Capital Structure I

The Big Picture: Part I - Financing

A. Identifying Funding Needs
   • Feb 6        Case: Wilson Lumber 1
   • Feb 11       Case: Wilson Lumber 2

B. Optimal Capital Structure: The Basics
   • Feb 13       Lecture: Capital Structure 1
   • Feb 20       Lecture: Capital Structure 2
   • Feb 25       Case: UST Inc.
   • Feb 27       Case: Massey Ferguson

C. Optimal Capital Structure: Information and Agency
   • Mar 4        Lecture: Capital Structure 3
   • Mar 6        Case: MCI Communications
   • Mar 11       Financing Review
   • Mar 13       Case: Intel Corporation
The Key Questions of Corporate Finance

- **Valuation**: How do we distinguish between good investment projects and bad ones?

- **Financing**: How should we finance the investment projects we choose to undertake?

Financing Policy

- Real investment policies imply funding needs.

- We have tools to forecast the funding needs to follow a given real investment policy (from Wilson Lumber)

- But what is the best source of funds?
  - Internal funds (i.e., cash)?
  - Debt (i.e., borrowing)?
  - Equity (i.e., issuing stock)?

- Moreover, different kinds of ...
  - internal funds (e.g., cash reserves vs. cutting dividends)
  - debt (e.g., Banks vs. Bonds)
  - equity (e.g., VC vs. IPO)
Capital Structure

- Capital Structure represents the mix of claims against a firm's assets and free cash flow.

- Some characteristics of financial claims:
  - Payoff structure (e.g., fixed promised payment)
  - Priority (debt paid before equity)
  - Maturity
  - Restrictive Covenants
  - Voting rights
  - Options (convertible securities, call provisions, etc)

- We focus on leverage (debt vs. equity) and how it can affect firm value.

Choosing an Optimal Capital Structure

- Is there an “optimal” capital structure, i.e., an optimal mix between debt and equity?

- More generally, can you add value on the RHS of the balance sheet, i.e., by following a good financial policy?

- If yes, does the optimal financial policy depend on the firm’s operations (Real Investment policy), and how?
Companies and Industries Vary in Their Capital Structures

<table>
<thead>
<tr>
<th>Industry</th>
<th>Debt Ratio* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric and Gas</td>
<td>43.2</td>
</tr>
<tr>
<td>Food Production</td>
<td>22.9</td>
</tr>
<tr>
<td>Paper and Plastic</td>
<td>30.4</td>
</tr>
<tr>
<td>Equipment</td>
<td>19.1</td>
</tr>
<tr>
<td>Retailers</td>
<td>21.7</td>
</tr>
<tr>
<td>Chemicals</td>
<td>17.3</td>
</tr>
<tr>
<td>Computer Software</td>
<td>3.5</td>
</tr>
<tr>
<td>Average over all industries</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

* Debt Ratio = Ratio of book value of debt to the sum of the book value of debt plus the market value of equity.
Returns

Average rates of return on Treasury bills, government bonds, corporate bonds, and common stocks, 1926-1997 (figures in percent per year)

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Average Annual Rate (over T-Bills)</th>
<th>Average Risk Premium (over T-Bills)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nominal</td>
<td>Real</td>
</tr>
<tr>
<td>Treasury bills</td>
<td>3.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Government bonds</td>
<td>5.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Corporate bonds</td>
<td>6.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Common stocks (S&amp;P 500)</td>
<td>13.0</td>
<td>9.7</td>
</tr>
<tr>
<td>Small-firm common stocks</td>
<td>17.7</td>
<td>14.2</td>
</tr>
</tbody>
</table>


Plan of Attack

1. Modigliani-Miller Theorem:
   → Capital Structure is irrelevant

2. What’s missing from the M-M view?
   → Taxes
   → Costs of financial distress
   → Other factors

3. “Textbook” view of optimal capital structure:
   → The choice between debt and equity

4. Apply/confront this framework to several business cases
   → Evaluate when its usefulness and its limitations
M-M’s “Irrelevance” Theorem

MM Theorem (without taxes for now).
- Financing decisions are irrelevant for firm value.
- In particular, the choice of capital structure is irrelevant.

Proof: From Finance Theory I,
- Purely financial transactions do not change the total cash flows and are therefore zero NPV investments.
- With no arbitrage opportunities, they cannot change the total price.
- Thus, they neither increase nor decrease firm value.

Q.E.D.

Example

Consider two firms with identical assets (in $M):

<table>
<thead>
<tr>
<th>Asset (economic, not book) value next year:</th>
<th>Firm A</th>
<th>Firm B</th>
</tr>
</thead>
<tbody>
<tr>
<td>In state 1:</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>In state 2:</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

- Firm A is all equity financed:
  → Firm A’s value is \( V(A) = E(A) \)

- Firm B is financed with a mix of debt and equity:
  → Debt with one year maturity and face value $60M
  → Market values of debt \( D(B) \) and equity \( E(B) \)
  → Firm B’s value is (by definition) \( V(B) = D(B) + E(B) \)

- MM says: \( V(A) = V(B) \)
Proof 1

- Firm A’s equity gets all cash flows
- Firm B’s cash flows are split between its debt and equity with debt being senior to equity.

<table>
<thead>
<tr>
<th>Claim's value next year:</th>
<th>Firm A’s Equity</th>
<th>Firm B’s Debt</th>
<th>Firm B’s Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>In state 1:</td>
<td>160</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>In state 2:</td>
<td>40</td>
<td>40</td>
<td>0</td>
</tr>
</tbody>
</table>

- In all (i.e., both) states of the world, the following are equal:
  → The payoff to Firm A’s equity
  → The sum of payoffs to Firm B’s debt and equity

- By value additivity, \[ D(B) + E(B) = E(A) \]  
  Q.E.D.

M-M Intuition 1

- If Firm A were to adopt Firm B’s capital structure, its total value would not be affected (and vice versa).

- This is because ultimately, its value is that of the cash flows generated by its operating assets (e.g., plant and inventories).

- The firm’s financial policy divides up this cashflow “pie” among different claimants (e.g., debtholders and equityholders).

- But the size (i.e., value) of the pie is independent of how the pie is divided up.
Proof 2

- In case you forgot where value additivity comes from...

- Assume for instance that market values are:
  → $D(B) = 50M$
  → $E(B) = 50M$

- MM says: $V(A) = D(B) + E(B) = 100M$

- Suppose instead that $E(A) = 105M$.
  - Can you spot an arbitrage opportunity?
Proof 2 (cont.)

- Arbitrage strategy:
  - Buy 1/1M of Firm B’s equity for $50
  - Buy 1/1M of Firm B’s debt for $50
  - Sell 1/1M of Firm A’s equity for $105

<table>
<thead>
<tr>
<th></th>
<th>Today</th>
<th>Next year State 1</th>
<th>Next year State 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm B’s equity</td>
<td>-$50</td>
<td>+$100</td>
<td>$0</td>
</tr>
<tr>
<td>Firm B’s debt</td>
<td>-$50</td>
<td>+$60</td>
<td>+$40</td>
</tr>
<tr>
<td>Subtotal</td>
<td>-$100</td>
<td>+$160</td>
<td>+$40</td>
</tr>
<tr>
<td>Firm A’s equity</td>
<td>+$105</td>
<td>-$160</td>
<td>-$40</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$5</td>
<td>$0</td>
</tr>
</tbody>
</table>

Note: Combining Firm B’s debt and equity amounts to “undoing Firm B’s leverage” (see bolded cells).

M-M: Intuition 2

- Investors will not pay a premium for firms that undertake financial transactions that they can undertake themselves (at the same cost).

- For instance, they will not pay a premium for Firm A over Firm B for having less debt.

- Indeed, by combining Firm B’s debt and equity in appropriate proportions, any investor can in effect “unlever” Firm B and reproduce the cashflow of Firm A.
The Curse of M-M

• M-M Theorem was initially meant for capital structure.

• But it applies to all aspects of financial policy:
  → capital structure is irrelevant.
  → long-term vs. short-term debt is irrelevant.
  → dividend policy is irrelevant.
  → risk management is irrelevant.
  → etc.

• Indeed, the proof applies to all financial transactions because they are all zero NPV transactions.

Using M-M Sensibly

• M-M is not a literal statement about the real world. It obviously leaves important things out.

• But it gets you to ask the right question: How is this financing move going to change the size of the pie?

• M-M exposes some popular fallacies such as the “WACC fallacy”.