

## ECONOMICS 448, Review 4

16.12 The general expression for the value of a leveraged firm in a world in which  $T_s=0$  is

$$V_L = V_U + [1 - (1 - T_C)(1 - T_S)/(1 - T_B)]B - C(B)$$

where:

$V_U$  = Value of an unlevered firm

$T_C$  = Efficient corporate tax rate for the firm

$T_B$  = Personal tax rate of the marginal bondholder

$B$  = Debt level of the firm

$C(B)$  = Present value of the cost of financial distress for the firm as a function of its debt level. [Note:  $C(B)$  encompasses all non-tax-related effects of leverage on the firm's value]

Assume all investors are risk-neutral.

- a. In their no-tax model, what do Modigliani and Miller assume about  $T_C$ ,  $T_B$  and  $C(B)$ ? What do the assumption imply about a firm's optimal debt-equity ratio?
- b. In their model that includes taxes, what do Modigliani and Miller assume about  $T_C$ ,  $T_B$  and  $C(B)$ ? What do these assumptions imply about a firm's optimal debt-equity ratio?
- c. Assume that IBM is certain to be able to use its interest deductions to reduce its corporate tax bill. What would the change in the value of IBM be if the company issued \$1 billion in debt and used the proceeds to repurchase equity? Assume that the personal tax rate on bond income is 20 percent, the corporate tax rate is 34 percent, and the cost of financial distress is zero.
- d. Assume that USX is virtually certain not to be able to use interest reductions. What would the change in the value of the company be from adding \$1 of perpetual debt rather than \$1 of equity? Assume that the personal tax rate on bond income is 20 percent, the corporate tax rate is 35 percent, and the cost of financial distress is zero.
- e. For companies that may or may not be able to use the interest deduction, what would the change in the value of the company be from adding \$1 of perpetual debt rather than \$1 of equity? Assume that the personal tax rate on bond income is 20 percent, the corporate tax rate is 35 percent, and the costs of financial distress are zero. Also assume the probability of using the incremental deduction is 65 percent.

16.14: The EXES Company is assessing its present capital structure and that structure's implications for the welfare of its investors. EXES is currently financed entirely with common stocks, of which 1,000 shares are outstanding. Given the risk of the underlying cash flows (EBIT) generated by EXES, investors currently require a 20-percent return on the EXES common stock. The company pays out all earnings as dividends to common stockholders.

EXES estimates that operating income may be \$1,000, \$2,000, or \$4,200 with respective probabilities of 0.1, 0.4 and 0.5. Assume the firm's expectations about earnings will be met and that they will be unchanged in perpetuity. Also, assume that the corporate and personal tax rates are equal to zero.

- a. What is the value of EXES Company?
- b. The president of EXES has decided that shareholders would be better off if the company had equal proportions of debt and equity. He therefore propose to issue \$7,500 of debt at an interest rate of 10 percent. He will use the proceeds to purchase 500 shares of common stock.
  - i. **What will the new value of the firm be?**
  - ii. **What will the value of EXES's debt be?**
  - iii. **What will the value of EXES's equity be?**
- c. Suppose the president's proposal is implemented?
  - i. **What is the required rate of return on equity?**
  - ii. **What is the firm's overall required return?**
- d. Suppose the corporate tax rate is 40 percent.
  - i. **Use the Modigliani-Miller framework that includes taxes to find the value of the firm.**
  - ii. **Does the presence of taxes increase or decrease the value of the firm? Why?**
  - iii. **Verbally explain how the presence of bankruptcy costs would change the effect of taxes on the value of the firm, if at all.**
- e. Suppose interest income is taxed at 40 percent while the effective tax on returns to equity holders is zero. Assume that the introduction of the personal tax rate not affect the required return on equity.
  - i. **What is the value of EXES in a world with personal taxes?**
  - ii. **Under the Miller model, what will happen to the value of the firm as the tax of interest income rises?**

**16.17** The Gulf Power Company is an electric utility planning to build a new power-generating plant of conventional design. The company has traditionally paid out all earnings to the stockholders as dividends and financed capital expenditures with new issues of common stock. There is no debt or preferred stock presently outstanding. Data on the company and the new power plan follow. Assume all earnings streams are perpetuities that are constant.

**Company Data**

Current annual earnings: \$27 million.

Number of outstanding shares: 10 million

**New Power Plant**

Initial outlay: \$20 million

Added annual earnings: \$3 million

Management estimates the rate of return currently required by stockholders to be 10 percent per year and considers the power plant to have the same risk as existing assets. Assume there are no taxes, no cost of bankruptcy, and perfect capital markets.

- a. What will be the total cost market value of Gulf Power if common stock is issued to finance the plant?
- b. What will be the total value (stock plus bonds) of the firm if \$20 million in bonds at an interest rate of 8 percent is issued to finance the plant, assuming the bonds are perpetuities?
- c. Given the bonds will be issued as in (b), calculate the rate of return required by stockholders after the financing occurred and the plant has been built.

17.2 Peatco, Inc., is considering a \$2.1 million project that will be depreciated according to the straight-line method over the three-year life of the project. The project will generate pretax earnings of \$900,000 per year, and it will not change the risk level of the firm. Peatco can obtain a three-year, 12.5-percent loan to finance the project; the bank will charge Peatco flotation fees of 1 percent of the gross proceeds of the loan. The fee must be paid up front, not from the loan proceeds. If Peatco financed the project with all equity, its cost of capital would be 18 percent. The tax rate is 30 percent, and the risk-free rate is 6 percent.

- a. Using the APV method, determine whether or not Peatco should undertake the project.
- b. After hearing that Peatco would not be initiating the project in their town, the city council voted to subsidized Peatco's loan. Under the city's proposal, Peatco will pay the same flotation costs, but the rate on the loan will be 10 percent. Should Peatco accept the city's offer and begin the project?

17.4 Roller and Decker Corp. has established a joint venture with Malaysia Road Construction Company to build a toll road in Malaysia. The initial investment in paving equipment is \$20 million. Straight-line depreciation will be used, and the equipment has an economic life of five years with no salvage value. The annual construction costs are estimated to be \$10 million. The project will be finished in two years. Net toll revenue collected from the usage of the road is projected to be \$6 million per annum for 20 years starting from the end of the first year of usage. The local preferential corporate tax rate for joint ventures is 25 percent. There are no other taxes. The required rate of return for the project under all-equity financing is 12 percent. The prevailing market interest rate is 9 percent. To encourage foreign capital participation in the infrastructure sector, the Malaysian government will subsidize the project with \$10 million of a 15-year, long-term loan, at an interest rate of 5 percent a year. What is the NPV of this project?



