ADDITIONAL SOLVED PROBLEMS

CHAPTER 2

P.2.12 An investor wishes to choose the better of the two equally costly cashflow streams, namely, Annuity *X* (*AX*) and Annuity *Y* (*AY*). While *AX* is an annuity due (i.e. cash flows occur at the beginning of the year) with a cash inflow of Rs 90,000 for each of 6 years, AY is an ordinary annuity (i.e. cash flows occur at the end of the year) with a cash inflow of Rs 1,00,000 for each of 6 years. Assuming 15 per cent return on investment (a) find the future value at the end of year 6 (FVA_6) for both *AX* and *AY* and (b) which annuity is more attractive?

Solution

(a) Annuity *X*, FAV_6 = Rs 90,000 × FVIA (15.6 × 0.15)
= Rs 90,000 × 8.754 × 1.15 = Rs 9,06,039

Annuity *Y*, FVA_6 = Rs 1,00,000 × $FVIFA_{(15,6)}$
= Rs 1,00,000 × 8.754 = Rs 8,75,400

(b) *AX* is more attractive as its FVA_6 is larger than that of *AY*. This is so because the benefit of receiving the cash flows of *AX* at the beginning of the year more than offsets the fact that its flows are Rs 10,000 less than those of *AY*, which has year-end cash flows. The cash flows of *AX* earn 15 per cent for an extra year, thereby enhancing its future value.

P.2.13 You have a choice of accepting either of two 5-year cashflow streams or lump-sum amounts given below.

End of year	*Cash flow stream*	
	Alternative I	*Alternative II*
1	Rs 7,000	Rs 11,000
2	7,000	9,000
3	7,000	7,000
4	7,000	5,000
5	7,000	3,000
	Lump-sum amount	
At time zero (t = 0)	28,250	28,000

Assuming 10 per cent required rate of return, which alternative (I or II) and in which form (Cash flow or lump-sum) would you prefer and why?

Solution

Alternative I:

Cash flow stream (annuity):

PVA_5 = Rs 7,000 × $PVIFA_{(10,5)}$
= Rs 7,000 × 3.791 = Rs 26,537

Lump sum = Rs 28,250

Alternative II:

Cash flow stream (mixed stream)

Year (n)	*Cash flow (1)*	*$PVIF_{(10,n)}$ (2)*	*Present value [(1) × (2)] (3)*
1	Rs 11,000	0.909	Rs 9,999
2	9,000	0.826	7,434
3	7,000	0.751	5,257
4	5,000	0.683	3,415
5	3,000	0.621	1,863
			27,968
Lump sum =			Rs 28,000

Conclusion: Alternative I in the form of lump-sum payment is preferable as it has the largest present value.

P.2.14 You wish to accumulate Rs 80,00,000 by the end of 5 years by making equal annual year-end deposits over the next 5 years. Assuming 7 per cent rate of return, how much should you deposit at the end of each year to accumulate Rs 8,00,000?

Solution $FVA_n = X[FVIFA_{(r,n)}]$
FVA_5 = Rs 80,000; $FVIFA_{(7,5)} = 5.751$
Rs 8,00,000 = 5.751 X
X = Rs 8,00,000 ÷ 5.751 = Rs 1,39,106.

P.2.15 Compute the future values of (1) an initial Rs 100 compounded annually for 10 years at 10 per cent and (2) an annuity of Rs 100 for 10 years at 10 per cent.

Solution

(1) The future value of an investment compounded annually = $F_n = P(1 + i)^n = P \times \text{FIVF}_{i,n} = F_{10}$ = Rs 100 $(1 + 0.10)^{10}$ = Rs 100 (2.5937) = Rs 259.4

(2) The future value of an annuity = $S_n = A \times \text{FVIFA}_{i,n}$ = Rs 100 × 15.937 = Rs 1,593.7.

P.2.16 An investor has two options to choose from: (a) Rs 6,000 after 1 year; (b) Rs 9,000 after 4 years. Assuming a discount rate of (i) 10 per cent and (ii) 20 per cent, which alternative should he opt for?

Solution

(i) (a) Rs 6,000 after 1 year at 10 per cent discount = P = Rs 6,000(0.9091) = Rs 5,454.6.

(i) (b) Rs 9,000 after 4 years at 10 per cent discount = P = Rs 9,000(0.6830) = Rs 6,147.
At 10 per cent required rate, the investor should choose Rs 9,000 after 4 years.

(ii) (a) Rs 6,000 after 1 year at 20 per cent discount = P = Rs 6,000(0.8333) = Rs 4,999.8.

(ii) (b) Rs 9,000 after 4 years at 20 per cent discount = P = Rs 9,000(0.4823) = Rs 4,340.7.
At 20 per cent required rate, the investor should choose Rs 6,000 after 1 year.

P.2.17 An investor is 50 years of age today. He will retire at the age of 60. In order to receive Rs 2,00,000 annually for 10 years after retirement, how much amount should he have at the time of retirement? Assume the required rate of return is 10 per cent.

Solution P_n(present value of annuity) = $A \times \text{PVIFA}_{i,n} = P_{10}$ = Rs 2,00,000 (6.1446) = Rs 12,28,920.

P.2.18 A person would need Rs 100, 5 years from now. How much amount should he deposit each year in his bank account, if the yearly interest rate is 10 per cent?

Solution $S_n = A \times \text{FVIFA}_{i,n}$ or $A = S_n/\text{FVIFA}_{i,n}$ = Rs 100/6.1051 = Rs 16.38

P.2.19 *X* has taken a 20-month car loan of Rs 6,00,000. The rate of interest is 12 per cent per annum. What will be the amount of monthly loan amortisation?

Solution A = Rs 6,00,000/$\text{PVIFA}_{1,20}$ = Rs 6,00,000/18.0456 = Rs 33,249.1. Monthly interest
= 12 per cent/12
= 1 per cent.

P.2.20 ABC Ltd has borrowed Rs 1,000 to be repaid in equal instalments at the end of each of the next 3 years. The interest rate is 15 per cent. Prepare a amortisation schedule.

Solution Amount of equal instalment, A = $P_n/\text{PVIFA}_{i,n}$ = Rs 1,000/2.2832 = Rs 437.98

Amortisation schedule

Year	*Payment*	*Interest**	*Repayment of principal*	*Balance outstanding*
1	Rs 437.98	Rs 150.00	Rs 287.98	Rs 712.02
2	437.98	106.80	331.18	380.84
3	437.98	57.13	380.85	

*= Loan balance at the beginning of the year × interest rate, e.g., year 1 = (Rs 1,000 × 0.15) = Rs 150.

P.2.21 ABC Ltd has borrowed Rs 1,000 to be repaid in 12 monthly instalments of Rs 94.56. Compute the annual interest.

Solution

$$P_n = A \times \text{PVIFA}_{i,n}$$

$$\text{PVIFA}_{i,n} = P_n/A = \text{Rs } 1{,}000/\text{Rs } 94.56 = 10.5753$$

According to Table A-4 (Appendix), a PVIFA of 10.5753 for 12 periods at interest (i) = 2 per cent. The annual interest rate is therefore 0.02 × 12 = 24 per cent.

CHAPTER 3

P.3.15 The risk-free rate is 6 per cent and the expected rate of return on the market portfolio is 16 per cent, with a standard deviation of 8 per cent. An aggressive investor is keen to earn 20 per cent return. Is it possible for a rational investor to achieve the target return? How? Explain the nature of risk-return trade-off for him and verify results.

Solution The capital market line (CML) shows that returns in excess of market portfolio can be obtained by creating a margined or leveraged portfolio, that is borrowing at the risk-free rate and investing the whole amount in the market portfolio. With borrowings, the weight of the market portfolio (risky asset) is taken as w, which is greater than one. Since the sum of the weights should be zero, the weight of risk-free asset (T-bills or any other asset like savings deposit) is one minus w $(1 - w)$.

$$\begin{aligned} E(r_p) &= w_a r_a + w_b r_b = w\,(16\%) + (1 - w)\,(6\%) \\ &= 20 = 16w - 6w + 6 \\ 10w &= 20 - 6 = 14 \\ w &= 14/10 = 1.4 \\ 1 - w &= 1.0 - 1.4 = -0.4 \end{aligned}$$

Thus, the investor should borrow a sum equivalent to 40% of his owned funds at risk-free rate and invest the owned plus borrowed funds in the market portfolio. His risk return trade-off is implicit in the CML, which constitutes an efficient frontier. With risk-free lending (borrowing), the portfolio risk is simply the weight of risky asset times the standard deviation of the market portfolio. Thus, portfolio risk $(\sigma_p) = w\sigma_m = 1.4 \times 8\% = 11.2$ per cent.

Verification: Using the CML, the portfolio return may be obtained using the formula

$$\begin{aligned} E(r_p) &= r_f + [(r_m - r_f)/\sigma_m]\,\sigma_p \\ &= 6 + [(16\text{–}6)/8] \times 11.2 = 6 + 14 = 20 \text{ per cent} \end{aligned}$$

Alternatively,

Return on the market portfolio = $w \times r_m = 1.4 \times 16\% = 22.4$ per cent

Interest cost of borrowings = $(1 - w) \times r_f = -0.4 \times 6\% = 2.4$ per cent

Net return from investment= 22.4% – 2.4% = 20 per cent

P.3.16 If the simple CAPM holds good, comment on the following situations.

(a)

Portfolio	*E(r)*	σ
Aries (%)	30	25
Taurus (%)	40	15

(b)

Portfolio	*E(r)*	σ
Risk-free asset (%)	10	0
Market	18	24
Libra	18.8	27

Solution

(a) Positive incremental return 10 per cent (40% – 30%) is available with lower risk (standard deviation). This violates the basic assumption of the CAPM. Between Aries and Taurus. Aries is dominated by Taurus.

(b) The equation of the capital market line (CML) as per the CAPM is:

$$\begin{aligned} E(r_r) &= r_f + (\sigma\rho/\sigma_m)\,[E(r_m) - r_f] \\ &= 10\% + (27/24)\,(18 - 10) = 10\% + 27/3\% = 19\% \end{aligned}$$

The expected return on Libra is not commensurate with the total variability in returns (standard deviation). It is an inefficient portfolio and lies below the CML.

P.3.17 Risk-return features of two securities X and Y are:

Portfolio	*E(r)*	σ
X (%)	20	16
Y (%)	25	20

If the correlation coefficient between X and Y is 0.6, determine:

(a) Weights of X and Y, which would produce minimum portfolio risk (standard deviation), calculate expected return for these weights
(b) Portfolio risk and return, if weights are equal
(c) Portfolio risk and return, if weights are 3:1
(d) Portfolio risk and return, if weights are 1:3

*S*olution

(a) Weights that produce minimum variance in a 2 security portfolio may be obtained as:

$$W^*_x = (\sigma^2_Y - COV_{xy})/(\sigma^2_x + \sigma^2_y - 2COV_{xy})$$

where $COV_{xy} = \rho\ \sigma_x\ \sigma_y$

$COV_{xy} = 0.6 \times 16 \times 20 = 192$

$W^*_x = [(20)^2 - 192]/[(16)^2 + (20)^2 - 2.192] = (400 - 192)/(256 + 400 - 384)$

$= 208/272 = 0.765 = 76.5$ per cent

$W_y = 1 - W^*_x = 1–0.765 = 0.235 = 23.5$ per cent

$\sigma^2_p = (W_x\ \sigma_x)^2 \times (W_y\ \sigma_y)^2 + 2\ \sigma_x \sigma_y\ W_x\ W_y\ \rho$

$= (0.765 \times 16)^2 + (0.235 \times 20)^2 + 2\ (0.765)\ (0.235)\ 16 \times 20 \times 0.6)$

$= 149.82 + 22.09 + 69.03 = 240.94$ per cent

$\sigma\rho = 15.52$ per cent

$E(r_p) = w_x r_x + w_y\ r_y = 0.765 \times 20\% + 0.235 \times 25\% = 15.3\% + 5.88\% = 21.18$ per cent

(b) $\sigma^2_p = (0.5 \times 16)^2 + (0.5 \times 20)^2 + 2\ (0.6 \times 16 \times 20)\ (0.5)\ (0.5) = 64 + 100 + 96 = 260$ per cent

$\sigma_p = 16.12$ per cent

$E(r_p) = 0.5 \times 20\% + 0.5 \times 25\% = 10\% + 12.5\% = 22.5$ per cent

(c) $\sigma^2_p = (0.75 \times 16)^2 + (0.25 \times 20)^2 + 2\ (0.6 \times 16 \times 20)\ (\ 0.75 \times 0.25)$

$= 144 + 25 + 72 = 241$ per cent

$\sigma_p = 15.52$ per cent

$E(r_p) = 0.75 \times 20\% \times 0.25 \times 25\% = 15\% + 6.25\% = 21.25$ per cent

(d) $\sigma^2_p = (0.25 \times 16)^2 + (0.75 \times 20)^2 + 2\ (0.6 \times 16 \times 20)\ (0.75 \times 0.25)$

$= 16 + 225 + 72 = 313$ per cent

$\sigma_p = 17.69$ per cent

$E(r_p) = 0.25 \times 20\% + 0.75 \times 25\% = 5\% + 18.75\% = 23.75$ per cent

P.5.8 The following are the summarised balance sheets of Hypothetical Ltd. as at March 31 for the two consecutive years 1 and 2. Prepare CFS as per AS-3.

(Rs in thousand)

Particulars		*Year 2*		*Year 1*
Assets				
Cash on hand and balances with banks		200		25
Short-term investments		670		135
Sundry debtors		1,700		1,200
Interest receivable		100		—
Inventories		900		1,950
Long-term investments		2,500		2,500
Fixed assets at cost	2,180		1,910	
Accumulated depreciation	(1,450)		(1,060)	
Fixed assets (net)		730		850
Total assets		6,800		6,660
Liabilities				
Sundry creditors		150		1,890
Interest payable		230		100
Income taxes payable		400		1,000
Long-term debt		1,110		1,040
Total liabilities		1,890		4,030
Shareholders' Funds				
Share capital		1,500		1,250
Reserves		3,410		1,380
Total shareholders' funds		4,910		2,630
Total liabilities and shareholders' funds		6,800		6,660

Statement of Profit and Loss
for the year 2 ended March 31

(Rs '000)

Sales	30,650
Cost of sales	(26,000)
Gross profit	4,650
Depreciation	(450)
Administrative and selling expenses	(910)
Interest expense	(400)
Interest income	300
Dividend income	200
Foreign exchange loss	(40)
Net profit before taxation and extraordinary item	3,350
Extraordinary item-Insurance proceeds from earthquake disaster settlement	180
Net profit after extraordinary item	3,530
Income-tax	(300)
Net profit	3,230

Additional information *(Rs in thousand)*

(i) An amount of 250 was raised from the issue of share capital and a further 250 was raised from long-term borrowings.

(ii) Interest expense was 400 of which 170 was paid during the period. 100 relating to interest expense of the prior period was also paid during the period.

(iii) Dividends paid were 1,200.
(iv) Tax deducted at source on dividends received (included in the tax expense of 300 for the year) amounted to 40.
(v) During the period, the enterprise acquired fixed assets for 350. The payment was made in cash.
(vi) Plant with original cost of 80 and accumulated depreciation of 60 was sold for 20.
(vii) Foreign exchange loss of 40 represents the reduction in the carrying amount of a short-term investment in foreign-currency designated bonds arising out of a change in exchange rate between the date of acquisition of the investment and the balance sheet date.
(viii) Sundry debtors and sundry creditors include amounts relating to credit sales and credit purchases only.

Solution

Direct Method Cash Flow Statement		*(Rs '000)*
Cash flows from operating activities		
Cash receipts from customers	30,150	
Cash paid to suppliers and employees	(27,600)	
Cash generated from operations	2,550	
Income taxes paid	(860)	
Cash flow before extraordinary item	1,690	
Proceeds from earthquake disaster settlement	180	
Net cash from operating activities		1,870
Cash flows from investing activities		
Purchase of fixed assets	(350)	
Proceeds from sale of equipment	20	
Interest received	200	
Dividends received	160	
Net cash from investing activities		30
Cash flows from financing activities		
Proceeds from issuance of share capital	250	
Proceeds from long-term borrowings	250	
Repayment of long-term borrowings	(180)	
Interest paid	(270)	
Dividends paid	(1,200)	
Net cash used in financing activities	(1,150)	
Net increase in cash and cash equivalents		750
Cash and cash equivalents at beginning of period (*see Note 1*)		160
Cash and cash equivalents at the end of period (*see Note 1*)		910

Indirect Method Cash Flow Statement		*(Rs '000)*
Cash flows from operating activities		
Net profit before taxation, and extraordinary item	3,350	
Adjustments for:		
Depreciation	450	
Foreign exchange loss	40	
Interest income	(300)	
Dividend income	(200)	
Interest expense	400	
Operating profit before working capital changes	3,740	
Increase in sundry debtors	(500)	
Decrease in inventories	1,050	
Decrease in sundry creditors	(1,740)	
Cash generated from operations	2,550	
Income taxes paid	(860)	

(*Contd*)

(*Contd*)

Cash flow before extraordinary item	1,690	
Proceeds from earthquake disaster settlement	180	
Net cash from operating activities		1,870
Cash flows from investing activities:		
Purchase of fixed assets	(350)	
Proceeds from sale of equipment	20	
Interest received	200	
Dividends received	160	
Net cash from investing activities		30
Cash flows from financing activities	250	
Proceeds from issuance of share capital	250	
Proceeds from long-term borrowings	(180)	
Repayment of long-term borrowings	(270)	
Interest paid	(1,200)	
Dividends paid		(1,150)
Net cash used in financing activities		750
Net increase in cash and cash equivalents		750
Cash and cash equivalents at beginning of period (*see Note 1*)		160
Cash and cash equivalents at end of period (*see Note 1*)		910

Notes to the cash flow statement (direct method and indirect method)

1. Cash and cash-equivalents

Cash and cash equivalents consist of cash on hand and balances with banks, and investments in money-market instruments. Cash and cash-equivalents included in the cash flow statement comprise the following balance sheet amounts.

	Year 2	*Year 1*
Cash on hand and balances with banks	Rs 200	Rs 25
Short-term investments	670	135
Cash and cash-equivalents	870	160
Effect of exchange rate changes	40	—
Cash and cash equivalents as restated	910	160

Cash and cash-equivalents at the end of the period include deposits with banks of 100 held by a branch which are not freely remissible to the company because of currency exchange restrictions.

The company has undrawn borrowing facilities of 2,000 of which 700 may be used only for future expansion.

2. Total tax paid during the year (including tax deducted at source on dividends received) amounted to 900.

Alternative Presentation (indirect method):

As an alternative, in an indirect method cash flow statement, operating profit before working capital changes is sometimes presented as follows:

Revenues excluding investment income	Rs 30,650	
Operating expense excluding depreciation	(26,910)	
Operating profit before working capital changes		Rs 3,740

Working Notes

(Figures in Rs '000)

1. Cash receipts from customers		
Sales		30,650
Add: Sundry debtors at the end of the year		1,200
		31,850
Less: Sundry debtors at the end of the year		1,700
		30,150
2. Cash paid to suppliers and employees		
Cost of sales		26,000
Administrative and selling expenses		910
		26,910
Add: Sundry creditors at the beginning of the year	1,890	
Inventories at the end of the year	900	2,790
Less: Sundry creditors at the end of the year	150	29,700
Inventories at the beginning of the year	1,950	2,100
		27,600
3. Income taxes paid (including tax deducted at source from dividends received)		
Income tax expense for the year (including tax deducted at source from dividends received)		300
Add: Income tax liability at the beginning of the year		1,000
		1,300
Less: Income tax liability at the end of the year		400
		900
Out of 900, tax deducted at source on dividends received (amounting to 40) is included in cash flows from investing activities and the balance of 860 is included in cash flows from operating activities.		
4. Repayment of long-term borrowings		
Long-term debt at the beginning of the year		1,040
Add: Long-term borrowing made during the year		250
		1,290
Less: Long-term borrowings at the end of the year		1,110
		180
5. Interest paid		
Interest expense for the year		400
Add: Interest payable at the beginning of the year		100
		500
Less: Interest payable at the end of the year		230
		270

P.5.9 The following are the summarised balance sheets of Sound Ltd. as on March 31 for the two consecutive years 1 and 2:

(*Rs in thousand*)

Particulars	*Year 2*	*Year 1*
Assets:		
Plant and machinery	1,980	1,010
Land and buildings	1,000	1,000
Long-term investments	550	550
Short-term investments	470	85
Sundry debtors	2,195	2,500
Inventories	1,400	1,300

(*Contd*)

(*Contd*)

Interest receivable	100	65
Cash in hand	300	500
Cash in bank	405	300
	8,400	7,310
Liabilities:		
Share capital	2,600	2,150
Reserve and surplus	1,460	900
15% debentures	2,000	1,800
Sundry creditors	440	650
Wages outstanding	40	20
Income-tax payable	400	450
Accumulated depreciation:		
Plant and machinery	910	840
Land and buildings	550	500
	8,400	7,310

Income Statement
for the period ending March 31, year 2 *(Rs in thousand)*

Sales revenue		45,300
Less: Cost of sales		39,000
Gross profit		6,300
Less: Depreciation		(540)
Selling and administration expenses		(2,960)
Interest paid		(300)
Add: Interest income		65
Dividend income (gross)		95
Net profit before extraordinary items		2,660
Add: Insurance settlement received		10
		2,670
Less: Provision for income-taxes		550
Net profit after taxes		2,120

Additionation Information (*Rs in thousand*):

(1) 15% Debentures of Rs 300 was redeemed during year 2.
(2) Tax deducted at source on dividends received (included in provision for taxes) amounts to Rs 15.
(3) A plant costing Rs 500, having accumulated depreciation of Rs 420 was sold for Rs 80.
(4) During year 2, interim dividend of Rs 760 was paid; final dividend paid was Rs 800.
(5) All sales and purchases are made on credit basis.

You are required to prepare a cash flow statement as per AS-3 (revised).

Solution

Direct Method Cash Flow Statement *(Rs in thousand)*

Cash flows from operating activities:		
Cash receipts from customers	45,605	
Cash paid to suppliers and employees	(42,250)	
Cash generated from operations	3,355	
Income tax paid	(585)	

(*Contd*)

(*Contd*)

Cash flow before extraordinary item	2,770	
Proceeds from insurance settlement	10	
Net cash from operating activities		2,780
Cash flows from investing activities:		
Purchases of plant and machinery	(1,470)	
Proceeds from sale of plant and machinery	80	
Interest received	30	
Dividends received (Rs 95 – 15)	80	
Net cash used in investing activities		(1,280)
Cash flows from financing activities:		
Proceeds from issuance of share capital	450	
Proceeds from issue of 15% debentures	500	
Redemption of 15% debentures	(300)	
Interest paid	(300)	
Dividends paid (interim + final)	(1,560)	
Net cash used in financing activities		(1,210)
Net increase in cash and cash-equivalent		290
Cash and cash-equivalent at beginning of year 2		885
Cash and cash-equivalents at the end of year 2		1,175

Working Notes

(figures in Rs '000)

1. Cash receipts from customers:

Sales	45,300
Add: Sundry debtors at the beginning of year 2	2,500
	47,800
Less: Sundry debtors at the end of year 2	(2,195)
	45,605

2. Cash paid to suppliers and employees:

Cost of sales	39,000
Add: Administrative and selling expenses	2,960
Sundry creditors at the beginning of year 2	650
Wages outstanding at the beginning of year 2	20
Inventories at the end of year 2	1,400
	44,030
Less: Sundry creditors at the end of year 2	(440)
Wages outstanding at the end of the year 2	(40)
Inventories at the end of year 1	(1,300)
	42,250

3. Income tax paid (including tax deducted at source from dividends received)

Income tax for year 2 (including tax deducted at source from dividends received)	550
Add: Income tax liability at the beginning of year 2	450
Less: Income tax liability at the end of year 2	(400)
	600

Out of Rs 600, tax deducted at source on dividend received (amounting to Rs 15) is included in cash flows from investing activities and the balance of Rs 585 is included in cash flows from operating activities.

4. Interest received:

Interest income for year 2	65
Add: Interest receivable in the beginning of year 2	65
Less: Amount receivable at the end of year 2	(100)
	30

5. Machinery purchased:

Balance at the end of year 2	1,980
Add: Book value of machine sold	500
Less: Balance at the beginning of year 2	(1,010)
	1,470

Indirect Method Cash Flow Statement *(Amount in '000 Rs)*

Cash flows from operating activities:		
Net profit before taxation and extraordinary items	2,660	
Adjustment for:		
Depreciation	540	
Interest income	(65)	
Dividend income	(95)	
Interest expenses	300	
Operating profit before working capital changes	3,740	
Decrease in sundry debtors	305	
Increase in wages outstanding	20	
Increase in inventories	(100)	
Decrease in creditors	(210)	
Cash generated from operations	3,355	
Income taxes paid	(585)	
Cash flow before extraordinary item	2,770	
Add: Insurance settlement	10	
Net cash from operating activities		2,780
Cash flows from investing activities:		
Purchase of plant and machinery	(1,470)	
Proceeds from sale of plant and machinery	80	
Interest received	30	
Dividends received (95 – 15)	80	
Net cash used in investing activities		(1,280)
Cash flows from financial activities:		
Proceeds from issuance of share capital	450	
Proceeds from issue of 15% debentures	500	
Redemption of 15% debentures	(300)	
Interest paid	(300)	
Dividends paid (interim + final)	(1,560)	
Net cash used in financing activities		(1,210)
Net increase in cash and cash-equivalent		290
Cash and cash-equivalents at beginning of year 2		885
Cash and cash-equivalents at the end of year 2		1,175

Cash and Cash-equivalents *(Figures in '000 Rs)*

Particulars	*Year 2*	*Year 1*
Cash in hand	300	500
Cash at bank	405	300
Short-term investments	470	85
	1,175	885

CHAPTER 6

P.6.17 While working in a financial institution, you have come across the following statements. Give your views and comments on these statements with the necessary arguments.

(a) 'The sales of company A have been growing at a faster rate than those of company B. The profitability of company A must, therefore, be greater than that of company B.'

(b) 'From the viewpoint of equity shareholders, debt in the capital structure affects both the risk and the profitability of the firm.'

(c) 'Firm X and firm Y have the same expected sales volume for next year and they are identical in every respect except that the firm X has a greater proportion of fixed costs. If sales are expected to increase (decrease), firm X will have greater (lower) profit from operations than firm Y.'

(d) 'Assume Calico has a profit margin of 20 per cent and Mafatlal has a profit margin of 25 per cent. It is, therefore, obvious that Mafatlal is a better investment than Calico.'

(e) 'Firm A is aggressively making capital expenditure and firm B is not. Firm A is clearly more efficient and profitable than firm B.'

Solution **(a)** The profitability of a company is a product of two factors: (i) margin of profit on sales, and (ii) assets turnover. Symbolically, it is equal to $\frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}}$ *or* Margin of net profit × Assets turnover

Accordingly, the profitability of company A need not necessarily be greater than that of company B. The answer hinges on the margin of profit of company A. If the margin of profit on sales of both the companies is equal, the profitability of company A would certainly be greater than that of B; because of higher sales company A would cause a higher assets turnover *vis-a-vis* company B (assuming the size of total assets of companies A and B is equal). If the margin of profit of company B is greater than that of A, profitability of company B may be even greater than that of company A. For instance, the margin of profit on sales of company A is 2 per cent and that of company B is 4 per cent. Let us assume further the assets turnover of company A is 8 while that of company B is 5. Due to increased sales, the total rate of return would be 16 per cent of company A, while that of Company B would be 20 per cent.

(b) Debt in the capital structure certainly affects both the risk and profitability from the point of view of equity-holders. If the company's earnings rate is greater than the interest rate paid on debt, the company is said to have favourable leverage as it enhances the rate of return available to equityholders. Conversely, if the rate of interest paid on debt exceeds the company's earning rate, the company is said to have unfavourable leverage as it will depress the rate of return available to equity holders. Let us take a simple example to make the point clear:

Total assets	Rs 20,000
Equity capital	10,000
10% Debt	10,000
Net income before interest and taxes	5,000
Tax rate (%)	35

Profit and loss statement

Net income before interest and taxes	Rs 5,000
Less: Interest on debt	1,000
Net income	4,000
Less: Taxes (0.35)	1,400
Net income available to equityholders	2,600
Rate of return on equity capital (per cent)	26

The company is increasing the profitability of equity holders by employing debt in the capital structure. In the absence of debt, the rate of return would have been 16.25 per cent [(Rs 5,000 – Rs 1,750 taxes) ÷ Rs 20,000].

If the net income before interest and taxes is Rs 1,500 only, the use of debt would work against the interest of equityholders, as shown by the following calculations:

Net income before interest and taxes	Rs 1,500
Less: Interest on debt	1,000
Net income	500
Less: Taxes	175
Net income available to equityholders	325
Rate of return on equity capital (per cent)	3.25

In the absence of debt, the rate of return on equity capital would have been 4.9 per cent [Rs 1,500 – Rs 525] ÷ Rs 20,000.

The use of debt in the company's capital structure increases the financial risk of equityholders, as the use of debt increases the variability of the shareholders' returns and probability of insolvency if the firm fails to make the payment of interest and repayment of the principal in time.

(c) The profit of firm X need not necessarily be higher than that of Y. The answer hinges on the margin of safety and amount of fixed costs of firms X and Y. Let us take an example.

	Firms	
Particulars	*X*	*Y*
Sales	Rs 1,00,000	Rs 1,00,000
P/V ratio (%)	50	50
Fixed cost	40,000	20,000
Net profit	10,000	30,000

Net profit X, (Sales, Rs 1,00,000 – Variable cost, Rs 50,000 – Fixed cost, Rs 40,000) = Rs 10,000. Net profit, Y (Sales, Rs 1,00,000 – Variable cost, Rs 50,000 – Fixed cost, Rs 20,000) = Rs 30,000. If sales increase by 20 per cent,

Particulars	*X*	*Y*
Sales	Rs 1,20,000	Rs 1,20,000
Less: Variable cost (1 – P/V ratio)	60,000	60,000
Contribution	60,000	60,000
Less: Fixed costs	40,000	40,000
	20,000	20,000

(d) Mafatlal need not necessarily be a better investment than Calico for the following reasons:

(i) Profitability is also affected by turnover of total assets and not by margin of profit only. The assets turnover of Calico may be greater than Mafatlal's.

(ii) The degree of financial risk in Mafatlal due to the use of debt may be more than that in Calico. Therefore, the required rate of return on equity capital of Mafatlal would be more than that of Calico affecting the market value of their shares.

(iii) Calico may be pursuing a stable dividend policy as against an unstable dividend policy by Mafatlal.

(iv) The future prospects of the two companies may be different.

The above factors taken together determine the quality of investments.

(e) The answer rests on the existing position of firm B and the rate of return earned by company A on capital expenditures. If company A is investing in such proposals which will add to the net present value of the shareholders' wealth, they will certainly add to the efficiency and profitability of firm A. But if the firm B has already made such investments in the past, the company A need not necessarily be more efficient and profitable than firm B.

P.6.18 From the following particulars, prepare the balance sheet of Shri Mohan Ram and Co. Ltd as at March 31, current year.

Current ratio, 2	Stock velocity, 2 months
Working capital, Rs 4,00,000	Creditors velocity, 2 months
Capital block to current asset, 3:2	Debtors velocity, 2 months
Fixed asset to turnover, 1:3	Gross profit ratio, 25 per cent (to sales)
Sales cash/credit, 1:2	Capital block:
Debentures/share capital, 1:2	Net profit, 10 per cent of turnover
	Reserve, 2.5 per cent of turnover

Solution

Balance sheet as at March 31

Liabilities	*Amount*	*Assets*	*Amount*
Share capital	Rs 6,00,000	Fixed assets (net)	Rs 8,00,000
Reserves	60,000	Current assets:	
Profit and loss A/c	2,40,000	Stock	3,00,000
Debentures	3,00,000	Debtors	2,66,667
Creditors	3,50,000	Other current assets	2,33,333
Other current liabilities	50,000		
	16,00,000		16,00,000

Working Notes

1. Current ratio of 2 implies that CA_s = twice CL, i.e., CA - 2CL = 0
   Further, CA - CL = Rs 4,00,000 or, CL = Rs 4,00,000 and CA = Rs 8,00,000.
2. Capital block to current assets ratio of 3:2 implies that long-term capital funds (equity funds + debentures) are 1.5 times current assets, i.e., Rs 8,00,000 × 1.5 = Rs 12,00,000.
3. Total assets = Total liabilities = Rs 16,00,000 (Rs 12,00,000 long-term funds + Rs 4,00,000 CL).
4. Fixed assets = Rs 16,00,000, Total assets – Rs 8,00,000, CA = Rs 8,00,000.
5. FA/Turnover (sales) = 1/3 or Sales = Rs 8,00,000 × 3 = Rs 24,00,000.
6. Proportion of cash sales to credit sales is 1:2 or cash sales are one-third of total sales, i.e. 1/3 × Rs 24,00,000 = Rs 8,00,000; credit sales = Rs 16,00,000.
7. Gross profit = 0.25 × Rs 24,00,000 = Rs 6,00,000; cost of goods sold = Rs 18,00,000.
8. Debtors = Rs 16,00,000/6 (Debtors turnover ratio, 12 ÷ 2) = Rs 2,66,667.
9. Stock = Rs 18,00,000/6 (Stock turnover ratio, 12 ÷ 2) = Rs 3,00,000.
10. Other CAs = Rs 8,00,000 – (Rs 2,66,667 + Rs 3,00,00) = Rs 2,33,333.
11. Reserves = 0.025 × Rs 24,00,000 = Rs 60,000.
12. Credit purchases = Cost of goods sold + Closing stock = Rs 18,00,000 + Rs 3,00,000 = Rs 21,00,000.
13. Creditors = Rs 21,00,000 ÷ 6 (creditors turnover ratio, 12 ÷ 2) = Rs 3,50,000.
14. Other CLs = Total CL – Creditors, i.e. Rs 4,00,000 – Rs 3,50,000 = Rs 50,000.
15. Debentures to share capital ratio of 1:2 implies that debentures in value are equal to one-half of share capital (2 Debentures = Share capital). Further, capital block (as per working note 3) is Rs 12,00,000.
    Rs 12,00,000 = Debentures + Share capital + Net profit + Reserves
    Rs 12,00,000 = 3 Debentures + Rs 2,40,000 (10 per cent of sales) + Rs 60,000
    Rs 3,00,000 = Debentures; Share capital = Rs 6,00,000

P.7.7 On investigation it was found that variable cost in *XYZ* Ltd is 80 per cent of the selling price. If the fixed expenses are Rs 10,000, calculate the break-even sales of the company.

Another firm, IMN Company Ltd, having the same amount of fixed expenses, has its break-even point at a lower figure than that of *XYZ* Ltd. Comment on the causes.

Solution

BEP (amount) = Rs 10,000/ P/V ratio (100 per cent-Variable cost to volume ratio = 0.80)
= Rs 10,000/0.20 = Rs 50,000 (*XYZ* Ltd)

The lower break-even point of IMN Ltd *vis-à-vis XYZ* Ltd is due to its lower variable expenses to volume ratio, which in turn may be either due to its lower VC per unit or higher *SP* per unit, eventually yielding higher contribution margin and, hence, higher P/V ratio and lower BEP.

P.7.8 Calculate from the following data (i) the value of output at which the business breaks even; and (ii) the percentage of capacity at which it breaks even:

Particulars	*Budget based on 100 per cent capacity*	*Shut down expenditure*
Direct wages	Rs 2,09,964	
Direct materials	2,44,552	
Works expenses	88,292	Rs 93,528
Selling and distribution expenses	21,000	40,188
Administrative expenses	9,492	20,508
Net sales	8,40,000	

Solution **Determination of P/V ratio**

(i) *Net sales*		Rs 8,40,000
Less: Variable costs:		
Direct wages	Rs 2,09,964	
Direct materials	2,44,552	
Works expenses	88,292	
Selling and distribution expenses	21,000	
Administrative expenses	9,492	5,73,300
Contribution (C)		2,66,700
P/V ratio (C ÷ Sales) (per cent)		31.75

BEP (amount) = Fixed costs (shut down expenditure)/P/V ratio = Rs 1,54,224/0.3175 = Rs 4,85,744.88
(ii) Break-even sales/Sales at 100 per cent capacity = Rs 4,85,744.88/Rs 8,40,000 = 57.83 per cent

P.7.9 Calculate the break-even sales from the following data for a company producing three products:

Product	*Sales*	*Variable costs*
A	Rs 10,000	Rs 6,000
B	5,000	2,500
C	5,000	2,000
	20,000	10,500

Total fixed costs amount to Rs 5,700.

Solution

Determination of weighted P/V ratio

Product	*Sales*	*Variable costs*	*Contribution*
A	Rs 10,000	Rs 6,000	4,000
B	5,000	2,500	2,500
C	5,000	2,000	3,000
	20,000	10,500	9,500

Weighted P/V ratio = (Total contribution/Total sales) × 100 = (Rs 9,500/ Rs 20,000) × 100 = 47.5 per cent
BEP = FC/Weighted P/V ratio = Rs 5,700/0.475 = Rs 12,000

P.7.10 Market Well Ltd manufactures filing cabinets. For the current year, the company expects to sell 4,000 cabinets involving a loss of Rs 2,00,000. Only 40 per cent of the plant's normal capacity is being utilised during the current year. The fixed costs for the year are Rs 10,00,000 and fully variable costs are 60 per cent of sales value.

You are required to

1. Calculate the break-even point;
2. Calculate the profit if the company operates at 70 per cent of its normal capacity;
3. Calculate the sales required to achieve a profit of Rs 60,00,000;
4. Calculate the revised break-even point if the existing selling prices are decreased by 10 per cent, the total fixed and variable expenses remaining the same.

Solution

1. BEP (amount) = FC/ PV ratio = Rs 10,00,000/0.40 = Rs 25,00,000

2. Determination of the existing sales volume and sales price per cabinet

Sales revenue	*X*
Less: Variable cost (0.60)	0.6 *X*
Contribution	(*X* – 0.6X)
Less: Fixed costs	Rs 10,00,000
Loss (given)	2,00,000

0.4 *X* – Rs 10,00,000 = (– Rs 2,00,000)
0.4 *X* = Rs 8,00,000
X = 20,00,000 (sales revenue)
Sales price per cabinet = Rs 20,00,000/4,000 cabinets = Rs 500
Number of cabinets sold at 70 per cent capacity = 7,000 = (4,000 × 70/40)

Projected income statement at 70 per cent capacity

Sales revenue (7,000 × Rs 500)	Rs 35,00,000
Less: Variable cost (0.60)	21,00,000
Contribution	14,00,000
Less: Fixed costs	10,00,000
Profit	4,00,000

Alternatively, (Expected sales revenue-Break-even sales revenue) × P/V ratio or (Margin of safety) × P/V ratio = (Rs 35,00,000 – Rs 25,00,000) × 0.40 = Rs 4,00,000

3. Desired sales volume to earn a profit of Rs 60,00,000 = (FC + Rs 60,00,000)/0.40 = (Rs 10,00,000 + Rs 60,00,000)/0.40 = Rs 1,75,00,000

4. Break-even point (revised) at reduced selling price by 10 per cent

Sales price	Rs 450
Less: Variable cost (0.60 × Rs 500)	300
CM	150
P/V ratio (Rs 150/Rs 450) (%)	33.33
BEP Rs (10,00,000/0.3333)	30,00,000

P.7.11 Hansa Ltd manufacturing a single product is facing severe competition in selling it at Rs 50 per unit. The company is operating at 60 per cent level of activity at which level sales are Rs 12,00,000; variable costs are Rs 30 per unit; semi-variable costs may be considerd fixed at Rs 90,000 when output is nil and the variable element is Rs 250 for each additional 1 per cent level of activity; fixed costs are Rs 1,50,000 at the present level of activity, but if a level of activity of 80 per cent or above is reached, these costs are expected to increase by Rs 50,000.

To cope with the competition, the management of the company is considering a proposal to reduce the selling price by 5 per cent. You are required to prepare a statement showing the operating profit at levels of activity of 60 per cent, 70 per cent and 82 per cent, assuming that:

1. The selling price remains at Rs 50; and
2. The selling price is reduced by 5 per cent.

Show also the number of units, which will be required to be sold to maintain the present profits if the company decides to reduce the selling price of the product 5 by per cent.

Solution

Statement showing operating profit (flexible budget)

Particulars	*Percentage of capacity*					
	60		*70*		*82*	
	Old selling price	*New selling price*	*Old selling price*	*New selling price*	*Old selling price*	*New selling price*
Units	24,000	24,000	28,000	28,000	32,800	32,800
Sales price	Rs 50	Rs 47.50	Rs 50	Rs 47.50	Rs 50	Rs 47.50
Sales revenue	12,00,000	11,40,000	14,00,000	13,30,000	16,40,000	15,58,000
Less: Costs:						
Variable costs	7,20,000	7,20,000	8,40,000	8,40,000	9,84,000	9,84,000
Semi-variable costs	1,05,000	1,05,000	1,07,500	1,07,500	1,10,500	1,10,500
Fixed costs	1,50,000	1,50,000	1,50,000	1,50,000	2,00,000	2,00,000
Total costs	9,75,000	9,75,000	10,97,500	10,97,500	12,94,500	12,94,500
Operating profit	2,25,000	1,65,000	3,02,500	2,32,500	3,45,500	2,63,500

Sales volume required to maintain present level of profit: (Fixed costs + Profit)/CM per unit = (Rs 1,50,000 + 90,000 + 2,25,000)/Rs 16.875 = 27,556 units

Working note

Selling price		Rs 47.50
Less: Variable cost	Rs 30.00	
Semi variable cost (variable element)	0.625	30.625
CM per unit		16.875

P.7.12 After a study of cost-volume relationships, the Kaling Tubes Company Ltd concluded that its costs for any given volume of sales could be expressed as Rs 1,00,000 for fixed costs plus variable costs equal to 60 per cent of sales. The company's range of volume was from zero to Rs 8,00,000 of sales.

Prepare a graph, which will illustrate this cost-volume relationship. Also draw a proper sales line to the graph to form a break-even chart. Determine the break-even point.

A competitor operating a plant of the same size as Kaling also has fixed cost of approximately Rs 1,00,000 per year, but his break-even point is Rs 3,00,000 of sales. What may be the probable causes of the difference between the break- even points of the Kaling Company Ltd and its competitor?

Solution Since selling price per unit is not given, it is necessary to draw the cost-volume graph on the same scale so that a 45° line can be the proxy of the sales line.

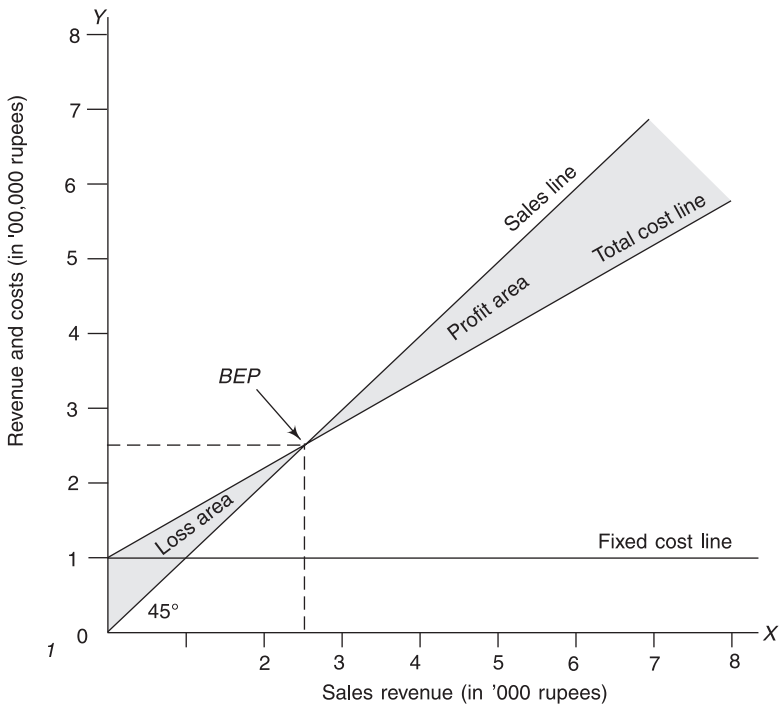

FIGURE 7.9 Volume-Cost-Profit Graph

Determination of two points for drawing the total cost line:

Sales revenue	FC	VC	*TC*
Rs 1,00,000	Rs 1,00,000	Rs 60,000	Rs 1,60,000
8,00,000	1,00,000	4,80,000	5,80,000

The point of intersection of the TC line and sales line is BEP (Rs 2,50,000).

Verification: FC/P/V ratio = Rs 1,00,000/0.40 = Rs 2,50,000

Possible causes for the differences in BEP:

1. The competitors are having a higher variable cost to volume ratio than the Kaling Tubes Ltd. It is 66.67 per cent for the competitors, assuming the selling price per unit for both the firms is same.
   BEP = FC/ P/V ratio = Rs 3,00,000 = Rs 1,00,000 P/V ratio
   P/V ratio = Rs 1,00,000/ Rs 3,00,000 = 33.33 per cent
2. The competitors are having lower sales price per unit. Their prices per units are 6.67 per cent lower than those of the Kaling Tubes Ltd as shown below:
   BEP = Rs 1,00,000/(0.9333-0.60) = Rs 1,00,000/0.3333 = Rs 3,00,000

3. Partly due to higher variable cost to volume ratio or partly due to lower selling price, the sum of the difference is 6.67 per cent.

P.7.13 During the current year, *AB* Ltd showed a profit of Rs 1,80,000 on a sale of Rs 30,00,000. The variable expenses were Rs 21,00,000.

You are required to work out:

1. The break-even sales at present
2. The break-even sale if variable cost increase by 5 per cent
3. The break-even sale to maintain the profit as at present, if the selling price is reduced by 5 per cent.

Solution

Rs 30,00,000, Sales = Rs 21,00,000, VC + FC + Rs 1,80,000, profit or FC = Rs 7,20,000

1. BEP = Rs 7,20,000/ PV ratio = Rs 7,20,000/0.30 = Rs 24,00,000
P/V ratio = Rs 9,00,000/30,00,000 = 0.30

2. BEP (revised) = Rs 7,20,000/0.265 = Rs 27,16,981
P/V ratio = Rs 7,95,000/ Rs 30,00,000 = 0.265
Rs 7,95,000 Contribution = (Rs 30,00,000 – Rs 22,05,000, VC)

3. Revised P/V ratio with reduction in price

Sales revenue	Rs 28,50,000
Variable costs	21,00,000
Contribution	7,50,000

P/V ratio (Rs 7,50,000 ÷ Rs 28,50,000) = 26.316 per cent
Desired sales volume = Rs 9,00,000 (FC + *DP*)/0.26316 = Rs 34,19,973

P.7.14 There are two similar plants under the same management. The management desires to merge these two plants. The following particulars are available:

	Factory I	*Factory II*
Capacity (%)	100	60
Sales (Rs lakh)	300	120
Variable costs	220	90
Fixed costs	40	20

You are required to calculate: (a) What the break- even capacity of the merged plant would be, and (b) What the profitability on working at 75 per cent of the merged capacity would be?

Solution

(a) Break-even capacity

	Factory I (at 100% capacity)	*Factory II (at 100% capacity)*	*Combined (at 100% capacity)*
Sales (Rs lakh)	300	200	500
Less: Variable costs	220	150	370
Contribution	80	50	130

Break-even (amount) = Fixed costs/Combined P/V ratio = Rs 60 lakhs/0.26 = Rs 230.769 lakh
0.26 = (Rs 130 lakh/Rs 500 lakh) × 100
Break-even point (per cent capacity) = (Break-even sales/Total capacity) × 100
= (Rs 230.8 lakh/ Rs 500 lakh) × 100 = 46.15 per cent. The break-even capacity of the merged plant would be approximately 46.15 per cent.

(b) Income statement at 75 per cent merged capacity

Sales (Rs lakh)	375.00
Less: Variable costs (0.74 × *V/V* ratio)	277.50
Contribution	97.50
Less: Fixed costs	60.00
Net profit	37.50

Alternatively, (Actual sales – BE sales) × P/V ratio = (Rs 375 lakh – Rs 230.769 lakh) × 0.26 = Rs 37.50 lakh

P.7.15 The question as to which products to stress in order to obtain the most profitable sales-mix has always been of prime importance to businessmen. The amount of profit contribution, or the difference between the selling price and the variable costs, tells how much each product is contributing to fixed costs and profit in the present sales-mix. This information assists management in forming an opinion as to which products will add to profits if sales of these units can be increased.

Direct cost data can be utilised in this type of analysis when management seeks an answer to the question: "Which product shall we push"?

Data	*Product A*	*Product B*
Selling price	Rs 12.60	Rs 5.50
Variable cost	9.62	4.18
Fixed costs	2.07	0.65
Units per hour	45	0.70

1. What is the amount of net profit for each product?
2. What is the percentage of profit to selling price for each product?
3. What is the amount of profit contribution towards fixed cost and the profit for each product?
4. What is the profit contribution ratio?
5. What is the profit contribution per hour for each product?
6. If one allocates: (a) 200 hours to Product *A* and 100 hours to Product *B* or (b) 100 hours to Product *A* and 200 hours to Product B, which of the two courses is more profitable?

Solution

1. Net profit for products *A* and *B*

Particulars	*A*	*B*
Selling price	Rs 12.60	Rs 5.50
Less: Costs:		
Variable	9.62	4.18
Fixed	2.07	0.65
Net profit	0.91	0.67

2. Percentage of profit to selling price = (Net profit × 100) ÷ Selling price	7.22	12.18
3. Profit contribution (Selling price-Variable costs)	2.98	1.32
4. P/V ratio (%)	23.65	24
5. (Profit contribution per unit × Units produced per hour)		
Product *A* : Rs 2.98 × 45	134.10	
B : Rs 1.32 × 70		92.40

6. Statement of Profit

Particulars	*Alternative (a)*	*Alternative (b)*
Product A (Profit contribution per hour	Rs 134.10	Rs 134.10
× Hours)	× 200	× 100
	(a) 26,820	(a) 13,410
Product B (Profit contribution per hour	92.40	92.40
× Hours)	× 100	× 200
	(b) 9,240	(b) 18,480
Total profit [(a) + (b)]	36,060	31,890

Alternative (a) of allocating 200 hours to Product *A* and 100 hours to Product *B* is the more profitable course as it yields higher profits.

P.7.16 A.T. Ltd operating at 80 per cent level of activity furnishes the following information:

Particulars	*Products*		
	A	*B*	*C*
Selling price/units	Rs 10	Rs 12	Rs 20
Profit as percentage on selling price	25	33.33	20
Units produced and sold	10,000	15,000	5,000
Fixed costs	40,000	45,000	25,000

During the year, the variable costs are expected to increase by 10 per cent. There will, however, be no change in fixed costs, the selling prices and the units to be produced and sold. The sales potential for each of the products is unlimited.

(i) You are required to prepare a statement showing the P/V ratio, break-even point and margin of safety for each product and for the company as a whole.

(ii) The company intends to increase the production of only one of the three products to reach the full capacity level by utilising the spare capacity available. Assuming that all the three products take the same machine time, advise with reasons, which of the three products should be produced so that the overall profitability is the maximum.

*S*olution

(i) Statement showing BEP, margin of safety and P/V ratio of A.T. Ltd for Year 1 and 2

Particulars	*Year 1*				*Year 2*			
	A	*B*	*C*	*All combined*	*A*	*B*	*C*	*All combined*
Units produced and sold	10,000	15,000	5,000	30,000	10,000	15,000	5,000	30,000
Selling price per unit	Rs 10	Rs 12	Rs 20	Rs 12.666	Rs 10	Rs 12	Rs 20	Rs 12.666
Sales revenue	1,00,000	1,80,000	1,00,000	3,80,000	1,00,000	1,80,000	1,00,000	3,80,000
Less: Variable costs (see working notes)	35,000	75,000	55,000	1,65,000	38,500	82,500	60,500	1,81,500
Contribution	65,000	1,05,000	45,000	2,15,000	61,500	97,500	39,500	1,98,500
Less: Fixed costs	40,000	45,000	25,000	1,10,000	40,000	45,000	25,000	1,10,000
Operating profit	25,000	60,000	20,000	1,05,000	21,500	52,500	14,500	88,500
P/V ratio (%)	65	58.33	45	56.58	61.5	54.17	39.5	52.24
BEP				1,94,419				2,10,580
Margin of safety				1,85,581				1,69,420

Working Notes

A Rs 1,00,000 = 40,000 FC + Rs 25,000 profit (0.25 × Rs 1,00,000) + VC, that is, Rs 35,000.
B Rs 1,80,000 = 45,000 FC + Rs 60,000 profit (0.3333 × Rs 1,80,000) + VC, that is, Rs 75,000.
C Rs 1,00,000 = 25,000 FC + Rs 20,000 profit (0.20 × Rs 1,00,000) + VC, that is, Rs 55,000.

(ii) Product *C* should be produced to utilise the *SP* are capacity of 20 per cent as its marginal contribution per unit is maximum as shown below:

Particulars	*A*	*B*	*C*
Sales price	Rs 10	Rs 12	Rs 20
Less: Variable cost per unit	3.5	5.0	11
CM	6.5	7.0	9.0

CHAPTER 8

P.8.5 The Delhi Electrical Supply Company Ltd has a business of supplying electrical goods to various government and non-government companies. The controller, in collaboration with the economist, has developed the following equation that, he says, will forecast sales quite well, based on past pattern of behaviour: monthly sales (amount) = Rs 1,00,000 + (Rs 2,000 x orders received in prior month).

The sales manager is confused and seeks your advice. He presents you with the following data regarding actual and forecast numbers of orders. The forecasts have generally been quite accurate.

August (actual)	200
September (forecast)	300
October	450
November	700
December	650

It is the first week of September, the sales manager would like the forecasts of sales and income for as many months as you can prepare. The cost accountant informs you that costs of goods sold, which are all fixed costs, amount to Rs 2,00,000 per month.

You are required to prepare the budgeted income statement for as many months as you can.

Solution

Budgeted income statement of Delhi Electric Supply Company Ltd

Particulars	*September*	*October*	*November*	*December*	*January*
Sales:					
Fixed component	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000	Rs 1,00,000
Variable component (Rs 2,000 × orders received in previous months)	4,00,000	6,00,000	9,00,000	14,00,000	13,00,000
Total sales	5,00,000	7,00,000	10,00,000	15,00,000	14,00,000
Less: Cost of goods sold (0.50 × of sales)	2,50,000	3,50,000	5,00,000	7,50,000	7,00,000
Contribution (manufacturing)	2,50,000	3,50,000	5,00,000	7,50,000	7,00,000
Less: Other variable costs (0.20 × sales)	50,000	70,000	1,00,000	1,50,000	1,40,000
Contribution (final)	2,00,000	2,80,000	4,00,000	6,00,000	5,60,000
Less: Fixed costs	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000
Income	—	80,000	2,00,000	4,00,000	3,60,000

P. 8.6 The cost of an article at the capacity level of 5,000 units is given under A below. For a variation of 25 per cent in capacity above or below this level, the individual expenses vary as indicated under B below:

Particulars	*A*	*B (per cent)*
Material cost	Rs 25,000	100 (variable)
Labour cost	15,000	100 (variable)
Power	1,250	80 (semi-variable)
Repairs and maintenance	2,000	75 (semi-variable)
Stores	1,000	100 (variable)
Inspection	500	20 (semi-variable)

(*Contd*)

(*Contd*)

Administration overheads	5,000	25 (semi-variable)
Selling overheads	3,000	50 (semi-variable)
Depreciation	10,000	100 (fixed)
Total	62,750	
Cost per unit	12.55	

Prepare the production cost budget at 4,000 units and 6,000 units.

Solution

Production cost (flexible) budget

Particulars	*4,000 units*	*6,000 units*
Material cost (variable)	Rs 20,000	Rs 30,000
Labour cost (variable)	12,000	18,000
Stores (variable)	800	1,200
Power (semi-variable)	1,050	1,450
Repairs and maintenance (semi-variable)	1,700	2,300
Inspection (semi-variable)	480	520
Administration overheads (semi-variable)	4,750	5,250
Selling overheads (semi-variable)	2,700	3,300
Depreciation (fixed)	10,000	10,000
Total	53,480	72,020
Cost per unit	13.37	12.00

P.8.7 The Jay Engineering Limited manufacturers only one product, which passes through three departments. A study has been made by the cost accountant in consultation with engineers, technicians and other production experts of the variability of overheads. Each item was carefully analysed and the results are summarised as follows:

Department 2; Normal level of activity, 5,000 machine-hours.

Overheads	*Fixed amount*	*Variable rate per machine-hour*
Indirect material	Rs 1,200	Rs 0.20
Supervision and inspection	9,600	—
Indirect labour	2,400	0.40
Repairs and maintenance	1,800	0.30
Power, heat and light	4,200	1.20
Water	1,200	0.10
Telephone	2,400	0.10
Insurance	3,000	—
Depreciation	9,600	—
Miscellaneous	600	0.10
	36,000	2.40
Machine hour rate at normal level of activity:		
Fixed (Rs 36,000 ÷ 5,000 hours)		7.20
Variable		2.40
Total		9.60

The study has estimated the following results for a level of activity of 7,000 machine-hours:

1. Indirect labour will increase by Rs 800.
2. Increased supervision will be needed at a cost of Rs 1,400.
3. Increased maintenance and repairs are estimated at Rs 600.

4. Machinery will depreciate more rapidly than estimated at the normal level of activity to the extent of Rs 1,400.
5. Overtime will cost Rs 3,200.

Prepare a flexible budget at 4,000, 5,000, 6,000 and 7,000 machine-hours and also determine the machine-hour rate at these levels.

Solution

Department 2: flexible budget

Overheads	*Level of activity in machine-hours*			
	4,000	*5,000*	*6,000*	*7,000*
Indirect material	Rs 2,000	Rs 2,200	Rs 2,400	Rs 2,600
Supervision and inspection	9,600	9,600	9,600	11,000
Indirect labour	4,000	4,400	4,800	6,000
Repairs and maintenance	3,000	3,300	3,600	4,500
Power, heat and light	9,000	10,200	11,400	12,600
Water	1,600	1,700	1,800	1,900
Telephone	2,800	2,900	3,000	3,100
Insurance	3,000	3,000	3,000	3,000
Depreciation	9,600	9,600	9,600	11,000
Overtime cost	—	—	—	3,200
Miscellaneous	1,000	1,100	1,200	1,300
	45,600	48,000	50,400	60,200
Machine-hour rate	11.40	9.6	8.4	8.6

P.8.8 A company is drawing its production plan for the next year in respect of two of its products 'Gamma' and 'Delta'. The company's policy is not to carry any closing work-in-process (WIP) at the end of any month. However, its policy is to hold a closing stock of finished goods at 50 per cent of the anticipated quantity of sales of the succeeding month. For the next year, the company's budgeted production is 20,000 units of 'Gamma' and 25,000 units of 'Delta'. The following is the estimated cost data:

Particulars	*Gamma*	*Delta*
Direct material per unit	Rs 50	Rs 80
Direct labour per unit	20	80
Other manufacturing expenses apportionable to each type of product based on production	2,00,000	3,75,000

The estimated units to be sold in the first 7 months of the next year are as under:

Particulars	*April*	*May*	*June*	*July*	*August*	*September*	*October*
Gamma	900	1100	1400	1800	2200	2200	1800
Delta	2900	2900	2500	2100	1700	1700	1900

You are required to

(a) Prepare a production budget showing month-wise number of units to be manufactured:
(b) Present a summarised production cost budget for the half-year ending September 30.

Solution

(a) Production budget (units) for half year ending September 30

Particulars	*April*	*May*	*June*	*July*	*August*	*September*	*Total*
Product—Gamma:							
Budgeted sales	900	1,100	1,400	1,800	2,200	2,200	9,600
Add: Closing stock	550	700	900	1,100	1,100	900	900
	1,450	1,800	2,300	2,900	3,300	3,100	10,500
Less: Opening stock	450	550	700	900	1,100	1,100	450
Budgeted production	1,000	1,250	1,600	2,000	2,200	2,000	10,050
Product—Delta:							
Budgeted sales	2,900	2,900	2,500	2,100	1,700	1,700	13,800
Add: Closing stock	1,450	1,250	1,050	850	850	950	950
	4,350	4,150	3,550	2,950	2,550	2,650	14,750
Less: Opening stock	1,450	1,450	1,250	1,050	850	850	1,450
Budgeted production	2,900	2,700	2,300	1,900	1,700	1,800	13,300

(b) Cost budget for half year ending September 30

Particulars (units)	*Gamma (10,050 units)*		*Delta (13,300 units)*	
	Total	*Per unit*	*Total*	*Per unit*
Direct material	Rs 5,02,500	Rs 50	Rs 10,64,000	Rs 80
Direct labour	2,01,000	20	3,99,000	30
Other manufacturing expenses[1]	1,00,500	10	1,99,500	15
	8,04,000	80	16,62,500	125

[1]Other manufacturing expenses are apportioned on the basis of production.

	Gamma	*Delta*
1. Units to be produced	20,000	25,000
2. Other manufacturing expenses	Rs 2,00,000	Rs 3,75,000
3. Per unit (2 ÷ 1)	10	15

P.8.9 The GEC Ltd manufacturers pumps used in coolers. The firm has developed a forecasting tool that has been successful in predicting sales for the company: Sales = 10,000 + (0.25 × coolers sold). The coming year's cooler sales are expected to be 2,00,000.

The pump contains material costing Rs 50. Direct labour is Rs 60 per unit and variable manufacturing overhead is Rs 40 per pump. Besides the variable manufacturing costs, there are commissions to sales people of 10 per cent of sales amount. The pump sells for Rs 250 per unit. Fixed costs of manufacturing are Rs 10,00,000 per year and fixed selling and administrative expenses are Rs 5,00,000 per year. Both are incurred evenly over the year.

Sales are seasonal, and about 75 per cent are in the April-September period which begins from April 1. The sales forecast by months, as percentages of yearly sales, are given below:

April	10	August	8
May	15	September	7
June	20	October	5
July	15	November	3

The company has a policy of keeping inventory of finished product equal to the budgeted sales for the following two months. Materials are purchased and delivered daily and no inventory is kept. The inventory of finished product on March 31 is expected to be 15,500 units.

You are required to prepare a:
(i) Budgeted income statement for the coming year
(ii) Budgeted income statement for the first six months of the year.
(iii) Production budget by months for the first six months, in unit.

Solution

(i) and (ii) Budgeted income statement

Particulars	*Six months*	*Year*
Sales (units)	45,000	60,000
Sales price per unit	Rs 250	Rs 250
Total sales revenue	1,12,50,000	1,50,00,000
Less: Variable costs:		
Materials (Rs 60 per unit)	22,50,000	30,00,000
Labour (Rs 50 per unit)	27,00,000	36,00,000
Overheads (Rs 40 per unit)	18,00,000	24,00,000
Contribution (manufacturing)	45,00,000	60,00,000
Less: Sales commission (0.10 × sales)	11,25,000	15,00,000
Contribution (final)	33,75,000	45,00,000
Less: Fixed costs		
Manufacturing	5,00,000	10,00,000
Selling and administrative	2,50,000	5,00,000
Income	26,25,000	30,00,000

(iii) Production budget (units)

Month	*Sales*	*Planned inventory*		*Required production*
		Closing	*Opening*	*(Col. 2 + 3 – 4)*
1	*2*	*3*	*4*	*5*
April	6,000	21,000	15,500	11,500
May	9,000	21,000	21,000	9,000
June	12,000	13,800	21,000	4,800
July	9,000	9,000	13,800	4,200
August	4,800	7,200	9,000	3,000
September	4,200	4,800	7,200	1,800

Working Notes

(i) Sales forecasts for the coming year = 10,000 + (0.25 × 2,00,000) = 60,000 units
Sales forecasts by month (units):

April (0.10)	6,000
May (0.15)	9,000
June (0.20)	12,000
July (0.15)	9,000
August (0.08)	4,800
September (0.07)	4,200 = 45,000 units (75 per cent)
October (0.05)	3,000
November (0.03)	1,800

P.9.13 Swastik Ltd, manufacturers of special purpose machine tools, have two divisions which are periodically assisted by visiting teams of consultants. The management is worried about the steady increase of expenses in this regard over the years. An analysis of the last year's expenses reveals the following:

Consultants' remuneration	Rs 2,50,000
Travel and conveyance	1,50,000
Accommodation expenses	6,00,000
Boarding charges	2,00,000
Special allowances	50,000
	12,50,000

The management estimates accommodation expenses to increase by Rs 2,00,000 annually.

As part of cost reduction drive, Swastik Ltd is proposing to construct a consultancy centre to take care of the accommodation requirements of the consultants. This centre will additionally save the company Rs 50,000 in boarding charges and Rs 2,00,000 in the cost of executive training programme hitherto conducted outside the company's premises, every year.

The following details are available regarding the construction and maintenance of the new centre.

(a) Land: at a cost of Rs 8,00,000 already owned by the company, will be used.
(b) Construction: Rs 15,00,000 including special furnishing.
(c) Cost of annual maintenance: Rs 1,50,000.
(d) Construction cost will be written off (at a uniform rate) over 5 years, being the useful life.

Assuming that the write-off of construction cost as aforesaid will be accepted for tax purposes, that the rate of tax will be 35 per cent and that the desired rate of return is 15 per cent, you are required to analyse the feasibility of the proposal and make recommendations. Use present value up to two digits.

Solution

Financial feasibility of constructing consultancy centre

(Amount in lakh of rupees)

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Cost savings:					
Accommodation expenses	8	10	12	14	16
Boarding charges	0.5	0.5	0.5	0.5	0.5
Hire charges of executive training programme	2.0	2.0	2.0	2.0	2.0
Total	10.5	12.5	14.5	16.5	18.5
Less: Cost of annual maintenance	1.5	1.5	1.5	1.5	1.5
Less: Amortization of construction cost	3.0	3.0	3.0	3.0	3.0
Net savings/EBT	6.0	8.0	10.0	12.0	14.0
Less: Taxes (0.35)	2.1	2.8	3.5	4.2	4.9
EAT	3.9	5.2	6.5	7.8	9.1
CFAT	6.9	8.2	9.5	10.8	12.1
(x) PV factor at (0.15)	0.87	0.76	0.66	0.57	0.50
Present value	6.00	6.23	6.27	6.16	6.05
Total present value (t = 1 – 6)					30.71
Less: Incremental CO					15.00
NPV					15.71

Recommendation It is desirable for the company to construct its own consultancy centre.

Notes:

(i) Land cost does not involve any additional cash flows.
(ii) The firm will continue to incur expenses namely, consultants' remuneration, travel and conveyance and special allowances, and, hence, ignored.

P.9.14 A plastic manufacturing company is considering replacing an older machine which was fully depreciated for tax purposes with a new machine costing Rs 40,000. The new machine will be depreciated over its eight-year life. It is estimated that the new machine will reduce labour costs by Rs 8,000 per year. The management believes that there will be no change in other expenses and revenues of the firm due to the machine. The company requires an after-tax return on investment of 10 per cent. Its rate of tax is 35 per cent. The company's income statement for the current year is given for other informations.

Income statement for the current year

Sales		Rs 5,00,000
Costs:		
Materials	Rs 1,50,000	
Labour	2,00,000	
Factory and administrative	40,000	
Depreciation	40,000	4,30,000
Net income before taxes		70,000
Taxes (0.35)		24,500
Earnings after taxes		45,500

Should the company buy the new machine? You may assume the company follows straight line method of depreciation and the same is allowed for tax purposes.

Solution

Cash inflows:			
(i)	Present: Earnings after taxes		Rs 45,500
	Add: Depreciation		40,000
	CFAT (present)		85,500
(ii)	Estimated CFAT, if the new machine is purchased:		
	Sales		5,00,000
Costs:			
	Material	Rs 1,50,000	
	Labour	1,92,000	
	Factory and administrative	40,000	
	Depreciation (including Rs 5,000 on new machine)	45,000	4,27,000
	Net income before taxes		73,000
	Taxes		25,550
	Earnings after taxes		47,450
	Add: Depreciation		45,000
	CFAT (expected)		92,450
(iii)	Differential cash flow: Rs 92,450 – Rs 85,500		6,950

(iv) Determination of NPV

Years	*CFAT*	*PV factor (0.10)*	*Total PV*
1-8	Rs 6,950	5.335	Rs 37,078
Less: Cost of new machine			40,000
NPV			(2,922)

Recommendation Since the NPV is negative, the new machine should not be purchased.

P.9.15 The United Petroleum Ltd (UPL) has a retail outlet of petrol, diesel and petroleum products. Presently, it has two pumps exclusively for petrol, one for non-lead petrol and one for diesel. Free air filling is carried out for vehicles buying fuel from the outlet. The pumps have a useful life of 10 years with no salvage value as the underground tank will be completely corroded and unfit for reuse.

The UPL sells petrol and diesel @ Rs 23 and Rs 10 per litre respectively. The existing annual sale is petrol, 5 lakh litres, and diesel, 2 lakh litres. Its earnings are 4 per cent as commission on sales.

Due to a manifold increase in traffic, the existing pumps are not able to meet the demand during peak hours. The UPL is contemplating installation of additional pumps for diesel and petrol at a cost of Rs 10,00,000 together with additional working capital of Rs 5,00,000. The additional sales of petrol and diesel are expected to be 2 lakh litres and 1 lakh litres per annum respectively. As a result of the installation of the new pump, the operating cost would increase by Rs 24,000 annually by way of salary of the pump operator. Other yearly associated additional costs are estimated to be: insurance @ 1 per cent of the cost of the pump, maintenance cost, Rs 12,000 and power costs, Rs 13,000.

United Petroleum Ltd pays 35 per cent on tax on its income. Depreciation will be on straight line basis and the same is allowed for tax purposes.

The management of UPL seeks your advice on the financial viability of the expansion proposal. Prepare a report for its consideration, assuming 12 per cent required rate of return.

Solution

Financial analysis for setting up additional pumps (using NPV method)

Cash outflows:		
Cost of new pump		Rs 10,00,000
Increase in working capital		5,00,000
		15,00,000
Incremental CFAT and NPV (years (1 - 10):		
Commission on incremental sales		
Petrol: 2 lakhs × Rs 23 × 0.04		1,84,000
Diesel: 1 lakh × Rs 10 × 0.04		40,000
		2,24,000
Less: Incremental costs:		
Salary	Rs 24,000	
Insurance	10,000	
Maintenance costs	12,000	
Power costs	13,000	
Depreciation (Rs 10 lakh/10)	1,00,000	1,59,000
Earnings before taxes		65,000
Less: Taxes		22,750
Earnings after taxes		42,250
CFAT (EAT + D)		1,42,250
(x) PV factor for annuity for 10 years (0.12)		5.650
Present value		8,03,713
Add: PV of recovery of working capital (Rs 5,00,000 × 0.322)		1,61,000
Total present value		9,64,713
Less: Cash outflows		15,00,000
NPV		(5,35,287)

Recommendation Since NPV is negative, the installation of additional pumps is not financially viable.

P.9.16 Senior executives of Laxmi Rice Mill Ltd have been considering the proposal to replace the existing coal-fired furnace in the paddy boiling section by a new furnace is cyclone type husk-fired furnace. The capital cost of the new furnace is expected to be Rs 1 lakh. It will have useful life of 10 years at the end of which period its residual value will be negligible. The present furnace has a book value of Rs 15,000 and can be used for another 10 years with only minor repairs. If scrapped now, it can fetch Rs 10,000 but it cannot fetch any amount if scrapped after ten more years of use.

The basic advantage of the new furnace is that it does not depend on the coal whose supplies are becoming increasingly erratic in recent years. On a conservative estimate, the new furnace will result in a saving of Rs

25,000 per annum on account of eliminated coal cost. However, the cost of electricity and other operating expenses are likely to go up by Rs 8,000 and Rs 4,000 per annum respectively.

The husk which results as a by-product during the normal milling operations at 3,000 metric ton of paddy milled per year is considered adequated for operating the new furnace. On a average, for every metric ton of paddy milled, the husk content is 20 per cent. At present, the husk resulting during the milling operations is sold at a price of Rs 50 per metric ton. Once the new furnace is installed, the husk will be diverted for own use. 'White Ash' which constitutes about 5 percent of the husk burnt in the new furnace, will be collected in a separate ash-pit as it has considerable demand in the refractory industry. It can be sold very easily at a price of Rs 1,500 per metric ton.

The new furnace will require a motor of 15 HP, whose cost is not included in Rs 1 lakh, the capital cost of the furnace. A 15 HP motor is lying idle with the polishing section of the Mill which can fetch an amount of Rs 3,000 on sale. It has a net book value of Rs 5,000. The motor can be used for the new furnace. At the end of the ten years, it can be scrapped at zero residual value.

All the assets of the company are in the same block. Depreciation will be on straight line basis and the same is assumed to be acceptable for tax purpose as well. Applicable tax rate is 35 per cent and cost of capital is 12 per cent.

Required:

(i) Formulate the incremental net after-tax cash flows associated with the replacement project. (ii) Also calculate the project's NPV. (iii) Give your recommendation.

Solution

Financial analysis of replacement decision

Incremental cash outflows:		
Cost of new furnace		Rs 1,00,000
Add: Salvage value of 15 HP motor		3,000
Less: Sale proceeds of existing furnace		10,000
Investment in new furnace		93,000
Incremental CFAT and NPV:		
Savings and revenue on installation of new furnace:		
Reduction in coal cost (not required)		25,000
Sale of white ash (3,000 × 20/100 × 5/100 × Rs 1,500)		45,000
		70,000
Less: Cash incremental costs:		
Electricity costs	Rs 8,000	
Operating expenses	4,000	
Contribution lost due to use of husk (3,000 × 20/100 × Rs 50)	30,000	42,000
Incremental depreciation:		
Book value of existing machines/furnace (Rs 15,000 + Rs 5,000)	20,000	
Add: Cost of new furnace	1,00,000	
Less: Sale proceeds of existing furnace	(10,000)	
Depreciation base of new machine	1,10,000	
Less: Existing depreciation base	(20,000)	
Basic of incremental depreciation	90,000	
Depreciation per year Rs 90,000/10 years		9,000
Earnings before taxes		19,000
Less: Taxes, 35 per cent		6,650
EAT		12,350
CFAT		21,350
(x) PV factor for 10 years annuity at 12 per cent		5.650
Total PV		1,20,627
Less: Cash outflows		93,000
NPV		27,627

Recommendation As NPV is positive, the company is advised to replace the existing coal-fired furnace by new furnace.

P.9.17 Nine Gems Ltd has just installed Machine-R at a cost of Rs 2,00,000. The machine has a five year life with no residual value. The annual volume of production is estimated at 1,50,000 units, which can be sold at Rs 6 per unit. Annual operating costs are estimated at Rs 2,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at Rs 3 per unit for the same level of production.

Nine Gems Ltd has just come across another model called Machine-S capable of giving the same output at an annual operating cost of Rs 1,80,000 (exclusive of depreciation). There will be no change in fixed costs. Capital cost of this machine is Rs 2,50,000 and the estimated life is for 5 years with no residual value.

The company has an offer for sale of Machine-R at Rs 1,00,000. The cost of dismantling and removal will be Rs 30,000. As the company has not yet commenced operations, it wants to sell Machine-R and purchase Machine-S.

Nine Gems Ltd will be a zero-tax company, for seven years in view of several incentives and allowances available. The cost of capital may be assumed at 14 per cent.

(i) Advise whether the company should opt for replacement.

(ii) Will there be any change in your view if Machine-R has not been installed but the company is in the process of selecting one or the other machine?

Solution **Financial evaluation of whether to replace Machine-R**

(i) Incremental cash outflows

Cost of Machine-S		Rs 2,50,000
Less: Effective sale proceeds of Machine-R (Rs 1,00,000 – Rs 30,000, dismantling/removal costs)		70,000
		1,80,000
Incremental cash inflows and NPV (for years t = 1 – 5)		
Savings in annual operating costs:		
Annual cash operating costs (R)	Rs 2,00,000	
Annual cash operating costs (S)	1,80,000	20,000
(x) PV factor of annuity for 5 years (0.14)		× 3.433
Total present value		68,660
Less: Incremental cash outflows		1,80,000
NPV		(1,11,340)

Recommendation Since NPV is negative, the company is advised not to replace Machine-R.

(ii) Financial evaluation of Machine-R and S (determination of NPV)

Particulars	*Machine-R*	*Machine-S*
Sales revenue (1,50,000 × Rs 6)	Rs 9,00,000	Rs 9,00,000
Less: Operating costs	2,00,000	1,80,000
Less: Fixed costs (1,50,000 × Rs 3)	4,50,000	4,50,000
Annual cash inflows	2,50,000	2,70,000
(x) PV factor of annuity for 5 years (0.14)	(×) 3.433	(×) 3.433
Total present value	8,58,250	9,26,910
Less: Cash outflows	2,00,000	2,50,000
Net present value	6,58,250	6,76,910

Recommendation As NPV of Machine-S is higher, the company is advised to opt for Machine-S

Note: As the company is a zero-tax company for seven yerars and life of both the machines is five years only, depreciation aspect is not relevant.

P.9.18 Band-Box is considering the purchase of a new wash and dry equipment in order to expand its operations. Two types of options are available: a low-speed system (LSS) with a Rs 20,000 initial cost and a high speed system (HSS) with an initial cost of Rs 30,000. Each system has a fifteen year life and no salvage value. The net cash flows after taxes (CFAT) associated with each investment proposal are:

	Low speed system (LSS)	*High speed system (HSS)*
CFAT for years 1 through 15	Rs 4,000	Rs 6,000

Which speed system should be chosen by Band-Box, assuming 14 per cent cost of capital?

Solution

Determination of NPV

Years	*CFAT*		*PV factor (0.14)*	*Total PV*	
	LSS	*HSS*		*LSS*	*HSS*
1-15	Rs 4,000	Rs 6,000	6.142	Rs 24,568	Rs 36,852
Less: Initial cost				20,000	30,000
NPV				4,568	6,852

The high speed system should be chosen by Band-Box as its NPV is greater.

P.9.19 Welcome Limited is considering the manufacture of a new product. They have prepared the following estimate of profit in the first year of manufacture:

Sales, 9,000 units @ Rs 32		Rs 2,88,000
Cost of goods sold:		
Labour 40,000 hours @ Rs 3.50 per hour	Rs 1,40,000	
Materials and other variable costs	65,000	
Depreciation	45,000	
	2,50,000	
Less: Closing stock	25,000	2,25,000
Net profit		63,000

The product is expected to have a life of four years. Annual sales volume is expected to be constant over the period at 9,000 units. Production which was estimated at 10,000 units in the first year would be only 9,000 units each in year two and three and 8,000 units in year four. Debtors at the end of each year would be 20 per cent of sales during the year; creditors would be 10 per cent of materials and other variable costs. If sales differed from the forecast level, stocks would be adjusted in proportion.

Depreciation relates to machinery which would be purchased especially for the manufacture of the new product and is calculated on the straight line basis assuming that the machinery would last for four years and have no terminal scrap value. Fixed costs are included in labour cost.

There is high level of confidence concerning the accuracy of all the above estimates except the annual sales volume. Cost of capital is 20 per cent per annum. You may assume that debtors are realised and creditors are paid in the following year. No changes in the prices of inputs or outputs are expected over the next four years.

You are required to show whether the manufacture of the new product is worthwhile. Ignore taxes.

Solution Cash outflows:

Cost of the machine (Depreciation per year × years of useful life of the machine, i.e. Rs 45,000 × 4)	Rs 1,80,000

Cash inflows and NPV

Particulars	*Year*				
	1	*2*	*3*	*4*	*5*
Sales revenue	Rs 2,88,000	Rs 2,88,000	Rs 2,88,000	Rs 2,88,000	
Less: Expenses:					
Labour cost	1,40,000	1,26,000	1,26,000	1,12,000	
Materials and other Variable costs	65,000	58,500	58,500	52,000	
Funds inflows	83,000	1,03,500	1,03,500	1,24,000	
Less: Debtors outstanding	57,600	57,600	57,600	57,600	
Add: Receipts from debtors	—	57,600	57,600	57,600	Rs 57,600
Add: Creditors outstanding	6,500	5,850	5,850	5,200	
Less: Payments to creditors	—	6,500	5,850	5,850	5,200
Cash inflows	31,900	1,02,850	1,03,500	1,23,300	52,400
(x) PV factor	0.833	0.694	0.579	0.482	0.402
Present Value	26,573	71,378	59,927	59,455	21,065
Total PV (year, t = 1-5)					2,38,398
Less: Cash outflows					1,80,000
NPV					58,398

Since the NPV is positive, the manufacture of new product is worthwhile.

P.9.20 A company is currently considering modernisation of a machine originally costing Rs 50,000 (current book value zero). However, it is in a good working condition and can be sold for Rs 25,000. Two choices are available. One is to rehabilitate the existing machine at a total cost of Rs 1,80,000; and the other is to replace the existing machine with a new machine costing Rs 2,10,000 and requiring Rs 30,000 to install. The rehabilitated machine as well as the new machine would have a six year life and no salvage value. The projected after-tax profits under the various alternatives are:

	Expected after-tax profits		
Year	*Existing machine*	*Rehabilitated machine*	*New machine*
1	Rs 2,00,000	Rs 2,20,000	Rs 2,40,000
2	2,50,000	2,90,000	3,10,000
3	3,10,000	3,50,000	3,50,000
4	3,60,000	4,00,000	4,10,000
5	4,10,000	4,50,000	4,30,000
6	5,00,000	5,40,000	5,10,000

The firm is taxed at 35 per cent. The company uses the straight line depreciation method and the same is allowed for tax purposes. Ignore block assets concept. The cost of capital is 12 per cent.

Advise the company whether it should rehabilitate the existing machine or should replace it with the new machine. Also, state the situation in which the company would like to continue with the existing machine.

Solution

Cash outflows

(i) If machine is rehabilitated:	
Rehabilitation costs	Rs 1,80,000
(ii) If machine is purchased:	
Cost of new machine	2,10,000
Add: Installation cost	30,000
Less: Effective sale value of old machine (Rs 25,000 – Rs 8,750, tax)	(16,250)
Incremental cash outflows	2,23,750

Cash inflows after taxes

Existing machine		*Rehabilitated machine*			*New machine*		
Year	*EAT/ CFAT*[a]	*EAT*	*D*	*CFAT*	*EAT*	*D*	*CFAT*
1	Rs 2,00,000	Rs 2,20,000	Rs 30,000	Rs 2,50,000	Rs 2,40,000	Rs 40,000	Rs 2,80,000
2	2,50,000	2,90,000	30,000	3,20,000	3,10,000	40,000	3,50,000
3	3,10,000	3,50,000	30,000	3,80,000	3,50,000	40,000	3,90,000
4	3,60,000	4,00,000	30,000	4,30,000	4,10,000	40,000	4,50,000
5	4,10,000	4,50,000	30,000	4,80,000	4,30,000	40,000	4,70,000
6	5,00,000	5,40,000	30,000	5,70,000	5,10,000	40,000	5,50,000

[a]Since the existing machine has been fully depreciated (book value being zero), no depreciation would be added to determine CFAT.

Determination of NPV

Year	*Incremental CFAT*			*Total PV*	
	Rehabilitated machine	*New machine*	*PV factor (0.12)*	*Rehabilitated machine*	*New machine*
1	Rs 50,000	Rs 80,000	0.893	Rs 44,650	Rs 71,440
2	70,000	1,00,000	0.797	55,790	79,700
3	70,000	80,000	0.712	49,840	56,960
4	70,000	90,000	0.636	44,520	57,240
5	70,000	60,000	0.567	39,690	34,020
6	70,000	50,000	0.507	35,490	25,350
Total present value				2,69,980	3,24,710
Less: Initial cash outflows				1,80,000	2,23,750
NPV				89,980	1,00,960

Recommendation Since NPV of the new machine is more, the company should buy it. If the NPV of incremental CFAT of both the alternatives were negative, the company would have continued with the existing machine.

P.9.21 Excel Ltd manufactures a special chemical for sale at Rs 30 per kg. The variable cost of manufacture is Rs 15 per kg. Fixed cost excluding depreciation is Rs 2,50,000. Excel Ltd is currently operating at 50 per cent capacity. It can produce a maximum of 1,00,000 kg at full capacity.

The production manager suggests that if the existing machines are replaced, the company can achieve maximum capacity in the next 5 years gradually increasing the production by 10 per cent a year.

The finance manager estimates that for each 10 per cent increase in capacity, the additional increase in fixed cost will be Rs 50,000. The existing machinesa with a current book value of Rs 10,00,000 and remaining useful life of 5 years can be disposed of for Rs 5,00,000. The vice-president (finance) is willing to replace the existing machines provided the NPV on replacement is Rs 4,53,000 at 15 per cent cost of capital. PV factor may be used up to two digits only.

(i) You are required to compute the total value of machines necessary for replacement. For your exercise you may assume the following:

(a) All the assets are in the same block. Depreciation will be on straight line basis and the same is allowed for tax purposes.

(b) There will be no slavage value for the new machines. The entire cost of the assets will be depreciated over a five year period.

(c) Tax rate is 40 per cent.

(d) Cash inflows will accrue at the end of the year.
(e) Replacement outflow will be at the beginning of the year (year 0).

(ii) On the basis of data given above, the managing director feels that the replacement, if carried out, would at least yield a post-tax return of 15 per cent in three years provided the capacity build up is 60, 80 and 100 per cent respectively. Do you agree?

Solution Determination of total replacement value of machines

(i) (a) Incremental cash outflows

Cost of replacement of new machines	Rs X
Less: Disposal value of existing machines	5,00,000
Cash outflows required	(X – Rs 5,00,000)

(b) Determination of CFAT and NPV (excluding depreciation)

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Increased production and sales (Kg)	10,000	20,000	30,000	40,000	50,000
(x) contribution per unit (Rs 30 – Rs 15) (Rs)	15	15	15	15	15
Incremental contribution	1,50,000	3,00,000	4,50,000	6,00,000	7,50,000
Less: Incremental fixed costs	50,000	1,00,000	1,50,000	2,00,000	2,50,000
Incremental profit before taxes	1,00,000	2,00,000	3,00,000	4,00,000	5,00,000
Less: Taxes (0.40)	40,000	80,000	1,20,000	1,60,000	2,00,000
Earnings after taxes	60,000	1,20,000	1,80,000	2,40,000	3,00,000
(x) PV factor (0.15)	0.87	0.76	0.66	0.57	0.49
Present value	52,200	91,200	1,18,800	136,800	1,47,000
Total PV for 5 years (t = 1 – 5)					5,46,000

(c) Base for incremental depreciation

Current book value of existing machine	Rs 10,00,000
Add: Cost of new machine	X
Less: Sale proceeds of existing machine	5,00,000
Depreciation base of new machine	X + 5,00,000
Less: Depreciation base of existing machine	10,00,000
Base for incremental depreciation	X – 5,00,000

(d) PV of tax savings on incremental depreciation for years 1 - 5

Incremental depreciation per year (X – Rs 5,00,000) ÷ 5	0.2X – Rs 1,00,000
(x) Tax rate	0.40
(x) PV factor of annuity for 5 years	3.35
(0.2 X – Rs 1,00,000) × 0.40 × 3.35 = 0.268X – Rs 1,34,000	

(e) Total PV (b + d) = Rs 5,46,000 + 0.268X – Rs 1,34,000

(f) Desired NPV = PV of CFAT – PV of outflows
Rs 4,53,000 = (Rs 4,12,000 + 0.268X) – (X – Rs 5,00,000)
Rs 4,53,000 = Rs 4,12,000 + 0.268X – X + Rs 5,00,000
Or 0.732X = Rs 4,59,000 Or X = Rs 4,59,000/0.732 = Rs 6,27,049
Total value of machines required for replacement is Rs 6,27,049.

(ii) Financial evaluation whether replacement would yield post-tax return of 15 per cent in 3 years

Particulars	*Year*		
	1	*2*	*3*
Increased capacity (per cent)	10	30	50
Increased sales (kg)	10,000	30,000	50,000
Incremental contribution (@ Rs 15 per kg)	Rs 1,50,000	Rs 4,50,000	Rs 7,50,000
Less: Incremental fixed cost	50,000	1,50,000	2,50,000
Less: Incremental depreciation (Rs 11,27,049 – Rs 10,00,000) ÷ 5 years	25,410	25,410	25,410
Earnings before taxes	74,590	2,74,590	4,74,590
Less: Taxes (0.40)	29,836	1,09,836	1,89,836
Earnings after taxes	44,754	1,64,754	2,84,754
CFAT	70,164	1,90,164	3,10,164
(x) PV factor (0.15)	0.87	0.76	0.66
Present value	61,043	1,44,525	2,04,708
Total present value (t = 1 – 3)			4,10,276
Less: Incremental cash outflows			1,27,049
NPV			2,83,227

The assessment of the managing director is correct as the NPV is positive.

P.10.22 The Indo Metal Works (IMW) Ltd manufactures products such as cooler shelving, stocking carts and bakery racks. Most of its products are directly sold to shops, super markets and hotels.

The IMW is currently using a manual system which was purchased 2 years ago for Rs 20 crore and has a remaining useful life of 6 years and zero salvage value. In order to gain competitive advantage by adopting new technology for higher level of profitability with improved quality of products and productivity, the managing director of IMW has under consideration the replacement of the manual system with a robotics manufacturing system. It would require an initial investment of Rs 56 crore as purchase and Rs 7 crore as installation cost. To work out the cost-benefit analysis of the proposal, he assigns the task to a committee consisting of the controller, the marketing director and the production director.

The controller supplies the given facts relating to the expected revenues and expenses (in lakh of rupees):

Year	*Sales*	*Variable costs (excluding depreciation)*	*Fixed costs*
1	4,000	2,280	720
2	4,500	2,360	730
3	4,750	2,445	800
4	5,150	2,705	880
5	5,550	2,810	960
6	5,800	2,864	1,000

The AIDE 900 robotic system has the capability to weld stainless steel and aluminum used by the IMW as raw materials and can be programmed to adjust the path, angle and speed of the torch. The production director is excited as the system would eliminate the need to hire welders who are so expensive and the market for welders seems perpetually tight.

Since the robotics welding is likely to provide better quality products and product scheduling and avoid late deliveries, the marketing director is convinced that the annual sales would increase by 40 per cent compared to the existing manual system of equipment. It is also anticipated that there would be reduction to the extent of 25 per cent in variables costs and 10 per cent in fixed costs (excluding depreciation).

The existing manual system can be sold for Rs 3 crore. Due to replacement, the management estimates the working capital requirement of Rs 7 crore.

Assuming 12 per cent cost of capital and 35 per cent tax, prepare a financial analysis report for the committee of directors of IMW to be submitted to the managing director. What recommendation would you make? The IMW uses written down value method of depreciation. The new system like the existing manual system will be subject to 25 per cent depreciation. It is expected to have useful economic life of six years with Rs 5 crore as salvage value. The company has several other plants in the asset block of 25 per cent depreciation.

Solution

Financial analysis whether to adopt AIDE 900 robotic system *(Rs in lakh)*

Cash outflows (incremental):	
Cost of AIDE 900 system	5,600
Installation costs	700
Working capital	700
Less: Sale value of existing manual system	300
	6,700

Determination of incremental CFBT (in lakh of rupees)

	Manual system					*Robotic system*					*Differential*
Year	*Sales*	–	*VC*	– *FC* =	*CFBT*	*Sales*	–	*VC*	– *FC* =	*CFBT*	*CFBT*
1	4,000		2,280	720	1,000	5,600		2,394 *	648	2,558	1,558
2	4,500		2,360	730	1,410	6,300		2,478	657	3,165	1,755
3	4,750		2,445	800	1,505	6,650		2,567	720	3,363	1,858
4	5,150		2,705	880	1,565	7,210		2,840	792	3,578	2,013
5	5,550		2,810	960	1,780	7,770		2,950	864	3,956	2,176
6	5,800		2,864	1,000	1,936	8,120		3,007	900	4,213	2,277

*(Existing VC ratio × 0.75 × sales under robotic system)

Determination of CFAT and NPV (amount in lakh of rupees)

Particulars	*Years*					
	1	*2*	*3*	*4*	*5*	*6*
CFBT	1,558	1,755	1,858	2,013	2,176	2,277
Incremental Depreciation	1,500	1,125	844	633	475	231
Taxable income	58	630	1,014	1,380	1,701	2,046
Less: Taxes	20.3	220	355	483	595	716
EAT	37.7	410	659	897	1,106	1,330
CFAT	1,537.7	1,535	1,503	1,530	1,581	1,561
Add: SV + Release of WC (500 + 700)						1,200
× PV factor (0.12)	0.893	0.797	0.712	0.636	0.567	0.507
PV	1,373	1,223	1,070	973	896	1,400
Total PV (t = 1 – 6)						6,935
Less: Cash outflows						6,700
NPV						235

Recommendation Since the NPV is positive, IMW is advised to switch to robotic system.

Working Notes

(i) WDV of existing machine in the beginning of year 3 *(Rs in lakh):*

Cost of machine			2,000
Less: Depreciation:	year 1	500	
	2	375	875
			1,125

(ii) Depreciation base of new robotic system *(Rs in lakh):*

WDV of existing system	1,125
Add: Cost of new robotic system	6,300
Less: Sale value of existing system	300
	7,125

(iii) Base for incremental depreciation: Rs 7,125 lakh – Rs 1,125 lakh = Rs 6,000 lakh.

Incremental depreciation (t = 1 – 6) (Rs in lakh)

Year	*Increment asset cost base*	*Depreciation*
1	6,000	1,500
2	4,500	1,125
3	3,375	844
4	2,531	633

(*Contd*)

(*Contd*)

5	1,898	475
6	1,423	231*

*0.25 × (Rs 1,423 lakh – Rs 500 lakh, salvage value)

P.10.23 Company Y is operating an elderly machine that is expected to produce a net cash inflow of Rs 40,000 in the coming year and Rs 40,000 next year. Current salvage value is Rs80,000 and next year's value is Rs 70,000. The machine can be replaced now with a new machine, which costs Rs 1,50,000 but is much more efficient and will provide a cash inflow of Rs 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 per cent. Advise with reasons.

Solution **(i)** Determination of Equivalent Annual NPV if an elderly (Existing) Machine is Replaced Now (at time = 0 period)

(a) Cash outflows (incremental)

Cost of new machine	Rs 1,50,000
Less: Salvage value of an elderly machine	80,000
	70,000

(b) NPV of cash inflows

Year	*Incremental cash inflows*	*PV factor at 10%*	*Total PV*
1	Rs 40,000	0.909	Rs 36,360
2	40,000	0.826	33,040
3	80,000	0.751	60,080
Total PV of incremental cash inflows			1,29,480
Less: Incremental cash outflows			70,000
Net present value			59,480

(c) Equivalent annual net present value *(Rs 59,480 ÷ 2.487 PVF for 3 years at 10 per cent)*	*23,916.37*

(ii) Determination of Equivalent Annual NPV if an Elderly Machine is replaced next year (at time = 0 period)

(a) Incremental cash outflows	
Cost of new machine (Rs 1,50,000 × 0.909)	Rs 1,36,350
Less: Salvage value of an elderly machine (Rs 70,000 × 0.909)	63,630
	72,720

(b) NPV of cash inflows

Year	*Incremental cash inflows*	*PV factor at 10%*	*Total PV*
2	Rs 40,000	0.826	Rs 33,040
3	80,000	0.751	60,080
4	80,000	0.683	54,640
			1,47,760
Less: PV of cash outflows at t = 0			72,720
NPV at t = 0			75,040

(c) Equivalent annual NPV (Rs. 75,040 ÷ 2.487)	*Rs 30,172.90*

Recommendation Company Y is advised to replace the machine one year from now as it promises a higher equivalent annual NPV.

P.10.24 A software company is considering installing an air conditioning plant, for the entire company. It has two options, X and Y.

Plant X costs Rs 5,00,000 to purchase and install. It has 5 years of useful life and will be depreciated over this period on a straight-line basis to a book value of Rs 25,000. However, the management hopes to sell it for Rs 40,000. Maintenance and other operating costs of running the plant are Rs 2,50,000 per year.

Plant Y has a 10 year life but costs Rs 7,00,000 to purchase and install. It will be depreciated over 8 years on a straight-line basis to zero book value. However, at the beginning of year 7 and is expected to cost Rs 1,00,000; it is not to be capitalized but to be expended. At year-end 10, the plant is expected to have a salvage value of Rs 30,000, which is likely to be equivalent to the removal cost of the plant. Plant Y is less expensive to run than Plant X as it requires Rs 2,20,000 per year to operate.

Corporate tax rate is 35 per cent; cost of capital is 12 per cent. Assuming straight-line method of depreciation as well as the time period of depreciation are acceptable for tax purposes, advise which plant should be purchased by the company.

Solution

Determination of equivalent annual cost of plants *X* and *Y*

Particulars	*Year*	*COBT*	*COAT*	*PV factor at 0.12*	*Total PV*
Plant X					
Purchase cost	0	Rs 5,00,000	Rs 5,00,000	1.000	Rs 5,00,000
Operating costs	1–5	2,50,000	1,62,500[1]	3.605	5,85,812
Tax advantage on depreciation	1–5	—	(33,250[2])	3.605	(1,19,866)
Salvage value	5	40,000	(34,750[3])	0.567	(19,703)
Total cost					9,46,243
Divided by annuity PV factor at 12% corresponding to life of plant, 5 years					3.605
Equivalent annual cost					2,62,481
Plant Y					
Purchase costs	0	7,00,000	7,00,000	1.000	7,00,000
Operating costs	1–10	2,20,000	1,43,000[4]	5.650	8,07,950
Tax advantage on depreciation	1–8	—	(30,6255)	4.968	(1,52,145)
Overhaul cost	7	1,00,000	65,000[6]	0.507[7]	32,955
Total cost					13,88,760
Divided by annuity PV factor at 12% for 10 years					5.650
Equivalent annual cost					2,45,798

1. Rs 2,50,000 (1-tax rate 0.35) = Rs 1,62,500
2. [(Rs 5,00,000 – Rs 25,000)/5 years] × tax rate, 0.35 = Rs 33,250
3. Rs 40,000 – Tax payment on gain i.e., Rs 15,000 × 0.35 = Rs 34,750
4. Rs 2,20,000 (1 – 0.35) = Rs 1,43,000
5. (Rs 7,00,000/8 years) × 0.35 = Rs 30,625
6. Rs 1,00,000 × 0.65 = Rs 65,000
7. PV factor at year-end 6 at 12% (as per Table A-3).

Recommendation Buy plant Y as its EAC is lower.

P.11.21 Mr *X* an investor, purchases an equity share of a growing company, *Y* for Rs 210. He expects the company to pay dividends of Rs 10.5, Rs 11.025 and Rs 11.575 in years 1, 2 and 3, respectively. He expects to sell the shares at a price of Rs 243.10 at the end of 3 years.

(i) Determine the growth rate in dividend.
(ii) Calculate the current dividend yield
(iii) What is the required rate of return of Mr *X* on his equity investments?

Solution

(i) Growth rate in dividend = $D_1(1 + r)^n = D_n$, that is, Rs $10.50(1 + r)^2 = 11.575 = (1 + r)^2 = 11.575 \div 10.50$ = 1.1024 Table A-1 (compounded sum of Re 1) suggests that Re 1 compounds to Rs 1.102 in 2 years at the compound rate of 5 per cent. Therefore, growth rate in dividend is 5 per cent.

(ii) Current dividend yield (D_y) = Expected dividend/Current price = Rs 10.50/210 = 5 per cent

(iii) Required rate of return (K_e) = $(D_1/P_0) + g$, i.e., Rs 10.50/210 + 0.05 = 10 per cent

P.11.22

(i) If current earning are Rs 2.76 a share, while 10 years earlier, they were Rs 2, what has been the rate of growth in earnings?
(ii) If a company is paying currently a dividend of Rs 6 per share, whereas 5 years before it was paying Rs 5 per share, what has been the rate of growth in dividends?
(iii) A company which is not subject to growth expects to pay dividend of Rs 12 per share for ever. Calculate the value of a share, assuming 10 per cent as the appropriate discount rate for such a company.

Solution

Case	*Growth (in years)*	*Compound factor*	*Rate of growth*
(i)	10	1.38*	Rs 1.344[1]
(ii)	5	1.20**	1.217[2]

*Rs 2.76/2; **Rs 6/5

[1]Nearest factor, 3 per cent; 2 Nearest factor, 4 per cent

The exact rates of growth would be 3.27 per cent and 3.71 per cent in case (i) and (ii) respectively.

(iii) $P = Cl_i$ = Dividend cash flows/Appropriate discount rate = Rs 12/0.10 = Rs 120

P.11.23 A company is contemplating an issue of new equity shares. The firm's equity shares are currently selling at Rs 125 a share. The historical pattern of dividend payments per share, for the last 5 years is given below:

Year	*Dividend*
1	Rs 10.70
2	11.45
3	12.25
4	13.11
5	14.03

The flotation costs are expected to be 3 per cent of the current selling price of the shares. You are required to determine growth rate in dividends.

Solution

Growth rate in dividends = $D_0(1 + r)^n = D_n$ = Rs $10.70(1 + r)^4$ = Rs 14.03

Table A-1 (Sum of Re 1) suggests that Re 1 compounds to Rs 1.311 in 4 years at the compound rate of 7 per cent. Therefore, growth rate in dividends is 7 per cent.

P.11.24 The following is the capital structure of Simons company Ltd. as on 31st March, current year

Equity share: 10,000 shares (of Rs 100 each)	Rs 10,00,000
12% Preference shares (of Rs 100 each)	4,00,000
10% Debentures	6,00,000
	20,00,000

The market price of the company's share is Rs 110 and it is expected that a dividend of Rs 10 per share would be declared at the end of the current year. The dividend growth rate is 6 per cent.

(i) If the company is in the 35 per cent tax bracket, compute the weighted average cost of capital.

(iii) Assuming that in order to finance an expansion plan, the company intends to borrow a fund of Rs 10 lakh bearing 12 per cent rate of interest, what will be the company's revised weighted average cost of capital? This financing decision is expected to increase dividend from Rs 10 to Rs 12 per share. However, the market price of equity share is expected to decline from Rs 110 to Rs 105 per share.

Solution

(i) Statement showing determination of weighted average cost of capital, K_0 (market value weights)

Source	*Amount (1)*	*After tax cost (%) (2)*	*Total cost [1 × 2] (3)*
Equity	Rs 11,00,000	15.09%[1]	Rs 1,65,990
12% Preference share	4,00,000	12.00	48,000
10% Debentures	6,00,000	6.50[2]	39,000
	21,00,000		2,52,990

K_0 = Rs 2,52,990/Rs 21,00,000 = 12.05 per cent

Satement showing determination of K_0 (book-value weights)

Source	*Amount (1)*	*After-tax cost (%) (2)*	*Total cost [1 × 2] (3)*
Equity	Rs 10,00,000	15.09	Rs 1,50,900
Preference shares	4,00,000	12.00	48,000
Debentures	6,00,000	6.50	39,000
	20,00,000		2,37,900

K_0 = Rs 2,37,900/Rs 20,00,000 = 11.89 per cent

Note: Conceptually, market value weights are preferred.

(ii) Statement showing revised K_0 (book value as well as market value weights)

Source	*Amount*		*After-tax cost (%)*	*Total cost*	
	Book value	*Market value*		*Book value*	*Market value*
Equity	Rs 10,00,000	10,50,000	17.43[3]	Rs 1,74,300	1,83,015
12% Preference shares	4,00,000	4,00,000	12.00	48,000	48,000
10% Debentures	6,00,000	6,00,000	6.50	39,000	39,000
12% Loan	10,00,000	10,00,000	7.80[4]	78,000	78,000
	30,00,000	30,50,000		3,39,300	3,48,015

K_0 (market value weights) = Rs 3,48,015/Rs 30,50,000 = 11.41 per cent
K_0 (book value weights) = Rs 3,39,300/Rs 30,00,000 = 11.31 per cent

1. K_e = (Rs 10/Rs 110) + 6% = 15.09 per cent
2. K_d = 10%(1 −0.35) = 6.5 per cent
3. K_e (revised) = (Rs 12/Rs 105) + 6% = 17.43 per cent
4. Cost of loan = 12% (1 – 0.35) = 7.8 per cent

It is assumed that the market values and book values of preference shares and debentures are equal.

P.11.25 XYZ company has debentures outstanding with 5 years left before maturity. The debentures are currently selling for Rs 90 (the face value is Rs 100). The debentures are to be redeemed at 5 per cent premium. The interest is paid annually at a rate of interest of 12 per cent. The firm's tax rate is 35 per cent. Calculate cost of debt.

Solution

The value of k_d is to be determined by trial and error.

Determination of PV at 11% and 12% rates of interest

Year	Cash outflows after taxes	PV factor at		Total PV at	
		11%	12%	11%	12%
1-5	Rs 7.8	3.696	3.605	Rs 28.83	Rs 28.12
5	105	0.593	0.567	62.27	59.54
				91.10	87.66

By interpolation, the value of k_d would be 11% + (Rs 1.10/Rs 3.44 = 0.32) = 11.32 per cent

P.11.26 An investor is contemplating the purchase of equity shares of a company which had paid a dividend of Rs 5 per share last year. The dividends are expected to grow at 6 per cent for ever. The required rate of return on the shares of this company in the capital market is 12 per cent. What will be the maximum price you will recommend the investor to pay for an equity share of the company? Will your answer be different if he wants to hold the equity share for 3 years and 6 years?

Solution

$$P_0 = \frac{\text{Rs } 5.30}{12\% - 6\%} = \text{Rs } 88.33$$

The maximum price we shall recommend the investor to pay for an equity share of the company is Rs 88.33.

The value of the share is not dependent upon the holding period. The value of the share would be the same whether he holds the share for 3 years or 6 years.

P.11.27 A large sized chemical company has been expected to grow at 14 per cent per year for the next 4 years and then to grow indefinitely at the same rate as that of the national economy, that is, 5 per cent. The required rate of return on the equity shares is 12 per cent. Assume that the company paid a dividend of Rs 2 per share last year. Determine the market price of the shares today.

Solution The value of equity share = the sum of (i) *PV* of dividend payments during years 1-4 and (ii) *PV* of expected market price at the end of year 4 based on growth rate of 5 per cent.

Year	$D_t = D_0\ (1 + g)^t$	PV factor at 12%	Total PV
1	Rs $2(1 + 0.14)^1 = 2.28$	0.893	Rs 2.036
2	$2(1 + 0.14)^2 = 2.60$	0.797	2.072
3	$2(1 + 0.14)^3 = 2.96$	0.712	2.108
4	$2(1 + 0.14)^4 = 3.38$	0.636	2.150
			8.37

$$P_4 = \frac{D_5}{(k_e - g_n)} = \frac{(\text{Rs } 3.38)\,(1 + 0.05)}{12\% - 5\%} = \text{Rs } 50.71$$

g_n = normal growth rate

PV of market price of the share at the end of year 4 = Rs 50.71 × *PV* factor at 12 per cent at the end of year 4 (0.636) = Rs 32.25.

$$P_0 = \text{Rs } 8.37 + \text{Rs } 32.25 = \text{Rs } 40.62$$

The market price of the share would be Rs 40.62.

P.11.28 A fast growing foreign company wants to expand its total assets by 50 per cent by the end of the current year. Given below are the company's capital structure which it considers to be optimal. There are no short-term debts.

8% Debentures	Rs 4,00,000
9% Preference shares	1,00,000
Equity shares	5,00,000
	10,00,000

New debentures would be sold at 11 per cent coupon rate and will be sold at par. Preference shares will have a 12 per cent rate and will also be sold at par. Equity shares currently selling at Rs 100 can be sold to net the company Rs 95. The shareholders' required rate of return is to be 17 per cent consisting of a dividend yield of 10 per cent and an expected growth rate of 7 per cent. Retained earnings for the year are estimated to be Rs 50,000 (ignore depreciation). The corporate tax is 35 per cent. You are required to calculate the following values:

(a) Assuming all asset expansion (gross expenditure for fixed assets plus related working capital) is included in the capital budget, what is the required amount of capital budget?

(b) How much of the capital budget must be financed by external equity (that is, issue of new equity shares) to maintain the optimal capital structure?

(c) Calculate the cost of (i) new issues of equity shares and (ii) retained earnings.

(d) Calculate the weighted average cost of capital using marginal weights.

Solution

(a)	(i) Desired level of asset at the end of year	Rs 15,00,000
	(ii) Present level of assets	10,00,000
Required amount of capital budget (a) – (b)		5,00,000

(b) The optimal capital structure of the company requires financing of capital budget in the following proportions: Debts, 40 per cent, preference shares, 10 per cent and equity funds, 50 per cent. In order to maintain the proportion of equity funds at the level of 50 per cent, Rs 2,50,000 (50 per cent of Rs 5,00,000 additional capital budget) should be financed by equity funds. Internal equity funds (retained earnings) of the company are estimated at Rs 50,000. Therefore, Rs 2,00,000 is required to be financed through external equity by issuing new shares.

(c) (i) Cost of new equity shares, $k_e = \frac{0.10}{\text{Rs } 95} + 0.07 = 17.5$ per cent

(ii) Cost of retained earnings, $k_r = \frac{10}{\text{Rs } 100} + 0.07 = 17$ per cent

(d) Weighted average cost of capital using marginal weights:
(i) Cost of debt (k_d) = 11% (1 – 0.35) = 9.1 per cent
(ii) Cost of preference shares would be 12 per cent as they will be sold at par and no flotation costs are to be incurred.

Source of capital	*Amount (A)*	*Specific cost (k) (%)*	*Total costs [A (×) k]*
Debt	Rs 2,00,000	7.15	Rs 14,300
Preference shares	50,000	12	6,000
Equity	2,00,000	17.5	35,000
Retained earnings	50,000	17	8,500
	5,00,000		63,800

k_0 = Rs 63,800/5,00,000 = 12.76 per cent

P.12.11 Skylark Airways is planning to acquire a light commercial aircraft for flying class clients at an investment of Rs 50,00,000. The expected cash flow after tax for the next three years is as follows:

(Amount in Rs lakh)

Year 1		*Year 2*		*Year 3*	
CFAT	*Probability*	*CFAT*	*Probability*	*CFAT*	*Probability*
14	0.1	15	0.1	18	0.2
18	0.2	20	0.3	25	0.5
25	0.4	32	0.4	35	0.2
40	0.3	45	0.2	48	0.1

The Company wishes to take into consideration all possible risk factors relating to an airline operations. The Company wants to know:

(i) The expected NPV of this venture assuming independent probability distribution with 6 per cent risk free rate of interest.
(ii) The possible deviation in expected value
(iii) How would standard deviation of the present value distribution help in capital budgeting decisions.

Solution

(i) Determination of expected CFAT (*Amount in lakh of rupees*)

Year 1			*Year 2*			*Year 3*		
CFAT	P_j	*Cash flow* $(CF \times P_j)$	*CFAT*	P_j	*Cash flow* $(CF \times P_j)$	*CF*	P_j	*Cash flow* $(CF \times P_j)$
Rs 14	0.1	1.4	Rs 15	0.1	1.5	Rs 18	0.2	3.6
18	0.2	3.6	20	0.3	6	25	0.5	12.5
25	0.4	10	32	0.4	12.8	35	0.2	7
40	0.3	12	45	0.2	9	48	0.1	4.8
Mean $(\overline{CF_1})$		27	$(\overline{CF_2})$		29.3	$(\overline{CF_3})$		27.9

Determination of expected NPV

CFAT	*PV factor (0.06)*	*Total PV*
27	0.943	25.461
29.3	0.890	26.077
27.9	0.840	23.436
Total PV of CFAT		74.974
Less: Cash outflows		50.000
NPV		24.974

(ii) Determination of standard deviation for each year

$(CF_{j1} - \overline{CF_1})^2$	*(x)*	P_{j1}	$(CF_{j1} - \overline{CF_1})^2 \; P_{j1}$
Year 1			
169	x	0.1	16.9
81	x	0.2	16.2
4	x	0.4	1.6
169	x	0.3	50.7
			85.4

$\sigma_1 = \sqrt{85.4} = 9.24$

$(CF_{j2} - \overline{CF_2})^2$	(x)	P_{j2}	$(CF_{j2} - \overline{CF_2})^2 \; P_{j2}$
Year 2			
204.49	x	0.1	20.449
86.49	x	0.3	25.947
7.29	x	0.4	2.916
246.49	x	0.2	49.298
			98.61
			$\sigma_2 = \sqrt{98.61} = 9.93$

$(CF_{j3} - \overline{CF_3})^2$	(x)	P_{j3}	$(CF_{j3} - \overline{CF_3})^2 \; P_{j3}$
Year 3			
98.01	x	0.2	19.602
8.41	x	0.5	4.205
50.41	x	0.2	10.082
404.01	x	0.1	40.401
			74.29
			$\sigma_3 = \sqrt{74.29} = 8.61$

Standard deviation about the expected value= $\sqrt{\sum_{t=1}^{n} \frac{s_{2t}}{(1+i)^{2t}}}$

$$\sigma = \sqrt{\frac{85.4}{(1+0.06)^2} + \frac{98.61}{(1+0.06)^4} + \frac{74.29}{(1+0.06)^6}} = 14.37$$

(iii) Standard deviation enables to make use of the normal probability distribution to have more insight about the element of risk in capital budgeting. The use of the normal probability distribution will enable the decision-maker to have an idea of the probability of different expected values of NPV, that is the probability of having the value of zero or less; greater than zero and within the range of two values. The formula is Z = (Expected value – NPV)/σ. If the probability of having NPV of zero or less is considerably low, say 0.005, it implies that the risk in the project is negligible and the project is worth accepting.

P.12.12 A company is evaluating three proposed projects. You are required to rank the projects with respect to both risk and returns. The relevant data are given as follows:

A		*B*		*C*	
NPV	*Probability*	*NPV*	*Probability*	*NPV*	*Probability*
Rs (3,500)	0.05	(Rs 2,000)	0.01	Rs (4,500)	0.03
(1,000)	0.10	0	0.04	(1,500)	0.07
0	0.15	500	0.15	0	0.10
2,000	0.20	1,500	0.20	3,000	0.50
4,000	0.25	2,000	0.30	4,000	0.25
6,000	0.15	2,500	0.20	5,000	0.05
11,000	0.08	3,000	0.06	—	—
17,500	0.02	3,750	0.04	—	—

Solution

Expected NPV

Project A			*Project B*			*Project C*		
NPV	P_i	$\overline{NPV}$ $(NPV \times P_i)$	*NPV*	P_i	$\overline{NPV}$ $(NPV \times P_i)$	*NPV*	P_i	$\overline{NPV}$ $(NPV \times P_i)$
Rs (3,500)	0.05	Rs (175)	Rs (2,000)	0.01	Rs (20)	Rs (4,500)	0.03	Rs (135)
(1,000)	0.10	(100)	0	0.04	0	(1,500)	0.07	(105)
0	0.15	0	500	0.15	75	0	0.10	0
2,000	0.20	400	1,500	0.20	300	3,000	0.50	1,500
4,000	0.25	1,000	2,000	0.30	600	4,000	0.25	1,000
6,000	0.15	900	2,500	0.20	500	5,000	0.05	250
11,000	0.08	880	3,000	0.06	180	—	—	—
17,500	0.02	350	3,750	0.04	150	—	—	—
Expected	$\Sigma \overline{NPV}_A$	3,255	Expected	$\Sigma \overline{NPV}_B$	1,785	Expected	$\Sigma \overline{NPV}_C$	2,510

Determination of standard deviation about the expected NPV

Project A

NPV_i	$\overline{NPV}$	$NPV_i - \overline{NPV}$	$(NPV_i - \overline{NPV})^2$	P_i	$(NPV_i - \overline{NPV})^2 P_i$
Rs (3,500)	Rs 3,255	Rs (6,755)	Rs 4,56,30,025	Rs 0.15	Rs 22,81,501
(1,000)	3,255	(4,255)	1,81,05,025	0.10	1,81,050
0	3,255	(3,255)	1,05,95,025	0.15	15,89,254
2,000	3,255	(1,255)	15,75,025	0.20	3,15,005
4,000	3,255	745	5,55,025	0.25	1,38,756
6,000	3,255	2,745	75,35,025	0.15	11,30,254
11,000	3,255	7,745	59,98,025	0.08	47,98,602
17,500	3,255	14,245	20,29,20,025	0.02	40,58,400
				$(NPV_i - \overline{NPV_A})^2 P_i$	144,92,823

Project B

NPV_i	$\overline{NPV}$	$NPV_i - \overline{NPV}$	$(NPV_i - \overline{NPV})^2$	P_i	$(NPV_i - \overline{NPV})^2 P_i$
Rs (2,000)	Rs 1,785	Rs (3,785)	Rs 1,43,26,225	0.01	Rs 1,43,262
0	1,785	(1,785)	31,86,225	0.04	1,27,449
500	1,785	(1,285)	16,51,225	0.15	2,47,684
1,500	1,785	(285)	81,225	0.20	16,245
2,000	1,785	215	46,225	0.30	13,867
2,500	1,785	715	5,11,225	0.20	1,02.245
3,000	1,785	1,215	14,76,225	0.06	8,85,735
3,750	1,785	1,965	38,61,225	0.04	1,54,449
				$(NPV_i - \overline{NPV_B})^2 P_i$	16,90,936

Project C

Rs (4,500)	Rs 2,510	Rs (7,010)	Rs 4,91,40,100	0.03	Rs 14,74,203
(1,500)	2,510	(4,010)	1,60,80,100	0.07	11,25,607
0	2,510	(2,510)	63,00,100	0.10	6,30,010
3,000	2,510	490	2,40,100	0.50	1,20,050
4,000	2,510	1,490	22,20,100	0.25	5,55,025
5,000	2,510	2,490	62,00,100	0.05	3,10,005
				$(NPV_i - \overline{NPV_C})^2 P_i$	42,14,900

$$\sigma_A\sqrt{1,44,92,823} = 3,833$$

$$\sigma_B\sqrt{16,90,936} = 1,300$$

$$\sigma_C\sqrt{42,14,900} = 2,053$$

Determination of coefficient of variation (V) = $\dfrac{\text{Standard deviation}\,(\sigma)}{\text{Expected net present value (NPV)}}$

$$V_A = \frac{\text{Rs } 3,833}{\text{Rs } 3,255} = 1.178$$

$$V_B = \frac{\text{Rs } 1,300}{\text{Rs } 1,785} = 0.730$$

$$V_C = \frac{\text{Rs } 2,053}{\text{Rs } 2,510} = 0.818$$

Ranking of projects

Project	*Return*	*Risk*
A	1	3
B	3	1
C	2	2

P.12.13 What would be the risk-adjusted rates of discount for projects, A, B and C in P.12.6 if the company has gathered the following data to determine the risk-return trade-offs:

Coefficient of variation	*Market discount rate*	*Coefficient of variation*	*Market discount rate*
0.0	8.0	1.2	14.0
0.2	9.0	1.4	15.0
0.4	10.0	1.6	16.0
0.6	11.0	1.8	17.0
0.8	12.0	2.0	18.0
1.0	13.0		

Solution

Project	*Coefficient of variation*	*Market discount rate (%)*
A	1.178	14
B	0.730	12
C	0.818	13

P.13.8 A proforma cost sheet of a company provides the following particulars:

Particulars	*Amount per unit*
Elements of cost:	
Raw materials	Rs 80
Direct labour	30
Overhead	60
Total cost	170
Profit	30
Selling price	200

The following further particulars are available:

Raw materials in stock, on average, one month; Materials in process (completion stage, 50 per cent), on average, half a month; Finished goods in stock, on average, one month.

Credit allowed by suppliers is one month; Credit allowed to debtors is two months; Average time-lag in payment of wages is 1.5 weeks and one month in overhead expenses; one-fourth of the output is sold against cash; cash in hand and at bank is desired to be mantained at Rs 3,65,000.

You are required to prepare a statement showing the working capital needed to finance a level of activity of 1,04,000 units of production. You may assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. For calculation purposes, 4 weeks may be taken as equivalent to a month.

Solution

STATEMENT SHOWING DETERMINATION OF NET WORKING CAPITAL

(A) Current assets:	
(i) Stock of materials for 1 month: (1,04,000 × Rs 80 × 4/52)	Rs 6,40,000
(ii) Work-in-progress for 0.5 month:	
(a) Material (1,04,000 × Rs 80 × 2/52) × 0.50	1,60,000
(b) Labour (1,04,000 × Rs 30 × 2/52) × 0.50	60,000
(c) Overheads (1,04,000 × Rs 60 × 2/52) × 0.50	1,20,000
(iii) Finished goods for 1 month: (1,04,000 × Rs 170 × 4/52)	13,60,000
(iv) Debtors for 2 months (78,000 × Rs 170 × 8/52)	20,40,000
(v) Cash in hand and at bank	3,65,000
Total investments in current assets	47,45,000
(B) Current liabilities:	
(i) Creditors, 1 month's purchase of raw materials, (i.e. 1,04,000 × Rs.80 × 4/52)	6,40,000
(ii) Average time-lag in payment of expenses	
(a) Overheads (1,04,000 × Rs 60 × 4/52)	4,80,000
(b) Labour (1,04,000 × Rs 30 × 3/104)	90,000
Total estimate of current liabilities	12,10,000
(C) Net working capital = Current assets – Current liabilities (*A* – *B*)	35,35,000

Working Notes and Assumptions

(i) 26,000 units have been sold for cash. Therefore, credit sales pertain to 78,000 units only.

(ii) Year has 52 weeks.

(iii) All overheads are assumed to be variable. Presence of depreciation element in overheads will lower the working capital requirement.

P.13.9 From the following information, extracted from the books of a manufacturing company, compute the operating cycle in days:

Period covered: 365 days Average period of credit allowed by suppliers, 16 days
Other data are as follows:

	(*Rs '000*)
Average debtors (outstanding)	480
Raw material consumption	4,400
Total production cost	10,000
Total cost of sales	10,500
Sales for the year	16,000
Value of average stock maintained:	
Raw material	320
Work-in-process	350
Finished goods	260

Solution

DETERMINATION OF OPERATING CYCLE

(AMOUNT IN '000)

Particulars	*Days*
(i) Raw material holding period (365 days × Rs 320/4,400)	27
(ii) *Less:* Creditors payment period	(16)
(iii) Work-in-process holding period (365 days × Rs 350/Rs 10,000)	13
(iv) Finished goods holding period (365 days × Rs 260/Rs 10,000)	9
(v) Debtors collection period (365 days × Rs 480/Rs 16,000) (sales given are assumed equal to credit sales)	11
Duration of operating cycle	44

P.13.10 Foods Ltd is presently operating at 60 per cent level, producing 36,000 packets of snack foods and proposes to increase its capacity utilisation in the coming year by 33.33 per cent over the existing level of production. The following data has been supplied:

(i) Unit cost structure of the product at current level:

Raw material	Rs 4
Wages (variable)	2
Overheads (variable)	2
Fixed overhead	1
Profit	3
Selling price	12

(ii) Raw materials will remain in stores for 1 month before being issued for production. Material will remain in process for further 1 month. Suppliers grant 3 months credit to the company.

(iii) Finished goods remain in godown for 1 month.

(iv) Debtors are allowed credit for 2 months.

(v) Average time-lag in wages and overhead payments is 1 month and these expenses accrue evenly throughout the production cycle.

(vi) No increase either in cost of inputs or selling price is envisaged.

Prepare a projected profitability statement and a statement showing working capital requirement at the new level, assuming that a minimum cash balance of Rs 19,500 has to be maintained.

Solution

PROJECTED PROFITABILITY STATEMENT AT 80 PER CENT LEVEL OF CAPACITY (48,000 PACKETS)

Sales revenue (48,000 × Rs 12)		Rs 5,76,000
Less: Cost of sales:		
Raw material (48,000 × Rs 4)	Rs 1,92,000	
Wages (48,000 × Rs 2)	96,000	
Overheads, variable (48,000 × Rs 2)	96,000	
Fixed overheads (48,000 × Rs 0.75)	36,000[@]	4,20,000
Profit		1,56,000

[@]It is assumed the total fixed overheads are Rs 36,000 (earlier Re 1 per unit was the absorption rate 36,000 × Re 1; at 48,000 units, per unit fixed overheads are Re 0,75).

STATEMENT SHOWING DETERMINATISON OF NET WORKING CAPITAL AT 48,000 PACKETS

(A) Current assets:	
(i) Stock of raw materials (48,000 × Rs 4 × 1/12)	Rs 16,000
(ii) Work-in-process (48,000 × Rs 6.375* × 1/12)	25,500
(iii) Finished goods (48,000 × Rs 8.75 × 1/12)	35,000
(iv) Debtors (48,000 × Rs 8.75 × 2/12)	70,000
(v) Cash	19,500
Total current assets	1,66,000
(B) Current liabilities:	
(i) Creditors (48,000 × Rs 4 × 3/12)	48,000
(ii) Wages (48,000 × Rs 2 × 1/12)	8,000
(iii) Variable overheads (48,000 × Rs 2 × 1/12)	8,000
(iv) Fixed overheads (48,000 × Re 0.75 × 1/12)	3,000
Total current liabilities	67,000
(C) Net working capital (*A* – *B*)	99,000

*Material = Rs 4.0 + 50 per cent of other conversion costs (Rs 2 wages + Rs 2 variable overheads + Re 0.75 fixed overheads)

Assumption: Since wages and overhead expenses accrue evenly throughout the production cycle, it is assumed that they will be in process for half-a-month on an average. In other words, conversion costs will be 50 per cent. Fixed overheads are exclusive of depreciation.

P.13.11 You are supplied with the following information in respect of XYZ Ltd for the ensuing year:

Production of the year, 69,000 units
Finished goods in store, 3 months
Raw material in store, 2 months' consumption
Production process, 1 month
Credit allowed by creditors, 2 months
Credit given to debtors, 3 months
Selling price per unit, Rs 50
Raw material, 50 per cent of selling price
Direct wages, 10 per cent of selling price
Manufacturing and administrative overheads, 16 per cent of selling price
Selling overheads, 4 per cent of selling price

There is a regular production and sales cycle and wages overheads accrue evenly. Wages are paid in the next month of accrual. Material is introduced in the beginning of the production cycle. You are required to ascertain its working capital requirement.

Solution

Statement showing working capital requirement

(A) Current assets:	
(i) Raw material in store (69,000 × Rs 25 × 2/12)	Rs 2,87,500
(ii) Work-in-process (69,000 × Rs 31.5* × 1/12)	1,81,125
(*Material, Rs 25 + 0.50 × (Rs 5, Direct wages + Rs 8, Manufacturing and other administrative overheads)	
(iii) Finished goods in store (69,000 × Rs 38 × 3/12)	6,55,500
(iv) Debtors (69,000 × Rs 40 × 3/12)	6,90,000
Total current assets	18,14,125
(B) Current liabilities:	
(i) Creditors (69,000 × Rs 25 × 2/12)	2,87,500
(ii) Wages (69,000 × Rs 5 × 1/12)	28,750
Total current liabilities	3,16,250
(C) Net working capital (*A* – *B*)	14,97,875

Assumptions: (i) Conversion costs (wages, manufacturing and other administrative overheads) are assumed to be equivalent to 50 per cent to determine WIP (ii) sales are credit sales and equivalent to units produced (69,000).

P.13.12 On April 1 of the current year, the board of directors of Dowell Ltd wishes to know the amount of working capital that will be required to meet the programme of activity they have planned for the year. The following information is available:

(i) Issued and paid-up capital, Rs 2,00,000.
(ii) 5% Debentures (secured on assets), Rs 50,000.
(iii) Fixed assets valued at Rs 1,25,000 on March 31 of the previous year.
(iv) Production during the previous year was 60,000 units; it is planned that this level of activity should be maintained during the present year.
(v) The expected ratios of cost to selling price are - raw materials 60 per cent, direct wages 10 per cent and overheads 20 per cent.
(vi) Raw materials are expected to remain in store for an average of two months before these are issued for production.
(vii) Each unit of production is expected to be in process for one month. Full unit of raw materials is required in the beginning of production.
(viii) Finished goods will stay in warehouse for approximately three months.
(ix) Creditors allow credit for 2 months from the date of delivery of raw materials.
(x) Credit allowed to debtors is 3 months from the date of dispatch.
(xi) Selling price per unit is Rs 5.
(xii) There is a regular production and sales cycle.

Prepare:

(a) working capital requirement forecast; and
(b) an estimated profit and loss account and balance sheet at the end of the year.

Solution

(a) Forecast of working capital of Dowell Ltd

(A) Current assets:	
(i) Raw materials (60,000 × Rs 3 × 2/12)	Rs 30,000
(ii) Work-in-process (60,000 × Rs 3.75 × 1/12)	18,750
(Rs 3 material cost + 50 per cent of wages and overheads i.e., Rs 1.5)	
(iii) Finished goods (60,000 × Rs 4.5 × 3/12)	67,500
(iv) Debtors (60,000 × Rs 4.5 × 3/12)	67,500
Total current assets	1,83,750

(*Contd.*)

(B) Current liabilities: Creditors (60,000 × Rs 3 × 2/12)	30,000
(C) Net working capital (*A* – *B*)	1,53,750

(b) Projected profit and loss account of the current year

Sales revenue (60,000 × Rs 5)		Rs 3,00,000
Less: Cost of sales:		
Raw material (0.60 × Rs 3,00,000)	Rs 1,80,000	
Direct wages (0.10 × Rs 3,00,000)	30,000	
Overheads (0.20 × Rs 3,00,000)	60,000	2,70,000
Less: Interest (Rs 50,000 × 0.05)		2,500
Profit		27,500

Projected balance sheet at the end of March 31, current year

Liabilities		*Assets*	
Share capital	Rs 2,00,000	Fixed assets	Rs 1,25,000
Reserves & surplus:		Current assets:	
Profit of the current year	27,500	Raw material	30,000
Profit & loss A/c (balancing figure)	8,750	Work-in-progress	18,750
5% Debentures	50,000	Finished goods	67,500
Creditors	30,000	Debtors at selling price (15,000 units × Rs 5)	75,000
	3,16,250		3,16,250

P.13.13 A company is considering its working capital investment and financial policies for the next year. Estimated fixed assets and current liabilities for the next year are Rs 2.60 crore and Rs 2.34 crore respectively. Estimated sales and EBIT depend on current assets investment, particularly inventories and book-debt. The financial controller of the company is examining the following alternative working capital policies (Rs crore):

Working capital policy	*Investment in current assets*	*Estimated sales*	*EBIT*
Conservative	4.50	12.30	1.23
Moderate	3.90	11.50	1.15
Aggressive	2.60	10.00	1.00

After evaluating the working capital policy, the financial controller has advised the adoption of the moderate working capital policy. The company is now examining the use of long-term and short-term borrowings for financing its assets. The company will use Rs 2.50 crore of the equity funds. The corporate tax rate is 35 per cent. The company is considering the following debt alternatives:

Financing Policy	*Short-term debt*	*Long-term debt*
Conservative	0.54	1.12
Moderate	1.00	0.66
Aggressive	1.50	0.16
Interest rate-Average (%)	12	16

Required: (1) Working capital investment for each policy. (a) Net working capital position, (b) Rate of return, and (c) Current ratio

(2) Financing for each policy. (a) Net working capital position, (b) Rate of return on shareholder equity, and (c) Current ratio

Solution

(1) Statement showing working capital investment under each policy

	Particulars	*Working capital policy*		
		Conservative	*Moderate*	*Aggressive*
(A)	Current assets	4.50	3.90	2.60
(B)	Fixed assets	2.60	2.60	2.60
(C)	Total assets (A) + (B)	7.10	6.50	5.20
(D)	Current liabilities	2.34	2.34	2.34
(E)	Net worth (C) – (D)	4.76	4.16	2.86
(F)	Estimated sales	12.30	11.50	10.00
(G)	EBIT	1.23	1.15	1.00
(a)	Net working capital position (A) – (D)	2.16	1.56	0.26
(b)	Rate of return (G)/(C) (in per cent)	17.3	17.7	19.2
(c)	Current ratio (A)/(D)	1.92	1.67	1.11

(2) Statement showing effect of financing under alternative financing policy

(Rs in crores)

	Particulars	*Financing policy*		
		Conservative	*Moderate*	*Aggressive*
(A)	Current assets	3.90	3.90	3.90
(B)	Fixed assets	2.60	2.60	2.60
(C)	Total assets (A) + (B)	6.50	6.50	6.50
(D)	Current liabilities	2.34	2.34	2.34
(E)	Short-term debt	0.54	1.00	1.50
(F)	Long-term debt	1.12	0.66	0.16
(G)	Equity capital	2.50	2.50	2.50
	Total liabilities (D) + (E) + (F) + (G)	6.50	6.50	6.50
	Estimated sales	11.50	11.50	11.50
(H)	EBIT	1.15	1.15	1.15
(I)	*Less:* Interest on short-term debt [12% of (E)]	(0.06)	(0.12)	(0.18)
(J)	Interest on long-term debt [16% of (F)]	(0.18)	(0.11)	(0.03)
(K)	EBT [(H) – (I) – (J)]	0.91	0.92	0.94
(L)	*Less:* Taxes @ 35%	(0.32)	(0.32)	(0.33)
(M)	EAT [(K) – (L)]	0.59	0.60	0.61
(a)	Net working capital [(A) – (D) – (E)]	1.02	0.56	0.06
(b)	Rate of return on equity funds [(M)/(G)%]	23.6%	24%	24.4%
(c)	Current ratio [(A)/(D) + (E)	1.35	1.17	1.02

P.14.10 From the following information, prepare cash budget of a business firm for the month of April.

(a) The firm makes 20 per cent cash sales. Credit sales are collected 40, 30 and 25 per cent in the month of sales, month after and second month after sales, respectively. The remaining 5 per cent becomes bad debts.

(b) The firm has a policy of buying enough goods each month to maintain its inventory at two and one-half times the following month's budgeted sales.

(c) The firm is entitled to 2 per cent discount on all its purchases if bills are paid within 15 days and the firm avails of all such discounts. Monthly purchases are made in two equal lots on fortnightly basis.

(d) Cost of goods sold, without considering the 2 per cent discount, is 50 per cent of selling prices. The firm records inventory net of discount.

(e) Other data is:

Sales

January (actual)	Rs 1,00,000
February (actual)	1,20,000
March (actual)	1,50,000
April (budgeted)	1,70,000
May (budgeted)	1,40,000

Inventory on March 31, Rs 2,25,400.
Cash on March 31, Rs 30,000.
Gross purchases in March, Rs 1,00,000.
Selling, general and administrative expenses budgeted for April, Rs 45,000 (includes Rs 10,000 depreciation).

Solution

Cash budget for the month of April

Particulars		*Amount*
(a) Cash inflows		
Balance in the beginning April I		Rs 30,000
Collection from sales		
Cash sales (0.20 × Rs 1,70,000)		34,000
Collection from debtors:		
For February sales	Rs (0.25 × Rs 96,000)	24,000
For March sales	(0.30 × 1,20,000)	36,000
For April sales	(0.40 × 1,36,000)	54,400
Total		1,78,400
(b) Cash outflows		
Payment for purchases		
March (Rs 1,00,000 × 0.98 × 1/2)		49,000
April (Rs 29,400 × 1/2) (see purchase budget)		14,700
Selling, general and administrative expenses (Rs 45,000 – Rs 10,000)		35,000
Total		98,700
(c) Budgeted cash balance [end of April (a – b)]		79,700

Working Notes

Purchase budget (April)	*Gross*	*Net*
Desired ending inventory—gross (Rs 1,40,000 × 0.50 × 2.5)	Rs 1,75,000	Rs 1,71,500
Add: Cost of sales in April—gross (Rs 1,70,000 × 0.50)	85,000	83,300
Total requirements	2,60,000	2,54,800
Less: Beginning inventory—gross (Rs 2,25,400 × 100/98)	2,30,000	2,25,400
Required purchases	30,000	29,400

P.14.11 Prepare cash budget for January-June from the following information:

(i) The estimated sales and expenses are as follows:

Particulars	*Nov.*	*Dec.*	*Jan.*	*Feb.*	*March*	*April*	*May*	*June*
Sales (Rs)	2,00,000	2,20,000	1,20,000	1,00,000	1,50,000	2,40,000	2,00,000	2,00,000
Wages and salaries (Rs)	30,000	30,000	24,000	24,000	24,000	30,000	27,000	27,000
Miscellaneous expenses (Rs)	27,000	27,000	21,000	30,000	24,000	27,000	27,000	27,000

(ii) 20 per cent of the sales are on cash and balance on credit.
(iii) The firm has a gross margin of 25 per cent on sales.
(iv) 50 per cent of the credit sales are collected in the month following the sales, 30 per cent in the second month and 20 per cent in the third month.
(v) Material for the sale of each month is purchased one month in advance on a credit for two months.
(vi) The time-lag in the payment of wages and salaries is one-third of a month and of miscellaneous expenses, one month.
(vii) Debentures worth Rs 40,000 were sold in January.
(viii) The firm maintains a minimum cash balance of Rs 40,000. Funds can be borrowed @ 12 per cent per annum in the multiples of Rs 1,000, the interest being payable on monthly basis.
(ix) Cash balance at the end of December is Rs 60,000.

Solution

Cash budget (January-June) (Amount in thousands of rupees)

Particulars	*January*	*February*	*March*	*April*	*May*	*June*
(a) Cash inflows						
Cash sales (20% of total sales)	24	20	30	48	40	40
Collection from debtors:						
– 50% in the month following	88	48	40	60	96	80
– 30% in the second month	48	52.8	28.8	24	36	57.6
– 20% in the third month	—	32.0	35.2	19.2	16	24
Issue of debentures	40	—	—	—	—	—
Total	200	152.8	134.0	151.2	188	201.6
(b) Cash outflows						
Payment to creditors (working note 2)	165	90	75	112.5	180	150
Wages and salaries						
1/3 of last month	10	8	8	8	10	9
2/3 of current month	16	16	16	20	18	18
Miscellaneous expenses (one month's time-lag)	27	21	30	24	27	27
Total	218	135	129	164.5	235	204
(c) Cash surplus/deficiency) [a – b]	(18)	17.8	5	(13.3)	(47)	(2.4)
Beginning balance	60	42	59.8	64.8	51.5	40.5
Ending balance (indicated)	42	59.8	64.8	51.5	4.5	38.1
Payment of interest (working note 1)	—	—	—	—	—	0.36
Borrowings required	—	—	—	—	36.0	3.0
Ending balance (actual estimated)	42	59.8	64.8	51.5	40.5	40.74

Working Notes

1. Determination of interest: $\text{Rs } 36{,}000 \times \frac{12}{100} \times \frac{1}{12} = \text{Rs } 360$

2. Payment to creditors (*Amount in thousands of rupees*)

Particulars	*November*	*December*	*January*	*February*	*March*	*April*	*May*	*June*
Sales	200	220	120	100	150	240	200	200
Purchases (75% of sales as 25% is gross margin)	150	165	90	75	112.5	180	150	150
Purchases (one month in advance)	165	90	75	112.5	180	150	150	NA
Payments (two month's time-lag)	—	—	165	90	75	112.5	180	150

P.14.12 Prepare cash budget for April-October from the following information supplied by Shah Agencies Ltd.

Balance sheet as at March 31

Proprietor's capital	Rs 1,00,000	Cash		Rs 20,500
Outstanding liabilities	11,000	Stock in trade		50,500
		Sundry debtors		20,000
		Furniture	Rs 25,000	
		Less: Depreciation	5,000	20,000
	1,11,000			1,11,000

Sales and the expenditure on salaries are expected to be as under:

Months	*Sales*	*Salaries*	*Months*	*Sales*	*Salaries*
April	Rs 30,000	Rs 3,000	August	90,000	4,000
May	52,000	3,500	September	35,000	3,000
June	50,000	3,500	October	25,000	3,000
July	75,000	4,000			

The other expenses per month are: Rent, Rs 1,000, Depreciation, Rs 1,000, Miscellaneous expenses, Rs 500, and Commission, 1 per cent of sales.

Of the total sales, 80 per cent is on credit and 20 per cent for cash; 70 per cent of the credit sales are collected in the first month following sale and the balance in the second month. There are no bad debt losses. Gross margin on sales on an average is 30 per cent. Purchases equal to the next month's sales are made every month and they are paid during the month in which they are made. The firm maintains a minimum cash balance of Rs 10,000. Cash deficiencies are made up by the bank loans which are repaid at the earliest opportunity available and cash in excess of Rs 15,000 is invested in securities (interest on bank loans and securities is to be ignored). Outstanding liabilities remain unchanged. Debtors pertain to credit sales of March. State your assumptions, if any.

Solution

Cash budget (April-October)

Particulars	*April*	*May*	*June*	*July*	*August*	*September*	*October*
(a) Cash inflows							
Cash sales	Rs 6,000	Rs 10,400	Rs 10,000	Rs 15,000	Rs 18,000	Rs 7,000	Rs 5,000
Collection from debtors							
First month following sales (70%)	14,000	16,800	29,120	28,000	42,000	50,400	19,600
Second month following sales (30%)	6,000	6,000	7,200	12,480	12,000	18,000	21,600
Total	26,000	33,200	46,320	55,480	72,000	75,400	46,200

(*Contd*)

(*Contd*)

(b) Cash outflows							
Payment to creditors (*see working notes*)	36,400	35,000	52,500	63,000	24,500	17,500	17,500
Salaries	3,000	3,500	3,500	4,000	4,000	3,000	3,000
Rent	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Miscellaneous expenses	500	500	500	500	500	500	500
Commission (1% of sales)	300	520	500	750	900	350	250
Total	41,200	40,520	58,000	69,250	30,900	22,350	22,250
(c) Surplus/(deficiency) [a – b]	(15,200)	(7,320)	(11,680)	(13,770)	41,100	53,050	23,950
Beginning balance	20,500	10,000	10,000	10,000	10,000	13,700	15,000
Ending balance (deficiency)	5,300	2,680	(1,680)	(3,770)	51,100	66,750	38,950
Borrowing required (minimum cash balance+deficiency–surplus)	4,700	7,320	11,680	13,700	—	—	—
Repayment made	—	—	—	—	37,400	—	—
Investment in securities	—	—	—	—	—	51,750	23,950
Closing balance (actually now estimated)	10,000	10,000	10,000	10,000	13,700	15,000	15,000

Working Notes

Payment to creditors

Particulars	*April*	*May*	*June*	*July*	*August*	*Sept.*	*Oct.*	*Nov.*
Sales (Rs)	Rs 30,000	Rs 52,000	Rs 50,000	Rs 75,000	Rs 90,000	Rs 35,000	Rs 25,000	Rs 25,000 (assumed)
Cost of goods to be purchased (70% of next month's sales and paid)	36,400	35,000	52,500	63,000	24,500	17,500	17,500	—

P.14.13 P Company has to make payment of Rs 2 million on 16th April. It has a surplus money today i.e. 15th January and the company has decided to invest in certificate of deposit (CD's) of a leading nationalised bank at 8.00 per cent per annum. What money is required to be invested now? Take year as 365 days.

Solution Amount required to make payment on 16th April Rs 2 million
Let amount invested in Certificates of Deposit for 91 days on 15th January be Rs X
Rate of interest 8 per cent per annum
Based on these facts, the equation is

$$\text{Rs X} \left(1 + \frac{0.08 \times 91}{365}\right) = \text{Rs } 20{,}00{,}000$$

or 1.0199452 X = Rs 20,00,000
or X = Rs 20,00,000/1.10199452 = Rs 19,60,890
Therefore, the company is advised to invest Rs 19,60,890 on 15th January in Certificate of Deposit for 91 days in order to receive Rs 20,00,000 on 16th April to make payment.

P.15.11 In order to increase sales from the normal level of Rs 2.4 lakh per annum, the marketing manager submits a proposal for liberalising credit policy as under: Normal sales, Rs 2.4 lakh, Normal credit period, 30 days

Proposed increase in credit period beyond normal 30 days	*Increase in normal sales*
15	Rs 12,000
30	18,000
45	21,000
60	24,000

The contribution to volume/profit-volume ratio is 33.33 per cent. The company expects a pre-tax return of 20 per cent on investment. Evaluate the above 4 alternatives and advise the management (assume 360 days a year).

Solution

Effect of extending credit period to customers *(Amount in lakh of rupees)*

Particulars	*Credit period (days)*				
	30	*45*	*60*	*75*	*90*
Sales	2.4	2.52	2.58	2.61	2.64
Variable costs (2/3)	1.6	1.68	1.72	1.74	1.76
Contribution (1/3)	0.8	0.84	0.86	0.87	0.88
Less: Cost of investment in debtors at variable costs (as data related to fixed cost is not given)	0.027	0.042	0.057	0.0725	0.088
(Total VC/Debtors turnover) × 0.20	$\left(\frac{1.6}{12}\right)$	$\left(\frac{1.68}{8}\right)$	$\left(\frac{1.72}{6}\right)$	$\left(\frac{1.74}{4.8}\right)$	$\left(\frac{1.76}{4}\right)$
Profit	0.773	0.798	0.803	0.7975	0.792

Recommendation The company is advised to extend credit for 60 days.

P.15.12 Pollock Co. Pvt. Ltd, which is operating for the last 5 years, has approached Sudershan industries for grant of credit limit on account of goods bought from the latter, annexing balance sheet and income statement for the last 2 years are as below:

Pollock Co. Pvt. Ltd—balance sheet *(Rs '000)*

Liabilities	*Current year*	*Last year*	*Assets*	*Current year*	*Last year*
Share capital equity (Rs 10 each)	600	600	Plant & equipment	1,500	1,400
Share premium	400	400	(less depreciation)		
Retained earnings	900	700	Land	750	750
Total equity	1,900	1,700	Total fixed assets	2,250	2,150
First mortgage	200	300	Inventories	580	300
Second mortgage	—	200	Accounts receivable	350	200
Bonds	300	300	Marketable securities	120	120
Long-term liabilities	500	800	Cash	100	80
Accounts payable	300	60	Total current assets	1,150	700
Notes payable	600	220			
Secured liabilities	100	70			
Total current liabilities	1,000	350			
	3,400	2,850		3,400	2,850

Pollock Co. Pvt. Ltd—income statement (Rs '000)

Particulars	*Current year*		*Last year*	
Sales	5,980		5,780	
Income from investment	20	6,000	20	5,800
Opening inventory	300		400	
Total manufacturing Costs	4,200		3,200	
Ending inventory	(580)	3,920	(300)	3,300
		2,080		2,500
General and administrative expenses		950		750
Operating income		1,130		1,750
Interest expenses		60		62
Earnings before taxes		1,070		1,688
Income-tax		480		674
Net income after taxes		590		1,014
Dividend declared and paid				250

Sudershan industries has established the following broad guidelines for granting credit limits to its customers:

(i) Limit credit limit to 10 per cent of net worth and 20 per cent of the net working capital.

(ii) Not to give credit in excess of Rs 1,00,000 to any single customer.

You are required to detail the steps required for establishing credit limits to Pollock Co. Pvt. Ltd. In this case what you consider to be reasonable credit limit.

Solution

Steps required for establishing the credit limit to be extended by Sudershan Industries to Pollock Co. Pvt. Ltd

(i) Maximum credit limit: In this context, the broad guidelines for granting credit limit are as follows:

(a) Maximum credit limit restricted to 10 per cent of net worth and 20 per cent of net working capital.

(b) Maximum of Rs 1,00,000 to any single customer.

Net worth of Pollock Co. Pvt. Ltd	Rs 19,00,000
Net working capital of Pollock Co. Pvt. Ltd. (Rs 11,50,000 – Rs 10,00,000)	1,50,000
Therefore, credit limits possible to be granted are:	
Based on net worth (Rs 19,00,000 × 10 per cent)	Rs 1,90,000
Based on net working capital (Rs 1,50,000 × 20 per cent)	30,000

Based on the above guidelines, maximum credit limit recommended for Pollock Co. is Rs 30,000.

Besides, it will be useful for Sudarshan Industries to carry out liquidity analysis.

Statement showing major ratios related to liquidity of Pollock company

(Amount is Rs '000)

Particulars	*Current year*		*Last year*	
	Computation	*Ratio*	*Computation*	*Ratio*
(I) Current ratio	(1,150/1,000)	1.15	(700/350)	2.00
(II) Acid-test ratio	(570/1,000)	0.57	(400/350)	1.14
(III) Debtors collection period	(365 × 350/5,980)	21 Days	(365 × 200/5,780)	13 Days
(IV) Inventory holding period	(365 × 580/3,920)	54 Days	(365 × 300/3,300)	33 Days

It is apparent that liquidity ratios have shown a market decline in the current year *vis-a-vis* the previous year. This decrease is primarily attributed to sharp increase in current liabilities. The collection period from debtors seems to be satisfactory. Given the unsatisfactory level of liquidity ratios, the firm should ascertain the reasons for increase in current liabilities from Pollock & Co. and should safeguard against 'big' credit sales.

P.15.13 A bank is analysing the receivables of Jackson company in order to identify acceptable collateral for a short-term loan. The company's credit policy is 2/10 net 30. The bank lends 80 per cent on accounts where customers are not currently overdue and where the average payment period does not exceed 10 days past the net period. A schedule of Jackson's receivables has been prepared. How much will the bank lend on a pledge of receivables, if the bank uses a 10 per cent allowance for cash discount and returns?

Account	*Amount*	*Days outstanding*	*Average payment period historically (in days)*
74	Rs 25,000	15	20
91	9,000	45	60
107	11,500	22	24
108	2,300	9	10
114	18,000	50	45
116	29,000	16	10
123	14,000	27	48
	1,08,000		

Solution

Statement showing loan amount on pledge of receivables

Account No.	*Amount*	*Allowance for cash discount and returns (10% × Col. 2)*	*Net amount (Col. 2 – Col. 3)*	*Loan amount @ 80% amount (4)*
1	*2*	*3*	*4*	*5*
74	Rs 25,000	Rs 2,500	Rs 22,500	Rs 18,000
107	11,500	1,150	10,350	8,280
108	2,300	230	2,070	1,656
116	29,000	2,900	26,100	20,880
Total loan amount				48,816

Working Notes

1. Account numbers 91 and 114 are currently overdue by 15 and 20 days respectively, credit policy being 2/10 net 30 days. Also these accounts have average payment period of more than 40 days i.e., 10 days more than credit period allowed. Loan is not available on these accounts as per short-term loan policy of bank.
2. Account number 123, though not currently overdue but has average payment period of more than 40 days. Hence, this account is not eligible for bank loan.

CHAPTER 16

P.16.12 A manufacturer buys casting equipment from outside suppliers @ Rs 30 per unit. Total annual needs are 800 units. The following further data are available:

Annual return on investment, 10 per cent
Rent, insurance, taxes per unit per year, Re 1
Cost of placing an order, Rs 100

Determine the economic order quantity.

Solution

$$\text{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 800 \times 100}{4}} = 200 \text{ units}$$

$$\text{Total interest cost} = \frac{800 \times \text{Rs } 30 \times 10}{100} = \text{Rs } 2{,}400$$

$$\text{Interest cost per unit} = \frac{\text{Rs } 2{,}400}{800} = \text{Rs } 3$$

Rs 3 + other carrying costs (rent, insurance, taxes) per unit that is, Re 1 per unit.

Carrying cost per unit = Rs 4.

P.16.13 Precision Engineering Factory consumes 50,000 units of a component per year. The ordering, receiving and handling costs are Rs 3 per order while the trucking costs are Rs 12 per order. Further details are as follows: deterioration and obsolescence cost Rs 0.004 per unit per year; interest cost Re 0.06 per unit per year; storage cost Rs 1,000 per year for 50,000 units. Calculate the economic order quality.

Solution $\text{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 50{,}000 \times 15}{0.084}} = 4{,}226$

Carrying cost per unit:

Interest cost	Re 0.060
Deterioration and obsolescence cost	0.004
Storage cost $\left(\frac{\text{Rs } 1{,}000}{50{,}000}\right)$	0.020
Total	0.084

P.16.14 Shriram Enterprises manufactures a special product "Zed." The following particulars were collected for the current year.

Monthly demand of Zed, 1000 units
Cost of placing an order, Rs 100
Annual carrying cost per unit, Rs 15
Normal usage, 50 units per week
Maximum usage, 75 units per week
Minimum usage, 25 units per week
Reorder period, 4 to 6 weeks

Compute from the above: (a) Reorder quantity, (b) Reorder level, (c) Minimum level, (d) Maximum level, and (e) Average stock level.

Solution

(a) **Reorder quantity/EOQ** = $\sqrt{2\,AB/C} = \sqrt{2 \times 2,600^{*} \times \text{Rs } 100/\text{Rs } 15}$ = 187 units

*Annual demand for input unit of (1,000 × 12) 12,000 Zed = 52 weeks × Normal usage of inputs per week (52 × 50 units) = 2,600 units

(b) **Reorder level** = (Maximum usage × Maximum delivery time) = (75 units × 6 weeks) = 450 units

(c) **Minimum level** = Reorder level – (Normal usage × Average delivery time in weeks)
= 450 units – (50 units × 5 weeks) = 200 units

(d) **Maximum level** = Reorder level – (Minimum usage × Minimum delivery time) + Reorder quantity
= 450 units – (25 units × 4 weeks) + 187 units = 537 units.

(e) **Average stock level** = (Minimum level + Maximum level)/2 = (200 units + 537 units)/2 = 369 units

P.16.15 From the details given below, calculate: (a) Reordering level, (b) Minimum level, (c) Maximum level, and, (d) Danger level:

Reordering quantity is to be calculated on the basis of the following information:
Cost of placing a purchase order is Rs 20
Number of units to be purchased during the year is 5,000
Purchase price per unit inclusive of transportation cost is Rs 50. Annual cost of storage per unit is Rs 5.
Details of lead time: Average, 10 days; Maximum, 15 days; Minimum, 6 days. For emergency purchases, 4 days.
Rate of consumption: Average: 15 units per day; Maximum: 20 units per day.

Solution

(a) **Reordering level** = Maximum usage × Maximum delivery time = 20 units × 15 days = 300 units

(b) **Minimum level** = Reorder level – (Normal usage × Average delivery time in days) = 300 units – (15 units × 10 days) = 150 units

(c) **Maximum level** = Reorder level – (Minimum usage × Minimum delivery time) + Reorder quantity = 300 units – (15 × 4 days) + 200 units* = 440 units.

*Reorder quantity = $\sqrt{2\,AB/C} = \sqrt{2 \times 5000 \times \text{Rs } 20/\text{Rs } 5}$ = 200 units

(d) **Danger level** = 15 units per day × Emergency purchase for 4 days = 60 units

P.16.16 The Complete Gardener is deciding on the economic order quantity for two brands of lawn fertilizer: Super Grow and Nature's Own. The following information is collected:

Particulars	*Fertilizer*	
	Super Grow	*Nature's Own*
Annual demand	2,000 Bags	1,280 Bags
Relevant ordering cost per purchase order	Rs 1,200	Rs 1,400
Annual relevant carrying cost per bag	480	560

Required:

(i) Compute EOQ for Super Grow and Nature's Own.

(ii) For the EOQ, what is the sum of the total annual relevant ordering costs and total annual relevant carrying costs for Super Grow and Nature's Own?

(iii) For the EOQ, compute the number of deliveries per year for Super Grow and Nature's Own.

Solution

(i) **EOQ** = $\sqrt{\frac{2\,AB}{C}} = \sqrt{\frac{2 \times 2,000 \times 1,200}{480}}$ = 100 bags (Super Grow)

= $\sqrt{\frac{2 \times 1,280 \times 1,400}{560}}$ = 80 bags (Nature's Own)

(ii) and (iii) Statement showing total relevant costs for Super Grow and Nature's Own Fertilizer

Particulars	*Super Grow*	*Nature's Own*
Annual demand (bags)	2,000	1,280
EOQ (bags)	100	80
Number of orders/deliveries	20	16
Multiplied by ordering cost per order	Rs 1,200	Rs 1,400
(a) Total ordering cost	24,000	22,400
Average inventory (1/2 × EOQ) of bags	50	40
Multiplied by carrying cost per bag	480	560
(b) Total carrying cost	24,000	22,400
(c) Total cost (a) + (b)	48,000	44,800

P.16.17 The following details are available in respect of a firm:

Annual requirement of inventory, 40,000 units
Cost per unit (other than carrying and ordering cost), Rs 16
Carrying costs are likely to be 15 per cent per year
Cost of placing order, Rs 480 per order

Determine the economic order quantity.

Solution $$\text{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 40{,}000 \times \text{Rs } 480}{\text{Rs } 2.40}} = 4{,}000 \text{ units}$$

C = Rs 16 × 0.15 = Rs 2.40

P.16.18 Good Luck Company estimates its carrying cost at 15 per cent and its ordering cost at Rs 9 per order. The estimated annual requirement is 38,000 units at a price of Rs 4 per unit. What is the most economical number of units to order and how often will an order need to be placed?

Solution

(i) $$\text{EOQ} = \sqrt{\frac{2AB}{C}} = \sqrt{\frac{2 \times 38{,}000 \times \text{Rs } 9}{0.6}} = 1{,}068.$$

(ii) Time after which an order is to be placed is given by the following formula (in days):

$$= \frac{\text{EOQ}}{\text{Per day consumption (annual usage } \div \text{ 365 days)}} = \frac{1{,}068}{104.11\,(38{,}000 \div 365 \text{ days})} = 10 \text{ days}$$

Working Notes

Total carrying cost = 38,000 units × Rs 4 × 15/100 = Rs 22,800

Carrying cost per unit = Rs 22,800/38,000 = Re 0.60

P.16.19 A customer has been ordering 5,000 special design metal columns at the rate of 1,000 per order during the past year. The production cost is Rs 12 a unit – Rs 8 for materials and labour and Rs 4 for overheads (fixed cost). It costs Rs 1,500 to set up for one run of 1,000 columns, and inventory carrying cost is 20 per cent. Since this customer may buy at least 5,000 columns this year, the company would like to avoid making five different production runs. Find the most economic production run.

Solution Economic production run is given by the formula of EOQ in which B is setting up costs for one production run in place of buying cost per order. Accordingly, economic production run

$$= \sqrt{\frac{2 \times 5{,}000 \times \text{Rs } 1{,}500}{\text{Rs } 2.40}} = 2{,}500$$

P.16.20 PQR Tubes Ltd are the manufacturers of picture tubes for T.V. The following are the details of their operations during the current financial year.

Ordering cost (per order)	Rs 100
Inventory carrying cost (per annum)	20%
Cost of tubes (per tube)	Rs 500
Normal usage (tubes per week)	100
Minimum usage (tubes per week)	50
Maximum usage (tubes per week)	200
Lead time to supply (weeks)	6–8

Required:

(i) Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5 per cent, is it worth accepting?
(ii) Re-order level
(iii) Maximum level of stock
(iv) Minimum level of stock

Solution

(i) $\text{EOQ} = \sqrt{\frac{2\,AB}{C}} = \sqrt{\frac{2 \times 5{,}200 \text{ units} \times \text{Rs } 100}{\text{Rs } 100}} = 101.98 \text{ or } 102 \text{ units}$

A = 100 tubes per week × 52 weeks = 5,200 units
C = Rs 500 per tube × 0.2 = Rs 100 per unit per year

(b) Statement showing comparative total cost when order is placed on EOQ basis and when it is placed on quarterly basis, (supplying 1,500 units at 5 per cent discount)

Particulars	*When order is placed on*	
	EOQ basis	*1,500 units*
1. Annual requirement (units)	5,200	5,200
2. Order size (in units)	102	1,500
3. Number of order (1 ÷ 2)	50.98	3.47
4. Cost per order	Rs 100	Rs 100
5. Total ordering costs (3 × 4)	5,098	347
6. Cost per unit (tube)	500	475
7. Cost of tubes (1 × 6)	26,00,000	24,70,000
8. Average inventory (2/2) (units)	51	750
9. Carrying cost per unit per annum	100	95
10. Total carrying cost (8 × 9)	5,100	71,250
11. Total cost (5 + 7 + 10)	26,10,198	25,41,597

Since total costs are lower when discounts are offered, it is worth accepting to place order of 1,500 units on quarterly basis.

(ii) Re-order level
Maximum ordering period (in weeks) × Maximum usage per week = 8 weeks × 200 tubes = 1,600 tubes

(ii) Maximum level of stock
Re-order level + Re-order quantity – (Minimum usage in weeks × Minimum lead time in weeks)
= 1,600 tubes + 102 tubes – (50 tubes × 6 weeks) = 1,702 tubes – 300 tubes = 1402 tubes

(iv) Minimum level of stock
Re-order level – (Normal usage × Average lead time) = 1,600 tubes – (100 tubes × 7 weeks) = 900 tubes

CHAPTER 17

P**17.3 (Factoring)** Avon Bijli Ltd deals in electronics goods. The company started business in 1992 as a small electronics sale and repair shop in Delhi with a capital contribution of Rs 5 lakh from its promoters. It recorded impressive growth over the years and is now a significant player with the current annual sales being Rs 200 crore. It currently manages its receivable in-house with the credit terms 3/10 net, 45. Past records have shown that 20 per cent of the customers avail of the discount and the remaining receivables are collected in 60 days. Bad debts amount to 4 per cent of sales. Avon Bijli finances its investments in receivables through a cash credit limit from Yes Bank at an effective rate of 11 per cent. The cost of own funds of the company average 14 per cent.

PNB Factor Ltd has approached Amit Goel, the CEO of Avon Bijli Ltd, with a proposal for factoring arrangement for a guaranteed payment within 45 days. They would make advance payment of upto 90 per cent and 85 per cent in case of non-recourse and recourse arrangement respectively. The commission charges payable upfront would be 1.5 per cent in case of recourse arrangement and 3 per cent in case of non-recourse factoring. The discount charge for advance payable upfront for recourse and non-recourse factoring by the factors are at 13 per cent and 14 per cent respectively.

Amit Goel seeks the opinion of Ashish Juneja, the CFO of the company, on the proposal. Ashish estimates that if the factoring arrangement is availed of, Avon can save Rs 30 lakh in overheads. He also estimates that with a shift in focus, sales can be expected to increase by 10 per cent. The gross margin on sales of Avon is 25 per cent.

Required Evaluate the proposal as the CFO of Avon and make your recommendations to the CEO.

Solution

Financial Analysis of Factoring Proposal (Rs crore)

(A) In-house Management of Receivables:	
1 Cash discount (Rs 200 × 0.20 × 0.03)	Rs 1.20
2 Bad debts (Rs 200 × 0.04)	8.0
3 Avoidable administrative costs	0.30
4 Opportunity cost (lost sales) [200 × 0.10 × 0.21, net of bad debts]	4.2
5 Cost of investment in debtors[@]	3.05
	16.75

[@] Average collection period (10 days × 0.20) + (60 days × 0.80) = 50 days
Cost of investment = Rs 200 crore × 50/360 × 0.11 = Rs 3.05 crore

(B) Cost of Factoring Arrangement:

		Recourse	Non-recourse
1	Factoring commission (Rs 220 crore × 0.015)	3.3	—
	(220 × 0.03)	—	6.6
2	Discount charge (Rs 184.2[*] crore × 0.13 × 45/360)	2.99	—
	(192.1[£] × 0.14 × 45/360)	—	3.36
3	Cost of extra debt financing [(Rs 220 crore – Rs 184.2 crore) × 0.14 × 45/360]	0.63	—
	[(Rs 220 – Rs 192.1) × 0.14 × 45/360]	—	0.49
Total cost		6.92	10.45

[*]Amount of advance = 0.85 × (Rs 220 – Rs 3.3) = Rs 184.2
[£]Amount of advance = 0.90 × (Rs 220 – 6.6) = 192.1.

Decision Analysis (Recourse Factoring) *Amount in Rs crore*

Benefits (Rs 16.75 – Rs 8.00 Bad debts to be borne by company)	Rs 8.75
Costs of factoring	6.92
Net benefits	1.83

Decision Analysis (Non-Recourse Factoring)	*Amount in Rs crore*
Benefits (Rs 16.75 + 0.8 Bad debts loss to be borne by factor)	Rs 17.55
Costs of factoring	10.45
Net benefits	7.10

Decision The net benefits in the case of non-recourse factoring are higher. I would advise the CEO to avail of the non-recourse factoring proposal of PNB Factors Ltd.

P.18.12 Calculate (a) the operating leverage, (b) financial leverage and (c) combined leverage from the following data under situations I and II and financial plans, *A* and *B*.
Installed capacity, 4,000 units
Actual production and sales, 75 per cent of the capacity
Selling price, Rs 30 per unit
Variable cost, Rs 15 per unit

Fixed cost:
Under situation I, Rs 15,000
Under situation II, 20,000

Capital structure:

Particulars	*Financial plan*	
	A	*B*
Equity	Rs 10,000	Rs 15,000
Debt (0.20 interest)	10,000	5,000
	20,000	20,000

Solution

(a) Determination of operating leverage

Particulars	*Situations*	
	I	*II*
Sales	Rs 90,000	Rs 90,000
Less: Variable costs	45,000	45,000
Contribution	45,000	45,000
Less: Fixed costs	15,000	20,000
EBIT	30,000	25,000
Operating leverage $\left(\frac{\text{Contribution}}{\text{EBIT}}\right)$	1.5	1.8

(b) Determination of financial leverage

Particulars	*Situation I* *Financial plans*		*Situation II* *Financial plans*	
	A	*B*	*A*	*B*
EBIT	Rs 30,000	Rs 30,000	Rs 25,000	Rs 25,000
Less: Interest on debt	2,000	1,000	2,000	1,000
EBT	28,000	29,000	23,000	24,000
Financial leverage (EBIT/EBT)	1.07	1.03	1.09	1.04

(c) Determination of combined leverage

Particulars	*Financial plans*	
	A	*B*
Situation I	1.5 × 1.07 = 1.61	1.5 × 1.03 = 1.54
Situation II	1.8 × 1.09 = 1.96	1.8 × 1.04 = 1.87

P.18.13 Skyline Software Ltd has appointed you as its finance manager. The comapny wants to implement a project for which Rs 30 lakh is required to be raised from the market as a means of financing the projet. The following financing plans and options are at hand: (Number in thousands)

Particulars	*Plan A*	*Plan B*	*Plan C*
Option 1:			
Equity shares	30	30	30
Option 2:			
Equity shares	15	20	10
12% Preference shares	Nil	10	10
10% Non-convertible debentures	15	Nil	10

Assuming corporate tax to be 35 per cent and the face value of all the shares and debentures to be Rs 100 each, calculate the indifference points and earnings per share (EPS) for each of the financing plans. Which plan should be accepted by the company?

Solution

Determination of indifference point under plans A, B, C

Plan A:

$$\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t)}{N_2};\ \frac{X(1-0.35)}{30,000} = \frac{(X - \text{Rs } 1.5 \text{ lakh})\,0.65}{15,000}$$

OR $X - 0.35X = 2(0.65X - \text{Rs } 97,500);$

$X - 0.35X = 1.3X - \text{Rs } 1,95,000$

OR $0.65X = \text{Rs } 1,95,000$ or $X = \text{Rs } 1,95,000/0.65 = \text{Rs } 3,00,000$

Plan B:

$$\frac{X(1-0.35)}{30,000} = \frac{X(1-0.35) - \text{Rs } 1,20,000}{20,000}$$

OR $$\frac{0.65X}{30,000} = \frac{0.65X - \text{Rs } 1,20,000}{20,000};$$

$2(0.65X) = 3(0.65X - \text{Rs } 1,20,000)$

$1.3X = 1.95X - \text{Rs } 3,60,000$

OR $X = \text{Rs } 3,60,000/0.65 = \text{Rs } 5,53,846$

Plan C:

$$\frac{X(1-t)}{N_1} = \frac{(X-I)(1-t) - D_P}{N_2};\ \frac{0.65X}{30,000} = \frac{(X - \text{Rs } 1 \text{lakh})\,0.65 - \text{Rs } 1.2 \text{ lakh}}{10,000}$$

OR $$\frac{0.65X}{30,000} = \frac{0.65X - \text{Rs } 65,000 - \text{Rs } 1,20,000;}{10,000}$$

OR $$\frac{0.65X}{30,000} = \frac{0.65X - \text{Rs } 1,85,000}{10,000}$$

$X = \text{Rs } 5,55,000/1.3 = \text{Rs } 4,26,923$

Determination of EPS under plans *A*, *B* and *C* for options 1 and 2

Particulars	*Plan A*		*Plan B*		*Plan C*	
	1	*2*	*1*	*2*	*1*	*2*
EBIT	Rs 3,00,000	Rs 3,00,000	Rs 5,53,846	Rs 5,53,846	Rs 4,26,923	Rs 4,26,923
Less: Interest	—	1,50,000	—	—	—	1,00,000
EBT	3,00,000	1,50,000	5,53,846	5,53,846	4,26,923	3,26,923
Less: Taxes	1,05,000	52,500	1,93,846	1,93,846	1,49,423	1,14,423
EAT	1,95,000	97,500	3,60,000	3,60,000	2,77,500	2,12,500
Less: Dividend on preference shares	—	—	—	1,20,000	—	1,20,000
Earnings available for equity-holders	1,95,000	97,500	3,60,000	2,40,000	2,77,500	92,500
Number of equity shares (N)	÷ 30,000	÷ 15,000	÷ 30,000	÷ 20,000	÷ 30,000	÷ 10,000
EPS	6.5	6.5	12	12	9.25	9.25

P.18.14 The capital structure of the Progressive Corporation Ltd consists of an ordinary share capital of Rs 10,00,000 (shares of Rs 100 par value) and Rs 10,00,000 of 10% debentures. The unit sales increased by 20 per cent from 1,00,000 units to 1,20,000 units, the selling price is Rs 10 per unit, variable costs amount to Rs 6 per unit and fixed expenses amount to Rs 2,00,000. The income tax rate is assumed to be 35 per cent.

(a) You are required to calculate the following:
  (i) The percentage increase in earnings per share.
  (ii) The degree of financial leverage at 1,00,000 units and 1,20,000 units.
  (iii) The degree of operating leverage at 1,00,000 units and 1,20,000 units.

(b) Comment on the behaviour of operating and financial leverage in relation to increase of production from 1,00,000 to 1,20,000 units.

*S*olution

(a) Determination of earnings per share (EPS)

Sales level (units)	1,00,000	1,20,000
Sales revenue	Rs 10,00,000	Rs 12,00,000
Less: Variable costs	6,00,000	7,20,000
Less: Fixed costs	2,00,000	2,00,000
EBIT	2,00,000	2,80,000
Less: Interest	1,00,000	1,00,000
Earnings after interest	1,00,000	1,80,000
Less: Taxes	35,000	63,000
EAT	65,000	1,17,000
Number of equity shares	10,000	10,000
EPS (EAT ÷ N)	6.5	11.7

(i) Percentage increase per share $= \dfrac{\Delta EPS}{EPS} \times 100 = \dfrac{Rs\ 5.2}{Rs\ 6.5} \times 100 = 80$ per cent

(ii) DFL (at 1,00,000 units) $= \dfrac{Rs\ 2,00,000}{Rs\ 1,00,000} = 2.0$ (at 1,20,000 units) $= \dfrac{Rs\ 2,80,000}{Rs\ 1,80,000} = 1.56$

(iii) DOL (at 1,00,000 units) $= \dfrac{Rs\ 4,00,000}{Rs\ 2,00,000} = 2.0$ (at 1,20,000 units) $= \dfrac{Rs\ 4,80,000}{Rs\ 2,80,000} = 1.71$

(b) As a result of increase in production and sales from 1,00,000 units to 1,20,000 units, EPS has gone up by 80 per cent. Moreover, there has been a decrease in both types of leverages–operating as well as financial–reflecting a decline in the total risk of the company.

P.18.15 *X* Ltd, a widely held company, is considering a major expansion of its production facilities and the following alternatives are available:

Particulars	*Alternatives (Rs lakh)*		
	A	*B*	*C*
Share capital	50	20	10
14% Debentures	—	20	15
Loan from a financial institution @ 18 per cent	—	10	25

The expected rate of return before interest and tax is 25 per cent. The rate of dividend of the comapny is not less than 20 per cent. The company at present has no debt. The corporate tax rate is 35 per cent. Which of the alternative would you choose, assuming maximising ROR on equity capital as the objective of the firm?

Solution

Rate of return (ROR) on equity capital under proposed financial alternatives

Particulars	*Financing alternatives (Rs lakh)*		
	A	*B*	*C*
EBIT (Rs 50 lakh × 0.25)	12.5	12.5	12.5
Less: Interest on debentures	—	2.8	2.1
Less: Interest on loan	—	1.8	4.5
EBT	12.5	7.9	5.9
Less: Taxes (0.35)	4.375	2.765	2.065
EAT	8.125	5.135	3.835
ROR on equity capital (%)	16.25	25.675	38.35

Alternative C is the best.

P.18.16 Consider the following information for Strong Ltd:

	(Rs in lakh)
EBIT	1,120
EBT	320
Fixed cost	700

Calculate the percentage of change in EPS, if sales increase by 5 per cent.

Solution

Degree of combined leverage (DCL) = (Degree of operating leverage × Degree of financial leverage)

$$= \frac{\text{Percentage change in EBIT}}{\text{Percentage change in sales}} \times \frac{\text{Percentage change in EPS}}{\text{Percentage change in EBIT}}$$

$$\text{DCL} = \frac{\text{Percentage change in EPS}}{\text{Percentage change in sales}}$$

Alternatively, DCL can be determined as

$$\text{DCL} = \left(\frac{\text{Sales} - \text{Variable costs*}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBT}} \right)$$

*Sales – VC i.e., Contribution = EBIT + Fixed costs = Rs 1,120 lakh + Rs 700 lakh = Rs 1,820 lakh

DCL = (Contribution/EBT) i.e. (Rs 1,820 lakh/Rs 320 lakh) = 5.6875

5.6875 = Percentage change in EPS/Percentage increase in sales

Percentage change in EPS = Percentage increase in sales × 5.6875 = 5% × 5.6875 = 28.4375 per cent

5 per cent increase in sales will cause 28.4375 per cent increase in EPS

P.20.6 The Modern Chemicals Ltd requires Rs 25,00,000 for a new plant. This plant is expected to yield earnings before interest and taxes of Rs 5,00,000. While deciding about the financial plan, the company considers the objective of maximising earnings per share. It has three alternatives to finance the project—by raising debt of Rs 2,50,000 or Rs 10,00,000 or Rs 15,00,000 and the balance, in each case, by issuing equity shares. The company's share is currently selling at Rs 150, but is expected to decline to Rs 125 in case the funds are borrowed in excess of Rs 10,00,000. The funds can be borrowed at the rate of 10 per cent upto Rs 2,50,000, at 15 per cent over Rs 2,50,000 and upto Rs 10,00,000 and at 20 per cent over Rs 10,00,000. The tax rate applicable to the company is 50 per cent. Which form of financing should the company choose?

Solution

Earnings Per Share (EPS) under proposed financial alternatives

Particulars	*Financial alternatives to raise Rs 25 lakh*		
	I (Raising debt of Rs 2.5 lakh + Equity of Rs 22.5 lakh)	*II (Raising debt of Rs 10 lakh + Equity of Rs 15 lakh)*	*III (Raising debt of Rs 15 lakh + Equity of Rs 10 lakh)*
Expected EBIT	Rs 5,00,000	Rs 5,00,000	Rs 5,00,000
Less: Interest[1]	25,000	1,37,500	2,37,500
Earnings before taxes	4,75,000	3,62,500	2,62,500
Less: Taxes	2,37,500	1,81,250	1,31,250
Earnings after taxes (EAT)	2,37,500	1,81,250	1,31,250
Number of shares[2]	15,000	10,000	8,000
Earnings per share (EPS)	15.833	18.125	16.406

Recommendation Financing option II (raising debt of Rs 10 lakh and issue of equity share capital of Rs 15 lakh) is the best option as it maximises the EPS.

Working Notes

(1)	Determination of interest:		
	Plan **I** (Rs 2,50,000 × 0.10)		Rs 25,000
	Plan **II** (Rs 2,50,000 × 0.10)	Rs 25,000	
	(Rs 7,50,000 × 0.15)	1,12,500	1,37,500
	Plan **III** (Rs 2,50,000 × 0.10)	25,000	
	(Rs 7,50,000 × 0.15)	1,12,500	
	(Rs 5,00,000 × 0.20)	1,00,000	2,37,500
(2)	Number of equity shares to be issued		
	Plan **I** (Rs 22,50,000/Rs 150 Market price per share)		15,000
	Plan **II** (Rs 15,00,000/Rs 150 Market price per share)		10,000
	Plan **III** (Rs 10,00,000/Rs 125 Market price per share)		8,000

P.20.7 Harbour company, is a medium-sized producer of chemicals and vinyl coatings used in a variety of industrial processes.

Last year, the company recorded over Rs 1,500 lakh in sales, showed net income after tax of Rs 250 lakh and concluded a very successful year. For the year coming up, the firm expects a 10 per cent improvement in its sales and operating income figures. Other relevant details—total assets Rs 2,200 lakh, debt assets ratio (i.e. total debts including current liabilities) 31.8 per cent, earnings per share Rs 3.16 (No. of equity shares of Rs 10 paid up 80 lakh); dividend per share Rs 1.50 (These all relate to the last year).

Harbour Co. has been invited to bid on a long-term contract to produce a line of plastics for a large chemical company. It appears that the firm can easily get Rs 600 lakh contract, which will yield an additional Rs 180 lakh in operating income (EBIT). These figures are for next year only and the firm estimates even higher sales and profits in future years. The production manger knows of a small plastics company located about three kilometres away from the present factory and has all the equipments needed to produce the new line of plastics and the company is presently for sale with a Rs 1,050 lakh asking price (which represents largely the value of the assets). This company is available at the negotiated price of Rs 900 lakh.

Harbour Co. has sufficient working capital to add the new plastic line, but does not have the cash to buy Rs 900 lakh for machinery and equipment. The following financing options are available.

(i) Harbour Co. can borrow Rs 400 lakh through a 12 per cent mortgage on its main facilities. A mortgage company has indicated that it would help finance the plastic machinery with a Rs 500 lakh, 12 per cent mortgage. Harbour as per its policy wants to keep debt asset ratio below 40 per cent.

(ii) The company can probably issue upto Rs 1,000 lakh in 13 per cent preferred stock or class A equity shares. If equity shares are issued, it could net Rs 50 per share.

Harbour Co. shares has traditionally traded at a 15/1 price-earnings multiple and it is expected that this will hold in the future. (Corporate income-tax 50 per cent)

Required:

1. Analysis needed to decide whether to accept the plastic project.
2. Recommendation on the financing method of the project.

Solution

(1) Commercial profitability of proposed plastics project:

ROR on new project = (EBIT/Investment) × 100

Rs 180 lakh/900 lakh = 20 per cent

To assess its acceptance, it will be useful to compare the ROR of this project with its existing ROR.

EAT Rs 250 lakh

EBT Rs 250 lakh/0.50 = Rs 500 lakh

EBIT Rs 500 lakh + Interest on borrowed funds

Borrowed funds are 31.8 per cent of Rs 2,200 lakh = Rs 700 lakh

Since the rate of interest on debt is not provided, we are constrained to determine interest amount. Accordingly, the value of ROR computed will be lower based on the figure of Rs 500 lakh (EBT)

ROR = Rs 500 lakh/Rs 2,200 lakh = 22.73 per cent.

To make the picture comparable, let us assume interest rate of 10 per cent on debt. ROR (revised) is Rs 500 lakh + 0.10 (Rs 700 lakh)/Rs 2,200 lakh = 25.91 per cent.

Though the projected ROR on plastic project is lower than the ROR earned by the project, it is still worth accepting given the fact that the cost of funds is (likely) lower than rate of return earned. This apart, it is equally important to recognise that the firm expects higher sales and profits in the coming years

(2) Financing method

The firm will opt for such a financing option (mix) which helps it to maximse market price of its equity shares (MPS). The following statement is prepared to determine MPS under three alternative options.

Determination of MPS under various financing options

(Amount in Rs lakh)

Particulars	*Financing options to raise Rs 900 lakh*		
	12% Debt	*13% Preference Shares*	*18 lakh Equity shares*
Expected EBIT	180	180	180
Less: Interest on debt	108	—	—
Earnings before taxes	72	180	180
Less: Taxes (50%)	36	90	90
Earnings after taxes	36	90	90
Add: Existing EAT	250	250	250
Profits available to shareholders	286	340	340
Less: Preference dividends	—	117	—
Earnings for equityholders	286	223	340
Number of equityshares	80	80	98
EPS	3.575	2.7875	3.4934
P/E ratio (times)	15	15	15
Market price per share	Rs 53.625	Rs 41.8125	Rs 52.401

Debt option is the best alternative as it maximises MPS. However, the company cannot opt for Rs 900 lakh debt as it causes an increase in debt-asset ratio of the company to 51.6 per cent [(Rs 700 lakh + Rs 900 lakh) ÷ (Rs 2,200 lakh + Rs 900 lakh) *vis-à-vis* its policy of having its debt-asset ratio below 40 per cent. Accordingly, the maximum debt possible to be tapped is (40% × Rs 3,100 lakh assets after plastic project – Existing debt of Rs 700 lakh) = Less than Rs 540 lakh.

In such circumstances the firm is to opt for hybrid type of financing. The feasible mix may be Rs 500 lakh debt and Rs 400 lakh equity consist of 8 lakh shares @ Rs 50 per share (preference option is not considered as it has minimum EPS as well as minimum MPS).

Statement showing MPS under debt + equity financing options

(Amount in Rs lakh)

Particulars	*Amount*
Expected EBIT	180
Less: Interest on debt (Rs 500 lakh × 12%)	60
EBT	120
Less: Taxes	60
EAT	60
Add: Existing EAT	250
Total EAT available to equityholders	310
Divided by number of equity shares (80 lakh + 8 lakh)	88
EPS (Rs 310 lakh/88 lakh shares)	3.5227
Multiply by P/E ratio (times)	15
MPS	52.84
Current MPS (Rs 3.16 × 15 times)	47.4
Current issue price indicated	50

Recommendation The statement clearly demonstrates the financial viability of the proposed plastic project as it enhances its current market price of the share. The proposed project should be financed by debt-equity mix of Rs 500 lakh and Rs 400 lakh respectively.

P.25.16 The following data are furnished by the Hypothetical Leasing Ltd (HLL):

Investment cost	Rs 500 lakh
Primary lease term	5 years
Estimated residual value after the primary period	Nil
Pre-tax required rate of return	24 per cent

The HLL seeks your help in determining the annual lease rentals under the following rental structures:

(a) Equated, (b) Stepped (an annual increase of 15 per cent), (c) Ballooned (annual rental of Rs 80 lakh for years 1–4) and (d) Deferred (2 years deferment period).

You are required to compute the relevant annual rentals.

Solution

(a) Equated annual lease rentals, *Y*:

Y = Investment cost/PVIFA (24, 5 years) = Rs 500 lakh/2.745 = Rs 182.15 lakh

(b) Stepped lease rental (assuming annual increase of 15 per cent annually), Y:

$Y \times$ PVIF(24, 1) + $(1.15)Y \times$ PVIF(24, 2) + $(1.15)^2 Y \times$ PVIF(24, 3) + $(1.15)^3 Y \times$ PVIF(24, 4) + $(1.15)^4 Y \times$ PVIF(24, 5) = Rs 500 lakh.

Or $0.806Y + 0.7475Y + 0.693Y + 0.6433Y + 0.5894Y$ = Rs 500 lakh

Or $3.4792Y$ = Rs 500 lakh or Y = Rs 500 lakh/3.4792 = Rs 143.71 lakh

Lease rentals (year-wise) *(in lakh of rupees)*

Year	*1*	*2*	*3*	*4*	*5*
Lease rent	143.71	165.26	190.05	218.56	251.34

(c) Ballooned lease rental (Rs 80 lakh for years, 1 – 4)

Rs 80 lakh $\times$ PVIFA(24, 4), + $Y \times$ PVIF (24, 5) = Rs 500 lakh

Rs 80 lakh $\times$ 2.404 + $0.341Y$ = Rs 500 lakh

$0.341Y$ = Rs 500 lakh – Rs 192.32 lakh = Rs 307.68 lakh

or Y = Rs 307.68/0.341 = Rs 902.29 lakh (ballooned payment)

(d) Deferred lease rental (deferment of 2 years)

Denoting Y as the equated annual rental to be charged between years 3–5,

$Y \times$ PVIF (24, 3) + $Y \times$ PVIF (24, 4) + $Y \times$ PVIF (24,5) = Rs 500 lakh

$0.524\ Y + 0.423\ Y + 0.341Y$ = Rs 500 lakh

Y = Rs 500 lakh/1.288 = Rs 388.20 lakh.

P.25.17 Mr *X*, the Finance Manager of ABC Ltd, had almost decided to finance the purchase of Rs 20 lakh in new computer equipment with 16 % long-term debt when he was contacted by First Leasing Company Ltd. The manager of the leasing company tried to convince Mr *X* that leasing the equipment would be more beneficial to ABC Ltd.

If *ABC* borrowed, the firm would be required to pay 16 per cent interest on the borrowed funds plus an annual sinking fund payment of Rs 2,00,000. The equipment has an expected life of 10 years, with an anticipated salvage value of Rs 4,00,000. The firm uses the straight line method of depreciation, and is in the 50 per cent tax bracket.

The leasing company is willing to lease the equipment for Rs 3,80,000 per year. Further, it was stressed that the lease payments were fully tax deductible, while debt repayment was not.

Mr *X* seeks your advice before committing to lease the computer equipment. What advise would you, as a financial consultant, give to the finance manager of ABC Ltd?

Solution

PV of cash outflows under leasing alternative

Year end	*Lease payment after taxes (L) (1 – 0.5)*	*PV factor (0.08)*	*Total PV*
1–10	Rs 1,90,000	6.710	Rs 12,74,900

PV of cash outflows under buying alternative

Year-end	*Principal*	*Total payment*		*Tax advantage on*			*Cash out-flows after taxes (Col 4 – Col 7)*	*PV factor (0.08)*	*Total PV*
		*Interest (0.16)**	*Total*	*Interest (I × 0.50)*	*Depreciation (D × 0.50)**	*Total*			
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	Rs 2,00,000	Rs 3,20,000	Rs 5,20,000	Rs 1,60,000	Rs 80,000**	Rs 2,40,000	Rs 2,80,000	0.926	Rs 2,59,280
2	2,00,000	2,88,000	4,88,000	1,44,000	80,000	2,24,000	2,64,000	0.857	2,26,248
3	2,00,000	2,56,000	4,56,000	1,28,000	80,000	2,08,000	2,48,000	0.794	1,96,912
4	2,00,000	2,24,000	4,24,000	1,12,000	80,000	1,92,000	2,32,000	0.735	1,70,520
5	2,00,000	1,92,000	3,92,000	96,000	80,000	1,76,000	2,16,000	0.681	1,47,096
6	2,00,000	1,60,000	3,60,000	80,000	80,000	1,60,000	2,00,000	0.630	1,26,000
7	2,00,000	1,28,000	3,28,000	64,000	80,000	1,44,000	1,84,000	0.583	1,07,272
8	2,00,000	96,000	2,96,000	48,000	80,000	1,28,000	1,68,000	0.540	90,720
9	2,00,000	64,000	2,64,000	32,000	80,000	1,12,000	1,52,000	0.500	76,000
10	2,00,000	32,000	2,32,000	16,000	80,000	96,000	1,36,000	0.463	62,968
11	Salvage value	—	—	—	—	—	(4,00,000)	0.463	(1,85,200)
									12,77,816

* Interest is charged on the principal sum outstanding at the beginning of the year.

* Depreciation = (Rs 20 lakh – Rs 4 lakh) ÷ 10 years = Rs 1,60,000 × 0.50

Recommendation Lease alternative is better.

P.25.18 Hypothetical Limited is contemplating having an access to a machine for a period of 5 years Discussions with various financial institutions have shown that the company can have the use of machine for the stipulated period through leasing arrangement, or the requisite amount can be borrowed at 14 per cent to buy the machine. The firm is in the 50 per cent tax bracket. In case of leasing, the firm would be required to pay an annual end-of-year rent of Rs 1,20,000 for 5 years. All maintenance, insurance and other costs are to be borne by the lessee.

In the case of purchase of the machine (which costs Rs 3,43,300), the firm would have a 14 %, 5-year loan, to be paid in 5 equal instalments, each instalment becoming due at the end of each year. The machine would be depreciated on a straight line basis for tax purposes, with no salvage value.

Advise the company regarding the option it should go for, assuming lease rentals are paid (a) at the end of the year (b) in advance.

Solution

(a) **PV of cash outflows under leasing alternative (year-end payment of lease rentals)**

Year-end	*Lease payment (L) after tax*	*PV factor at after tax cost of debt (0.07)*	*Total PV of lease payments Col (2) × Col (3)*
1	*2*	*3*	*4*
1–5	Rs 60,000	4.100	Rs 2,46,000

Determination of the interest and principal components of loan instalment

Year-end	*Loan instalment*	*Loan at the beginning of the year*	*Payment*		*Principal out-standing at the end of the year (Col 3 – Col 5)*
			Interest on loan (Col 3 × 0.14)	*Principal re-payment (Col 2–Col 4)*	
1	*2*	*3*	*4*	*5*	*6*
1	Rs 1,00,000*	Rs 3,43,300	Rs 48,062	Rs 51,938	Rs 2,91,362
2	1,00,000	2,91,362	40,791	59,209	2,32,153
3	1,00,000	2,32,153	32,501	67,499	1,64,654
4	1,00,000	1,64,654	23,052	76,948	87,706
5	1,00,000	87,706	12,294	87,706	—

**Determination of loan instalment*: Amount of loan/PVIFA(14,5) = Rs 3,43,300/3.433 = Rs 1,00,000

PV of cash outflows after tax under buying (borrowing) alternative

Year-end	*Loan instalment*	*Tax advantage on interest payment*	*Tax advantage on depreciation*	*Net cash outflows (Col 2 – (Col 3 + 4)*	*PV factor at after-tax cost of debt (0.07)*	*PV of buying alternative*
1	*2*	*3*	*4*	*5*	*6*	*7*
1	Rs 1,00,000	Rs 24,031	Rs 34,330	Rs 41,639	0.935	Rs 38,932
2	1,00,000	20,395	34,330	45,275	0.873	39,525
3	1,00,000	16,250	34,330	49,420	0.816	40,327
4	1,00,000	11,526	34,330	54,144	0.763	41,312
5	1,00,000	6,147	34,330	59,523	0.713	42,440
		m			Total	2,02,536

Recommendation Since the PV of cash outflows for buying/borrowing (Rs 2,02,536) is lower than that of leasing (Rs 2,46,000), the buying alternative is preferred.

(b) **PV of cash outflows under leasing alternative, when lease rental is paid in advance**

Year-end	*Lease payment*	*Tax shield*	*Cash outflows after taxes*	*PV factor (0.07)*	*Total PV*
1	*2*	*3*	*4*	*5*	*6*
0	Rs 1,20,000	—	Rs 1,20,000	1.000	Rs 1,20,000
1–4	1,20,000	Rs 60,000	60,000	3.387	2,03,220
5	—	60,000	(60,000)	0.713	(42,780)
					2,80,440

Recommendation Buying alternative is better.

P.25.19 For the Hypothetical Ltd in **P.25.18** assume, (i) The company follows written down value method of depreciation, the depreciation rate being 25 per cent. There is no other asset in this asset block; (ii) The corporate tax rate is 35 per cent; (iii) Post-tax marginal cost of capital is 10 per cent; (iv) Salvage value, Rs 40,000 at the end of 5th year.

Compute the NAL to the lessee if lease rentals are paid (a) at the end of the year (b) in advance.

Solution

(a) Computation of NAL (lease rentals are paid in arrear, that is, at the year-end)

Benefits from leasing:	
Cost of the machine	Rs 3,43,300
PV of tax shield on lease rentals (working note 2)	1,59,222
Total	5,02,522
Cost of leasing:	
PV of lease rentals (1)	4,11,960
PV of tax shield foregone on depreciation (3)	67,259
PV of interest tax shield foregone on debt (4)	43,810
PV of salvage proceeds (Rs 40,0000 × 0.621)	24,840
PV of tax shield on short-term capital loss (5)	24,018
Total	5,71,887
NAL	(69,365)

Recommendation Leasing is not financially viable.

Working Notes

(1) PV of lease rentals: Lease rentals × PVIFA (14,5) = Rs 1,20,000 × 3.433 = Rs 4,11,960

(2) PV of tax shield on lease rentals: Rs 1,20,000 × 0.35 × 3.791 = Rs 1,59,222

(3) PV of shield foregone on depreciation

Year	*Depreciation**	*Tax shield*	*PV factor* (at 0.10)	*Total PV*
1	Rs 85,825	Rs 30,039	0.909	Rs 27,305
2	64,369	22,529	0.826	18,609
3	48,277	16,897	0.751	12,690
4	36,207	12,672	0.683	8,655
				67,259

*No depreciation is to be charged in 5th year as the block of assets ceases to exist.

(4) PV of interest tax shield

Year	*Interest*	*Tax shield*	*PV factor (at 0.10)*	*Total PV*
1	Rs 48,062	Rs 16,822	0.909	Rs 15,291
2	40,791	14,277	0.826	11,793
3	32,501	11,375	0.751	8,543
4	23,052	8,068	0.683	5,511
5	12,294	4,303	0.621	2,672
				43,810

(5) *PV of tax shield on short-term capital loss*: (Cost of machine – Accumulated depreciation – Salvage value) × t = (Rs 3,43,000 – Rs 2,34,678 – Rs 40,000) = Rs 68,622 × 0.35 = Rs 24,018.

(b) **Computation of NAL (lease rentals are paid in advance)**

Benefits from leasing:	
Cost of the machine	Rs 3,43,300
PV of tax shield on lease rentals	1,59,222
Total	5,02,522
Cost of leasing:	
PV of lease rentals (1)	4,69,680
PV of tax shield foregone on depreciation	67,259
PV of interest tax shield foregone on debt	43,810
PV of salvage proceeds	24,840
PV of tax shield on short-term capital loss	24,018
Total	6,29,607
NAL	(1,27,085)

Recommendation Leasing is not financially viable.

Working Notes

(1) **PV of lease rentals**

Year	*Lease payment*	*PV factor (at 0.14)*	*Total PV*
0	Rs 1,20,000	1.000	Rs 1,20,000
1–4	1,20,000	2.914	3,49,680
			4,69,680

P.25.20 For the facts in **P.25.18**, determine the break even lease rental (BELR) for the lessee in both the situations.

Solution

(a) **Computation of BELR (lease rents are paid at the end of the year)**

Benefits from leasing:			
Cost of the machine		Rs 3,43,300	
PV of tax shield on lease rentals (2)			1.20155L
Cost of leasing:			
PV of lease rentals (1)	3.433L		
PV of tax shield foregone on depreciation	Rs 67,259		
PV of interest tax shield foregone on debt	43,810		
PV of salvage proceeds	24,840		
PV of tax shield on short-term capital loss	24,018	1,59,927	

BELR (L) = Rs 3,43,300 + 1.20155L = 3.433L + Rs 1,59,927

2.23145L = Rs 1,83,373

L = Rs 82,177

Working Notes

(1) PV of lease rentals: $L \times$ PVIFA (14,5) = 3.433 $\times$ L = 3.433L

(2) PV of tax shield on lease rentals: 3.433L $\times$ tax rate = 3.433L $\times$ 0.35 = 1.20155L

(b) **BELR (lease rents paid in advance)**

Benefits from leasing		
Cost of the machine	Rs 3,43,300	
PV of tax shield on lease rentals (2)		1.3699L
Cost of leasing		
PV of lease rentals (1)		3.914L
Other costs (already computed)	1,59,927	

BELR(L) = Rs 3,43,300 + 1.3699L = 3.914L + Rs 1,59,927

2.5441L = Rs 1,83,373

L = Rs 1,83,373/2.5441 = Rs 72,078

Working Notes

(1) PV of lease rentals = 3.914 × *L* = 3.914*L*, PVIFA = 2.914 (years, 1–4) + 1 (year 0) = 3.914

(2) PV of tax shield on lease rentals: 3.914*L* × 0.35 = 1.3699*L*

P.25.21 Agrani Ltd. is in the business of manufacturing bearings. Some more product lines are being planned to be added to the existing system. The machinery required may be bought or may be taken on lease. The cost of machine is Rs 40,00,000 having a useful life of 5 years with the salvage value of Rs 8,00,000. The full purchase value of machine can be financed by 20 per cent loan repayable in five equal instalments falling due at the end of each year. Alternatively, the machine can be procured on a 5 years lease, year-end lease rentals being Rs 12,00,000 per annum. The Company follows the written down value method of depreciation at the rate of 25 per cent. Company's tax rate is 35 per cent and cost of capital is 16 per cent.

(i) Advise the company which option it should choose lease or borrow.

(ii) Assess the proposal from the lessor's point of view examining whether leasing the machine is financially viable at 14 per cent cost of capital (Detailed working notes should be given).

Solution

(i) **PV of cash outflows under leasing alternative**

Year-end	*Lease rent after taxes [LR (1-t)] [Rs 12,00,000 (1 – 0.35)]*	*PVIFA at 13 per cent [20% (1 – 0.35)]*	*Total PV*
1 - 5	Rs 7,80,000	3.517	Rs 27,43,260

(ii) Borrowing/Buying option

Equivalent annual loan instalment = Rs 40,00,000/2.991 (PVIFA for 5 years at 20 per cent) = Rs 13,37,345.

PV of cash outflows under buying alternative

Year-end	*Loan instalment*	*Tax advantage on Interest (I × 0.35)*	*Tax advantage on Depreciation (D × 0.35)*	*Net cash outflows (Col. 2 – Col. 3 + 4)*	*PVIF at 13%*	*Total PV*
1	*2*	*3*	*4*	*5*	*6*	*7*
1	Rs 13,37,345	Rs 2,80,000	Rs 3,50,000	Rs 7,07,345	0.885	Rs 6,26,000
2	13,37,345	2,42,386	2,62,500	8,32,459	0.783	6,51,815
3	13,37,345	1,97,249	1,96,875	9,43,221	0.693	6,53,652
4	13,37,345	1,43,084	1,47,656	10,46,605	0.613	6,41,569
5	13,37,345	77,635	1,10,742	11,48,968	0.543	6,23,890
Total PV of cash outflows						31,96,926
Less: PV of salvage value (Rs 8,00,000 × 0.543)						(4,34,400)
Less: PV of tax savings on short-term capital loss (9,49,279 – 8,00,000) × 0.35 = (52,226 × 0.543)						(28,358)
NPV of cash outflows						27,34,168

Working Notes

Schedule of debt payment

Year-end	*Loan instalment*	*Loan at the beginning of the year*	*Interest (Col. 3 × 20%)*	*Payments Principal repayment*	*Loan outstanding at the year (Col. 3 – Col. 5)*
1	*2*	*3*	*4*	*5*	*6*
1	Rs 13,37,345	Rs 40,00,000	Rs 8,00,000	Rs 5,37,345	Rs 34,62,655
2	13,37,345	34,62,655	6,92,531	6,44,814	28,17,841
3	13,37,345	28,17,841	5,63,568	7,73,777	20,44,064
4	13,37,345	20,44,064	4,08,813	9,28,532	11,15,532
5	13,37,345	11,15,532	2,21,813*	11,15,532	—

*Difference between loan instalment and loan outstanding.

Schedule of Depreciation

Year	*Depreciation*	*Balance at the end of the year*
1	Rs 40,00,000 × 0.25 = Rs 10,00,000	Rs 30,00,000
2	30,00,000 × 0.25 = 7,50,000	22,50,000
3	22,50,000 × 0.25 = 5,62,500	16,87,500
4	16,87,500 × 0.25 = 4,21,875	12,65,625
5	12,65,625 × 0.25 = 3,16,406	9,49,219

Recommendation The Company is advised to go for borrowing as the PV of cash outflows under borrowing option is lower than under leasing alternative.

Assumption The machine is sold after the expiry of its useful of 5 years; for this reason, the depreciation is charged in 5th year and there is no other asset in this block.

(ii) **Determination of NPV of cash inflows**

Particulars	*Years*				
	1	*2*	*3*	*4*	*5*
Lease rent	Rs 12,00,000	Rs 12,00,000	Rs 12,00,000	Rs 12,00,000	Rs 12,00,000
Less: Depreciation	10,00,000	7,50,000	5,62,500	4,21,875	3,16,406
Earnings before taxes	2,00,000	4,50,000	6,37,500	7,78,125	8,83,594
Less: Taxes (0.35)	70,000	1,57,500	2,23,125	2,72,344	3,09,258
Earnings after taxes	1,30,000	2,92,500	4,14,375	5,05,781	5,74,336
Cash inflows after taxes	11,30,000	10,42,500	9,76,875	9,27,656	8,90,742
(x) PV factor at (0.14)	0.877	0.769	0.675	0.592	0.519
Present value	9,91,010	8,01,682	6,59,391	5,49,172	4,62,295
Total PV of operating CFAT					34,63,550
Add: PV of salvage value of machine (8,00,000 × 0.519)					4,15,200
Add: PV of tax savings on short-term capital loss (52,226 × 0.519)					27,105
Gross PV					39,05,855
Less: Cost of machine					(40,00,000)
NPV					(94,145)

Recommendation It is not financially profitable to let out the machine on lease by the leasing Company, as NPV is negative.

Assumption The machine is to be sold after the expiry of 5 years. There is no other asset in the block of 25 per cent of the lessee.

P.25.22 From the given facts relating to the Hypothetical Leasing Ltd, calculate the annual rentals under the following rental structure for the 6-year period;

(a) Equated,
(b) Stepped (annual increase of 12 per cent),
(c) Ballooned (annual rental of Rs 15 lakh for year 1 and 2)
(d) Deferred (deferment period of 1 year).

Investment cost	Rs 96 lakh
Primary lease term	3 years
Residual value	Nil
Pre-tax required rate of annual return	22 per cent

Assume that the lease can be renewed for an additional period of 3 years (secondary lease period). The lease rental for the secondary period will be 5 per cent of the rental charged during the primary period.

Solution

(a) Equated annual lease rentals, Y

$Y \times$ PVIFA (22, 3) + $0.05Y \times$ PVIFA (22, 4–6) = Rs 96 lakh $2.042Y + 0.05625Y$ = Rs 96 lakh

Y = Rs 96 lakh/2.09825 = Rs 45.75 lakh (primary lease period); Rs 2.29 lakh (secondary lease period).

(b) Stepped lease rentals (annual increase of 12 per cent)

$Y \times$ PVIF (22, 1) + $1.12Y \times$ PVIF (22, 2) + $(1.12)^2Y \times$ PVIF (22, 3) + $(1.12)^3Y \times$ PVIF (22, 4) + $(1.12)^4Y \times$ PVIF (22, 5) + $(1.12)^5Y \times$ PVIF (22, 6) = Rs 96 lakh

Or $0.820Y + 0.7526Y + 0.6912Y + 0.6336Y + 0.5822Y + 0.534Y$ = Rs 96 lakh

Or Y = Rs 96 lakh/4.0136 = Rs 23.92 lakh

(c) Ballooned lease rentals (Rs 15 lakh for years 1–2)

Rs 15 lakh $\times$ PVIFA (22, 2) + $Y \times$ PVIF (22, 3) + $0.05Y \times$ PVIFA (22, 4–6) = Rs 96 lakh

Rs 22.38 lakh + $0.658Y + 0.05625Y$ = Rs 96 lakh

Y = Rs 96 lakh – Rs 22.38 lakh/0.71425 = Rs 103.07 lakh

(d) Deferred lease rentals (deferment of 1 year), Y

$Y \times$ PVIF (22, 2) + $Y \times$ PVIF (22, 3) + $0.05Y \times$ PVIF (22, 4–6) = Rs 96 lakh

$0.672Y + 0.551Y + 0.05625Y$ = Rs 96 lakh

Y = Rs 96 lakh/1.2795 = Rs 75.04 lakh

P.25.23 Hypothetical Ltd is expanding its facilities. In the coming year, the company will either purchase or lease equipment which it plans to use for 4 years and then replace it with a new one. Its current tax bracket is 50 per cent. The other data are as follows:

Purchase: (i) The purchase price of the equipment is Rs 40,00,000, (ii) The expected salvage value after 4 years is Rs 10,00,000, (iii) The equipment is subject to the straight line method of depreciation, (iv) Funds to finance the equipment can be obtained at 16 per cent, (v) The loan is to be repaid in four equal annual instalments due at the end of each year, (vi) The equipment will increase the annual revenues by Rs 30,00,000, and increase annual cash operating costs by Rs 20,00,000.

Leasing: (i) The annual lease is Rs 10,00,000, (ii) The lease rent is payable at the end of each year for 4 years, (iii) The equipment will increase annual revenues by Rs 30,00,000 and increase annual non-depreciation operating costs by Rs 19,00,000, as the lessor will pay Rs 1,00,000 for the maintenance costs associated with the equipment.

Determine whether the company should purchase or lease the equipment.

Solution

PV of cash outflows under leasing alternative

Year-end	Gross	Effective lease payment				PV factor (0.08)	Total PV
		Savings in maintenance costs	Net (Col 2 – Col 3)	Tax shield (Col 4 × 0.50)	Cash outflows after taxes		
1	2	3	4	5	6	7	8
1–4	Rs 10,00,000	Rs 1,00,000	Rs 9,00,000	Rs 4,50,000	Rs 4,50,000	3.312	Rs 14,90,400

Determination of interest and principal components of loan instalment

Year-end	Loan instalment	Loan at the beginning	Payment of		Principal out-standing at the end of the year
			Interest (Col 3 × 0.16)	Principal (Col 2 – Col 4)	
1	2	3	4	5	6
1	Rs 14,29,593*	Rs 40,00,000	Rs 6,40,000	Rs 7,89,593	Rs 32,10,407
2	14,29,593	32,10,407	5,13,665	9,15,928	22,94,497
3	14,29,593	22,94,479	3,67,117	10,62,476	12,32,003
4	14,29,593	12,32,003	1,97,590	12,32,003	—

*Rs 40,00,000 ÷ 2.798 that is, PV annuity factor of 4 years at 16 per cent.

PV of cash outflows under buying alternative

Year	Loan instalment	Interest (I × t)	Depreciation (D × t)	Cash outflows after taxes [Col 2 – (Col 3 + Col 4)]	PV factor (0.08)	Total PV
1	2	3	4	5	6	7
1	Rs 14,29,593	Rs 3,20,000	Rs 3,75,000	Rs 7,34,593	0.926	Rs 6,80,233
2	14,29,593	2,56,832	3,75,000	7,97,761	0.857	6,83,681
3	14,29,593	1,83,558	3,75,000	8,71,035	0.794	6,91,602
4	14,29,593	98,795	3,75,000	9,55,798	0.735	7,02,512
4	Salvage value	—	—	(10,00,000)	0.735	(7,35,000)
						20,23,028

Recommendation The lease alternative is better, as it is a cheaper source of finance than debt in terms of the NPV of the cash outflows.

P.27.15 Prashant is bullish about the index. Spot Nifty stands at Rs 1,100. He decides to buy one three-month Nifty call option contract (having a market lot of 200) with a strike price of Rs 1,160 at a premium of Rs 15 per call. Three months later, the index closes at Rs 1,195. Determine the amount of profit (or loss) to Prashant.

Solution Prashant gains as on the date of maturity the Nifty Index is higher than the exercise price. His gain gets reduced by the option premium paid. Accordingly, his gain is (Rs 1,195 – Rs 1,160 – Rs 15) × 200 lot size = Rs 20 × 200 = Rs 4,000.

P.27.16 Akram is bearish about the index. Spot Nifty stands at Rs 1,240. He decides to buy one three-month Nifty put option contract with a strike price of Rs 1,225, at Rs 34.50 a put. Three months later the index closes at Rs 1,280. Compute his payoff on the position.

Solution The put option expires out-of-the money as the exercise price at which Akram can sell is lower (Rs 1,225) than the market price (Rs 1,280) on the date of maturity. So, he loses the put premium he paid, that is (Rs 34.50 × 200) = Rs 6,900 at the time of contract.

P.27.17 Mohan is bearish about the index. Spot Nifty stands at Rs 1,150. He decides to sell one three-month Nifty call option contract with a strike of Rs 1,175 for a premium of Rs 28.60. Three months later, the index closes at Rs 1,195. What is his net payoff on the position?

Solution Since the index closes above the strike price of Rs 1,275, the call option buyer exercises the option. As a result, he loses. (Rs 1195 – Rs 1,175 = Rs 20). But he has received an up-front premium Rs 28.60. Therefore, his net profits are Rs 8.6 × 200 = Rs 1,720.

P.33.17 The following information is provided related to the acquiring firm A Ltd. and the target firm T Ltd:

Particulars	*Firm A*	*Firm T*
EAT (Rs lakh)	1,000	200
Number of shares outstanding (in lakh)	100	50
EPS (Rs)	10	4
P/E ratio (times)	10	5
MPS (Rs)	100	20

(a) What is the swap ratio based on current market prices?
(b) What is the EPS of A Ltd after acquisition?
(c) What is the expected market price per share (MPS) of A Ltd after acquisition, assuming P/E ratio of Firm A remains unchanged.
(d) Determine the market value of the merged firm.
(e) Calculate gain/loss for shareholders of the two independent companies, after acquisition.
(f) Determine the upper and lower limits for swap ratio beyond which the two firms would not go for the acquisition/merger.

Solution

(a) Exchange ratio based on market prices = Rs 20/Rs 100 = 0.2:1. For every one share of Firm T, 0.2 share will be issued in Firm A. Based on this ratio, the number of new shares issued by Firm T will be = 50 lakh × 0.2 = 10 lakh.

(b) EPS after the merger (EPSc) $= \dfrac{\text{Rs } 1{,}000 \text{ lakh} + \text{Rs } 200 \text{ lakh}}{100 \text{ lakh shares} + 10 \text{ lakh shares}} = \text{Rs } 10.91$

(c) Expected MPS after merger = Rs 10.91 × 10 = Rs 109.10

(d) Market value of merged firm = Rs 109.10 MPS × 110 lakh shares = Rs 120.01 crore.

(e) Gains from the merger *(Rs crore)*

Post-merger market value of the firm		Rs 120.01
Less: Pre-merger market value:		
Firm A (100 lakh shares × Rs 100 MPS)	Rs 100	
Firm T (50 lakh shares × Rs 20 MPS)	10	110.00
Gains from merger		10.01

Apportionment of gains from merger among shareholders	*(Rs crore)*
Firm A:	
Post-merger market value (100 lakh shares × Rs 109.10 MPS)	109.10
Less: Pre-merger market value	100.00
Gains to the shareholders of Firm A	9.10
Firm B:	
Post-merger market value (10 lakh shares × Rs 109.10)	
10.91	
Less: Pre-merger market value	10.00
Gain to the shareholders of Firm T	0.91

(f)	**Determination of upper limit and lower limit of share exchange ratio**	*(Rs crore)*
(i)	Lower limit (based on total gains accruing to shareholders of Firm A)	
	Total market value of the merger firm	Rs 120.01
	Less: Pre-merger (or minimum post-merger) value acceptable to shareholders of Firm T	10.00
	Maximum acceptable post-merger market value of Firm A (in lakh)	110.01
	Divided by the number of equity shares outstanding in Firm A	100
	Post-merger MPS (Rs 110.01 crore/100 lakh)	110.01
	Number of equity shares required to be issued in Firm A to have the desired MPS of Rs 110.01 and to have a post-merger value of Rs 10 crore of Firm T, that is, (Rs 10 crore/Rs 110.01) = 9,09,008.27	9,09,009 shares
	Existing number of equity shares of Firm T	50
	Share exchange ratio (9,09,009/50 lakh) = 0.1818: 1 or	1: 5.5
	For every 5.5 shares of Firm T, 1 share in Firm A will be issued. This is the lowest exchange ratio acceptable to shareholders of Firm T. Any ratio lower than this will decrease their existing wealth of Rs 10 crore.	
(ii)	Upper limit (based on total gains accruing to shareholders of Firm T)	
	Total market value of the merged firm	Rs 120.01
	Less: Pre-merger (or minimum post-merger) value acceptable to the shareholders of Firm A	100.00
	Maximum acceptable post-merger market value of Firm T	20.01
	Since post-merger market value of Firm A remains unchanged at Rs 100 crore (and so the number of its shares (100 lakh) and MPS of Rs 100), number of equity shares required to be issued in Firm A to have a MPS of Rs 100 and to have a post-merger value of Rs 20.01 crore of Firm T (Rs 20.01 crore/ Rs 100 MPS)	20,01,000 shares
	Existing number of equity shares outstanding in Firm T	50 lakh
	Share exchange ratio (20,01,000/50 lakh) = 0.4002:1 or	1: 2.5
	For every 2.5 shares of Firm T, 1 share in Firm A will be issued. This is the upper most exchange ratio acceptable to shareholders of Firm A as any ratio higher than this will dilute their existing wealth of Rs 100 crore.	

P.33.18 Company X is contemplating the purchase of Company Y. Company X has 3,00,000 shares having a market price of Rs 30 per share while Company Y has 2,00,000 shares selling at Rs 20 per share. The EPS are Rs 4.00 and Rs 2.25 for Company X and Y, respectively. Managements of both companies are discussing two alternative proposals for exchange of shares as indicated below:

(i) in proportion to the relative earnings per share of two companies.

(ii) 0.5 share of Company X for one share of Company Y (.5 :1).

You are required: (i) to calculate the Earnings Per Share (EPS), after merger, under two alternatives and (ii) to show the impact on the EPS for the shareholders of two companies under both the alternatives.

Solution

(i) (a) Determination of post-merger earnings

Company	*Original number of shares*	*EPS*	*Total earnings after taxes (2 × 3)*
1	*2*	*3*	*4*
X	3,00,000	Rs 4.00	Rs 12,00,000
Y	2,00,000	2.25	4,50,000
Total post-merger earnings			16,50,000

(b) Post-merger EPS when share exchange ratio is in relative proportion to pre-merger EPS, 0.5625 that is Rs 2.25/4.00

Total post-merger earnings (with no synergy assumed)	Rs 16,50,000
Divided by total number of shares after the merger (3,00,000 + 1,12,500 i.e., 2,00,000 × 0.5625)	4,12,500
Combined EPS after merger (Rs 16,50,000/4,12,500 shares)	4

(c) Post-merger EPS when share exchange ratio is 0.5

Total post-merger earnings	Rs 16,50,000
Divided by total number of shares after the merger (3,00,000 + 1,00,000 i.e., 2,00,000 × 0.5)	4,00,000
Combined EPS after merger (Rs 16,50,000/4,00,000 shares)	4.125

(ii) (a) Impact on EPS of the shareholders of Company X and Company Y when share exchange ratio is 0.5625

Shareholders of company X:	
EPS before the merger	Rs 4.00
EPS after the merger (Rs 16,50,000/4,12,500 shares)	4.00
Shareholders of Company Y:	
EPS before the merger	2.25
Equivalent EPS after the merger (EPS after the merger × shares exchange ratio, i.e., Rs 4 × 0.5625)	2.25
There is no change in EPS for shareholders of Company X or Company Y	

(b) Impact of EPS on the shareholders of Companies X and Y when share exchange ratio is 0.5

Shareholders of Company X:	
EPS after the merger (Rs 16,50,000/4,00,000 shares)	Rs 4.125
EPS before the merger	4.000
Accretion in EPS	0.125
Shareholders of Company Y:	
EPS before the merger	Rs 2.25
Equivalent EPS after the merger (Rs 4.125 × 0.5)	2.0625
Dilution in EPS	(0.1875)
While the shareholders of Company X gain, the shareholders of Company Y lose.	

P.33.19 Nelson Electronic Company acquires Borton Electronic Company on 'share for share exchange' basis. The position before takeover was as under:

Particulars	*Nelson Electronic company*	*Borton Electronic company*
Number of shares	20,000	10,000
Total earnings (Rs)	2,00,000	1,00,000
Market price of share, MPS (Rs)	20	15

The shareholders of Borton Electronic Company are offered 7,500 shares of Nelson Electronic Company for 10,000 shares (i.e. each shareholder of Borton Electronic Company gets 0.75 shares of Nelson Electronic Company for 1 share of Borton Electronic Company).

You are required to calculate the EPS of the amalgamated company *vis-a-vis* before takeover position of the two companies and the gain/loss of the shareholders of the two independent companies consequent to amalgamation.

Solution

(a) EPS of companies before and after takeover

Particulars	*Before takeover*		*After takeover*
	Nelson	*Borton*	*Combined*
Total earnings (Rs)	2,00,000	1,00,000	3,00,000
Divided by Number of shares (N)	20,000	10,000	27,500
EPS (Rs)	10	10	10.91

(b) Gain/loss to shareholders

(i) In terms of EPS:

Nelson Electronic (Rs 10.91 – Rs 10) = Re 0.91 (Gain)

Borton Electronic:

EPS before merger	Rs 10.00
Less: Equivalent EPS after merger (Rs 10.91 × 0.75, share exchange ratio)	8.18
Loss	(1.82)

(ii) In terms of valuation:

Valuation after merger (27,500 shares × Rs 240/11) (assuming Nelson maintains its existing P/E ratio of 2 i.e. Rs 20 ÷ Rs 10)		Rs 6,00,000
Less: Pre-merger market value:		
Nelson (20,000 × Rs 20)	4,00,000	
Borton (10,000 × Rs 15)	1,50,000	5,50,000
Total gain from the merger		50,000

Apportionment of gains:

	Nelson	Borton
Post-merger value	4,36,363.63[@]	1,63,636.37 [@@]
Less: Pre-merger value	4,00,000.00	1,50,000.00
Gain	36,363.63	13,636.37

[@]20,000 shares × Rs 240/11; [@@] 7,500 shares × Rs 240/11 (market price of share)

P.33.20 From the following data, calculate the cost of merger.

Particulars	*Firm A*	*Firm B*
Market price per share	Rs 60	Rs 15
Number of shares	1,00,000	50,000
Market value of the firm	6,00,000	7,50,000

Firm A intends to pay Rs 10,00,000 cash for acquisition of Firm B.

Solution Cost = Cash – PV_B = Rs 10,00,000 – Rs 7,50,000 = Rs 2,50,000

P.34.22 You are required to fill in the missing figures and complete the table.

Currencies	*US $*	*POUND £*	*Canadian*	*YEN*	*EURO*
1 USD	1.0	0.6161	1.5259	—	0.9287
1 POUND	—	1.0	—	—	—
1 CANADIAN DOLLAR	—	—	1.0	—	—
1 YEN	—	—	—	1.0	—
1 EURO	—	—	—	—	1.0

Solution

Determination of equivalent exchange rates

Currencies	*US $*	*POUND £*	*Canadian $*	*YEN ×*	*EURO €*
1 US $	1.0000	0.6161	1.5259	118.08	0.9287
1 POUND	1/0.6161[1] = 1.6231	1.0000	1.5259/0.6161 = 2.4767[2]	118.08/0.6161 = 191.6556[3]	0.9287/0.6161 = 1.5074[4]
1 Canadian Dollar	1/1.5259 = 0.6553	0.6161/1.5259 = 0.4037	1.0000	118.08/1.5259 = 77.3838	0.9287/1.52599 = 0.6086
1 YEN	1/118.08 = 0.0085	0.6161/118.08 = 0.0052	1.5259/118.08 = 0.0129	1.0000	0.9287/118.08 = 0.0078
1 EURO	1/0.9287 = 1.0767	0.6161/0.9287 = 0.6634	1.5259/0.9287 = 1.6430	118.08/0.9287 = 127.145	1.000

Working Notes

1. Since 1 US $ is equivalent to £0.6161, £1 = 1/0.6161$ = US $1.6231.
2. 1 US $ = 1.5259 Canadian $; therefore £1 will be = 1.5259/0.6161 = 2.4767.
3. £0.6161 = 118.08; therefore £1 = 118.08/0.6161 = 191.6556.
4. £0.6161 = **0.9287; therefore £1 = 0.9287/0.6161 = 1.5074.

This equivalence procedure has been followed in determining other missing figures.

P.34.23 In 1994 a foreign institutional investor (FII) invested US $1 million in the Indian stock market. The rupee return from the Indian stock market since 1994 has been 16 per cent as dividend income. However, stock prices have come down by 10 per cent since 1994. The currency rate at the time of FII purchase in 1994 was Rs 31/$. If FII sells its holding today and the current currency rate is Rs 48/$, what is the loss/profit to the FII in dollar terms?

Solution FII investment in rupee terms = $10,00,000 × Rs 31 = Rs 3,10,00,000
Dividend income is Rs 3,10,00,000 × 16/100 = Rs 49,60,000
Capital loss due to decrease in stock prices is Rs 3,10,00,000 × 10/100 = Rs 31,00,000

So the current value of the portfolio is (Rs 3,10,00,000 + Rs 49,60,000 – Rs 31,00,000) = Rs 3,28,60,000. If the FII sells his portfolio now, it will fetch him Rs 3,28,60,000. The value in dollar terms will be Rs 3,28,60,000 × 1/48 = $6,84,583. Thus, FII suffers a loss of US $3,15,417, i.e., (US $10,00,000 – US $6,84,583).

P.35.20 Prepare a table of the profit profile of the buyer of a call option with the following infor-mation:

Current spot rate	Rs 51.49/∈
Exercise price	52.10/∈
Call premium	2 per cent

Solution The profit resulting from a call option is given by the following equation

$$\text{Profit} = S_T - X - C \text{ for } S_T > X = -C \text{ for } S_T < X$$

Where S_T is current spot rate (Rs 51.49/∈), X is exercise price (Rs 52.10/∈) and C is call premium (2 per cent).

Let us assume that the amount is ∈ 1. So, the amount of the premium to be paid up-front is (Rs 1 × 0.02 × Rs 51.49) = Rs 1.0298.

The call option will be exercised if the spot rate (S_T) on the date of exercise is more than Rs 52.10. Otherwise, it will be allowed to lapse. The reason is that at an exchange rate lower than Rs 52.10, it will be profitable to buy from the spot market itself. The table below contains the profit data corresponding to various S_T values.

	S_T (Rs/∈)	Option value	Premium already paid	Net profit
1	49.0	0.00	Rs 1.0298	(–) Rs 1.0298
2	50.0	0.00	1.0298	–1.0298
3	51.0	0.00	1.0298	–1.0298
4	51.49	0.00	1.0298	–1.0298
5	52.10	0.00	1.0298	–1.0298
6	53.0	0.90	1.0298	–0.1298
7	54.0	1.90	1.0298	+0.8702
8	55.0	2.90	1.0298	+1.8702
9	56.0	3.90	1.0298	+2.8702

P.35.21 For a value date of 1 July 2000, a company entered into a five year interest rate swap with its bank under which it has contracted to pay 9 per cent and receive a six month MIBOR, settled semi-annually, on a principal amount of Rs 1,00,00,000. On 1 July of the current year, with the swap payment of exactly three years is remaining, the bank offers to unwind the swap at the rate of 6.5 per cent. If the company agrees to the bank's offer, the transaction will be cancelled today by means of a settlement.

(a) Set out the underlying fixed-rate cash flow that would take place if instead of canceling the existing deal a new deal were made and the two deals were to exist till maturity.

(b) What sum of money would be paid today to cancel the transaction? And in case of cancellation who will pay to whom?

(c) What assumptions are implicit in the above calculation?

Solution Under the old swap agreement the company is paying 4.5 per cent on Rs 1,00,00,000, every six months. But under the new swap agreement the swap rate is 3.25 per cent on Rs 1,00,00,000 every six months.

(a) So, the fixed-rate cash flow that would take place if both the deals co-exist is
Rs 1,00,00,000 × (0.045 – 0.0325) = Rs 1,25,000 per six months.

(b) The sum to be paid to cancel the transaction would be the present value of equivalent future cash flows of Rs 1,25,000 discounted at 3.25 per cent for every six month period = 1,25,000 $[1/1.0325 + 1/(1.0325)^2 + 1/(1.0325)^3 + 1/(1.0325)^4 + 1\ (1.0325)^5 + 1/(1.0325)^6]$ = Rs 1,25,000 × 5.3726 = Rs 6,71,575.
As the company will be enjoying these benefits due to the fall in interest rate, under the cancellation, the company will be paying this amount to the bank.

(c) All the future cash flows have been discounted at same rate (3.25 per cent per six months). So it implicitly assumes that the yield curve is flat. If the yield curve were not flat then different discount rates should be applied to each cash flow.

P.35.22 In the year 1990 an Indian importer was required to pay Rs 21 to receive 1 US dollar. In the year 1997 it was Rs 31 and in the year 2002 the importer is required to pay Rs 48 to buy one dollar.

(i) How much has the rupee appreciated or depreciated during 1990 – 1997 and between 1997 – 2002 *vis-à-vis* the US $?

(ii) What has been the corresponding appreciation/depreciation in the dollar during these periods, in relation to Indian rupee?

Solution **Appreciation/depreciation in dollar terms:**

$$\text{Period 1990–97, appreciation} = \frac{\text{Rs } 31 - \text{Rs } 21}{\text{Rs } 21} \times 100 = \text{Rs } 47.62\%$$

$$\text{Period 1997 –2002, appreciation} = \frac{\text{Rs } 48 - \text{Rs } 31}{\text{Rs } 31} \times 100 = \text{Rs } 54.84\%$$

Appreciation/depreciation in rupee terms:

$$\text{Period 1990–97, depreciation} = \frac{\frac{1}{21} - \frac{1}{31}}{1/21} \times 100 = 32.25\%$$

$$\text{Period 1997–2002, depreciation} = \frac{\frac{1}{31} - \frac{1}{48}}{1/31} \times 100 = 35.42\%$$

P.35.23 Romesh Sharma is a currency trader for a large currency trading firm of US, based in New Jersey. He expects the US dollar to depreciate against the euro. The current spot rate of the euro is US $1.0768/€ and the premium on call and put options are as follows:

Strike: US $1.1000/€	*30 days*	*60 days*
Call option on the euro	0.085	0.100
Put option on the euro	0.110	0.135

(a) What should Romesh Sharma do to profit from his anticipation?

(b) What will the profit or loss be, if the rate on settlement date, after 30 days, is US $1.220/Î, and (i) Romesh Sharma has bought a 30 day call, (ii) Romesh Sharma has sold a 30 day put.

Solution

(a) As Romesh Sharma anticipates the US dollar to depreciate against the euro (appreciation of euro against the US dollar), he can be benefited either by buying a call option on euros or selling a put option on euros.

(b) (i) Profit from purchase of call

Profit from purchase of call for a strike price of US $1.1000/€, premium US $0.085/€ and settlement rate (expiration rate) of US $1.220/€

= US $(1.220 – 1.1000)/€ – US $0.085/€ = US $0.035/€

As the settlement rate is higher than the strike rate, Romesh Sharma will exercise the option.

(ii) Profit from sell of put

As the settlement rate (US $1.220/€) is higher than the strike rate, this put option will not be exercised. So, for Romesh Sharma the premium that he received on selling (writing) the put option is his profit (US $0.110/€).

Selling an option entails high risk, but is used as a strategy by the currency trader when he is confident of his anticipation.