Capital Structure: Theory and Practical Decision Making

How do firms choose Capital Structures?
Can managers affect firm value by employing different debt/equity mix?
Modigliani & Miller Framework

Modigliani-Miller (MM) Propositions—3 situations with differing set of assumptions:
1. World without taxes:
2. World with Corporate Taxes
3. World with Corporate & Personal Taxes
Modigliani & Miller Framework
-- Continued

What do the two Propositions say for each of the 3 situations?

Proposition I-- Deals with Value of firm
Proposition II-- Deals with WACC of firm
World Without Taxes (Prop. I) {MM 1958}

Conventional wisdom prior to 1958

- leverage is good: increases $V_{firm}$
  - leverage $\rightarrow$ WACC ↓

MM: Firm’s value (S/H wealth) is unaffected by Capital Structure (leverage)

- set of restrictive assumptions
Prop I-- Continued

Arbitrage support for Prop. I:  *Homemade Leverage* can be substituted for *Corporate Leverage*

● Firm cannot do anything for the investors that they can’t do for themselves.

**THUS, Proposition I:**

\[ V_L = V_U = \frac{EBIT}{r_o} \]
World Without Taxes (Prop. II)

If Prop. I holds, \( r_{\text{wacc}} \) of a firm is independent of Capital Structure employed

- as leverage ↑, (I.e., we use more of the cheaper debt), why doesn’t the \( r_{\text{wacc}} \) ↓ ???
  - cost of equity capital ↑ linearly with leverage

\[
rs = ro + \frac{B}{S} \times (ro - r_B)
\]
Terminology

- $r_B$ is the interest rate (before-tax cost of debt)
- $r_s$ is the return on (levered) equity (cost of equity)
- $r_0$ is the return on unlevered equity
  - Cost of Capital
- $B$ is the value of debt
- $S$ is the value of levered equity
The Capital-Structure Question and The Pie Theory

The value of a firm is defined to be the sum of the value of the firm’s debt and the firm’s equity.

\[ V = B + S \]

- If the goal of the management of the firm is to make the firm as valuable as possible, the firm should pick the debt-equity ratio that makes the pie as big as possible.

Value of the Firm
The Cost of Equity, the Cost of Debt, and the WACC: MM Proposition II with No Corporate Taxes

Cost of capital:

\[ r_s = r_0 + \frac{B}{S_L} \times (r_0 - r_B) \]

\[ r_{WACC} = \frac{B}{B + S} \times r_B + \frac{S}{B + S} \times r_S \]
World With Corp. Taxes (Prop. I)
{MM 1963}

Unlike Dividends, **Interest is tax-deductible**

Total income to all investors $\uparrow$ by $T_C \times r_B \times B$
(Tax rate * interest)

- *tax shield from debt (Perpetuity)*

$$V_L = V_U + PV \text{ of tax-shield} = V_U + T_C B$$

$$V_U = EBIT \times (1 - T_C)/r_o$$

**Firm value increases with Leverage**

**Optimal cap. structure might be *all debt!!*
World With Corp. Taxes (Prop. II)

Cost of equity still ↑ as B/S ↑

- However, some of the increase in equity risk and return is offset by interest tax shield
  - Thus, overall the cost of capital continues to ↓ as leverage ↑

\[ r_s = r_o + \frac{B/S}{1 - T_C} * (r_o - r_B) \]

\[ r_{wacc} \downarrow \text{ as leverage } \uparrow \]
The Effect of Financial Leverage on the Cost of Debt & Equity Capital

Debt-to-equity ratio ($B/S$)

Cost of capital: $r$

$\frac{r_S}{r_0} = \frac{r_0 + \frac{B}{S_L} \times (1-T_C) \times (r_0 - r_B)}{r_0}$

$\frac{r_{WACC}}{r_B} = \frac{B}{B + S_L} \times r_B \times (1-T_C) + \frac{S_L}{B + S_L} \times r_S$

Debt-to-equity ratio ($B/S$)
The levered firm pays less in taxes than does the all-equity firm.

Thus, the sum of the debt plus the equity of the levered firm is greater than the equity of the unlevered firm.
Miller (1977)

- Interest on bonds taxed as personal income
- Income from stocks:
- Partly from dividends (taxed as personal income) & partly from capital gains (taxed at lower CG rate)
  - Also CG taxes can be deferred
Miller (1977)

- Favorable tax treatment of income from stocks:
  - Investors are willing to accept relatively lower before-tax returns on stocks

\[
PV \text{ of Tax-Shield} = \frac{1 - (1 - T_C)(1 - T_S) * B}{(1 - T_B)}\]
Miller (1977)-- Continued

\[ V_L = V_U + PV \text{ of tax-shield} \]

What is the Gain from leverage?

- deductibility of interest favors usage of debt
- favorable tax treatment of income from stock → preference for equity financing

*What’s the net effect?*

Gain from leverage (if any) depends on relative values of \( T_C \), \( T_S \), and \( T_B \)
Miller (1977)-- Continued

- If $T_B = T_S$, we revert to Prop. I with Corp. taxes
- If $T_S = 0$, and $T_C = T_B$, no gain from leverage (original Prop. I without any taxes)
- Real-world: $T_S \neq 0$, but $T_S < T_B$
  - Some gain to leverage but not as much as the world with corporate taxes alone
Effect of Fin. Lev. on Firm Value with both corp. & personal Taxes

\[ V_L = V_U + \left[ 1 - \frac{(1-T_C) \times (1-T_S)}{1-T_B} \right] \times B \]

- \( V_L = V_U + T_C B \) when \( T_S = T_B \)
- \( V_L < V_U + T_C B \) when \( T_S < T_B \) but \( (1-T_B) > (1-T_C) \times (1-T_S) \)
- \( V_L = V_U \) when \( (1-T_B) = (1-T_C) \times (1-T_S) \)
- \( V_L < V_U \) when \( (1-T_B) < (1-T_C) \times (1-T_S) \)
EBIT- EPS analysis

What is the impact on EPS of different financing alternatives?

🔹 Future EBIT (which is NOT dependent on financing mechanism) is unpredictable

🔹 Debt → a “fixed” obligation

🔹 Debt: ↑ EPS (vis-a-vis Stock financing) during “good” years & ↓ during “bad” years
EBIT- EPS analysis-- Continued

Break-Even/Indifference point: Level of EBIT at which EPS of two financing alternatives is the same
Criticisms of MM & Miller models

- Homemade leverage leads to a larger “loss exposure” than Corporate leverage
  - discourages substitution
- Assumption of no transaction costs!
- borrowing rate_{firm} ≠ borr. rate_{personal}
- We are ignoring financial distress & agency costs
Costs of Financial Distress

probability/costs of bankruptcy might (at least partially) offset the benefits of leverage

*Indirect costs of financial distress:
- customers, suppliers, and employees take “evasive actions”
- non-optimal managerial actions
  - Deferred Maintenance
Costs of Financial Distress--Continued

**Direct costs of financial distress:**
- Legal costs, court costs, administrative costs…
- ↑ debt, ↑ the fixed interest;

Thus, ↑ the probability that a drop in the earnings will lead to financial distress:

Thus, ↑ the probability that costs of financial distress will be incurred
Financial Distress & Firm Value

\[ V_L = V_U + \text{PV of Tax Shield} \]
- PV of expected costs of financial distress

Costs of financial distress ↑ non-linearly with debt

∪ shaped value curve implies an Optimal Capital Structure
Integration of Tax Effects and Financial Distress Costs

Value of firm \( (V) \)

Present value of tax shield on debt

Value of firm under MM with corporate taxes and debt

\[ V_L = V_U + TCB \]

\( V = \text{Actual value of firm} \)

\( V_U = \text{Value of firm with no debt} \)

Maximum firm value

Optimal amount of debt

Chhachhi/519/Chs. 15 & 16

25
Integration of Tax Effects and Financial Distress Costs

There is a trade-off between the tax advantage of debt and the costs of financial distress.

It is difficult to express this with a precise and rigorous formula.
The Pie Model Revisited

Taxes and bankruptcy costs can be viewed as just another claim on the cash flows of the firm.

Let $G$ and $L$ stand for payments to the government and bankruptcy lawyers, respectively.

$$V_T = S + B + G + L$$

The essence of the M&M intuition is that $V_T$ depends on the cash flow of the firm; capital structure just slices the pie.
Agency Cost of debt

Agency costs between B/Hs and S/Hs create additional drag on the value of the firm

- another cost of leverage
- managers have the opportunity to take actions that would “transfer wealth” from B/Hs to the S/Hs

1. Increase the riskiness of the firm
2. Don’t accept positive NPV projects
3. Pay extra dividends to the S/Hs
Agency cost of debt -- Continued

Who incurs the cost of these “disincentives?”

S/Hs!!

- B/Hs know about these disincentives and demand compensation at the outset

Can the agency cost be reduced?

- Yes; by including protective covenants
  - COSTLY mechanism
  - limits what the managers can & can’t do
Recapitulation

\[ V_L = V_U + PV \text{ of TS} \]
- PV of expected costs of financial distress
- PV of Agency Cost of debt

MM 1963: tax gains from leverage
- optimal capital structure might be 99+ % debt

How to reconcile seeming MM anomaly of gross under-leveraging by U.S. corporations??
- Actual B/S ratios are nowhere close to 99%!!!
Recapitulation-- Continued

In the presence of personal taxes, when $T_s$ is significantly less than $T_B$, tax gains from leverage might be relatively small.

- When joined with reasonable presumed costs of leverage (bankruptcy & agency costs), theoretical MM predictions might be v. close to “observed” capital structures.
Issues relevant to making “real-life” capital structure decisions

1. Taxes: can firm “use” tax-shield?
2. Leverage causes $r_S$ ↑
3. Is Financial distress a “significant” possibility
   ◆ if yes, then agency cost of debt
4. Cash flow ability to service debt
5. EBIT-EPS Analysis
6. Industry average debt ratios
“Real-Life”-- Continued

7. Timing

- Is this a good time to issue debt or equity?

8. Flexibility

- how will today’s financing decision affect future financing?

**H.W. Chapter 15**: 1, 2, 4, 5, 9, 12, 15, 17
**Chapter 16**: 5, 11, 12, 13