Chapter 17

- *Financial Leverage and Capital Structure Policy*

Key Concepts and Skills

- Understand the effect of financial leverage on cash flows and the cost of equity
- Understand the Modigliani and Miller Theory of Capital Structure with/without Taxes
- Understand the impact of taxes and bankruptcy on capital structure choice

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
  - The firm can increase leverage by issuing debt and repurchasing outstanding shares
  - The firm can 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
- The Optimal Capital structure is debt or equity mix, that
  - (1) Maximizes the value of the firm
  - (2) Minimizes the WACC
  - (3) Maximizes the market value of the common stocks

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 cost and we have more left over for our stockholders
  - If we have a really bad year, we still have to pay our fixed costs and we have less left over for our stockholders
- Leverage magnifies the variation in both EPS and ROE

Example 17.1: Financial Leverage, EPS and ROE – Part I

- We will ignore the effect of taxes at this stage
- What happens to EPS and ROE when we issue debt and buy back shares of stock?

Financial Leverage Example

Answer 17.1: Financial Leverage, EPS and ROE – Part II

- Variability in ROE
  - Current: ROE ranges from 6% to 20%
  - Proposed: ROE ranges from 2% to 30%
- Variability in EPS
  - Current: EPS ranges from $0.60 to $2.00
  - Proposed: EPS ranges from $0.20 to $3.00
- The variability in both ROE and EPS increases when financial leverage is increased

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 damaging to our stockholders

Example: Break-Even EBIT

$$\frac{EBIT}{500{,}000} = \frac{EBIT - 250{,}000}{250{,}000}$$

$$EBIT = \left[\frac{500{,}000}{250{,}000}\right](EBIT - 250{,}000)$$

$$EBIT = 2EBIT - 500{,}000$$

$$EBIT = \$500{,}000$$

$$EPS = \frac{500{,}000}{500{,}000} = \$1.00$$

Break-even Graph

Capital Structure Theory

- One of the most influential and best known theorems is the **Modigliani-Miller Theorem**.
- In 1958, Modigliani and Miller **(M&M)** proved that changes in capital structure do not affect firm value when financial markets are perfect. Only market imperfections (taxes, transactions costs, and the possibility of default etc.) allow for leverage to affect firm value. Based on this assumptions M&M concluded that the value of a firm is unaffected by its leverage..***M&M Proposition I***

Modigliani and Miller Theory of Capital Structure

- **M&M Proposition I – Firm Value**
  - The value of the firm is independent of the firms capital structure under certain assumption. (No taxes, no bankruptcy costs etc.)
  - The cash flows of the firm do not change; therefore, value doesn't change
  - State that the size of the pie doesn't depend on how it is sliced. D:40%-E:60%, D:60%-E:40%)
  - Levered firm value = Unlevered firm value.

$$V_L = V_U$$

M&M Proposition II– WACC

- As a firm increases its use of debt, its cost of equity also increases; but its WACC remains constant.
- If we ignore taxes, WACC is;

  WACC = $R_A = (E/V)R_E + (D/V)R_D$ ……V=D+E

  $R_E = R_A + R_A - R_D (D/E)$ ……This is MM Position II
- Although changing capital structure of the firm does not change the firms total value, it does cause important changes in the firms debt-equity ratio.
- MM Position II tells us that cost of equity depends on 3 things: (1)Required rate of return of the firms cost of asset, R_A, (2) Firms cost of debt R_D and (3) Firms debt to equity ratio (D/E).

MM Propositions without Taxes

- Primary point is that there are **no taxes**. Propositions restated:

  Proposition I: Firm value is independent of leverage.
  - The value of firm does not change with debt
    Levered firm value = Unlevered firm value.

    $V_L = V_U$ .....MM Position I

  Proposition II: As a firm increases its use of debt, its cost of equity also increases; but its WACC remains constant.

    $R_E = R_A + R_A - R_D (D/E)$ ..... MM Position II

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

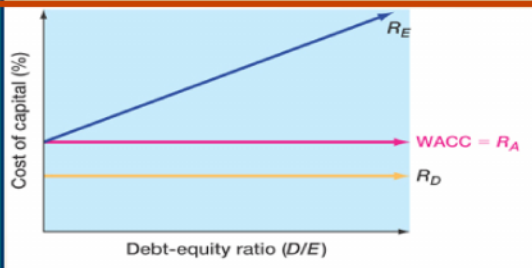
Case I – Propositions I and II

- 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

MM Proposition II



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

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

where $V = D + E$

- R_E is straight line with slope $(R_A - R_D)$.
- Y-intercept is a firm with ratio of D/E is zero, therefore $R_A = R_E$.
- As D/E ratio raise, leverage increases the risk of equity and therefore the required return or R_E.
- The change in the capital structure weights (E/V and D/V) is exactly offset by change in the cost of equity R_E, so the WACC stays the same.

Case II – Cash Flow

- 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

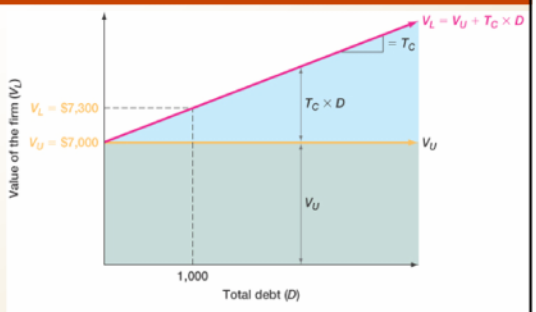
	Unlevered Firm	Levered Firm
EBIT	1000	1000
Interest	0	80
Taxable Income	1000	920
Taxes (30%)	300	276
Net Income	700	644
CFFA (EBIT+Depr-Tax)	700	724

Case II – Proposition I

- The value of the firm increases by the presen 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
  - $V_U = EBIT(1-T) / R_U$
  - $V_L = V_U + DT_C$

Ru = Value of Unleverage;
Rl= Value of Leverage
D=Debt; T=Tax rate

MM Proposition I with Taxes



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.

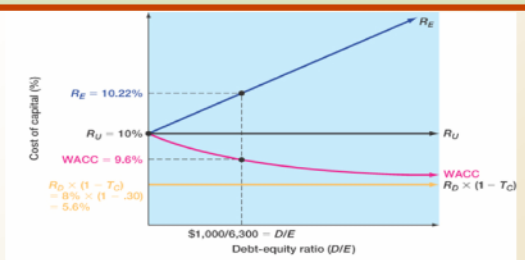
Example: Case II – Proposition I

- Data
  - EBIT = $1,000; Tax rate = 30%; Debt = $1,000; Cost of debt = 8%; Unlevered cost of capital = 10%
- $V_U = EBIT(1-T) / R_U$
  $= 1,000(1-.30) / .10 = \$7,000$
- $V_L = V_U + DT_C$
  $=7,000 + 1,000(.30) = \$7,300$
  - As figure illustrates, the value of the firm goes up by $0.30 for every $1 in debt.
  - Hence, once we include taxes, capital structure definitely matters.
  - ***Question:*** Should the optimal capital structure be 100%? Is this an logical conclusion?

Case II – Proposition II

- The WACC decreases as D/E increases because of the government subsidy on interest payments
  - $WACC = R_A = (E/V)R_E + (D/V)(R_D)(1-T_C)$
  - $R_E = R_U + (R_U – R_D)(D/E)(1-T_C)$
- Example
  - $R_E = .10 + (.10-.08)(1000/6300)(1-.30) =$ **10.22%**
  - $WACC = R_A = (6,300 / 7,300)(10.22\%) + (1,000 / 7,300)(8\%)(1-.30) =$ **9.6%**
    - Without debt WACC is over 10%, and with debt it is 9.6%. Therefore, the firm is better off with debt.

MM Proposition II with Taxes



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:

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

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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 increase in expected bankruptcy cost
- At this point, the value of the firm will start to decrease and the WACC will start to increase as more debt is added

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Optimal Capital Structure

- Is there an easily identifiable debt to equity ratio that will maximize the value of the firm? Why or why not?
- Because many relevant factors such as bankruptcy costs, tax asymmetries, and agency costs cannot easily be identified or quantified, it's practically impossible to determine the precise debt/equity ratio that maximizes the value of the firm.

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Financial Distress

Costs of Financial Distress - Costs arising from bankruptcy or distorted business decisions before bankruptcy. (Significant problems in meeting debt obligations)

Market Value = Value if all Equity Financed
+ PV Tax Shield
- PV Costs of Financial Distress

Optimal Capital Structure
The Static Theory of Capital Structure

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.

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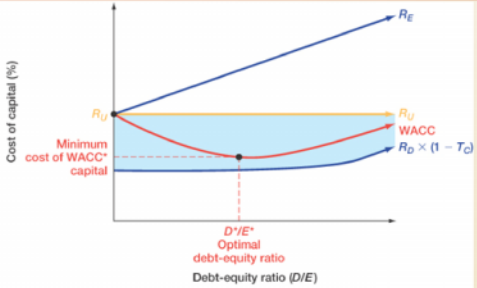
Optimal Capital Structure
The Static Theory of Capital Structure



According to the static theory, the WACC falls initially because of the tax advantage of debt. Beyond the point D^*/E^*, it begins to rise because of financial distress costs.

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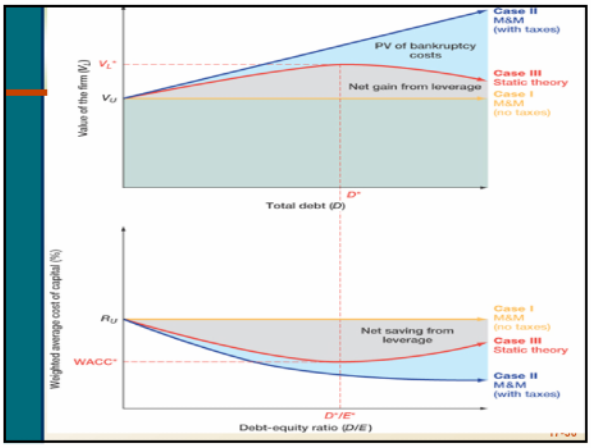

Conclusions

- Case I – no taxes or bankruptcy costs
  - The value of firm and its WACC are not affected by capital structures.
  - No optimal capital structure
- Case II – corporate taxes but no bankruptcy costs
  - The value of the firm increases and the WACC decreases as the amount of debt goes up.
  - Optimal capital structure is almost 100% debt
  - Each additional dollar of debt increases the cash flow of the firm
- Case III – corporate taxes and bankruptcy costs
  - The value of the firm reaches a maximum at D*, the point representing the optimal amount of borrowing. At the same time, the WACC is minimized at D*/E*
  - 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

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 and as a manager you need to understand the cost for your industry

Observed Capital Structure

- Capital structure does differ by industries
- Differences according to *Cost of Capital 2000 Yearbook by Ibbotson Associates, Inc.*
  - Lowest levels of debt
    - Drugs with 2.75% debt
    - Computers with 6.91% debt
  - Highest levels of debt
    - Steel with 55.84% debt
    - Department stores with 50.53% debt

Sugested Problems

- 1-4, 6, 12-14, 16,17.