ADM 3350 (Summer)

SOLUTIONS

OF

ASSIGNMENT 1 PROBLEMS

(Capital Structure)

Solutions to Capital Structure Problems

Problem 1

We are given that the firm currently has no debt, that is, it is all-equity capital financed firm. Therefore, the firm's existing equity shareholders get all (1 – .35) $80,000. The cost of equity capital is 25%. This means that the existing shareholders require 25% return on their capital investment in the firm. Thus:

$$V_U = \frac{(1-.35)\ (\$80{,}000)}{.25}$$

$$= \$208{,}000$$

To answer the second question note that the firm borrows $50,000 and uses this amount to repurchase $50,000 worth of shares. Thus, it makes its capital structure levered with debt. According to M&M, the value of the levered firm, V_L, will be:

$V_L = V_U + t_cD$, where t_c is the corporate tax rate

$= \$208{,}000 + (.35)\ (\$50{,}000)$

$= \$208{,}000 + \$17{,}500$

$= \$225{,}500$

Problem 2

The cost of equity after "recapitalization" means the rate of return required on the levered equity after the firm is recapitalized with $50,000 debt. Thus, the problem asks for: What is k_e^l?

The easiest way to find k_e^l is to use the formula:

$$k_e^l = \frac{(1-t_c)(EBIT - I)}{E_L}$$

We know: $t_c = .35$, EBIT = $80,000, I = 14% of $50,000

And $E_L = V_L - D$

$= \$225,500 - \$50,000$

$= \$175,500$

Plug in these values and get:

$$k_e^l = \frac{(1-.35)(\$80,000 - \$7,000)}{\$175,500}$$

$= .27037$ or 27.037%

$$\text{WACC} = \left(\frac{E_L}{V_L}\right) k_l^e + \left(\frac{D}{V_L}\right) k_b$$ where k_b = after-tax int. rate

$= (1-.35)\ 14\% = 9.1\%$

$$= \frac{\$175,500}{\$225,500}(27.037\%) + \frac{\$50,000}{\$225,000}(9.1\%)$$

$= .2306$ or 23.06%

Now remember, without the debt, the cost of capital was 25%. With debt, it has gone down to 23.06%. The lower the cost of capital, higher the value of the firm. So the implication is, the firm should lever itself with debt in presence of corporate tax to benefit from the int. tax shield t_cD.

Problem 3

Notice that the problem gives us WACC = 12%. So, we can find V_L by using the formula:

$$V_L = \frac{(1-t_c)EBIT}{WACC}$$

$$= \frac{(1-.35)\$26,000}{.12}$$

$= \$140,833.33$

This answers only the first question in the problem. To answer the second question, we have to find V_U to see whether or not V_L exceeds V_U. But how to find V_U? For this we know:

$V_L = V_U + t_cD$

$\$140,833 = V_U + .35D$ ...(1)

Now if we can find D, we will be able to find V_U from the above equation. For this, we use:

$$k_e^l = \frac{(1-t_c)(EBIT - I)}{E_L}$$

We know: I = .08D, and $E_L = V_L - D = \$140,833.33\text{-}D$ ...(2)

So:

$$k_e^l = \frac{(1-.35)(\$26,000 - .08D)}{\$140,833.33 - D}$$

We can solve this equation for D if we knew k_e^l. To find k_e^l we proceed as follows:

$$\text{WACC} = k_e^l\left(\frac{E_L}{V_L}\right) + k_b\left(\frac{D}{V_L}\right) \text{ where } k_b = (1 - t_c)i$$

$$= (1 - .35)\ 8\% = 5.2\%$$

$$V_L = D + E_L$$

The problem gives: debt-equity

$$\text{Ratio } \frac{D}{E_L} = .60 \Rightarrow \frac{D}{E_L} = \frac{3}{5} \Rightarrow \frac{D}{D + E_L} = \frac{3}{3+5}$$

$$\Rightarrow \frac{D}{V_L} = \frac{3}{8}, \Rightarrow \frac{E_L}{V_L} = \frac{5}{8}$$

We plug these capital structure ratios in the above equation to get:

$$.12 = k_e^l\left(\frac{5}{8}\right) + 5.2\%\left(\frac{3}{8}\right)$$

$$\Rightarrow k_e^l = .1608$$

Now go back to Equation 2 for k_e^l set up previously and plug in $k_e^l = .1608$ and solve that equation for D.

$$.1608 = \frac{(1-.35)\ (\$26,000 - .08D)}{\$140,833.33 - D}$$

Solving this expression for D, we get:

D = $52,812

Now plug this value of D, in Equation 1 and get

$140,833.33 = V_U + .35 ($52,812), which gives:

V_U = $122,349.13

Since V_L of $140,833.33 exceeds V_U, it means the firm's debt of $528,12 will increase its value, and even more debt will further increase its value if bankruptcy costs are ignored.

Problem 4

$$V_U = \frac{(1-.35)\$6,000}{.16}$$

$$= \$24,640.63$$

The firm is currently all-equity financed and the market value of the total equity capital invested in the firm = $24,640.63.

If the firm converts 50% of the $24,640.63 to debt, then debt D = 50% of $24,640.63 = $12,320.18 and

$V_L = V_U + t_cD$

= $24,640.63 + .35 ($12,320.18)

= $28,640.63

If D is 100% of $24,640.63, then D = $24,640, and

V_L = $24,375 + .35 ($24,375)

= $32,906.25

Problem 5

Think of a balance sheet. Beta of assets (on the left side) = weighted average of Beta of equity and Beta of debt. Let's write Beta of debt as β_D. Thus

$$\beta_A = \beta_E\left(\frac{E}{V}\right) + \beta_D\left(\frac{D}{V}\right)$$

We are told in the problem that the debt is risk-free. Thus:

β_D = 0. So:

$$\beta_A = \beta_E\left(\frac{E}{V}\right) \Rightarrow \beta_E = \beta_A\left(\frac{V}{E}\right)$$

We know V = D + E, so

$$\Rightarrow \beta_E = \beta_A\left(\frac{D+E}{E}\right)$$

$$\Rightarrow \beta_E = \beta_A\left(\frac{D}{E}+1\right)$$

$$\Rightarrow \beta_E = \beta_A\left(1+\frac{D}{E}\right)$$

Problem 6

$\frac{D}{E} = 0 \Rightarrow (i)\ \beta_E = 1(1+0) = 1$ (we are given $\beta_A = 1$)

$\frac{D}{E} = 1 \Rightarrow (ii)\ \beta_E = 1(1+1) = 2$

$\frac{D}{E} = 5 \Rightarrow (iii)\ \beta_E = 1(1+5) = 6$

$\frac{D}{E} = 20 \Rightarrow (iv)\ \beta_E = 1(1+20) = 21$

The message of the problem is:

The equity risk to the shareholders is composed of both business risk and financial risk from debt. Even if the assets of the firm are not very risky, the risk to the shareholders will be large if the financial leverage (reflected in high debt-equity ratio) is high. These higher levels of risk will be reflected in higher k_e^l.

Problem 7

If alive, PV $= \frac{\$10M}{.18}$

$= \$55.56M$

Since the PV if alive is less than the \$75M liquidation value, the firm should be liquidated. It is worth more "dead than alive".