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** = \( R_A = \frac{E}{V} R_E + \frac{D}{V} R_D \)

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

<table>
<thead>
<tr>
<th></th>
<th>Unlevered Firm</th>
<th>Levered Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EBIT</strong></td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>Interest</strong></td>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td><strong>Taxable Income</strong></td>
<td>5,000</td>
<td>4,500</td>
</tr>
<tr>
<td><strong>Taxes (34%)</strong></td>
<td>1,700</td>
<td>1,530</td>
</tr>
<tr>
<td><strong>Net Income</strong></td>
<td>3,300</td>
<td>2,970</td>
</tr>
<tr>
<td><strong>CFFA</strong></td>
<td>3,300</td>
<td>3,470</td>
</tr>
</tbody>
</table>

### Interest Tax Shield

- **Annual interest tax shield**
  - Tax rate times interest payment
  - $6,250 in 8% debt = $500 in interest expense
  - Annual tax shield = $0.34($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
  ▪ $V_U = \frac{\text{EBIT}(1-T)}{R_U}$
  ▪ $V_L = V_U + D^*T_C$

![Figure 13.4](image_url)

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
  - \( R_A = \frac{E}{V} R_E + \frac{D}{V} (R_D)(1-T_C) \)
  - \( R_E = R_U + (R_U - R_D)(D/E)(1-T_C) \)
- Example
  - \( R_E = .12 + (.12 -.09)(75/86.67)(1-.35) = 13.69\% \)
  - \( R_A = \frac{86.67}{161.67}(13.69) + (75/161.67)(.09)(1-.35) \)
    \( R_A = 10.05\% \)

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:

\[
\text{WACC} = \left(1 - T_c\right) \times R_e + \left(1 - T_c\right) \times R_u = (1 - T_c)
\]

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:

\[
R_e - R_d = (R_u - R_d) \times (D/E) = (1 - T_c)
\]

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
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
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