CHAPTER 19

Solved Problems

P.19.13 "The value of a firm is independent of the proportion of debt to total capitalisation. The arbitrage process will establish a market equilibrium in which the total value of the firm will depend only on investor's estimate of the firm's business risk, and its expected future income." Explain the above mentioned statement with the help of the following data regarding two companies, A and B with the same expected annual income and same risk class.

Variables	Company A	Company B
Expected annual income (Y)	Rs 30,000	Rs 30,000
Market value of debt (L)	—	1,20,000
Rate of interest on debt (i)	—	0.125
Required rate of return on equity (K)	0.15	0.16
Market value of equity (E)	2,00,000	93,750
Market value of company (V), where $V = L + E$	2,00,000	2,13,750

Solution

Arbitrage process

Suppose an investor, Mr X, holds 10 per cent of the outstanding shares of the levered firm (B). His holdings and dividend income would be as follows:

(i) Investment outlay (0.10 × Rs 93,750)	Rs 9,375
(ii) Dividend income (0.16 × 9,375)	1,500

He sells his holdings in firm B and invests in the unlevered firm, A. Since firm A has no debt, the financial risk of Mr X would be less. To reach the level of financial risk of firm B, he borrows additional funds equal to his proportionate share in the levered firm's debt on his personal account (Rs 12,000 at 12.5 per cent rate of interest). He buys 10 per cent of the outstanding shares of the unlevered firm A at Rs 20,000 (0.10 × of Rs 2,00,000). Mr X's position in firm A is summarised below.

(i) Total funds available		
Own funds	Rs 9,375	
Borrowed funds	12,000	21,375
(ii) Investment outlay		20,000
(iii) Dividend income		
Gross (0.10 × Rs 30,000)	3,000	
Less: Interest payable on borrowed funds	1,500	1,500

Mr X is earning the same amount of dividend as in company B. But his investment outlay in company A is less by Rs 1,375. Thus, the investor is better off by selling his securities in the levered firm B, and buying the shares of the unlevered firm, A. Other investors will also enter into the arbitrage process. As a result, the price of the shares of the levered firm will decline, and that of unlevered firm will increase. This will continue till it is possible to reduce investment outlays and get the same return. Beyond this point, arbitrage will not be beneficial. This is the point of equilibrium. At this point, the total value of two firms as well as cost of capital would be identical. Thus, the value of the firm is independent of the proportion of debt to total capitalisation. But in actual practice, cost of capital is affected by leverage.

Review Questions

19.14 A company with net operating earnings of Rs 3,00,000 is attempting to evaluate a number of possible capital structures, given below. Which of the capital structures will you recommend and why?

Capital structure	Debt in capital structure	$K_i (\%)$	$K_e (\%)$
1	Rs 3,00,000	10	12.0
2	4,00,000	10	12.5
3	5,00,000	11	13.5
4	6,00,000	12	15.0
5	7,00,000	14	18.0

19.15 A company's current earnings before interest and taxes are Rs 4,00,000. The firm currently has outstanding Rs 15 lakh of debts at an average cost of 10 per cent. Its cost of equity capital is estimated to equal 16 per cent.
    (a) Determine the current value of the firm using the traditional valuation Approach.
    (b) Determine the firm's overall capitalisation rate and both types of leverage ratios: (i) B/S (ii) B/V.
    (c) The firm is considering reducing its leverage by selling Rs 5 lakh of equity in order to redeem a Rs 5 lakh debt. The cost of debt is expected to be unaffected. However, the firm's cost of equity capital is to be reduced to 14 per cent due to decrease in financial risk. Would you recommend the proposed action?

19.16 A company, wholly financed through equity, has a current market value of Rs 16 lakh; the equity capitalisation rate is 0.125. An expansion programme is planned that will involves Rs 5 lakh in capital expenditure in the current year. The financial manager suggests that debt should be used to finance at least part of Rs 5 lakh. Assuming the tax rate of 35 per cent, determine the weighted average cost of capital and value of company for each of the following alternatives developed by the financial manager:

Debt (in lakh of Rs)	Equity (in lakh of Rs)	$k_i(\%)$	$k_e(\%)$	$k_0(\%)$
—	16	—	12.5	12.5
1		10.0	12.6	
2		10.4	13.0	
3		11.0	14.0	
4		12.0	15.0	
5		13.0	17.0	

Which financing plan would you recommend and why?

19.17 Two companies A and B belong to the same risk class. The two firms are identical in every respect except that firm A has 10 per cent debentures. The valuation of two firms as per the traditional theory is as follows:

Particulars	A	B
Net operating income (EBIT)	Rs 22,50,000	Rs 22,50,000
Interest on debt (*I*)	1,50,000	—
Earnings to equityholders (*NI*)	21,00,000	22,50,000
Equity-capitalisation rate k_e	0.14	0.125
Market value of equity (*S*)	1,50,00,000	1,80,00,000
Market value of debt (*B*)	15,00,000	—
Total market value (*V*)	1,65,00,000	1,80,00,000
Implied over all capitalisation rate	0.136	0.125
Debt/equity ratio	0.1	0

Show the arbitrage process by which an investor who holds shares worth Rs 22,500 in company B will benefit by investing in company A.

19.18 Compute the equilibrium values (V) and equity-capitalisation rate of the two companies, X and Y on the basis of the data given below. Assume that (i) there is no income tax, and (ii) the overall capitalisation rate of such companies in the market is 0.125.

Expected net operating income (EBIT)	Rs 1,50,000	Rs 1,50,000
Interest ($k_i.B$)	20,000	—
Net income for equity [EBIT – ($k_i.B$)]	1,30,000	1,50,000
Equity-capitalisation rate (k_e)	0.13	0.12
Market value of equity (*S*)	10,00,000	12,50,000
Market value of debt (*B*)	4,00,000	—
Total value of firm (*V*)	14,00,000	12,50,000
Weighted average cost of capital (k_0)	0.1071	0.12

19.19 The following are the equilibrium values of two firms belonging to the homogeneous risk class according to the NOI Approach:

Expected net operating income (EBIT)	Rs 25,000	Rs 25,000
Less: Cost of debt (*I*) = $k_i.B$	5,000	—
Net income for equity (EBIT – *I*)	20,000	25,000
Equilibrium cost of capital, k_0	0.125	0.125

Total value of company $(V) = \text{EBIT}/k_0$	2,00,000	2,00,000
Market value of debt (B)	1,00,000	—
Market value of equity $(V - B)$	1,00,000	2,00,000
Cost of equity (k_e)	0.20	0.125

Determine the values of the firms X and Y under the traditional Approach assuming the k_e for company Y as 11 per cent and for X 14 per cent.

Answers

19.14 Capital structure, having a debt of Rs 3,00,000 is recommended.

19.15 (a) Rs 30,62,500 (b) k_0=13.06%, B/S = 0.96, B/V=0.49 (c) Proposed action is recommended (k_0=12.72%).

19.16 Financing plan, having debt of Rs 1,00,000 is recommended.

19.17 The investor can reduce his outlay by Rs 1,875

19.18 $V = $ Rs 12,00,000 (both for X and Y), $k_e = $ 16.25% (X) and 12.5% (Y).

19.19 $V = $ Rs 2,42,857 (firm X) and Rs 2,27,272 (firm Y).