is 5.5%.

You are required to estimate the value of Banana Leaf (assume the tax rate is 40% and the cost of borrowing is 9%). (I.C.W.A. Final Dec. 2003)

Solution

Calculation of annual revenue

Lunch	=	100 seats × 2 seatings × 80/100 × 340 days × Rs. 40	=	Rs. 21,76,000
Dinner	=	100 seats × 1 seating × 70/100 × 340 days × Rs. 50	=	Rs. 11,90,000
Total revenue p.a.	=	Rs. 21,76,000 + Rs. 11,90,000	=	Rs. 33,66,000
Cost of food p.a.	=	Rs. 33,66,000 × 30/100	=	Rs. 10,09,800

Calculation of Earnings after tax

		(Rs.)
Revenue from food	(a)	<u>33,66,000</u>
Costs:		
Cost of food		10,09,800
Staff expenses		10,00,000
Rent		<u>2,40,000</u>
	(b)	<u>22,49,800</u>
Net revenue	(a) - (b)	11,16,200
Less: Tax @ 40%		<u>4,46,480</u>
Earnings after tax		<u>6,69,720</u>

The cashflow expected to grow 6% a year for 3 years

$$\text{EAT of 1st year} = \text{Rs. } 6,69,720 \times 1.06 = \text{Rs. } 7,09,903$$

$$\text{EAT of 2nd year} = \text{Rs. } 7,09,903 \times 1.06 = \text{Rs. } 7,52,497$$

$$\text{EAT of 3rd year} = \text{Rs. } 7,52,497 \times 1.06 = \text{Rs. } 7,97,647$$

Calculation of cost of Equity

$$= R_f + \beta_i (R_m - R_f) = 8\% + 0.7(5.5\%) = 11.85\%$$

Calculation of weighted average cost of capital

$$= (11.85\% \times 0.90) + [9\%(1 - 0.4) \times 0.10] = 10.66 + 0.54 = 11.20\%$$

Value at the end of high growth period

$$= \frac{\text{Rs. } 7,97,647 \times 1.03}{0.112 - 0.03} = \text{Rs. } 1,00,19,225$$

Present value of Banana Leaf

$$= \frac{7,09,903}{(1.112)} + \frac{7,52,497}{(1.112)^2} + \frac{7,52,497 + 1,00,19,225}{(1.112)^3} = \text{Rs. } 90,78,015$$

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

Business Segment	Segment Sales	Segment Assets	Segment Operating Income
Wholesale	€225,000	€600,000	€75,000
Retail	€720,000	€500,000	€150,000
General	€ 2,500,000	€4,000,000	€700,000

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

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

Answer

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Wholesale	0.85	€225000	€191250
Retail	1.2	€720000	€864000
General	0.8	€2500000	<u>€2000000</u>
Total value			<u>€3055250</u>

Business Segment	Capital-to-Assets	Segment Assets	Theoretical Values
Wholesale	0.7	€600000	€420000
Retail	0.7	€500000	€350000
General	0.7	€4000000	<u>€2800000</u>
Total value			<u>€3570000</u>

Business Segment	Capital-to-Operating Income	Operating Income	Theoretical Values
Wholesale	9	€75000	€675000
Retail	8	€150000	€1200000

General	4	€700000	<u>€2800000</u>
Total value			<u>€4675000</u>

$$\text{Average theoretical value} = \frac{3055250 + 3570000 + 4675000}{3} = 3766750$$

Average theoretical value of Cranberry Ltd. = €3766750

5.

The Accounts of Siteraze Ltd. (SL) engaged in manufacturing business are summarized below :

Income Statement for the year ended March 31, 2010	(Rs. million)	
Sales revenue		95.00
Less: Cost of goods sold	59.10	
General expenses	6.80	
Administrative expenses	7.80	
Selling and distribution expenses	2.90	
Interest on loan	1.80	78.40
Earnings before tax (EBT)		16.60
Less: Corporate taxes (0.35)		5.81
Earnings after taxes (EAT)		10.79

Balance Sheet as at March 31, 2010

Liabilities	(Rs. million)	Assets	(Rs. million)
Equity share capital (10 lakh shares of Rs. 10 each)	10.00	Freehold land and buildings (net)	20.00
Reserves and surplus	31.50	Plant and machinery (net)	28.50
10% Loan	18.00	Current Assets :	
Creditors and other liabilities	18.00	Stock	10.00
		Debtors	15.00
		Bank and cash balances	4.00
	77.50		77.50

Additional information:

- (1) The risk free rate of return in the economy is 8% and the premium expected from business in general is 5%. The beta of Siteraze Ltd. shares is currently 1.27.
- (2) The equity shares of this company (SL) quoted in the market as on 31.3.2010 are Rs. 50 per share.
- (3) General expenses include R & D expenses of Rs. 0.50 million.

Note: For EVA computation R&D expenses are to be considered as an investment.

Requirements:

- (i) Determine the Economic Value Added (EVA) for the year ended March 31, 2010; and
- (ii) Determine the amount of Market Value Added (MVA) of the year ended March 31, 2010.

(I.C.W.A. Final Dec. 2005)

Solution

Calculation of NOPAT	(Rs. million)
Net profit after tax and interest	10.79
Add: Tax adjusted interest [1.80 (1 - 0.35)]	1.17
Profit after tax before interest	11.96
R & D expenses reintegrated	0.50
Net operating profit after taxes (NOPAT)	12.46

Calculation of Capital Employed	(Rs. million)
Share capital	10.00
Reserves and surplus	31.50
Adjustment for R & D	0.50
Equity	42.00
10% Loan	18.00
Capital employed	60.00

Calculation of WACC

$$\begin{aligned}
 \text{Cost of Equity} &= 8\% + 1.27 (5\%) = 14.35\% \\
 \text{Cost of Debt} &= 10\% \\
 \text{WACC} &= (14.35 \times 0.70) + [10 (1 - 0.35) \times 0.30] \\
 &= 10.045 + 1.95 = 11.995\% \text{ say } 12\%
 \end{aligned}$$

Calculation of Economic Value Added (EVA) (Rs. million)

Net operating profit after tax (NOPAT)	12.46
Less: Cost of capital employed (Rs. 60 million \times 0.12)	7.20
Economic Value Added (EVA)	5.26

Calculation of Market Value Added (MVA) for the year ended 31st March, 2010

$$\begin{aligned}
 \text{Market value per Equity share} &= \text{Rs. } 50 \\
 \text{No. of equity shares outstanding} &= 10,00,000
 \end{aligned}$$

		(Rs. million)
Total market value	(10,00,000 shares \times Rs. 50)	50.00
Less: Value of equity funds:		
Share capital		10.00
Reserves & Surplus		31.50
R & D adjustment		0.50
Market Value Added (MVA)		8.00

TRUECEPT

CH – 11 Interest Rate Risk Management

1.

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

It is expected that firm shall borrow a sum of €50 million for the entire period of slack season in about 3 months.

A Bank has given the following quotations:

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

3 month €50,000 future contract maturing in a period of 3 months is quoted at 94.15 (5.85%).

You are required to determine:

- (a) How a FRA, shall be useful if the actual interest rate after 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.

Answer

- (a) By entering into an FRA, firm shall effectively lock in interest rate for a specified future in the given it is 6 months. Since, the period of 6 months is starting in 3 months, the firm shall opt for 3 × 9 FRA locking borrowing rate at 5.94%. In the given scenarios, the net outcome shall be as follows:

	If the rate turns out to be 4.50%	If the rate turns out to be 6.50%
FRA Rate	5.94%	5.94%
Actual Interest Rate	4.50%	6.50%
Loss/ (Gain)	1.44%	(0.56%)
FRA Payment / (Receipts)	$€50 \text{ m} \times 1.44\% \times \frac{1}{2} =$ €360,000	$€50\text{m} \times 0.56\% \times \frac{1}{2} =$ (€140,000)
Interest after 6 months on €50 Million at actual rates	$= €50\text{m} \times 4.5\% \times \frac{1}{2}$ = €1,125,000	$= € 50\text{m} \times 6.5\% \times \frac{1}{2}$ = €1,625,000
Net Out Flow	€ 1,485,000	€1,485,000

Thus, by entering into FRA, the firm has committed itself to a rate of 5.94% as follows:

$$\frac{€ 1,485,000}{€ 50,000,000} \times 100 \times \frac{12}{6} = 5.94\%$$

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

$$\begin{aligned} \text{No. of Contracts} &= \frac{\text{Amount of Borrowing}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{3 \text{ months}} \\ &= \frac{€ 50,000,000}{€ 50,000} \times \frac{6}{3} = 2000 \text{ Contracts} \end{aligned}$$

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

	If the interest rate turns out to be 4.5%	If the interest rate turns out to be 6.5%
<i>Future Course Action :</i>		
Sell to open	94.15	94.15
Buy to close	95.50 (100 - 4.5)	93.50 (100 - 6.5)
Loss/ (Gain)	1.35%	(0.65%)
Cash Payment (Receipt) for Future Settlement	€50,000×2000× 1.35%×3/12 = €337,500	€50,000×2000×0.65%×3/12 = (€162,500)
Interest for 6 months on €50 million at actual rates	€50 million × 4.5% × ½ = €11,25,000	€50 million × 6.5% × ½ = €16,25,000
	€1,462,500	€1,462,500

Thus, the firm locked itself in interest rate $\frac{€ 1,462,500}{€ 50,000,000} \times 100 \times \frac{12}{6} = 5.85\%$

Question 79

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

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

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

- (i) You are required to calculate the rate of interest DEF Bank would quote under 2V3 FRA, using the company's yield information as quoted above.
- (ii) Suppose bank offers Interest Rate Guarantee for a premium of 0.1% of the amount of loan, you are required to calculate the interest payable by XYZ Ltd. if interest rate in 2 years turns out to be
- (a) 4.50%
- (b) 5.50%

Answer

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

XYZ Ltd.

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

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

$$r = 5.04\%$$

Bank will quote 5.04% for a 2V3 FRA.

ABC Ltd.

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

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

$$r = 6.38\%$$

Bank will quote 6.38% for a 2V3 FRA.

- (ii)

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

3.

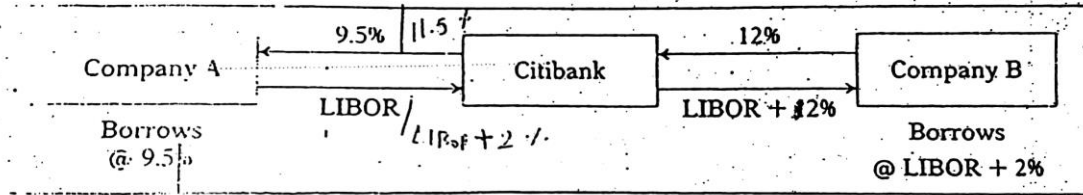
Company A has outstanding debt on which it currently pays fixed rate of interest at 9.5%. The company intends to refinance the debt with a floating rate of interest. The best floating rate it can obtain is LIBOR +2%. However, it does not want to pay more than LIBOR. Another company B is looking for a loan at a fixed rate of interest to finance its exports. The best rate it can obtain is 13.5% but it cannot afford to pay more than 12%. However, one bank has agreed to offer finance at a floating rate of LIBOR+2%.

Citi Bank is in the process of arranging an interest rate swap between these two companies.

- (i) With a schematic diagram, show how the swap deal can be structured..
- (ii) What are the interest savings by each company?
- (iii) How much would Citi Bank receive ?

Solution:

(i) Schematic diagram of swap deal



(ii) Savings:

$$\text{Company A} = [(LIBOR + 2) - (LIBOR)] = 2\%$$

$$\text{Company B} = 13.5 - 12 = 1.5\%$$

(iii) Gain of Citibank

$$= LIBOR - (LIBOR + 2) + 12 - 9.5 = 0.5\%$$

4.

XYZ Inc. issues a £ 10 million floating rate loan on July 1, 2013 with resetting of coupon rate every 6 months equal to LIBOR + 50 bp. XYZ is interested in a collar strategy by selling a Floor and buying a Cap. XYZ buys the 3 years Cap and sell 3 years Floor as per the following details on July 1, 2013:

Notional Principal Amount	\$ 10 million
Reference Rate	6 months LIBOR
Strike Rate	4% for Floor and 7% for Cap
Premium	0*

*Since Premium paid for Cap = Premium received for Floor

Using the following data you are required to determine:

(i) Effective interest paid out at each reset date,

TRUE

(ii) The average overall effective rate of interest p.a.

Reset Date	LIBOR (%)
31-12-2013	6.00
30-06-2014	7.50
31-12-2014	5.00
30-06-2015	4.00
31-12-2015	3.75
30-06-2016	4.25

Answer

(a) The pay-off of each leg shall be computed as follows:

Cap Receipt

$$\text{Max } \left\{ 0, \frac{[\text{Notional principal} \times (\text{LIBOR on Reset date} - \text{Cap Strike Rate}) \times \text{Number of days in the settlement period}]}{365} \right\}$$

Floor Pay-off

$$\text{Max } \left\{ 0, \frac{[\text{Notional principal} \times (\text{Floor Strike Rate} - \text{LIBOR on Reset date}) \times \text{Number of days in the settlement period}]}{365} \right\}$$

Statement showing effective interest on each re-set date

Reset Date	LIBOR (%)	Days	Interest Payment (\$) LIBOR+0.50%	Cap Receipts (\$)	Floor Pay-off (\$)	Effective Interest
31-12-2013	6.00	184	3,27,671	0	0	3,27,671
30-06-2014	7.50	181	3,96,712	24,795	0	3,71,917
31-12-2014	5.00	184	2,77,260	0	0	2,77,260
30-06-2015	4.00	181	1,98,356	0	0	1,98,356
31-12-2015	3.75	184	1,89,041	0	12,603	2,01,644
30-06-2016	4.25	182	2,36,849	0	0	2,36,849
Total		1096				16,26,094

(b) Average Annual Effective Interest Rate shall be computed as follows:

$$\frac{16,26,094}{1,00,00,000} \times \frac{365}{1096} \times 100 = 5.42\%$$

5.

It is now 1 June. In two months' time, on 1 August, Frog plc will need to borrow £3.9 million for three months. Frog can currently borrow money at 8% per annum interest, but Frog's treasurer fears that interest rates will have risen by August and so wishes to hedge using interest rate futures contracts. Currently sterling September three-month interest rate futures contracts are priced at 93.

We will look at the action required to hedge this risk in a number of steps. First though, we need to explain why we are considering September interest rate futures contracts. Remember that it is now 1 June and so Frog would have a choice of three contracts: June, September and December contracts. The June contracts are of no use to Frog, as they will have expired by the time Frog needs to borrow the money on 1 August. This leaves a choice of either September or December contracts. Although either could be used, it is normal to use the contract with the *next* expiry date *after* the date when the loan is required. We require the loan on 1 August and so the futures contracts with the next expiry date after that would be the September contracts. The following steps would be necessary for the company to set up its hedged position:

1. The first step is for the treasurer to set up a 'target' loan cost based on the existing interest rate. If there was no change in interest rates between now (1 June) and 1 August, then the loan would involve an interest charge of

$$£3.9\text{mn} \times 0.08 \times \frac{3}{12} = £78\,000 \text{ interest target.}$$

As we shall see, Frog's futures hedge will result in the company paying an actual net interest charge which is very close to this targeted cost of £78 000. (It may end up paying a little more or a little less than £78 000, for reasons we shall see presently.) This outcome will occur whatever happens to interest rates between 1 June and 1 August, when the loan is taken out.

2. The second step is to identify the number of futures contracts that are required to hedge the interest charge on the £3.9 million loan. Each contract is in respect of the interest on a deposit of £0.5 million and so Frog will require $£3.9 \text{ million} \div £0.5 \text{ million} = 7.8$ contracts. Given that we can



only deal in whole contracts, this means that Frog will round up to eight contracts. (Notice what this means – Frog are hedging the interest charges on a £3.9 million loan with futures contracts in respect of a total deposit of: $8 \times £0.5 \text{ million} = £4 \text{ million}$.)

3. The third and final step in setting up the hedge position is for Frog to decide whether they need to buy or sell the futures contracts. Remember the rule: if you wish to hedge a loan against rising interest rates, sell futures: if you want to hedge a deposit against falling interest rates buy futures. Here Frog want to hedge a *loan* and so they will *sell* eight sterling September interest rate futures contracts at a price of 93.

The reason for the buying and selling rule on futures contracts for deposits and loans respectively will become obvious as we proceed with the example. As we shall see, if Frog initially sell futures and then interest rates go up, they will end up making a profit on the futures which acts like compensation under an FRA, offsetting the higher interest charges on the loan. Similarly, if Frog initially buy futures and then interest rates fall, again they will make a profit on the futures which will compensate for the reduced interest earned on our deposited money as a result of the fall in interest rates.

Therefore futures hedges work on a very simple basis, similar to the compensation that is paid or received under an FRA. With Frog's loan, if interest rates go up, they will make an offsetting profit on the futures, and if interest rates go down, they will make an offsetting loss on the futures. Thus, as was pointed out before, futures contracts hedge the company against both sides of risk: the risk of adverse *and* favourable movements in interest rates.

Having set up this hedged position on 1 June we can then move forward two months to 1 August. This is the day Frog plc will need to borrow £3.9 million for three months.

Suppose that on 1 August short-term interest rates have risen to 10.5% and sterling September interest rate futures contracts are now priced at 90.75:

1. The company has to borrow £3.9 million for three months at 10.5% interest. Thus the actual interest charge incurred by the company on the loan will be:

$$£3.9\text{mn} \times 0.105 \times \frac{3}{12} = £102\,375.$$

This can be compared against the target interest cost of £78 000 to show a 'loss' on target of: $£102\,375 - £78\,000 = £24\,375$. In other words, because interest rates have risen by 2.5% over the two-month period from 1 June to 1 August, Frog plc is having to pay £24 375 more interest on the loan than it had hoped. What we shall see is that the company will make a profit on its futures contracts which will approximately offset this extra interest cost.

2. On 1 August, as well as borrowing £3.9 million, the company needs to 'close out' its futures position. It does this by transacting a deal in the futures market which is the *reverse* of the original transaction undertaken on 1 June. In that original transaction the company *sold* eight sterling September contracts; and so – in order to close out its futures position – it now *buys* eight sterling September contracts, at their current price of 90.75.

What have these two sets of futures transactions achieved? Originally, the company sold eight sterling September contracts at 93. Remember that the 'price' of the contracts represents an interest rate quoted on an index basis. Thus 93 represents: $100 - 93 = 7\%$ interest. Therefore what the company sold was the interest, at 7%, on eight three-month deposits of £500 000 each. This represents a total amount of interest of:

$$8 \times £0.5\text{mn} = £4\text{mn} \times 0.07 \times \frac{3}{12} = £70\,000.$$

This interest was due to be delivered on the third Wednesday of September. However, futures contracts are very seldom left to 'mature' in this way. Instead, futures positions are usually 'closed out' before the delivery date by undertaking an offsetting transaction. This is just what the company did in buying eight September contracts at 90.75. What they were doing in this transaction was buying the interest of eight £0.5 million three-month deposits. Therefore how much interest had they bought? Remembering that 90.75 represents an interest rate of: $100 - 90.75 = 9.25\%$:

$$8 \times £0.5\text{mn} = £4\text{mn} \times 0.0925 \times \frac{3}{12} = £92\,500.$$

In other words, through its futures transaction the company had bought £92 500 of interest and had sold £70 000 of interest. One set of futures contracts offsets (or cancels out) the other set of futures contracts and the company either receives the balance (if it has bought more interest than it has sold), or it has to pay off the balance (if it has sold more interest than it bought). In this way, it makes either a profit or a loss on its futures transactions.

In this example the company receives more interest than it sold and so it makes a profit on its futures transaction of: $£92\,500 - £70\,000 = £22\,500$. However, recall that we said earlier that profits and losses on futures contracts are usually measured in ticks. Therefore, how this profit would normally be calculated is as follows:

Bought the contracts at:	90.75		
Sold the contracts at:	93		
Profit per contract	2.25%	=	225 ticks
Total profit = 8 contracts × 225 ticks/contract		=	1800 ticks
Value of the profit: 1800 × £12.50	= £22 500.		

Therefore once the company closes out its futures position on 1 August, it will receive a profit from the futures market of £22 500 which will largely (but not precisely) offset the extra interest charge on its £3.9 million loan.

Interest charge:	£102 375
less Profit on futures:	£22 500
Net interest cost:	£79 875
Target interest cost:	£78 000

1.

Mr. Marin Kumar an investor is evaluating the prospects of investing in two companies Spark Ltd. and Amrit Ltd. The projections of returns for the stocks of the two companies along with their probabilities are as follows:

Economic scenario	Probabilities	Returns associated with		
		Spark Ltd.	Amrit Ltd.	Market Index
Boom	0.45	43%	34%	26%
Growth	0.25	23%	27%	10%
Stagnation	0.20	18%	16%	3%
Slump	0.10	8%	4%	-6%

TRUECEPT

The risk-free rate of return is 9%.

Requirements:

- (i) Calculate ex-ante betas for both the companies.
- (ii) Calculate excess return provided by both the companies.
- (iii) Calculate the proportion of systematic risk and unsystematic risk for both the companies.
- (iv) State whether the stock of Spart Ltd. and Amrit Ltd. is underpriced or overpriced?

(I.C.W.A. Final Dec. 2008)

Solution

(i) Expected return on stock and variance of Spark Ltd.

$$\begin{aligned}
 E(R_s) &= (0.45 \times 43) + (0.25 \times 23) + (0.20 \times 18) + (0.10 \times 8) \\
 &= 19.35 + 5.75 + 3.60 + 0.8 \\
 &= 29.50\%
 \end{aligned}$$

$$\begin{aligned}
 \alpha_s^2 &= 0.45(43 - 29.5)^2 + 0.25(23 - 29.5)^2 + 0.20(18 - 29.5)^2 + 0.10(8 - 29.5)^2 \\
 &= 82.10 + 10.56 + 26.45 + 46.22 \\
 &= 165.24\%
 \end{aligned}$$

Expected return on stock and variance of Amrit Ltd.

$$\begin{aligned}
 E(R_A) &= (0.45 \times 34) + (0.25 \times 27) + (0.20 \times 16) + (0.10 \times 4) \\
 &= 15.30 + 6.75 + 3.20 + 0.40 \\
 &= 25.65\%
 \end{aligned}$$

$$\begin{aligned}
 \alpha_A^2 &= 0.45(34 - 25.65)^2 + 0.25(27 - 25.65)^2 + 0.20(16 - 25.65)^2 + 0.10(4 - 25.65)^2 \\
 &= 31.37 + 0.455 + 18.62 + 46.87 \\
 &= 97.31\%
 \end{aligned}$$

Expected return on variance on Market

$$\begin{aligned}
 E(R_M) &= (0.45 \times 26) + (0.25 \times 10) + (0.20 \times 3) + (0.10 \times -6) \\
 &= 11.70 + 2.50 + 0.6 - 0.6 \\
 &= 14.20\%
 \end{aligned}$$

$$\begin{aligned}
 \alpha_M^2 &= 0.45(26 - 14.20)^2 + 0.25(10 - 14.20)^2 + 0.20(3 - 14.20)^2 + 0.10(-6 - 14.20)^2 \\
 &= 62.66 + 4.41 + 25.09 + 40.80 \\
 &= 132.96\%
 \end{aligned}$$

Covariance:

$$\begin{aligned}
 \text{Cov}_{SM} &= 0.45(43 - 29.5)(26 - 14.20) + 0.25(23 - 29.5)(10 - 14.20) + 0.20(18 - 29.5)(3 - 14.20) \\
 &\quad + 0.10(8 - 29.5)(-6 - 14.20) \\
 &= 71.68 + 6.82 + 25.76 + 43.43 \\
 &= 147.69\%
 \end{aligned}$$

$$\begin{aligned}
 \text{Cov}_{AM} &= 0.45(34 - 25.65)(26 - 14.20) + 0.25(27 - 25.65)(10 - 14.20) + 0.20(16 - 25.65)(3 - 14.20) \\
 &\quad + 0.10(4 - 25.65)(-6 - 14.20) \\
 &= 44.34 - 1.42 + 21.62 + 43.73 \\
 &= 108.27\%
 \end{aligned}$$

Betas:

$$\beta_S = 147.69 / 132.96 = 1.111$$

$$\beta_A = 108.27 / 132.96 = 0.814$$

(ii) Normal return

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

Spark Ltd.

$$= 9 + (14.20 - 9)1.111 = 14.78\%$$

Excess Return or Alpha

$$= 29.50 - 14.78 = 14.72\%$$

- Amrit Ltd.** $= 9 + 0.81(14.20 - 9) = 13.21$
Excess Return or Alpha $= 25.65 - 13.21 = 12.44\%$
- (iii) **Systematic risk** $= \beta^2 \text{var}(M)$
Unsystematic risk $= \text{Total risk} - \text{Systematic risk}$
 $= \text{Var}(i) - \beta^2 \cdot \text{var}(M)$
- Spark Ltd.**
- Systematic risk** $= (1.111)^2 \times 132.96 = 164.11\%$
Unsystematic risk $= 165.24 - 164.11 = 1.13\%$
Proportion of systematic risk $= 99.39\%$
Proportion of unsystematic risk $= 0.61\%$
- Amrit Ltd.**
- Systematic risk** $= (0.81)^2 \times 132.96 = 87.23\%$
Unsystematic risk $= 97.31 - 87.23 = 10.08\%$
Proportion of unsystematic risk $= 89.64\%$
Proportion of systematic risk $= 10.36\%$
- (iv) The Alpha is excess return of both companies stock is positive. Hence, the stock of Spark Ltd. and Amrit Ltd. is under priced.

2.

TRUECEPT

From the following details of HPL Ltd. calculate the cost of capital:

Debt	Amount	Nominal interest
Foreign loan	US \$100 million	5%
Local currency loan	Rs. 2,200 million	12%

Expected depreciation of rupee	: 3% per annum
Current exchange rate	: Rs. 45 per US \$
Bank/FI guarantee for raising foreign capital	: 1%
Equity capital	: Rs. 3,000 million
Unlevered beta	: 0.6
Risk-free rate	: 6%
Market premium	: 8%

The project expected to have an effective tax rate of 30 per cent. (I.C.W.A. Final June 2006)

Solution

Foreign loan in Rs. = US \$ 100 million × Rs. 45 = Rs. 4,500 million

Rate of interest on Foreign loan	(%)
Nominal interest p.a.	5
Add : Expected depreciation of rupee p.a.	3
Bank/FI guarantee for raising foreign capital	1
Total	9

Local currency loan = Rs. 2,200 million

Rate of interest on local currency loan = 12%

Total borrowing in Rs. = 4,500 + 2,200 = Rs. 6,700 million

Average interest rate (i)

$$= \frac{(4,500 \times 9) + (2,200 \times 12)}{6,700} = 9.985\%$$

After tax cost of borrowing (K_d)

$$= I(1 - t) = 9.985(1 - 0.30) = 6.99\%$$

Debt-equity ratio = $\frac{6,700}{3,000} = 2.23$

Leverage Beta (B_L) = $\beta_{ul} \times \frac{E + D(1 - t)}{E}$

$$= 0.6 \times \frac{1 + 2.23(1 - 0.30)}{1}$$

$$\begin{aligned}
 &= 0.6 \times (1 + 1.561) = 1.537 \\
 \text{Cost of Equity (K}_e\text{)} &= R_f + \beta_L (R_m - R_f) \\
 &= 0.06 + (1.537 \times 0.08) \\
 &= 0.18296 \text{ or } 18.30\%
 \end{aligned}$$

Calculation Weighted Average Cost of Capital

$$\begin{aligned}
 \text{WACC} &= K_e \left(\frac{E}{E+D} \right) + K_d \left(\frac{D}{E+D} \right) \\
 &= 0.1830 \left(\frac{3,000}{3,000+6,700} \right) + 0.0699 \left(\frac{6,700}{3,000+6,700} \right) \\
 &= (0.1830 \times 0.31) + (0.0699 \times 0.691) \\
 &= 0.1050 \text{ or } 10.50\%
 \end{aligned}$$

3.

XYZ Company is contemplating to undertake the following investment proposals: (i) expansion of existing capacity, and (ii) setting up a new project not related with the present business. The company's shares are regularly traded in stock exchanges, the recent estimate of share beta is 1.2. The debt-equity ratio of the company at present is 2:1. However, the new project, if undertaken, can be financed with a debt-equity ratio of 1:1, since the company has adequate internal accruals. To assess business/financial risk of the proposed new project, the XYZ company has identified a comparable company with debt-equity ratio of 1.5:1 and estimated share beta of 1.5. The comparable company is subject to an effective tax rate of 20%, whereas effective tax rate of XYZ company is 30%.

You are required to estimate (with necessary calculations) the following:

- (i) Cost of capital to be used as cut-off rate to evaluate the expansion project, assuming that its debt-equity ratio will be 2:1.
- (ii) Cost of capital to be used as cut-off rate to evaluate the new project.
- (iii) Based on your calculations in (i) and (ii) above, would you recommend different cut-off rates or single cut-off rate for the expansion and new projects? Give reasons.

You may further like to consider the following information while answering the above questions:

- (a) The company will be able to negotiate loan at 15%.
- (b) The present yield on long-dated government securities is around 7%.
- (c) Expected spread between return on stock index and government securities (i.e., market premium) 6%.
- (d) Estimated liquidity premium in the government securities is 1%.
- (e) Effective corporate tax rate of XYZ company will continue to be 30% even after the projects being undertaken.

(I.C.W.A. Final June 2005)

Solution

XYZ company :

Present share beta (β)	= 1.2
Present Debt-equity ratio	= 2 : 1
Debt-equity ratio if new project is undertaken	= 1 : 1
Effective tax rate applicable	= 30%

Comparable company :

Debt-equity ratio	= 1.5 : 1
Share beta	= 1.5
Effective tax rate applicable	= 20%

Other data :

Yield on long-dated Government securities = 7%

Liquidity premium on Government securities = 1%

Risk-free rate of return (R_f) (7% - 1%) = 6%

Expected spread between return on stock index and Government securities ($R_m - R_f$) = 6%.

$\beta_{\text{expansion project}}$ = 1.2

$\beta_{L(\text{proxy})}$ = 1.5

$\beta_{U(\text{proxy})}$ = $1.5 / [1 + (1 - 0.2) \times 1.5]$ = $1.5 / 2.2$ = 0.68

$B_{L(\text{new project})}$ = $0.68 [1 + (1 - 0.30) \times 1]$ = 0.68×1.7 = 1.16

$K_{c(\text{exp})}$ = $6 + 1.2 \times 6$ = 13.2% K_c = Cost of equity

$K_{c(\text{new})}$ = $6 + 1.16 \times 6$ = 12.96% K_d = Cost of debt/loan

K_d = $15(1 - 0.3)$ = 10.5%

(i) WACC (Expansion) = $(10.5 \times 0.67) + (13.2 \times 0.33)$ = $7.03 + 4.36$ = 11.39%

(ii) WACC (New) = $(10.5 \times 0.5) + (12.96 \times 0.5)$ = $5.25 + 6.48$ = 11.73%

(iii) Since the business and financial risk are different for expansion and new projects, different cutoff rates should be used. However, the two cutoff rates are very close to each other. We may therefore, use just one cutoff rate in practice.

4.

(b) Mr. Kapoor owns a portfolio with the following characteristics:

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

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

- (i) *If Mr. Kapoor has ₹ 1,00,000 to invest and sells short ₹ 50,000 of security Y and purchases ₹ 1,50,000 of security X, what is the sensitivity of Mr. Kapoor's portfolio to the two factors?*
- (ii) *If Mr. Kapoor borrows ₹ 1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹ 1,00,000 in security X and Y in the same proportion as described in part (i), what is the sensitivity of the portfolio to the two factors?*
- (iii) *What is the expected return premium of factor 2? (8 Marks)*
- (c) *Discuss about the Primary Participants in the process of Securitization. (4 Marks)*

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

$$\text{b prop. 1} = 1.50 \times 0.75 + (-0.50 \times 1.50) = 0.375$$

$$\text{b prop. 2} = 1.50 \times 0.60 + (-0.50 \times 1.10) = 0.35$$

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

$$\text{Security X} \quad ₹ 3,00,000 / ₹ 1,00,000 = 3$$

$$\text{Security Y} \quad -₹ 1,00,000 / ₹ 1,00,000 = -1$$

$$\text{Risk free asset} \quad -₹ 100000 / ₹ 100000 = -1$$

$$\text{b prop. 1} = 3.0 \times 0.75 + (-1 \times 1.50) + (-1 \times 0) = 0.75$$

$$\text{b prop. 2} = 3.0 \times 0.60 + (-1 \times 1.10) + (-1 \times 0) = 0.70$$

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

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

Accordingly

$$15 = 10 + 0.75 \lambda_1 + 0.60 \lambda_2$$

$$20 = 10 + 1.50 \lambda_1 + 1.10 \lambda_2$$

On solving equation, the value of λ_1 and λ_2 comes 6.67 and 0 respectively.

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

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

Security X

Total Return = 15%

Risk Free Return = 10%

Risk Premium = 5%

Security Y

Total Return = 20%

Risk Free Return = 10%

Risk Premium = 10%

Ch- 8 Derivatives

1.

The stock of Exotica Ltd. (EL) is currently trading at Rs. 408 and call option exercisable in three months time has an exercise rate of Rs. 400. The standard deviation of the continuously compounded stock price change for Exotica Ltd. is estimated to be 22% per year. The annualized Treasury Bill rate corresponding to this option life is 5%. The company is going to declare a dividend of Rs. 10 and it is expected to be paid in two months time.

Requirement: What is the value of a three month call option on the stock of Exotica Ltd. (based on Black and Scholes Model).

Note: Extracted from the Tables

1. Natural Logarithms:

$$L_n(0.99521) = -0.00480, L_n(1.020) = 0.01980, L_n(0.98039) = -0.019804$$

$$2. \text{ Value of } e^{-x} : e^{-0.01} = 0.99010, e^{-0.0125} = 0.98758$$

$$3. \text{ When } x \leq 0 : N(0.125) = 0.5498, N(0.015) = 0.5060$$

$$\text{When } x > 0 : N(-0.125) = 0.4502, N(-0.015) = 0.4940$$

$$4. \text{ PVIF (5\%, 1/4 year)} = 0.9877, \text{ PVIF(5\%, 1/6 year)} = 0.9917$$

(I.C.W.A. Final Dec. 2006)

Solution

Since dividend is expected to be paid in two months time, we have to adjust the stock price and then use Black and Scholes model to value the option.

$$\text{P.V. of the expected dividend} = 10 \times 0.9917 = \text{Rs. } 9.917$$

$$\text{Dividend adjusted stock price} = \text{Rs. } 408 - 9.917 = \text{Rs. } 398.083$$

This can be used in Black Scholes model

Value of the Call Option

$$V_0 = V_s N(d_1) - E e^{-rt} N(d_2)$$

Where,

V_s = Current price of stock (adjusted)

E = Exercise price

r = Risk free rate

$$d_1 = \frac{\ln(V_s/E) + (r + 1/2 \sigma^2)t}{\sigma \sqrt{t}}$$

$$d_2 = d_1 - \sigma \sqrt{t}$$

Where,

$$t = 3/12 = 0.25 \quad r = 0.05 \quad a = 0.22$$

$$\begin{aligned}
 d_1 &= \frac{\ln(398.083/400) + [0.05 + 1/2(0.22)^2] \times 0.25}{0.22\sqrt{0.25}} \\
 &= \frac{\ln(0.99521) + 0.0742 \times 0.25}{0.11} = \frac{-0.00480 + 0.01855}{0.11} \\
 &= \frac{0.01375}{0.11} = 0.125
 \end{aligned}$$

$$d_2 = 0.125 - 0.22\sqrt{0.25} = 0.125 - 0.11 = 0.015$$

$$N(d_1) = N(0.125) = 0.5498$$

$$N(d_2) = N(0.015) = 0.5060$$

Value of call option (V_0)

$$= V_{S_N}(d_1) - Ee^{-rt} N(d_2)$$

Where,

$$V_S = 398.083$$

$$E = 400$$

$$\begin{aligned}
 e^{-rt} &= e^{-0.05 \times 0.25} = e^{-0.0125} \\
 &= 0.98758
 \end{aligned}$$

$$\begin{aligned}
 V_0 &= 398.083 \times 0.5498 - 400 \times 0.98758 \times 0.5060 \\
 &= 218.866 - 199.886 = \text{Rs. } 18.98
 \end{aligned}$$

Hence, the value of a three month call option on the stock of Exotica Ltd. is Rs. 18.98

2.

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 ₹ lakh and upto 2 decimal points.

- (a) Yes, the apprehension of CEO is correct as the current portfolio is more riskier than market as the beta (Systematic Risk) of market portfolio is as computed as follows:

Shares	No. of shares (lakhs) (1)	Market Price of Per Share (2) (₹)	(1) × (2) (₹ lakhs)	% to total (w)	β (x)	Wx
X Ltd.	6.00	1000.00	6000.00	0.30	1.50	0.45
Y Ltd.	8.00	1500.00	12000.00	0.60	1.30	0.78
Z Ltd.	4.00	500.00	<u>2000.00</u>	<u>0.10</u>	1.70	<u>0.17</u>
			<u>20000.00</u>	1.00		<u>1.40</u>

- (b) Since the Beta of existing portfolio is 1.40, the systematic risk of the current portfolio is 1.40.

- (c) Required Beta 0.95

Let the proportion of risk-free securities for target beta $0.95 = p$

$$0.95 = 0 \times p + 1.40 (1 - p)$$

$$p = 0.32 \text{ i.e. } 32\%$$

Shares to be disposed off to reduce beta (20000 × 32%) ₹ 6,400 lakh and Risk Free securities to be acquired for the same amount.

(d) Number of shares of each company to be disposed off

Shares	% to total (w)	Proportionate Amount (₹ lakhs)	Market Price Per Share (₹)	No. of Shares (Lakh)
X Ltd.	0.30	1920.00	1000.00	1.92
Y Ltd.	0.60	3840.00	1500.00	2.56
Z Ltd.	0.10	640.00	500.00	1.28

(e) Since, the company is in long position in cash market it shall take short position in Future Market.

Number of Nifty Contract to be sold

$$\frac{(1.40-0.95) \times 20000 \text{ lakh}}{8,250 \times 210} = 519 \text{ contracts}$$

(f) If there is 2% rises in Nifty there will be 2.80%(2%×1.40) rise for portfolio of shares

	₹ Lakh
Current Value of Portfolio of Shares	20000
Value of Portfolio after rise	20560
Mark-to-Market Margin paid (8250 × 0.020 × ₹ 210 × 519)	179.83
Value of the portfolio after rise of Nifty	20380.17
% change in value of portfolio (20380.17 – 20000)/ 20000	1.90%
% rise in the value of Nifty	2%
New Systematic Risk (Beta)	0.95

3.

Dravid Investments Ltd. deals in equity derivatives. Their current portfolio comprises of the following instruments:

Infosys	Rs. 5600 Call Expiry June 2010	2,000 Units bought at Rs. 197 each (cost)
Infosys	Rs. 5700 Call Expiry June 2010	3,600 Units bought at Rs. 131 each (cost)
Infosys	Rs. 5400 Put Expiry June 2010	4,000 Units bought at Rs. 81 each (cost)

What will the profit or loss to Dravid Investments Ltd. in the following situations ?

- Infosys closes on the expiry day at Rs. 6,041
- Infosys closes on the expiry day at Rs. 5,812
- Infosys closes on the expiry day at Rs. 5,085

(I.C.W.A. Final June 2004)

Solution

Instrument	Units	Cost	Strike	Payoff/unit at Infosys Closing price		
				(i) At 6041	(ii) At 5812	(iii) At 5085
5600 Call	2,000	197	5,600	441	212	Nil
5700 Call	3,600	131	5,700	341	112	Nil
5400 Put	4,000	81	5,400	Nil	Nil	315

Instrument	Profit per unit			Instrument	Profit amount		
	Infosys	Closing	Price		Infosys	Closing	Price
Instrument	6,041	5,812	5,085	Instrument	6,041	5,812	5,085
5600 Call	244	15	-197	5600 Call	4,88,000	30,000	-3,94,000
5700 Call	210	-19	-131	5700 Call	7,56,000	-68,400	-4,71,000
5400 Put	-81	-81	234	5400 Put	-3,24,000	-3,24,000	9,36,000
				Total	9,20,000	-3,62,000	70,400

4.

Ramesh owns a plot of land on which he intends to construct apartment units for sale. No. of apartment units to be constructed may be either 10 or 15. Total construction costs for these alternatives are estimated to be ₹ 600 lakhs or ₹ 1025 lakhs respectively. Current market price for each apartment unit is ₹ 80 lakhs. The market price after a year for apartment units will depend upon the conditions of market. If the market is buoyant, each apartment unit will be sold for ₹ 91 lakhs, if it is sluggish, the sale price for the same will be ₹ 75 lakhs. Determine the value of vacant plot of land. Assuming that the construction cost will remain same in year 1 should Ramesh start construction now or keep the land vacant? The yearly rental per apartment unit is ₹ 7 lakhs and the risk free interest rate is 10% p.a.

Assume that the construction cost will remain unchanged.

Answer

Presently 10 units apartments shall yield a profit of ₹ 200 lakh (₹ 800 lakhs – ₹ 600 lakhs) and 15 unit apartment will yield a profit of ₹ 175 lakh (₹ 1200 lakhs – ₹ 1025 lakhs). Thus 10 units apartment is the best alternative if Ramesh has to construct now.

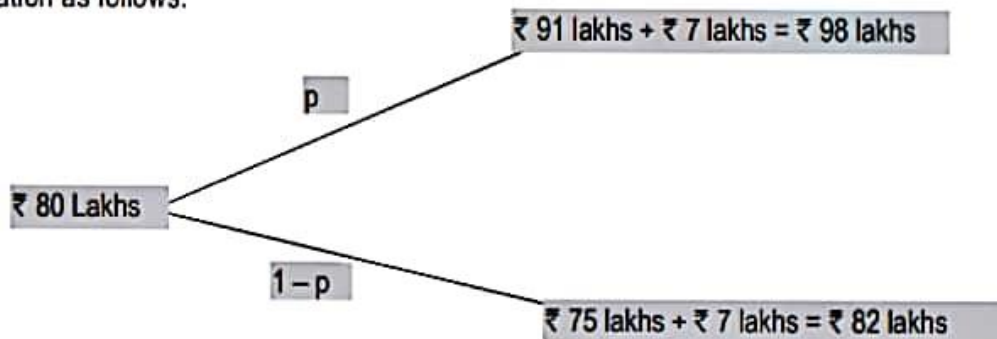
However, Ramesh waits for 1 year his pay-off will be as follows:



	<i>Market Conditions</i>	
	<i>Buoyant Market</i>	<i>Sluggish Market</i>
10 units apartments	₹ 91 lakhs X 10 – ₹ 600 lakhs = ₹ 310 lakhs	₹ 75 lakhs X 10 – ₹ 600 lakhs = ₹ 150 lakhs
15 units apartments	₹ 91 lakhs X 15 – ₹ 1025 lakhs = ₹ 340 lakhs	₹ 75 lakhs X 15 – ₹ 1025 lakhs = ₹ 100 lakhs

Thus if market conditions turnout to be buoyant the best alternative is 15 units apartments and net pay-off will be ₹ 340 lakhs and if market turnout to be sluggish the best alternative is the 10 units apartments and net pay-off shall be ₹ 150 lakhs.

To determine the value of vacant plot we shall use Binomial Model (Risk Neutral Method) of option valuation as follows:



Alternatively student can calculate these values as follows (Sale Value + Rent):

If market is buoyant then possible outcome = ₹ 91 lakh + ₹ 7 lakh = ₹ 98 lakhs

If market is sluggish then possible outcome = ₹ 75 lakh + ₹ 7 lakh = ₹ 82 lakhs

Let p be the probability of buoyant condition then with the given risk-free rate of interest of 10% the following condition should be satisfied:

$$₹ 80 \text{ lakhs} = \frac{[(p \times ₹ 98 \text{ lakhs}) + (1-p) \times ₹ 82 \text{ lakhs}]}{1.10}$$

$$p = \frac{3}{8} \text{ i.e. } 0.375$$

Thus $1-p = 0.625$

Expected cash flow next year

$$0.375 \times ₹ 340 \text{ lakhs} + 0.625 \times ₹ 150 \text{ lakhs} = ₹ 221.25 \text{ lakhs}$$

Present Value of expected cash flow:

$$₹ 221.25 \text{ lakhs} (0.909) = ₹ 201.12 \text{ lakhs}$$

Thus, the value of vacant plot is ₹ 201.12 lakhs

Since the current value of vacant land is more than profit from 10 units apartments now (₹ 200 lakh) the land should be kept vacant.

5.

A company is long on 10 MT of copper @ ₹ 474 per kg (spot) and intends to remain so for the ensuing quarter. The standard deviation of changes of its spot and future prices are 4% and 6% respectively, having correlation coefficient of 0.75.

What is its hedge ratio? What is the amount of the copper future it should short to achieve a perfect hedge?

Answer

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

$$H = \rho \frac{\sigma_S}{\sigma_F}$$

Where

σ_S = Standard deviation of ΔS

σ_F = Standard deviation of ΔF

ρ = coefficient of correlation between ΔS and ΔF

H = Hedge Ratio

ΔS = change in Spot price.

ΔF = change in Future price.

Accordingly

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

No. of contract to be short = $10 \times 0.5 = 5$

Amount = $5000 \times ₹ 474 = ₹ 23,70,000$

TRUECEPT

1.

X Ltd. is a Shoes manufacturing company. It is all equity financed and has a paid-up Capital of ₹10,00,000 (₹10 per share)

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

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

TRUECEPT

- (ii) Earnings are likely to grow at the rate of 10% from 3rd year and onwards.
- (iii) Further, if there is reduction in earnings growth, dividend payout ratio will increase to 50%.

The other data related to the company are as follows:

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

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

By using the Dividend Valuation Model, calculate

- (i) Expected Market Price per share
- (ii) P/E Ratio.

Answer

- (a) The formula for the Dividend valuation Model is

$$P_0 = \frac{D_1}{K_e - g}$$

K_e = Cost of Capital

g = Growth rate

D_1 = Dividend at the end of year 1

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

Year	EPS (₹)	DPS (₹)	PVF @15%	PV of DPS (₹)
2015	12.00 (9.60 x 125%)	4.80 (3.84 x 125%)	0.870	4.176
2016	15.00 (12.00 x 125%)	6.00 (4.80 x 125%)	0.756	4.536
2017	16.50 (15.00 x 110%)	8.25* (50% of ₹ 16.50)	0.658	5.429
				14.141

*Payout Ratio changed to 50%.

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

$$D_1 = ₹ 8.25 \times 110\% = ₹ 9.075$$

Therefore P_0 from the end of 2017

$$\frac{₹ 9.075}{0.15 - 0.10} = ₹ 181.50$$

This must be discounted back to the present value, using the 3 year discount factor after 15%.

	₹
Present Value of P_0 (₹ 181.50 × 0.658)	119.43
Add: PV of Dividends 2015 to 2017	<u>14.14</u>
Expected Market Price of Share	<u>133.57</u>

(b) P/E Ratio

$$\begin{aligned}
 \text{P/E Ratio} &= \frac{\text{Expected Market Price of Share } (P_1)}{\text{EPS}} \\
 &= \frac{₹ 133.57}{₹ 9.60} = ₹ 13.91
 \end{aligned}$$

2.

Rahim Enterprises is a manufacturer and exporter of woolen garments to European countries. Their business is expanding day by day and in the previous financial year the company has registered a 25% growth in export business. The company is in the process of considering a new investment project. It is an all equity financed company with 10,00,000 equity shares of face value of ₹ 50 per share. The current issue price of this share is ₹ 125 ex-divided. Annual earnings are ₹ 25 per share and in the absence of new investments will remain constant in perpetuity. All earnings are distributed at present. A new investment is available which will cost ₹ 1,75,00,000 in one year's time and will produce annual cash inflows thereafter of ₹ 50,00,000. Analyse the effect of the new project on dividend payments and the share price.

Answer

(i) Let us first compute the Cost of Equity $k_e = \frac{D}{P} = \frac{25}{125} = 20\%$

(ii) Current Earning = ₹ 25 × 10,00,000 = ₹ 2,50,00,000

The new project can be financed by retaining ₹ 1,75,00,000 of ₹ 2,50,00,000 earning next year, reducing dividend payment to ₹ 75,00,000 or

$$\frac{₹ 75,00,000}{10,00,000} = ₹ 7.50 \text{ per share}$$

(iii) In the following years, dividend will increase due to the cash generated by the new project. Dividend per share in year 2 shall be:

$$\frac{₹ 2,50,00,000 + ₹ 50,00,000}{10,00,000} = ₹ 30 \text{ per share}$$

(iv) The new share price can be calculated by finding the Present Value of the revised dividend payments:

$$P = \frac{₹ 7.50}{1.20} + \frac{₹ 30.00}{0.20} \times \frac{1}{1.20} = ₹ 131.25 \text{ per share}$$

3.

Ray gold Ltd. (RL) has a paid-up ordinary share capital of Rs. 200 lakhs represented by 4 lakhs shares of Rs. 50 each. Earnings after tax in the most recent year (2009-10) were Rs. 80,00,000 of which Rs. 26,50,000 was distributed as dividend. The current price/earning ratio of these shares as reported in the financial press is 8.

The company (RL) is planning a major investment that will cost Rs. 240 lakhs and is expected to produce additional after-tax earnings over the foreseeable future at a rate of 15 percent on the amount invested. The necessary finance is to be raised by a rights issue to the existing shareholders at a price 25 per cent below the current market price of the company's shares.

You are required to calculate :

- (i) the current market price of the shares already in issue
- (ii) the price at which the rights issue will be made
- (iii) the number of new shares that will be issued

- (iv) the value of the rights
- (v) the price at which the shares of the company should theoretically be quoted on completion of the rights issue (i.e., the ex-rights price), ignoring incidental and transaction costs. Assuming that - the rate of return on existing funds is 12.5% and the market accepts the company's forecast of incremental earnings. (I.C.W.A. Final Dec. 2005)

Solution

- (i) Calculation of current market price of the shares already in issue

$$\begin{aligned}
 \text{Earnings after tax (2009-10)} &= \text{Rs. } 80,00,000 \\
 \text{No. of shares outstanding} &= 4,00,000 \text{ shares} \\
 \text{EPS} &= \text{Rs. } 80,00,000 / 4,00,000 \text{ shares} = \text{Rs. } 20 \\
 \text{Price earning ratio} &= 8 \text{ (given)} \\
 \text{Market price of share} &= \text{Rs. } 20 \times 8 = \text{Rs. } 160
 \end{aligned}$$

(ii) Price at which the rights issue will be made

$$= \text{Rs. } 160 \times 0.75 = \text{Rs. } 120$$

(iii) Number of new shares to be issued

$$= \text{Rs. } 2,40,00,000 / \text{Rs. } 120 = 2,00,000 \text{ shares}$$

- (iv) Calculation of Value of Rights

$$\text{Value of right} = \frac{r(M-S)}{N+r}$$

Where,

- r = No. of rights issued
 M = Market price of share
 N = No. of existing shares
 S = Issue price of rights

$$= \frac{2,00,000(160-120)}{4,00,000+2,00,000} = \frac{80,00,000}{6,00,000} = \text{Rs. } 13.33$$

- (v) Calculation of Ex-rights Price

$$\begin{aligned}
 &= \left(160 \times \frac{4,00,000}{6,00,000}\right) + \left[\left(120 \times \frac{2,00,000}{6,00,000}\right) \times \frac{0.15}{0.125}\right] \\
 &= 106.67 + 48 = \text{Rs. } 154.67
 \end{aligned}$$

4.

Trupty Co. Ltd. promoted by a Multinational group "INTERNATIONAL INC" is listed on stock exchange holding 84% i.e. 63 lakhs shares.

Profit after Tax is ₹ 4.80 crores.

Free Float Market Capitalisation is ₹ 19.20 crores.

As per the SEBI guidelines promoters have to restrict their holding to 75% to avoid delisting from the stock exchange. Board of Directors has decided not to delist the share but to comply with the SEBI guidelines by issuing Bonus shares to minority shareholders while maintaining the same P/E ratio.

Calculate

- (i) P/E Ratio
- (ii) Bonus Ratio
- (iii) Market price of share before and after the issue of bonus shares
- (iv) Free Float Market capitalization of the company after the bonus shares.

Answer

1. P/E Ratio:

	% of holding	No. of Shares
Promoter's Holding	84%	63 Lacs
Minority Holding	16%	12 Lacs
Total Shares	100%	75 Lacs

Free Float Market Capitalization = ₹ 19.20 crores

Hence Market price $\frac{₹19.20 \text{ crores}}{12.00 \text{ lacs}}$ = ₹160 per share

EPS (PAT/No. of Shares) (₹ 4.80 crores /75 lac) = ₹ 6.40 per share

P/E Ratio (₹ 160/ ₹ 6.40) = 25

2. No. of Bonus Shares to be issued:

Promoters holding 84%, = 63 lacs shares

Shares remains the same, but holding % to be taken as 75%

Hence Total shares = $\frac{63 \text{ lacs}}{75\%}$ = 84 lacs

Shares of Minority = 84 lacs – 63 lacs = 21 lacs

Bonus 9 lacs for 12 lacs i.e. 3 bonus for 4 held or 0.75 shares for 1 share

3. Market price before & after Bonus:

Before Bonus = ₹160 per share

After Bonus

New EPS $\frac{₹ 4.80 \text{ crores}}{84 \text{ lacs}}$ = ₹ 5.71

New Market Price (25 x ₹ 5.71) = ₹ 142.75

4. Free Float Capitalization is

₹ 142.75 x 21 lacs = ₹ 29.9775 crores

1.

The following data is related to 8.5% Fully Convertible (into Equity shares) Debentures issued by JAC Ltd. at ₹ 1000.

Market Price of Debenture	₹ 900
Conversion Ratio	30
Straight Value of Debenture	₹ 700
Market Price of Equity share on the date of Conversion	₹ 25
Expected Dividend Per Share	₹ 1

You are required to calculate:

- (a) Conversion Value of Debenture
- (b) Market Conversion Price
- (c) Conversion Premium per share
- (d) Ratio of Conversion Premium
- (e) Premium over Straight Value of Debenture
- (f) Favourable income differential per share
- (g) Premium pay back period

TRUECEPT

Answer

(a) Conversion Value of Debenture

$$\begin{aligned}
 &= \text{Market Price of one Equity Share} \times \text{Conversion Ratio} \\
 &= ₹ 25 \times 30 = ₹ 750
 \end{aligned}$$

(b) Market Conversion Price

$$\begin{aligned}
 &= \frac{\text{Market Price of Convertible Debenture}}{\text{Conversion Ratio}} \\
 &= \frac{₹ 900}{30} = ₹ 30
 \end{aligned}$$

(c) Conversion Premium per share

$$\begin{aligned}
 &\text{Market Conversion Price} - \text{Market Price of Equity Share} \\
 &= ₹ 30 - ₹ 25 = ₹ 5
 \end{aligned}$$

(d) Ratio of Conversion Premium

$$\frac{\text{Conversion premium per share}}{\text{Market Price of Equity Share}} = \frac{₹ 5}{₹ 25} = 20\%$$

(e) Premium over Straight Value of Debenture

$$\frac{\text{Market Price of Convertible Bond}}{\text{Straight Value of Bond}} - 1 = \frac{₹ 900}{₹ 700} - 1 = 28.6\%$$

(f) Favourable income differential per share

$$\begin{aligned}
 &\frac{\text{Coupon Interest from Debenture} - \text{Conversion Ratio} \times \text{Dividend Per Share}}{\text{Conversion Ratio}} \\
 &\frac{₹ 85 - 30 \times ₹ 1}{30} = ₹ 1.833
 \end{aligned}$$

(g) Premium pay back period

$$\frac{\text{Conversion premium per share}}{\text{Favourable Income Differential Per Share}} = \frac{₹ 5}{₹ 1.833} = 2.73 \text{ years}$$

2.

On 31st March, 2013, the following information about Bonds is available:

Name of Security	Face Value ₹	Maturity Date	Coupon Rate	Coupon Date(s)
Zero coupon	10,000	31 st March, 2023	N.A.	N.A.
T-Bill	1,00,000	20 th June, 2013	N.A.	N.A.
10.71% GOI 2023	100	31 st March, 2023	10.71	31 st March
10 % GOI 2018	100	31 st March, 2018	10.00	31 st March & 30 th September

Calculate:

- (i) If 10 years yield is 7.5% p.a. what price the Zero Coupon Bond would fetch on 31st March, 2013?
- (ii) What will be the annualized yield if the T-Bill is traded @ 98500?
- (iii) If 10.71% GOI 2023 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)?
- (iv) If 10% GOI 2018 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)?

Answer

- (i) Rate used for discounting shall be yield. Accordingly ZCB shall fetch:

$$= \frac{10000}{(1+0.075)^{10}} = ₹ 4,852$$

- (ii) The day count basis is actual number days / 365. Accordingly annualized yield shall be:

$$\text{Yield} = \frac{\text{FV-Price}}{\text{Price}} \times \frac{365}{\text{No. of days}} = \frac{100000-98500}{98500} \times \frac{365}{81} = 6.86\%$$

Note: Alternatively, it can also computed on 360 days a year.

- (iii) Price GOI 2023 would fetch

$$\begin{aligned}
 &= ₹ 10.71 \text{ PVAF}(8\%, 10) + ₹ 100 \text{ PVF}(8\%, 10) \\
 &= ₹ 10.71 \times 6.71 + ₹ 100 \times 0.4632 \\
 &= ₹ 71.86 + ₹ 46.32 = ₹ 118.18
 \end{aligned}$$

- (iv) Price GOI 2018 Bond would fetch:

$$\begin{aligned}
 &= ₹ 5 \text{ PVAF}(4\%, 10) + ₹ 100 \text{ PVF}(4\%, 10) \\
 &= ₹ 5 \times 8.11 + ₹ 100 \times 0.6756 \\
 &= 40.55 + 67.56 = 108.11
 \end{aligned}$$

3.

4. Based on the following data, estimate the Net Asset Value (NAV) 1st July 2016 on per unit basis of a Debt Fund:

Name of Security	Face Value ₹	Purchase Price ₹	Maturity Date	No. of Securities	Coupon Date(s)	Duration of Bonds
10.71% GOI 2028	100	104.78	31 st March, 2028	100000	31 st March	7.3494
10 % GOI 2023	100	100.00	31 st March, 2023	50000	31 st March & 30 th September	5.086
9.5 % GOI 2021	100	97.93	31 st December, 2021	40000	30 th June & 31 st December	4.3949
8.5% SGL 2025	100	91.36	30 th June 2025	20000	30 th June	6.5205

Number of Units (₹ 10 face value each): 100000

All securities were purchased at a time when applicable Yield to Maturity (YTM) was 10%. On NAV date, the required yield increased by 75 basis point and Cash in hand and accrued expenses were ₹ 6,72,800 and ₹ 2,37,400 respectively.

TRUECEPT

4. Working Notes:

(i) Calculation of Interest Accrued

Name of Security	Maturity Date	Amount (₹)
10.71% GOI 2028	$100 \times 100000 \times 10.71\% \times \frac{3}{12}$	2,67,750
10 % GOI 2023	$100 \times 50000 \times 10.00\% \times \frac{3}{12}$	1,25,000
Total		3,92,750

Note: Interests on two remaining securities shall not be considered as last interest was paid on 30.06.2016

(ii) Valuation of Securities

Name of Security	Purchase Amount ₹	Duration of Bonds	Volatility (%)	(+)/(-)	Total Amount ₹
10.71% GOI 2028	1,04,78,000	7.3494	$\frac{7.3494}{1.10} \times 0.75 = 5.0110$	- 5,25,053	99,52,947
10% GOI 2023	50,00,000	5.086	$\frac{5.086}{1.05} \times 0.75 = 3.6329$	- 1,81,645	48,18,355
9.5% GOI 2021	39,17,200	4.3949	$\frac{4.3949}{1.05} \times 0.75 = 3.1392$	- 1,22,969	37,94,231
8.5% SGL 2025	18,27,200	6.5205	$\frac{6.5205}{1.10} \times 0.75 = 4.4456$	- 81,230	17,45,970
					2,03,11,503

Calculation of NAV

Particulars	₹ crores
Value of Securities as computed above	2,03,11,503
Cash in hand	6,72,800
Interest accrued	3,92,750

Sub total assets (A)	2,13,77,053
Less: Liabilities	
Expenditure accrued	2,37,400
Sub total liabilities (B)	2,37,400
Net Assets Value (A) – (B)	2,11,39,653
No. of units	1,00,000
Net Assets Value per unit (₹ 2,11,39,653/ 1,00,000)	₹ 211.40

4.

XL Ispat Ltd. has made an issue of 14 per cent non-convertible debentures on January 1, 2007. These debentures have a face value of ₹ 100 and is currently traded in the market at a price of ₹ 90.

Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2011 at the end of 5 years.

Required :

- (i) Estimate the current yield and YTM of the bond.*
- (ii) Calculate the duration of the NCD.*
- (iii) Assuming that intermediate coupon payments are, not available for reinvestment calculate the realised yield on the NCD.*

Answer

(i)
$$\text{Current yield} = \frac{\text{₹ } 7}{\text{₹ } 90} \times \frac{12}{6} = 0.1555 \text{ or } 15.55\%$$

YTM can be determined from the following equation

$$7 \times \text{PVIFA}(\text{YTM}, 10) + 100 \times \text{PVIF}(\text{YTM}, 10) = 90$$

Let us discount the cash flows using two discount rates 7.50% and 9% as follows:

Year	Cash Flows	PVF@7.50%	PV@7.50%	PVF@9%	PV@9%
0	-90	1	-90	1	-90
1	7	0.930	6.51	0.917	6.419
2	7	0.865	6.055	0.842	5.894
3	7	0.805	5.635	0.772	5.404
4	7	0.749	5.243	0.708	4.956
5	7	0.697	4.879	0.650	4.550
6	7	0.648	4.536	0.596	4.172
7	7	0.603	4.221	0.547	3.829
8	7	0.561	3.927	0.502	3.514
9	7	0.522	3.654	0.460	3.220
10	107	0.485	51.90	0.422	45.154
			6.560		-2.888

Now we use interpolation formula

$$7.50\% + \frac{6.560}{6.560 - (-2.888)} \times 1.50\%$$

$$7.50\% + \frac{6.560}{9.448} \times 1.50\% = 7.50\% + 1.041\%$$

YTM = 8.541% say 8.54%

Note: Students can also compute the YTM using rates other than 15% and 18%.

(ii) The duration can be calculated as follows:

Year	Cash Flow	PVF@ 8.54%	PV @ 8.54%	Proportion of NCD value	Proportion of NCD value × time
1	7	0.921	6.447	0.0717	0.0717
2	7	0.849	5.943	0.0661	0.1322
3	7	0.782	5.474	0.0608	0.1824
4	7	0.721	5.047	0.0561	0.2244
5	7	0.664	4.648	0.0517	0.2585
6	7	0.612	4.284	0.0476	0.2856
7	7	0.563	3.941	0.0438	0.3066

8	7	0.519	3.633	0.0404	0.3232
9	7	0.478	3.346	0.0372	0.3348
10	107	0.441	47.187	0.5246	5.2460
			89.95		7.3654

Duration = 7.3654 half years i.e. 3.683 years.

(iii) Realized Yield can be calculated as follows:

$$\frac{(7 \times 10) + 100}{(1+R)^{10}} = 90$$

$$(1 + R)^{10} = \frac{170}{90}$$

$$R = \left(\frac{170}{90}\right)^{1/10} - 1 = 0.06380 \text{ or } 6.380\% \text{ for half yearly and } 12.76\% \text{ annually.}$$

TRUECEPT

5.

From the following particulars, calculate the effective rate of interest p.a. as well as the total cost of funds to Bhaskar Ltd., which is planning a CP issue:

Issue Price of CP	₹ 97,550
Face Value	₹ 1,00,000
Maturity Period	3 Months
Issue Expenses:	
Brokerage	0.15% for 3 months
Rating Charges	0.50% p.a.
Stamp Duty	0.175% for 3 months

Answer

$$\text{Nominal Interest or Bond Equivalent Yield} = \left[\frac{F-P}{P} \right] \times \frac{12}{M} \times 100$$

Where

F= Face Value

P= Issue Price

$$= \frac{1,00,000 - 97,550}{97,550} \times \frac{12}{3} \times 100 = 0.025115 \times 4 \times 100 = 10.046 = 10.05\% \text{ p.a.}$$

$$\text{Effective interest rate} = \left[1 + \frac{0.1005}{4} \right]^4 - 1 = 10.435\% \text{ p.a.}$$

Cost of Funds to the Company

Effective Interest	10.435%
Brokerage (0.150 × 4)	0.60%
Rating Charge	0.50%
Stamp duty (0.175 × 4)	<u>0.70%</u>
	<u>12.235%</u>

Alternatively, effective interest rate can also be computed as follows:

Let i be the interest rate then

$$97,750 = \frac{100,000}{1 + i \times \frac{3}{12}}$$

$$i = 10.046$$

Cost of Funds to the Company

Effective Interest	10.046%
Brokerage (0.150×4)	0.60%
Rating Charge	0.50%
Stamp duty (0.175×4)	<u>0.70%</u>
	<u>11.846%</u>

6.

From the following data for Government securities, calculate the forward rates:

Face value (₹)	Interest rate	Maturity (Year)	Current price (₹)
1,00,000	0%	1	91,500
1,00,000	10%	2	98,500
1,00,000	10.5%	3	99,000

Answer

Consider one-year Treasury bill.

$$91,500 = \frac{1,00,000}{(1+r_1)}$$

$$1+r_1 = \frac{1,00,000}{91,500} = 1.092896$$

$$r_1 = 0.0929 \text{ or } 0.093$$

Consider two-year Government Security

$$98,500 = \frac{10,000}{1.093} + \frac{1,10,000}{1.093(1+r_2)}$$

$$98500 = 9149.131 + \frac{1,10,000}{1.093(1+r_2)}$$

$$\Rightarrow 89350.87 = \frac{100640.4}{1+r_2}$$

$$\Rightarrow 1 + r_2 = 1.126351$$

$$\Rightarrow r_2 = 0.12635$$

$$\Rightarrow r_2 = 0.1263$$

Consider three-year Government Securities:

$$99,000 = \frac{10,500}{1.093} + \frac{10,500}{1.093 \times 1.1263} + \frac{1,10,500}{1.093 \times 1.1263(1+r_3)}$$

$$\Rightarrow 99,000 = 9,606.587 + 8,529.65 + \frac{89,761.07}{1+r_3}$$

$$\Rightarrow 80,863.763 = \frac{89,761.07}{1+r_3}$$

$$\Rightarrow 1+r_3 = 1.1100284$$

$$\Rightarrow r_3 = 0.1100284 \text{ say } 11.003\%$$

Ch – 9 & 10 Foreign Exchange
No extra questions

1.

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

Given

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

You are required to determine the maximum possible investment.

(4 Marks)

Answer

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