

Chapter 13

Leverage and Capital Structure

Key Concepts and Skills

- Understand the effect of financial leverage on cash flows and cost of equity
- Understand the impact of taxes and bankruptcy on capital structure choice
- Understand the basic components of the bankruptcy process

Chapter Outline

- The Capital Structure Question
- The Effect of Financial Leverage
- Capital Structure and the Cost of Equity Capital
- Corporate Taxes and Capital Structure
- Bankruptcy Costs
- Optimal Capital Structure
- Observed Capital Structures
- A Quick Look at the Bankruptcy Process

Capital Restructuring

- We are going to look at how changes in capital structure affect the value of the firm, *all else equal*
- Capital restructuring involves changing the amount of leverage a firm has without changing the firm's assets
- Increase leverage by issuing debt and repurchasing outstanding shares
- Decrease leverage by issuing new shares and retiring outstanding debt

Choosing a Capital Structure

- What is the primary goal of financial managers?
 - Maximize stockholder wealth
- We want to choose the capital structure that will maximize stockholder wealth
- We can maximize stockholder wealth by maximizing firm value or minimizing WACC

The Effect of Leverage

- How does leverage affect the EPS and ROE of a firm?
- When we increase the amount of debt financing, we increase the fixed interest expense
- If we have a really good year, then we pay our fixed costs, and have more left over for our stockholders
- If we have a really bad year, we still have to pay our fixed costs, and have less left over for our stockholders
- Leverage amplifies the variation in both EPS and ROE

Break-Even EBIT

- Find EBIT where EPS is the same under both the current and proposed capital structures
- If we expect EBIT to be *greater* than the break-even point, then leverage is *beneficial* to our stockholders
- If we expect EBIT to be *less* than the break-even point, then leverage is *detrimental* to our stockholders

Example: Break-Even EBIT

$$\frac{\text{EBIT}}{400,000} = \frac{\text{EBIT} - 400,000}{200,000}$$

$$\text{EBIT} = \left[\frac{400,000}{200,000} \right] (\text{EBIT} - 400,000)$$

$$\text{EBIT} = 2\text{EBIT} - 800,000$$

$$\text{EBIT} = \$800,000$$

$$\text{EPS} = \frac{800,000}{400,000} = \$2.00$$

Capital Structure Theory

- Modigliani and Miller Theory of Capital Structure
 - Proposition I – firm value
 - Proposition II – WACC
- The value of the firm is determined by the cash flows to the firm and the risk of the firm's assets
- Changing firm value
 - Change the risk of the cash flows
 - Change the cash flows

Capital Structure Theory Under Three Special Cases

- Case I – Assumptions
 - No corporate or personal taxes
 - No bankruptcy costs
- Case II – Assumptions
 - Corporate taxes, but no personal taxes
 - No bankruptcy costs
- Case III – Assumptions
 - Corporate taxes, but no personal taxes
 - Bankruptcy costs

Case I – Propositions I and II

- Proposition I
 - The value of the firm is NOT affected by changes in the capital structure
 - The cash flows of the firm do not change; therefore, value doesn't change
- Proposition II
 - The WACC of the firm is NOT affected by capital structure

Case I - Equations

- $WACC = R_A = (E/V)R_E + (D/V)R_D$
- $R_E = R_A + (R_A - R_D)(D/E)$
 - R_A is the “cost” of the firm’s business risk (i.e., the risk of the firm’s assets)
 - $(R_A - R_D)(D/E)$ is the “cost” of the firm’s financial risk (i.e., the additional return required by stockholders to compensate for the risk of leverage)

Figure 13.3



$$R_E = R_A + (R_A - R_D) \times (D/E) \text{ by M\&M Proposition II}$$

$$R_A = \text{WACC} = \left(\frac{E}{V}\right) \times R_E + \left(\frac{D}{V}\right) \times R_D$$

$$\text{where } V = D + E$$

The CAPM, the SML, and Proposition II

- How does financial leverage affect systematic risk?
- CAPM: $R_A = R_f + \beta_A(R_M - R_f)$
 - Where β_A is the firm's asset beta, which measures the systematic risk of the firm's assets
- Proposition II
 - Replace R_A with the CAPM and assume that the debt is riskless ($R_D = R_f$)
 - $R_E = R_f + \beta_A(1+D/E)(R_M - R_f)$

Business Risk and Financial Risk

- $R_E = R_f + \beta_A(1+D/E)(R_M - R_f)$
- CAPM: $R_E = R_f + \beta_E(R_M - R_f)$
 - $\beta_E = \beta_A(1 + D/E)$
- Therefore, the systematic risk of the stock depends on:
 - Systematic risk of the assets, β_A , (business risk)
 - Level of leverage, D/E , (financial risk)

Case II – Cash Flows

- Interest is tax deductible
- Therefore, when a firm adds debt, it reduces taxes, all else equal
- The reduction in taxes increases the cash flow of the firm
- How should an increase in cash flows affect the value of the firm?

Case II - Example

| | Unlevered Firm | Levered Firm |
|-----------------------|----------------|--------------|
| EBIT | 5,000 | 5,000 |
| Interest | 0 | 500 |
| Taxable Income | 5,000 | 4,500 |
| Taxes (34%) | 1,700 | 1,530 |
| Net Income | 3,300 | 2,970 |
| CFFA | 3,300 | 3,470 |

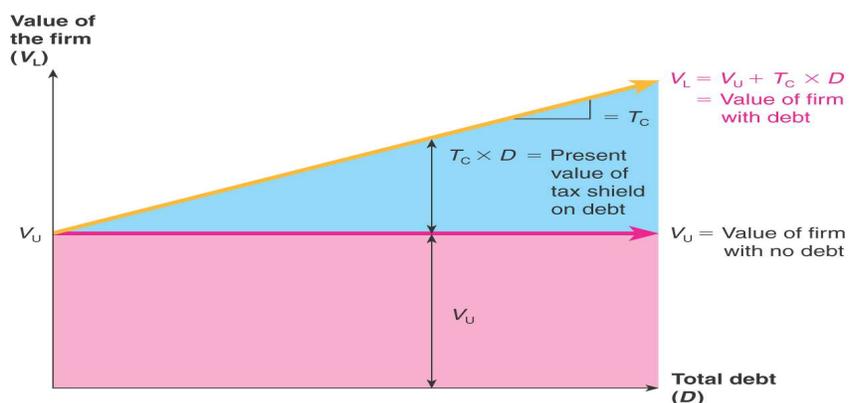
Interest Tax Shield

- Annual interest tax shield
 - Tax rate times interest payment
 - \$6,250 in 8% debt = \$500 in interest expense
 - Annual tax shield = $.34(\$500) = \170
- Present value of annual interest tax shield
 - Assume perpetual debt for simplicity
 - $PV = \$170 / .08 = \$2,125$
 - $PV = D(R_D)(T_C) / R_D = D * T_C = \$6,250(.34) = \$2,125$

Case II – Proposition I

- The value of the firm increases by the present value of the annual interest tax shield
 - Value of a levered firm = value of an unlevered firm + PV of interest tax shield
 - Value of equity = Value of the firm – Value of debt
- Assuming perpetual cash flows
 - $V_U = \text{EBIT}(1-T) / R_U$
 - $V_L = V_U + D \cdot T_C$

Figure 13.4



The value of the firm increases as total debt increases because of the interest tax shield. This is the basis of M&M Proposition I with taxes.

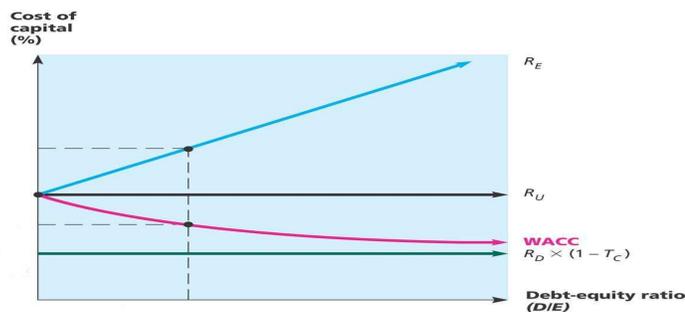
Case II – Proposition II

- The WACC decreases as D/E increases because of the government subsidy on interest payments
 - $R_A = (E/V)R_E + (D/V)(R_D)(1-T_C)$
 - $R_E = R_U + (R_U - R_D)(D/E)(1-T_C)$
- Example
 - $R_E = .12 + (.12 - .09)(75/86.67)(1 - .35) = 13.69\%$
 - $R_A = (86.67/161.67)(.1369) + (75/161.67)(.09)(1 - .35)$
 $R_A = 10.05\%$

Case II – Proposition II Example

- Suppose that the firm changes its capital structure so that the debt-to-equity ratio becomes 1.
- What will happen to the cost of equity under the new capital structure?
 - $R_E = .12 + (.12 - .09)(1)(1 - .35) = 13.95\%$
- What will happen to the weighted average cost of capital?
 - $R_A = .5(.1395) + .5(.09)(1 - .35) = 9.9\%$

Case II – Graph of Proposition II



M&M Proposition I with taxes implies that a firm's WACC decreases as the firm relies more heavily on debt financing:

$$WACC = \left(\frac{E}{V}\right) \times R_E + \left(\frac{D}{V}\right) \times R_D \times (1 - T_C)$$

M&M Proposition II with taxes implies that a firm's cost of equity R_E rises as the firm relies more heavily on debt financing:

$$R_E = R_U + (R_U - R_D) \times (D/E) \times (1 - T_C)$$

Case III

- Now we add bankruptcy costs
- As the D/E ratio increases, the probability of bankruptcy increases
- This increased probability will increase the expected bankruptcy costs
- At some point, the additional value of the interest tax shield will be offset by the expected bankruptcy costs
- At this point, the value of the firm will start to decrease and the WACC will start to increase as more debt is added

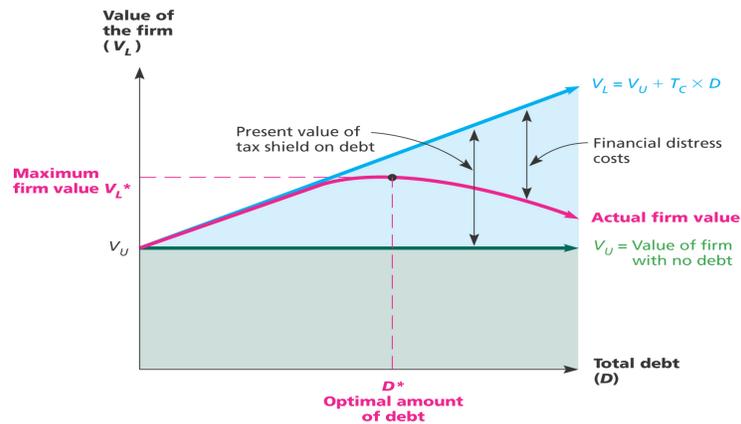
Bankruptcy Costs

- Direct costs
 - Legal and administrative costs
 - Ultimately cause bondholders to incur additional losses
 - Disincentive to debt financing
- Financial distress
 - Significant problems in meeting debt obligations
 - Most firms that experience financial distress do not ultimately file for bankruptcy

More Bankruptcy Costs

- Indirect bankruptcy costs
 - Larger than direct costs, but more difficult to measure and estimate
 - Stockholders wish to avoid a formal bankruptcy filing
 - Bondholders want to keep existing assets intact so they can at least receive that money
 - Assets lose value as management spends time worrying about avoiding bankruptcy instead of running the business
 - Also have lost sales, interrupted operations, and loss of valuable employees

Figure 13.5

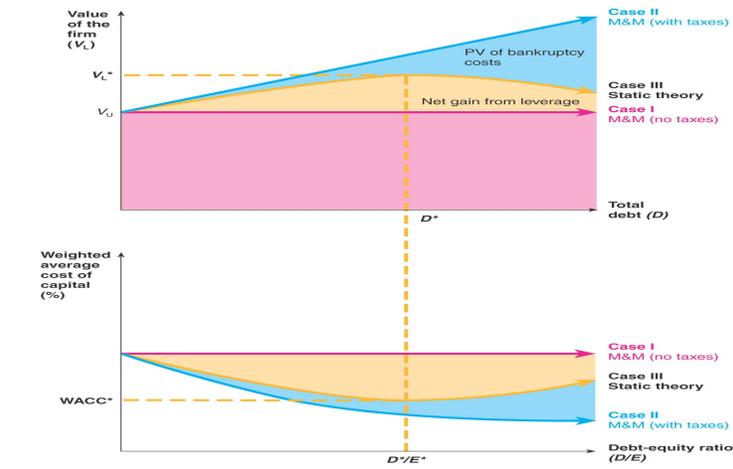


According to the static theory, the gain from the tax shield on debt is offset by financial distress costs. An optimal capital structure exists that just balances the additional gain from leverage against the added financial distress cost.

Conclusions

- Case I – no taxes or bankruptcy costs
 - No optimal capital structure
- Case II – corporate taxes but no bankruptcy costs
 - Optimal capital structure is 100% debt
 - Each additional dollar of debt increases the cash flow of the firm
- Case III – corporate taxes and bankruptcy costs
 - Optimal capital structure is part debt and part equity
 - Occurs where the benefit from an additional dollar of debt is just offset by the increase in expected bankruptcy costs

Figure 13.6



Additional Managerial Recommendations

- The tax benefit is only important if the firm has a large tax liability
- Risk of financial distress
 - The greater the risk of financial distress, the less debt will be optimal for the firm
 - The cost of financial distress varies across firms and industries; as a manager, you need to understand the cost for your industry

Observed Capital Structures

- Capital structure does differ by industries
- Differences according to *Cost of Capital 2004 Yearbook by Ibbotson Associates, Inc.*
 - Lowest levels of debt
 - Drugs with 6.39% debt
 - Electrical components with 6.97% debt
 - Highest levels of debt
 - Airlines with 64.35% debt
 - Department stores with 46.13% debt

Bankruptcy Process - I

- Business failure – business has terminated with a loss to creditors
- Legal bankruptcy – petition federal court for bankruptcy
- Technical insolvency – firm is unable to meet debt obligations
- Accounting insolvency – book value of equity is negative

Bankruptcy Process - II

- Liquidation
 - Chapter 7 of the Federal Bankruptcy Reform Act of 1978
 - Trustee takes over assets, sells them, and distributes the proceeds according to the absolute priority rule
- Reorganization
 - Chapter 11 of the Federal Bankruptcy Reform Act of 1978
 - Restructure the corporation with a provision to repay creditors