

## Capital Structure Decisions

|                           |        |
|---------------------------|--------|
| - Relevant textbook pages | - none |
| - Relevant eoc-problems   | - none |
| - Other relevant material | - None |
| - Assignments             | - None |
| - Other information       | - None |

## Fundamentals of Capital Structure Theory

### ◆ The Capital Structure Decision

- Firms regularly raise capital to invest in assets
  - Each time there is a choice between debt and equity, and this choice is influenced – among other things - by the firm's dividend policy
- there is **no general overall “optimal capital structure”**

### ◆ Target Capital Structure

- Using more debt raises the risk borne by stockholders (which usually lowers the stock price) ...
- ... but usually also leads to a higher ROE (which usually raises the stock price)
- Therefore: The optimal capital structure is based on a balance between risk and return, so that the stock price of the firm is being maximized

### ◆ Actual capital structure can vary from the target capital structure and is mainly influenced by ...

- Business risk (riskiness of the unleveraged firm's operations (i.e. if it used no debt)
- Tax situation → level of the **effective** tax rate
- Financial flexibility (ability to raise capital)
- Managerial attitude towards risk
- Growth opportunities vs. “assets-in-place”
- etc.

## Business Risk and Financial Risk

### ◆ Business Risk

- Riskiness of the firm's stock if it uses no debt
- Inherent in firm's operations
- Business risk of a leverage-free (i.e. debt-free) firm can be measured by the standard deviation of its ROIC (return on invested capital, for a debt-free company comparable to ROE)

### ◆ Business Risk mainly depends on

- **Variability** of demand, sales prices, input costs
- **Market power**, i.e. ability to adjust output prices
- Ability to **develop new products**
- Exposure to **foreign risk** (exchange rate risk, interest rate risk, political risk, etc.)
- **Operating Leverage** (extent to which costs are fixed):  
If a high percentage of a firm's total costs are fixed
  - high degree of operating leverage
  - a relatively small change in revenues results in a large change in earnings and ROE

## ◆ Financial Risk

- Additional risk placed on the common stockholders as a result of debt financing, usually measured by the *standard deviation of its levered RoE minus the standard deviation of its unlevered RoE*
- **Financial Leverage usually “leverages up” the expected ROE, but also increases the standard deviation (i.e. also increases the “risk”) of the levered RoE**

### Example:

- Assets = \$175,000; EBIT = \$35,000; Interest rate = 10%;
- Taxes = 40%, standard deviation of ROE = 8%.
- The company changes the capital structure from 100% equity-financing to 50% equity and 50% debt.
- Effects on ROE, business risk, financial risk? Tax shield?

|          | Before (100% Equity) |        |                                    | After (50% equity/50% debt) |        |  |
|----------|----------------------|--------|------------------------------------|-----------------------------|--------|--|
|          |                      | Exp.   |                                    |                             | Exp.   |  |
| EBIT     |                      | 35,000 |                                    |                             | 35,000 |  |
| Interest |                      | 0      |                                    |                             | 8,750  |  |
| EBT      |                      | 35,000 |                                    |                             | 26,250 |  |
| Tax      |                      | 14,000 |                                    |                             | 10,500 |  |
| NI       |                      | 21,000 |                                    |                             | 15,750 |  |
| RoE      |                      |        |                                    |                             |        |  |
|          |                      |        | Total expected return to investors |                             |        |  |

The use of debt shields a portion of a company’s earnings from the tax collector

## Estimating the Optimal Capital Structure

### ◆ General Aspects

- The optimal capital structure is the one that maximizes the price of the firm's stock
- Higher debt levels usually raise expected earnings per share, but also increase the firm's risk

### ◆ WACC and Capital Structure

- Corporate valuation model:  
Value of a firm = PV of future free cash flows, discounted at the WACC:

$$Value = \sum_{t=1}^{\infty} \frac{(FreeCashFlows)_t}{(1 + WACC)^t}$$

- The maximum value occurs with the capital structure that minimizes the WACC

### ◆ Hamada Equation

- Increase in debt ratio also increases the risk faced by shareholders, which can be measured with Beta
- Hamada Equation shows the effect of financial leverage on Beta:

$$Beta_{levered} = Beta_{unlevered} \left[ 1 + (1-t) \cdot \frac{D}{E} \right]$$

$$Beta_{unlevered} = Beta_{levered} \cdot \frac{1}{1 + (1-t) \cdot \left( \frac{D}{E} \right)}$$

### Example (1)

Elliott Athletics is trying to determine its optimal capital structure, which now consists of only debt and common equity. The firm does not currently use preferred stock in its capital structure, and it does not plan to do so in the future. To estimate how much its debt would cost at different debt levels, the company's treasury staff has consulted with investment bankers and, on the basis of those discussions, has created the following table:

| Market Debt-to-Value Ratio ( $w_d$ ) | Market Equity-to-Value Ratio ( $w_e$ ) | Market Debt-to-Equity Ratio (D/S) | Bond Rating | Before-Tax Cost of Debt ( $r_d$ ) |
|--------------------------------------|--|-----------------------------------|-------------|-----------------------------------|
| 0.0                                  | 1.0                                    | 0.00                              | A           | 7.0%                              |
| 0.2                                  | 0.8                                    | 0.25                              | BBB         | 8.0                               |
| 0.4                                  | 0.6                                    | 0.67                              | BB          | 10.0                              |
| 0.6                                  | 0.4                                    | 1.50                              | C           | 12.0                              |
| 0.8                                  | 0.2                                    | 4.00                              | D           | 15.0                              |

Elliott uses the CAPM to estimate its cost of common equity,  $r_s$ . The company estimates that the risk-free rate is 5 percent, the market risk premium is 6 percent, and its tax rate is 40 percent. Elliott estimates that if it had no debt, its "unlevered" beta,  $b_U$ , would be 1.2. Based on this information, what is the firm's optimal capital structure, and what would the weighted average cost of capital be at the optimal capital structure?

| D/E  | k(d) | k(d) a/tax | Beta* | k(s)** | WACC*** |
|------|------|------------|-------|--------|---------|
| 0    | 7    |            | 1.2   |        |         |
| 0.25 | 8    |            |       |        |         |
| 0.67 | 10   |            |       |        |         |
| 1.5  | 12   |            |       |        |         |
| 4    | 15   |            |       |        |         |

\* Using the Hamada equation

\*\*  $k(s) = 5 + \text{Beta} \cdot 6$

\*\*\*  $\text{WACC} = (D/(D+E)) \cdot k(d) \cdot a/\text{tax} + (E/(D+E)) \cdot k(s)$

### Example (2):

Beckman Engineering and Associates (BEA) is considering a change in its capital structure. BEA currently has \$20 million in debt carrying a rate of 8 percent, and its stock price is \$40 per share with 2 million shares outstanding. BEA is a zero growth firm and pays out all of its earnings as dividends. EBIT is \$14.933 million, and BEA faces a 40 percent federal-plus-state tax rate. The market risk premium is 4 percent, and the risk free rate is 6 percent. BEA is considering increasing its debt level to a capital structure with 40 percent debt, based on market values, and repurchasing shares with the extra money that it borrows. BEA will have to retire the old debt in order to issue new debt, and the rate on the new debt will be 9 percent. BEA has a beta of 1.0.

- a. What is BEA's unlevered beta? Use market value D/S when unlevering.
- b. What are BEA's new beta and cost of equity if it has 40 percent debt?
- c. What are BEA's WACC and total value of the firm with 40 percent debt?

## Capital Structure Theory

### ◆ Trade-off theory

- Debt is useful because interest is tax-deductible
- Debt brings costs associated with actual or potential bankruptcy
- The optimal capital structure strikes a balance between the tax benefits of debt and the costs associated with bankruptcy

### ◆ Signaling theory

- A firm's decision to use debt or stock to raise new capital gives a signal to investors
- A stock issue – according to this theory – sets off a negative signal, using debt is perceived as a positive (or neutral) signal
- Therefore companies are reluctant to issue new stock by maintaining a reserve borrowing capacity, which means that in “normal” times less debt is used than the trade-off theory would suggest