BEM 103
Introduction To Finance
Fall 2001

Homework 5

Suggested Solutions

17.4 The equity returns \$5,000 (=20% of \$25,000); the loan requires \$7,500 (=10% of \$75,000). Hence, the investment returns in total \$12,500, which is 12.5% on \$100,000. That would be the return on investment if it were totally financed by equity.

17.5 Nothing changes to the cash flows from the assets of the firm if the capital structure is changed. Hence, the value of the firm does not change. The new estimates will change the relative value of debt and equity, but shareholders will be no better off if the firm raises more debt or retires some debt. This is M&M irrelevance.

17.6 V', next year's value of the firm, is \$250 (in millions) in the "up"-state or \$100 minus (as yet unknown) bankruptcy costs in the "down" state. The state-price probability for the "up"-state is 0.6. Debt has a face value of $D = \$150$. The risk free rate equals 12%.

1. Using our formula, the value of equity, E, equals:

$$\begin{aligned} E &= \frac{1}{1+r} E^*[\max(V' - D, 0)] \\ &= \frac{1}{1.12} [(0.6)(250 - 150) + (0.4)0] \\ &= \$54. \end{aligned}$$

2. Without bankruptcy costs, the value of debt, B^{nocost}, would have been:

$$\begin{aligned} B^{nocost} &= \frac{1}{1.12} [(0.6)150 + (0.4)100] \\ &= \$116. \end{aligned}$$

Since the bonds are actually selling for $B = \$109$ (rounded), the *value of the bankruptcy costs*, BC, equals:

$$BC = B^{nocost} - B = 116 - 109 = \$7.$$

3. Using value additivity, the value of the firm, V, equals:

$$V = E + B = 54 + 109 = \$163.$$

4. The promised return, i.e., the yield, y, equals:

$$y = \frac{150}{109} - 1 = 38\%.$$

Note: one can imply the *actual bankruptcy costs upon default*, A, from the value of the firm. By our valuation formula,

$$\begin{aligned} V &= \frac{1}{1+r}E^*[V'] \\ &= \frac{1}{1.12}\left[(0.6)250 + (0.4)(100 - A)\right] \\ &= 163. \end{aligned}$$

Hence, $A = \$18.6$

17.8 If bonds are in place (the firm has collected the money), then shareholders may have the incentive to change projects, towards a more volatile one. This may even be a negative NPV project. We saw an example in class, although the new project had the same NPV as the old one. Covenants, warrants and conversion rights attached to the bonds will keep shareholders from doing so.

18.2 Use the formula on p. 168 (also referred to as Adjusted Present Value or APV):

$$V^L = V^U + \tau_c B^L.$$

In this case, B^L equals \$1 million (the face value of the bonds is \$1 million, the coupon is 10%, and the interest rate is 10%, so the value is \$1 million). Hence, in millions:

$$V^L = 3.5 + (0.3)1 = 3.8.$$

18.6

1. Determine the state-price probabilities:

$$100 = \frac{1}{1.1}(p^u 150 + (1 - p^u)50).$$

So, $p^u = 0.60$. Now compute the value of the firm V^L after the debt issue, namely, the old value V^U plus the value of the debt tax shield:

$$V^L = V^U + \frac{1}{1.1}(p^u(0.5)10 + (1 - p^u)(0.5)5) = 103.6.$$

2. The APV (adjusted present value) is given by the formula on p. 168:

$$V^L = V^U + \tau_c B^L.$$

In this case, the value of debt, B^L, equals

$$B^L = \frac{1}{1.1}(p^u 110 + (1 - p^u)(50 + (0.5)5)) = 79.1.$$

Hence,

$$V^L = 100 + (0.5)(79.1) = 139.6.$$

3. The APV only applies to a riskfree world with perpetual cash flows and perpetual bonds.