

# Capital Structure

## Optimal Capital Structure

- What is capital structure?
- How should a firm choose a debt-to-equity ratio?
  - The goal: \_\_\_\_\_
  - Which is done by: \_\_\_\_\_
  - Which is done by: \_\_\_\_\_

## Financial Leverage

	Scenario		
	<u>A</u>	<u>B</u>	<u>C</u>
Market Value of Debt	\$0	\$50	\$75
Market Value of Equity	<u>\$100</u>	<u>\$50</u>	<u>\$25</u>
Market Value of Assets	\$100	\$100	\$100
Debt-to-Equity Ratio			

## Financial Leverage

	Scenario		
	<u>A</u>	<u>B</u>	<u>C</u>
Corporate Borrowing Rate	8%	8%	8%
EBIT	\$20	\$20	\$20
Interest Expense	\$0	\$4	\$6
Taxes ( <i>assume 0%</i> )	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>
Net Income	\$20	\$16	\$14

## Financial Leverage

	Scenario		
	<u>A</u>	<u>B</u>	<u>C</u>
ROA	20%	16%	14%
ROE	20%	32%	56%
EPS	\$0.20	\$0.32	\$0.56
$\beta_e$ (assume $\beta_A = 1$ )	1.0	2.0	4.0

## Asset Betas and Equity Betas

$$\beta_{\text{Asset}} = \frac{\text{Equity}}{\text{Equity} + [(1 - t) \times \text{Debt}]} \times \beta_{\text{Equity}}$$

$$\beta_{\text{Equity}} = \beta_{\text{Asset}} \times \left[ 1 + (1 - t) \frac{\text{Debt}}{\text{Equity}} \right]$$

## A Note on Notation...

- Yost uses different notation than the textbook (and textbook solutions).

<u>Yost</u>		<u>Book</u>
$E$	→	$S$
$R_E$	→	$R_S$
$D$	→	$B$
$R_D$	→	$R_B$
$t$	→	$t_c$
$R_A$	→	$R_0$

## Financial Leverage

- What is financial leverage?
- What are the effects of financial leverage?
- What is meant by “homemade leverage”?
  - The use of personal borrowing to change the overall amount of financial leverage to which an individual is exposed.

## Homemade Leverage

- Assume the firm in the previous example has no debt (Scenario A).
- Also assume you personally prefer to have the leverage in Scenario C.
- How could you do this on your own?

## The M&M Propositions

- Franco Modigliani and Merton Miller won Nobel prizes for the following (irrelevance) propositions.
- Consider a world of no taxes (we will consider the role of taxes later), no bankruptcy costs, and perfect, efficient capital markets. People can borrow and lend at the same rate as the firm.

## M&M Proposition I (no taxes)

- Does capital structure matter?
- In our world of no taxes, bankruptcy costs, and perfect, efficient markets, is an individual firm's capital structure important?
- The value of the firm is \_\_\_\_\_ of the firm's capital structure. \_\_\_\_\_

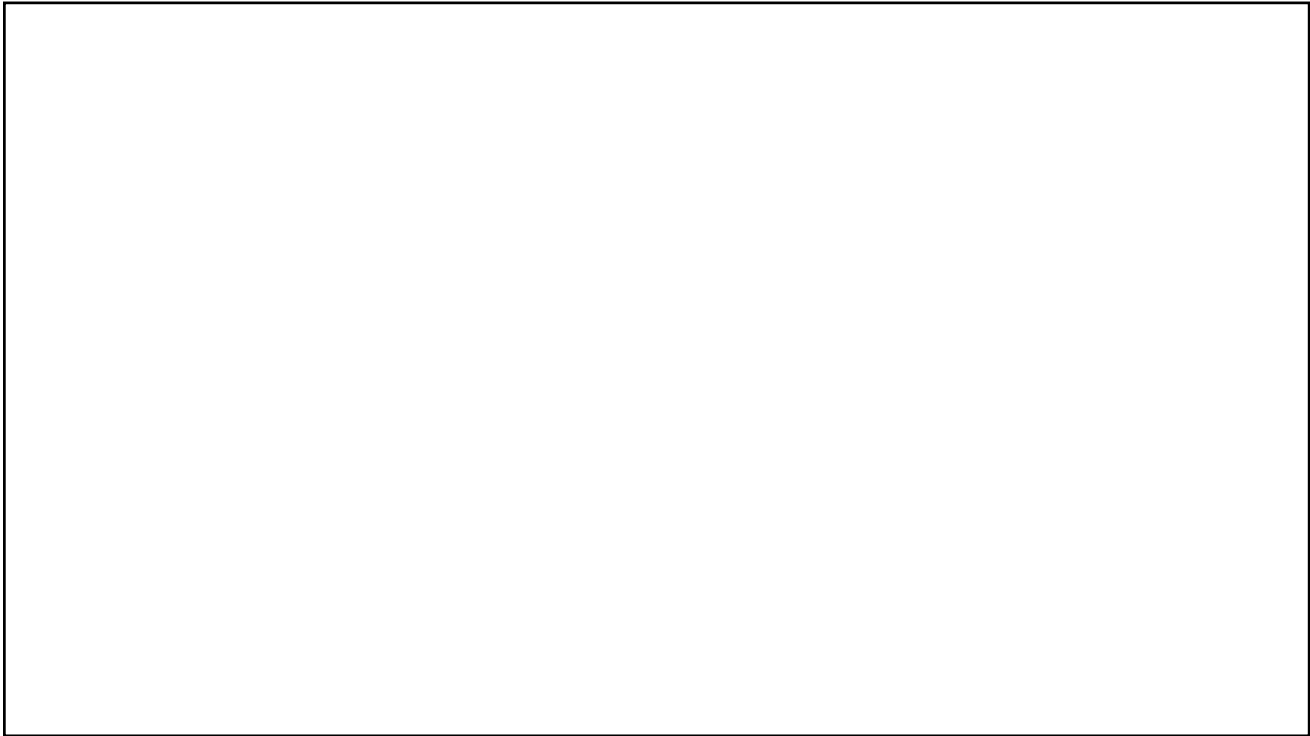
## M&M Proposition II (no taxes)

- What happens to the risk shareholders face when the firm increases its use of debt?
- What happens to beta?
- What happens to the cost of equity?

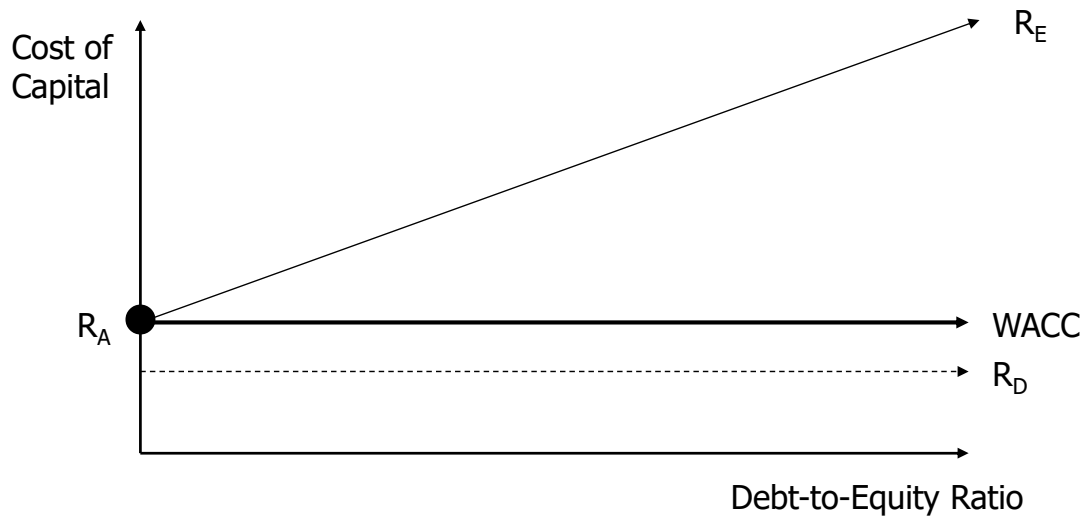
## M&M Proposition II (no taxes)

- The firm's cost of equity capital is a positive linear function of the firm's debt-to-equity ratio.

$$R_E = R_A + \left[ (R_A - R_D) \times \left( \frac{D}{E} \right) \right]$$



## M&M Proposition II (no taxes)





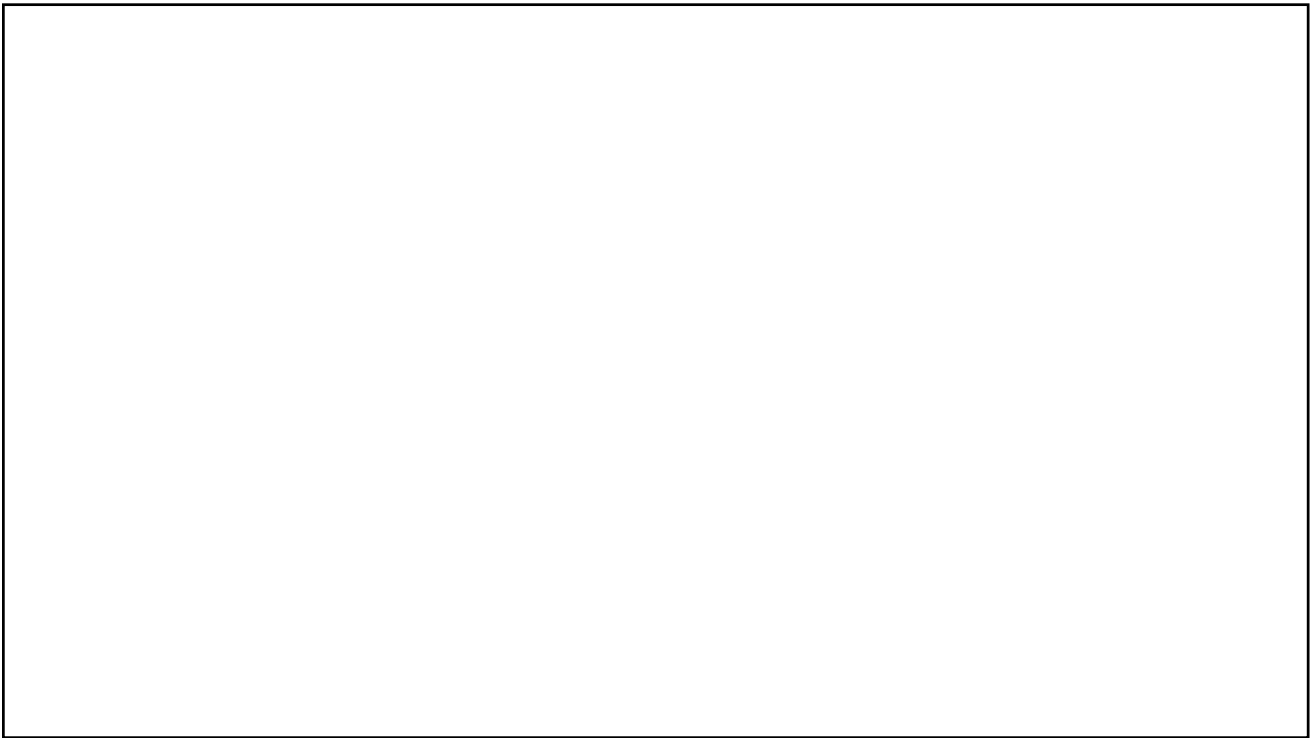
## An Example (no taxes)

Mullet Manufacturing, Inc. is financed solely by common stock and has outstanding 25 million shares with a market value of \$10 per share. It now announces that it intends to issue \$160 million of debt and use the proceeds to buy back common stock. The firm's current cost of equity is 10 percent. The cost of debt is 8 percent. Assume an M&M world, where all assumptions hold.

## An Example (no taxes) -- continued

- How many shares can the company buy back?
- What is the market value of the firm after the change in capital structure?
- What is the firm's new debt-to-equity ratio?
- After the repurchase, what will be the firm's new cost of equity? New cost of capital?

## Capital Structure



## Features of Debt

- Two features of debt that we ignored in our “perfect” financial world in the previous lecture:

1. \_\_\_\_\_

2. Costs of \_\_\_\_\_ or Financial Distress

## Back to our previous example...

	Scenario		
	<u>A</u>	<u>B</u>	<u>C</u>
Corporate Borrowing Rate	8%	8%	8%
EBIT	\$20	\$20	\$20
Interest Expense	\$0	\$4	\$6
<b>Taxes</b> ( <i>assume 50%</i> )	<b><u>\$10</u></b>	<b><u>\$8</u></b>	<b><u>\$7</u></b>
Net Income	\$10	\$8	\$7

Back to our previous example...

	Scenario		
	<u>A</u>	<u>B</u>	<u>C</u>
Cash Flow to Stockholders	\$10	\$8	\$7
Cash Flow to Debtholders	<u>\$0</u>	<u>\$4</u>	<u>\$6</u>
Total Cash Flow from Assets	\$10	\$12	\$13

- What, then, should happen to firm value?

Firm Value with Debt and Taxes

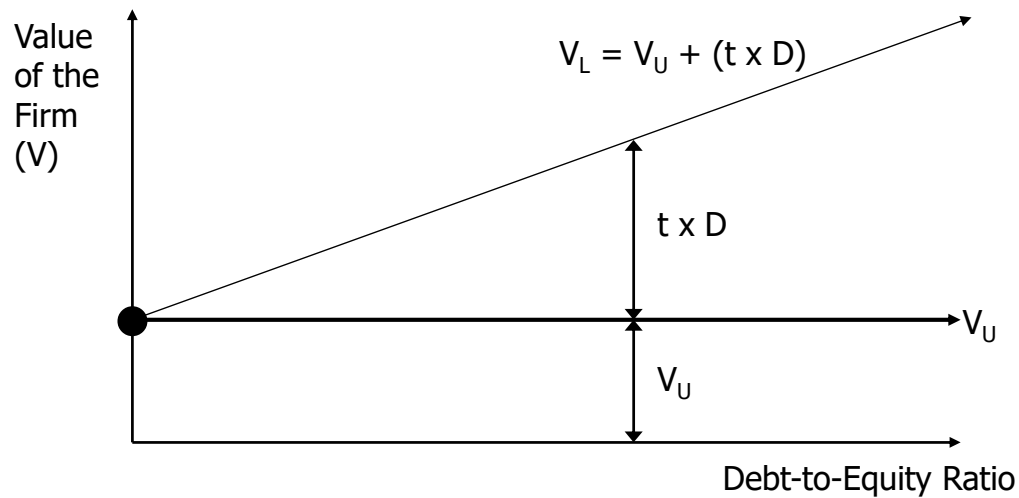
## M&M Proposition I (with taxes)

- \_\_\_\_\_
- How do we calculate the value of the firm?
- $V_U = [\text{EBIT} \times (1 - t)] / R_A$
- Assume that the cost of equity for the firm in scenario A is 10%...

## Back to our previous example...

	Scenario		
	<u>A</u>	<u>B</u>	<u>C</u>
Market Value of Debt	\$0	\$50	\$75
Market Value of Equity			
Market Value of Assets			

## M&M Proposition I (with taxes)



## M&M Proposition II (with taxes)

- The firm's cost of equity capital is a positive linear function of the firm's debt-to-equity ratio.

$$R_E = R_A + (R_A - R_D)(D/E)(1 - t)$$

## M&M Proposition II (with taxes)

- Assume that the cost of equity for the firm in scenario A is 10%. What is the required rate of return on equity for each scenario?

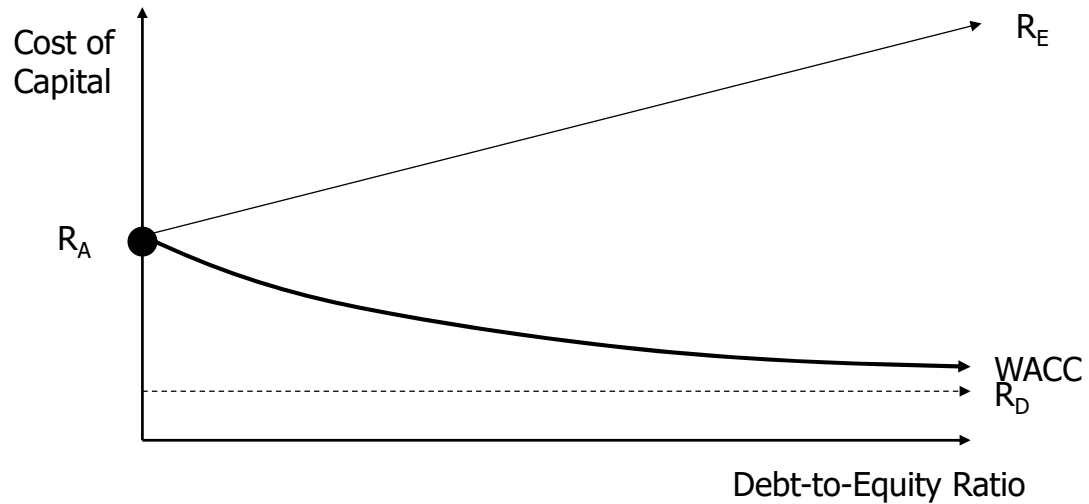
$$R_E = R_A + (R_A - R_D)(D/E)(1 - t)$$

## M&M Proposition II (with taxes)

- What is the WACC in each scenario?

$$WACC = [E/(D+E)] \times R_e + [D/(D+E)] \times R_d \times (1-t)$$

## M&M Proposition II (with taxes)



Therefore...

- What is the optimal capital structure?
- Why don't we see this?



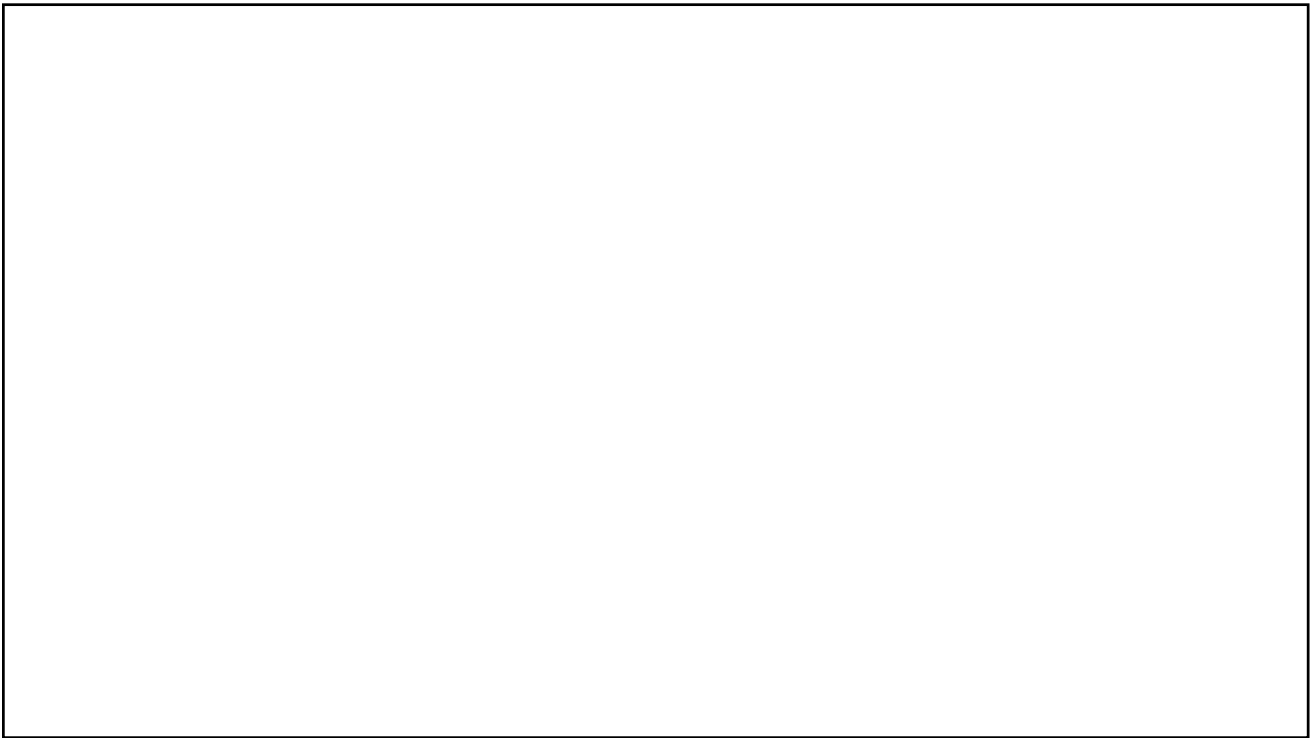
## Let's take another look...

Mullet Manufacturing, Inc. is financed solely by common stock and has outstanding 25 million shares with a market value of \$10 per share. It now announces that it intends to issue \$160 million of debt and use the proceeds to buy back common stock. The firm's current cost of equity is 10 percent. The cost of debt is 8 percent. *The tax rate is 40 percent.* Assume an M&M world, where all assumptions hold.

## Let's take another look...

- What is the market value of the firm after the announcement?
- How many shares can the company buy back?
- What is the firm's new debt-to-equity ratio?
- After the repurchase, what will be the firm's new cost of equity? New cost of capital?

## Capital Structure



## Optimal Capital Structure (with taxes and bankruptcy costs)

- Why do different firms have different capital structures?
  - \_\_\_\_\_ of financial distress greater for some firms.
  - \_\_\_\_\_ of financial distress greater for some firms.

## The Costs of Financial Distress

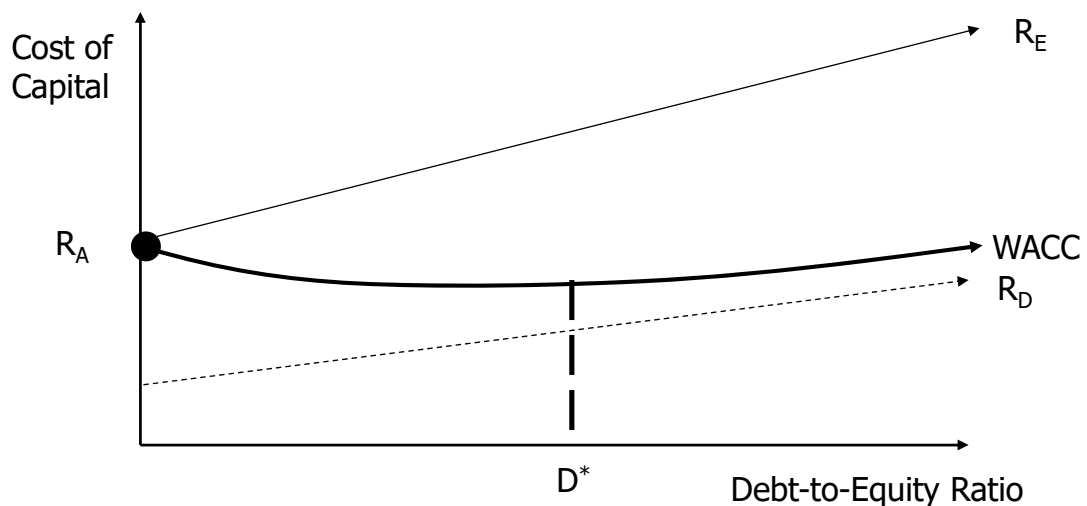
- Direct Costs
  - Legal expenses
  - Administrative expenses
- Indirect Costs
  - Lost sales
  - Lost time
  - Loss of morale and employees

## Optimal Capital Structure (with taxes and bankruptcy costs)

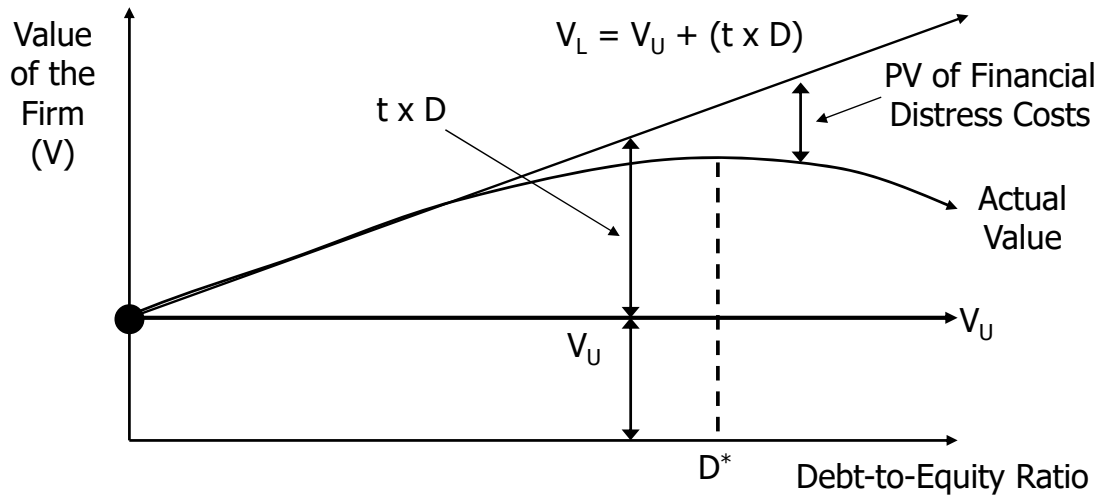
- Trade-Off Theory of Capital Structure:

The firm borrow up to the point where the tax benefits from an extra dollar of debt is exactly equal to the cost that comes from the increased probability of financial distress.

## Optimal Capital Structure (with taxes and bankruptcy costs)



## Optimal Capital Structure (with taxes and bankruptcy costs)



## Other Capital Structure Theories and Issues

- Signaling Theory
- Pecking Order Theory
- Windows of Opportunity
- Using Debt to Constrain Managers
- Estimating Optimal Capital Structure

## Suggested Problems

- Concept Questions
  - Chapter 16: 2, 3, 5, 7, 8, 9, and 10
  - Chapter 17: 1, 5, and 9
- Questions and Problems
  - Chapter 16: 12, 14, 15, 17, 24, and 25
  - Chapter 17: none