

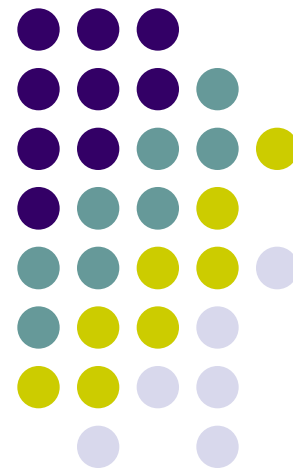
Corporate Finance

Lecture 9: Optimal Capital Structure & Limits to the Use of Debt

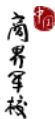
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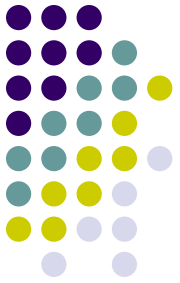




Review: M&M Theorem with Taxes

- Proposition I: $V_L = V_U + V_{ts} = V_U + D \cdot \tau$
 - Debt financing increases firm value.
 - 100% debt financing leads to the highest value.
- Proposition II: $r_E = r_A + (1 - \tau)(r_A - r_D) \cdot \frac{D}{E}$
 - $WACC = r_A \cdot (1 - \frac{\tau \cdot D}{V_L})$
 - Higher leverage \leftrightarrow Lower WACC

NOT 100%



Why don't we observe 100% debt ratio?

- Cost of distress



Cost of Distress

- If debt ratio is too high, the firm might run into trouble if, say, recession hits.
- Capital structure is irrelevant as long as it does not affect the **total cash flows** generated by the assets.
- Default *per. se.* **does not** lower firm value.
 - E.g., Go default when liquidation value equals to PV of future cash flows.
 - Default changes the ownership, not the cash flow of the firm.
- But the *possibility of bankruptcy* has a **negative effect** on the value of the firm. There might be *direct and indirect costs* associated.



Costs of Distress

Direct costs (at default):

- Legal and administrative expenses
- Fire sale, loss of intangible assets

Indirect costs (before default):

- **Poor operating decisions** while firm is financially distressed (*Agency costs of debt*)
- Because of the uncertainty about the future, the firm may lose customers, suppliers or key employees.



Example: Fire Sale of Fixed Asset

<u>Assets</u>	<u>BV</u>	<u>MV</u>	<u>Liabilities</u>	<u>BV</u>	<u>MV</u>
Cash	\$200	\$200	LT bonds	\$300	\$200
Fixed Asset	\$400	\$0	Equity	\$300	\$0
Total	\$600	\$200	Total	\$600	\$200

What happens if the firm is liquidated today?

- The bondholders get \$200;
- The shareholders get nothing.



Direct Costs of Bankruptcy

The bankruptcy process is complex, time-consuming and costly

Costly outside experts are often hired by the firm to assist with the bankruptcy process

Creditors also incur costs during the bankruptcy process

- They may wait several years to receive payment
- They may hire their own experts for legal and professional advice



Direct Costs of Bankruptcy

The direct costs of bankruptcy reduce the value of the assets that the investors will ultimately receive

The average direct costs of bankruptcy are approximately 3% to 4% of the pre-bankruptcy market value of total assets

For small businesses that file for Chapter 7, direct costs are on average 12% of the value of the firm's assets



Direct Costs of Bankruptcy

Examples:

United Airlines: \$8.6 million/month

Enron: \$30 million/month, \$750 million total

WorldCom: \$620 million total

Lehman: roughly \$2.2bn



Indirect Costs of Financial Distress

A firm need not to enter bankruptcy to suffer the indirect costs of financial distress

They are often much larger than direct costs of bankruptcy

It is estimated that the potential loss due to financial distress is 10% to 20% of firm value



Indirect Costs of Financial Distress

Loss of Customers

Loss of Suppliers

Loss of Employees

Loss of Receivables

Costs to Creditors Due to Conflict of Interest
(Shareholder vs creditors)



Example:

<u>Assets</u>	<u>BV</u>	<u>MV</u>	<u>Liabilities</u>	<u>BV</u>	<u>MV</u>
Cash	\$200	\$200	LT bonds	\$300	\$200
Fixed Asset	\$400	\$0	Equity	\$300	\$0
Total	\$600	\$200	Total	\$600	\$200

- Consider if the company has the following negative/positive NPV investment opportunity
- A close-to-bankrupt company might take up (let go) negative (positive) NPV project
- Such possibility ex-ante raises their cost of debt



1. Risk Taking

<u>The Gamble</u>	<u>Probability</u>	<u>Payoff</u>
Win Big	10%	\$1,000
Lose Big	90%	\$0

- Cost of investment is \$200 (all the firm's cash)
- Required return is 50%
- Expected CF from the Gamble = $\$1000 \times 0.10 + \$0 = \$100$
- $NPV = -\$200 + \frac{\$100}{1.5} = -\$133$



1. Risk Taking: Consider a Close-to-Bankrupt Firm's Decision

		Bond Holders	Equity Holders
Without the Gamble	PV	\$200	\$0
With the Gamble	FV	$10\% \times 300 = \$30$	$10\% \times (1000 - 300) = \70
	PV	$30 / (1 + 50\%) = \$20$	$70 / (1 + 50\%) = \$47$

- If managers make decisions on behalf of the stockholders, such gambling projects, even though with negative NPV, will be undertaken.
- When firms are highly levered, risky projects can improve shareholder value at costs of debtholder value. (***risk-shifting behavior***)
- Thus, **when debt was raised (ex ante)**, the price of debt would be discounted to reflect the potential costs of risk-shifting.
- R_D increases in $\frac{D}{E}$ considering such cost of financial distress.



2. Underinvestment

- Consider a government-sponsored project that guarantees \$350 in one period.
- Cost of investment is \$300 (the firm only has \$200 now). Assume that the stockholders will have to supply an additional \$100 to finance the project.
- Required return is 10%.
- $NPV = -\$300 + \frac{\$350}{1.1} = \$18.18 > 0$
- Will this project be accepted or rejected? (Assume that decision is made to maximize shareholder value.)



2. Underinvestment

		Bond Holders	Equity Holders
Without the Project	PV	\$200	\$0
With the Project	FV	\$300	$350 - 300 = 50$
	PV	$300 / (1 + 10\%) = \$272.73$	$50 / (1 + 10\%) - 100 = -\54.55

- If this project has to be financed from the equity holders, it won't be taken even though $NPV > 0$.
- Is it possible to finance the \$100 through issuing new bond? (Note that new bond will have a lower seniority than the existing bond.)
 - No.
 - If the project is taken, the existing bond holder will get \$300 and the new bondholders will get \$50.
 - NPV for the new bondholders: $50 / (1 + 10\%) - 100 = -\54.55



2. Underinvestment

- With senior debt in place, firms may not be able to raise capital for new investments, because all the additional value goes to the existing (senior) debt holders.
- Thus, positive NPV projects may be forgone.
- This is called the ***debt-overhang problem***.



2. Underinvestment

- What if the existing debt is not public bond, but *private bank loan* which is possible to renegotiate?
- Can the firm borrow the additional \$100 from the existing *debtholder*?
- Suppose the shareholders offer to pay existing debtholder \$F in one period.
- The debtholders would be better off, as long as $\frac{\$F}{1.1} - \$100 > \$200$ (i.e., $F > 330$).



3: Milking the Property

- Liquidating dividends
 - Suppose the firm paid out a \$200 dividend to the shareholders.
 - This leaves the firm insolvent, with nothing for the bondholders, but plenty for the former shareholders.
- Increase perquisites to shareholders and/or management



Can Costs of Debt be Reduced?

- It is the **shareholders** who bare the **costs of debt**, since anticipating the distress/agency costs, debtholders would have charged a higher return ex ante.
- Thus, the shareholders frequently make agreements with bondholders in order to get lower interest rates.
- These agreements, called **protective covenants**, are incorporated as part of the loan documents between stockholders and bondholders.



Debt Covenants

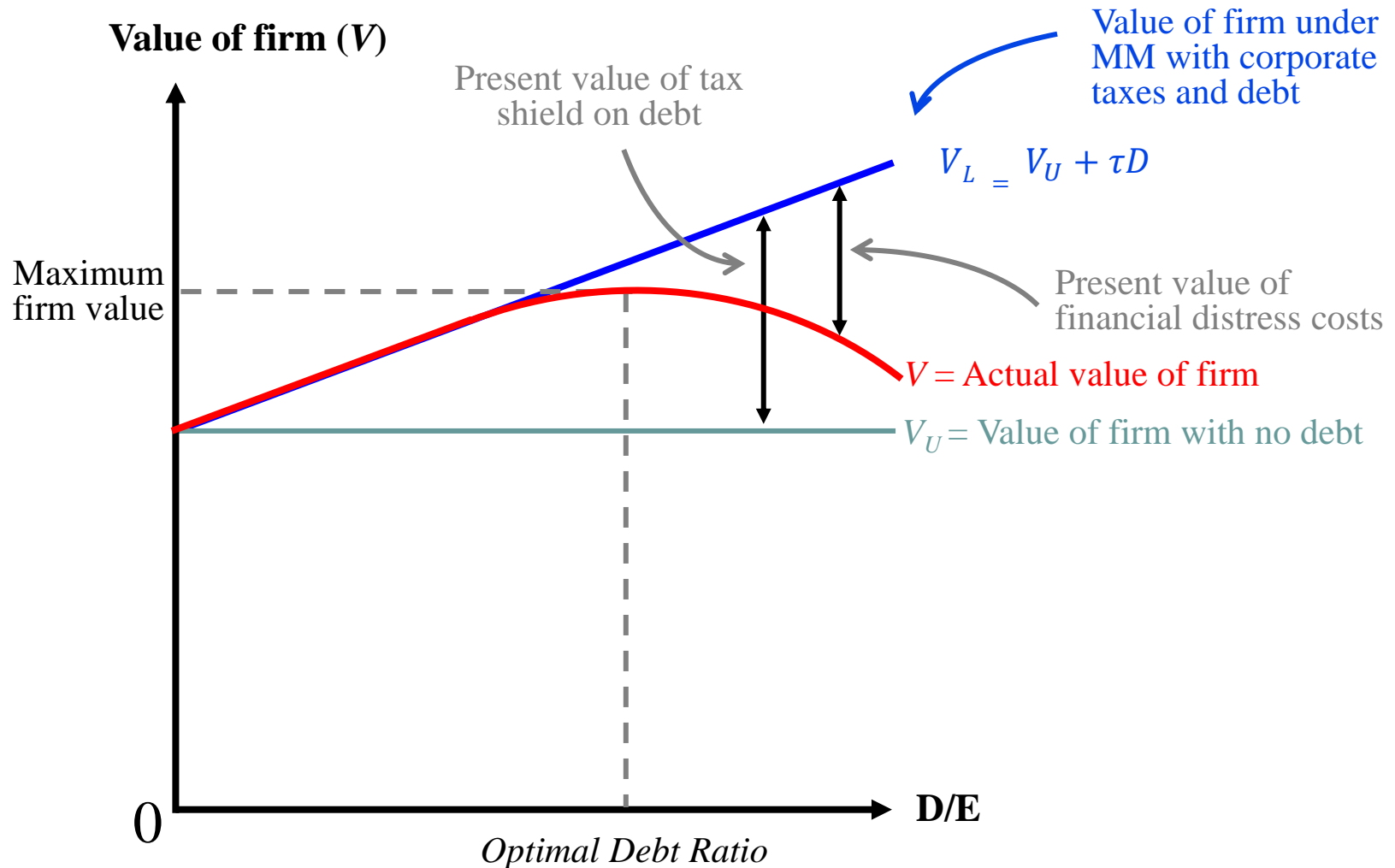
Negative Covenants

- Limit on dividend amounts.
- The firm may not pledge any of its assets to other lenders.
- The firm may not sell or lease major assets without approval by the lender.
- The firm may not issue additional long-term debt.
- The firm may not merge with another firm.

Positive Covenants

- The company agrees to maintain its working capital at a minimum level.
- The company must furnish periodic financial statements to the lender.

Trade-off Theory





Which Firms?

Which firms should have more debt according to **trade-off theory**?

- Facing higher tax rates
- Stable cash flows
- Low probability of bankruptcy
- Higher recover rate upon bankruptcy (more physical assets)
- More profitable



Exercise

Ch18-8 WACC National Electric Company (NEC) is considering a \$53 million project in its power systems division. Tom Edison, the company's chief financial officer, has evaluated the project and determined that the project's unlevered cash flows will be \$4.1 million per year in perpetuity. Mr. Edison has devised two possibilities for raising the initial investment: issuing 10-year bonds or issuing common stock.

The company's pretax cost of debt is 5.9 percent and its cost of equity is 10.3 percent. The company's target debt-to-value ratio is 60 percent. The project has the same risk as the company's existing businesses and will support the same amount of debt. The tax rate is 21 percent. Should NEC accept the project?

- $WACC = 0.6 \times 5.9\% \times (1 - 0.21) + 0.4 \times 10.3\% = 6.92\%$
- $NPV = -53mil + \frac{\$4.1mil}{6.92\%} = \$6.278mil$