Lecture 11
Capital Structure

MBA 614

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
- Increase leverage by issuing debt and repurchasing outstanding shares
- 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
- We want to choose the capital structure that will maximize stockholder wealth
- We can maximize stockholder wealth by maximizing firm value or minimizing WACC

Capital Structure Theory

- Modigliani and Miller Theory of Capital Structure
  - Proposition I – firm value
  - Proposition II – WACC
- The value of the firm is determined by the cash flows to the firm and the risk of the assets
- Changing firm value
  - Change the risk of the cash flows
  - Change the cash flows

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

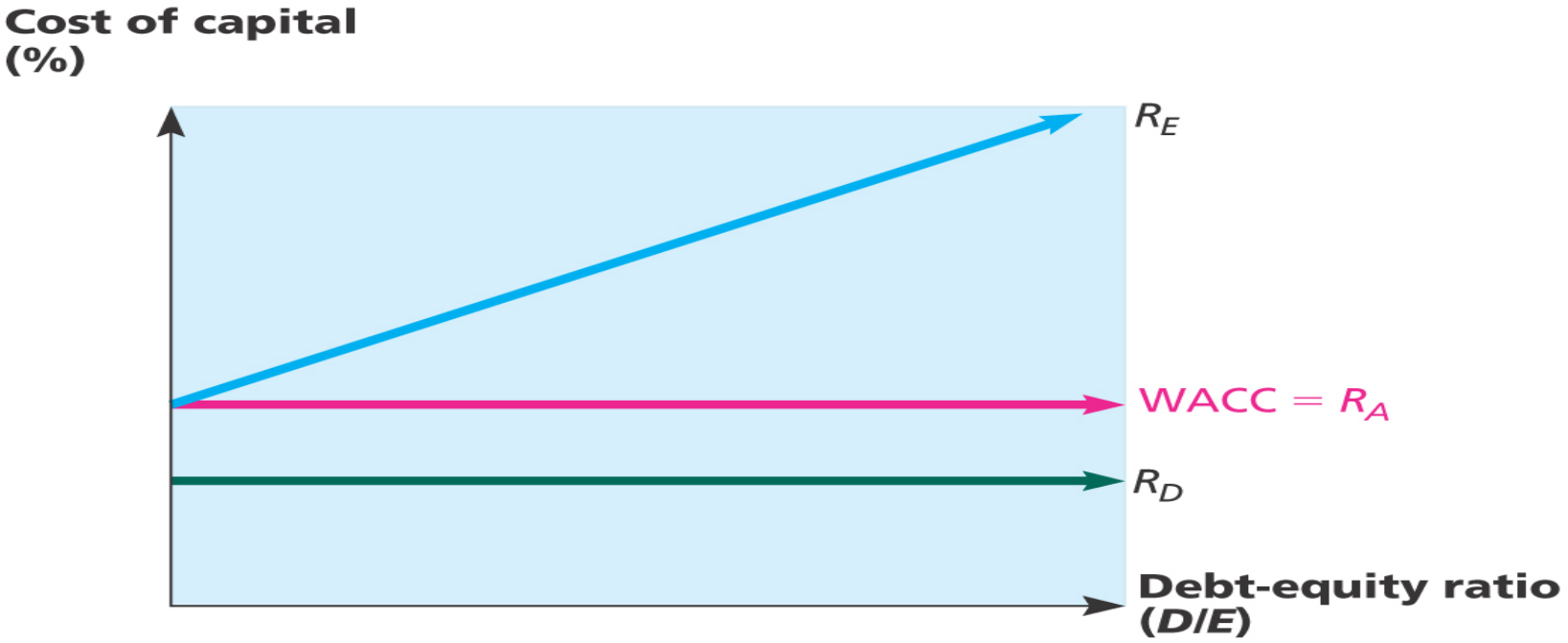
Case I – No Taxes or Bankruptcy Costs

- 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 required return on 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

Figure 16.3 – Cost of Equity and WACC (M&M without taxes)



$R_E = R_A + (R_A - R_D) \times (D/E)$ 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 $V = D + E$

Case I - Example

- Data
  - Required return on assets = 16%, cost of debt = 10%; percent of debt = 45%
- What is the cost of equity?
  - R_E = .16 + (.16 - .10)(.45/.55) = .2091 = 20.91%
- Suppose instead that the cost of equity is 25%, what is the debt-to-equity ratio?
  - .25 = .16 + (.16 - .10)(D/E)
  - D/E = (.25 - .16) / (.16 - .10) = 1.5
- Based on this information, what is the percent of equity in the firm?
  - E/V = 1 / 2.5 = 40%

The CAPM, the SML and Proposition II

- How does financial leverage affect systematic risk?
- CAPM: $R_A = R_f + \beta_A(R_M - R_f)$
  - Where β_A is the firm's asset beta and measures the systematic risk of the firm's assets
- Proposition II
  - Replace R_A with the CAPM and assume that the debt is riskless ($R_D = R_f$)
  - $R_E = R_f + \beta_A(1+D/E)(R_M - R_f)$

Business Risk and Financial Risk

- $R_E = R_f + \beta_A(1+D/E)(R_M - R_f)$
- CAPM: $R_E = R_f + \beta_E(R_M - R_f)$
  - $\beta_E = \beta_A(1 + D/E)$
- Therefore, the systematic risk of the stock depends on:
  - Systematic risk of the assets, β_A, (Business risk)
  - Level of leverage, D/E, (Financial risk)

Case II – With Corporate Taxes

- 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 1

	Unlevered Firm	Levered Firm
EBIT	5000	5000
Interest	0	500
Taxable Income	5000	4500
Taxes (34%)	1700	1530
Net Income	3300	2970
CFFA	3300	3470

Example 1 continued

- Assume the company has $6,250 8% coupon debt and faces a 34% tax rate.
- Annual interest tax shield
  - Tax rate times interest payment
  - 6250 in 8% debt = 500 in interest expense
  - Annual tax shield = .34(500) = 170
- Present value of annual interest tax shield
  - Assume perpetual debt for simplicity
  - PV = 170 / .08 = 2125
  - PV = $D(R_D)(T_C) / R_D = DT_C = 6250(.34) = 2125$

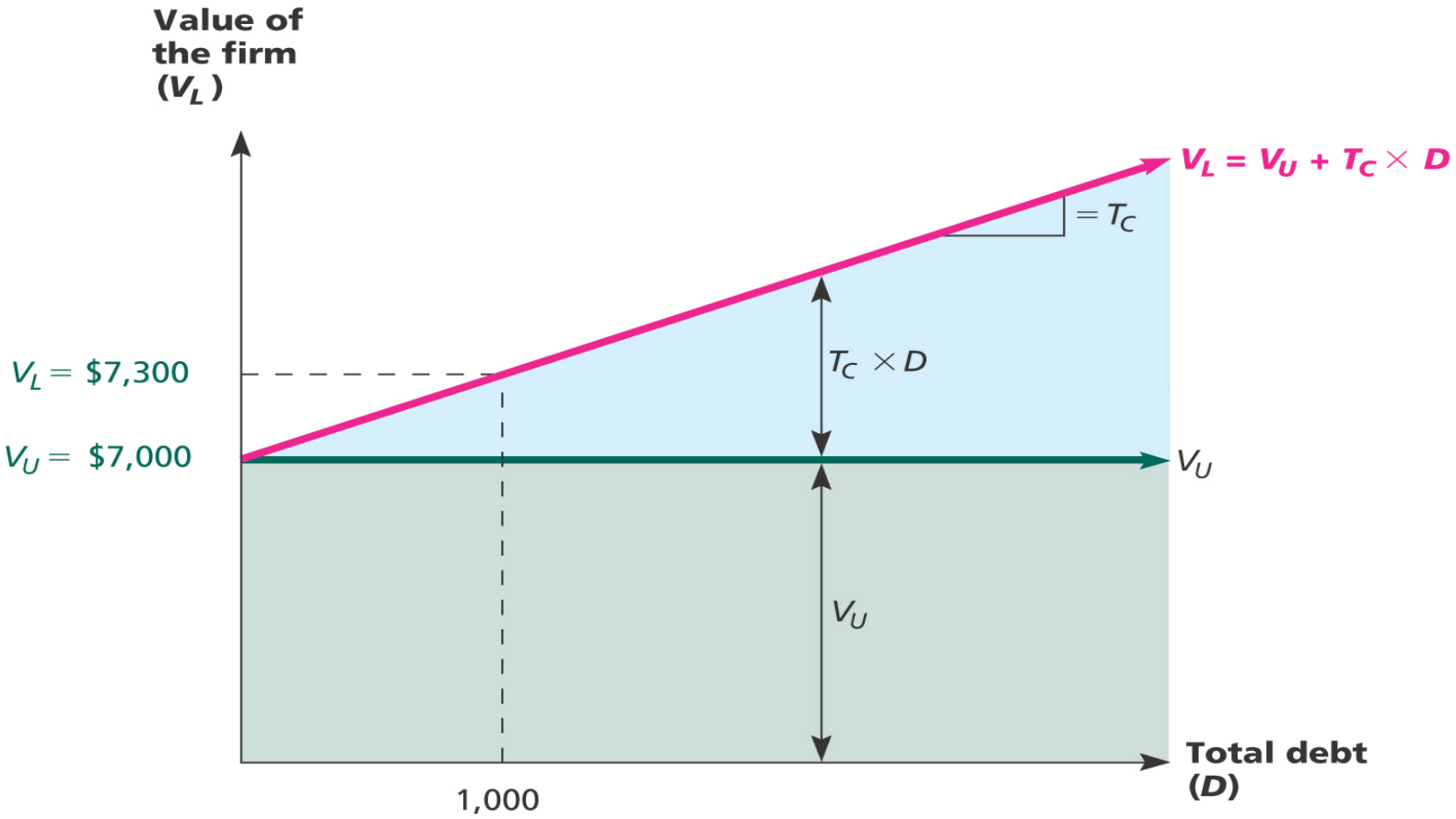
Case II – Proposition I

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

Example 2 – Case II – Proposition I

- Data
  - EBIT = $25 million; Tax rate = 35%; Debt = $75 million; Cost of debt = 9%; Unlevered cost of capital = 12%
- $V_U = 25(1-.35) / .12 = \$135.42$ million
- $V_L = 135.42 + 75(.35) = \$161.67$ million
- $E = 161.67 – 75 = \$86.67$ million

Figure 16.4 – M&M 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.

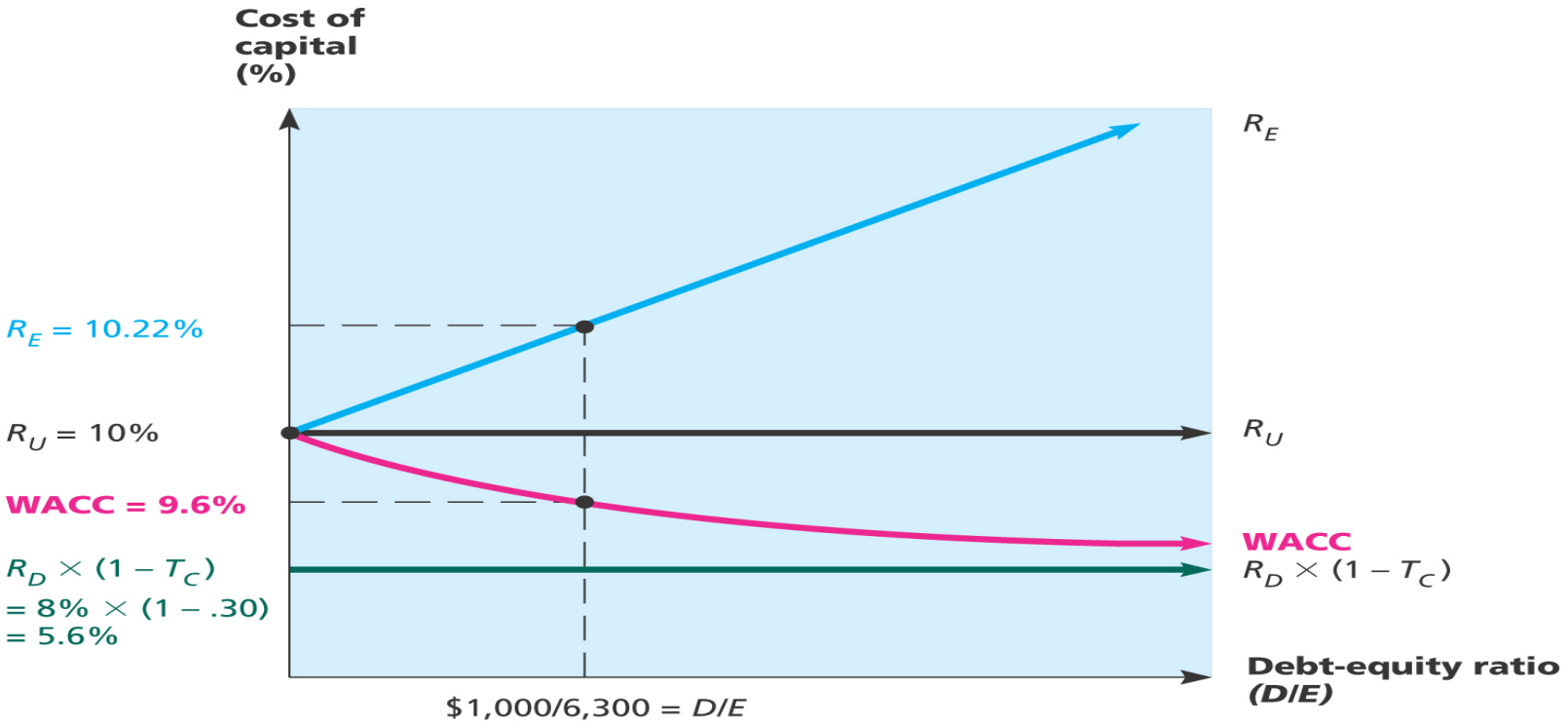
Case II – Proposition II

- The WACC decreases as D/E increases because of the government subsidy on interest payments
  - $WACC = (E/V)R_E + (D/V)(R_D)(1-T_C)$
  - $R_E = R_U + (R_U - R_D)(D/E)(1-T_C)$
- Example
  - $R_E = .12 + (.12-.09)(75/86.67)(1-.35) = 13.69\%$
  - WACC = (86.67/161.67)(.1369) + (75/161.67)(.09)
    (1-.35)
    WACC = 10.05%

Example: Case II – Proposition II

- Suppose that the firm changes its capital structure so that the debt-to-equity ratio becomes 1.
- What will happen to the cost of equity under the new capital structure?
  - R_E = .12 + (.12 - .09)(1)(1-.35) = 13.95%
- What will happen to the weighted average cost of capital?
  - WACC = .5(.1395) + .5(.09)(1-.35) = 9.9%

Figure 16.5 – Cost of Equity and WACC (M&M with Taxes)



M&M Proposition I with taxes implies that a firm's WACC decreases as the firm relies more heavily on debt financing:

$$\text{WACC} = \left(\frac{E}{V}\right) \times R_E + \left(\frac{D}{V}\right) \times R_D \times (1 - T_C)$$

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:

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

Case III – With Bankruptcy Costs

- 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 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

Bankruptcy Costs

- Direct costs
  - Legal and administrative costs
  - Ultimately cause bondholders to incur additional losses
  - Disincentive to debt financing
- Financial distress
  - Significant problems in meeting debt obligations
  - Most firms that experience financial distress do not ultimately file for bankruptcy

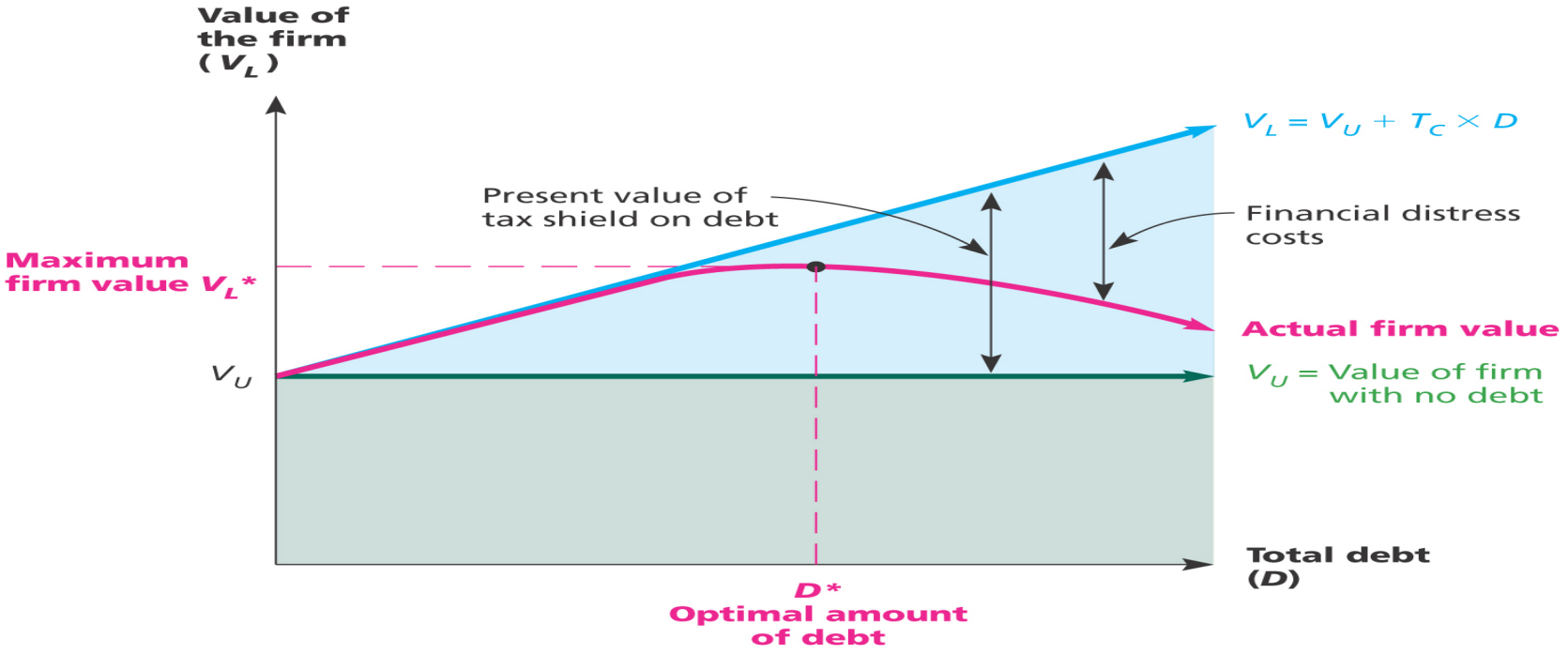
More Bankruptcy Costs

- Indirect bankruptcy costs
  - Larger than direct costs, but more difficult to measure and estimate
  - Stockholders wish to avoid a formal bankruptcy filing
  - Bondholders want to keep existing assets intact so they can at least receive that money
  - Assets lose value as management spends time worrying about avoiding bankruptcy instead of running the business
  - Also have lost sales, interrupted operations and loss of valuable employees

Static Theory of Capital Structure

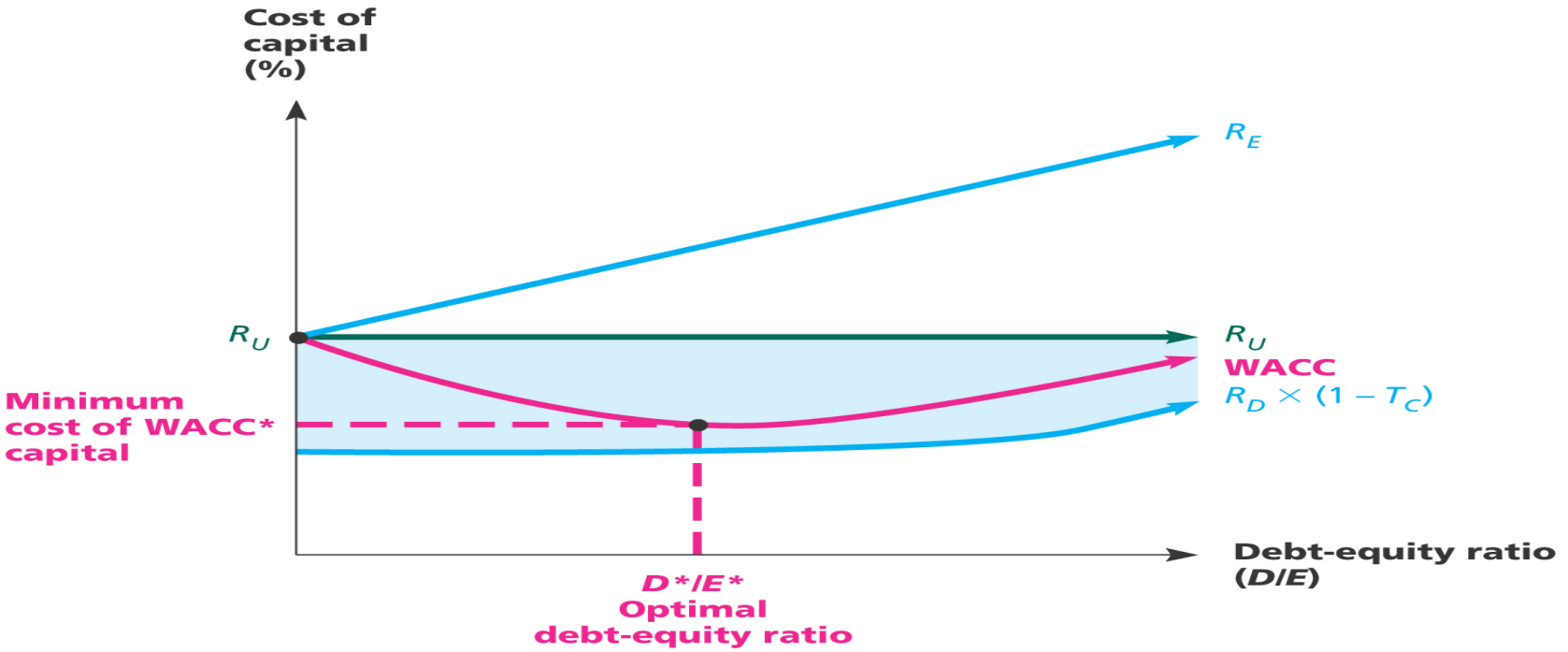
- So what is the optimal capital structure?
- A firm borrows up to the point where the tax benefit from an extra dollar in debt is exactly equal to the cost that comes from the increased probability of financial distress
- This is the point where the firm's WACC is minimized

Figure 16.6 – Static Theory and Firm Value



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.

Figure 16.7 – Static Theory and Cost of Capital

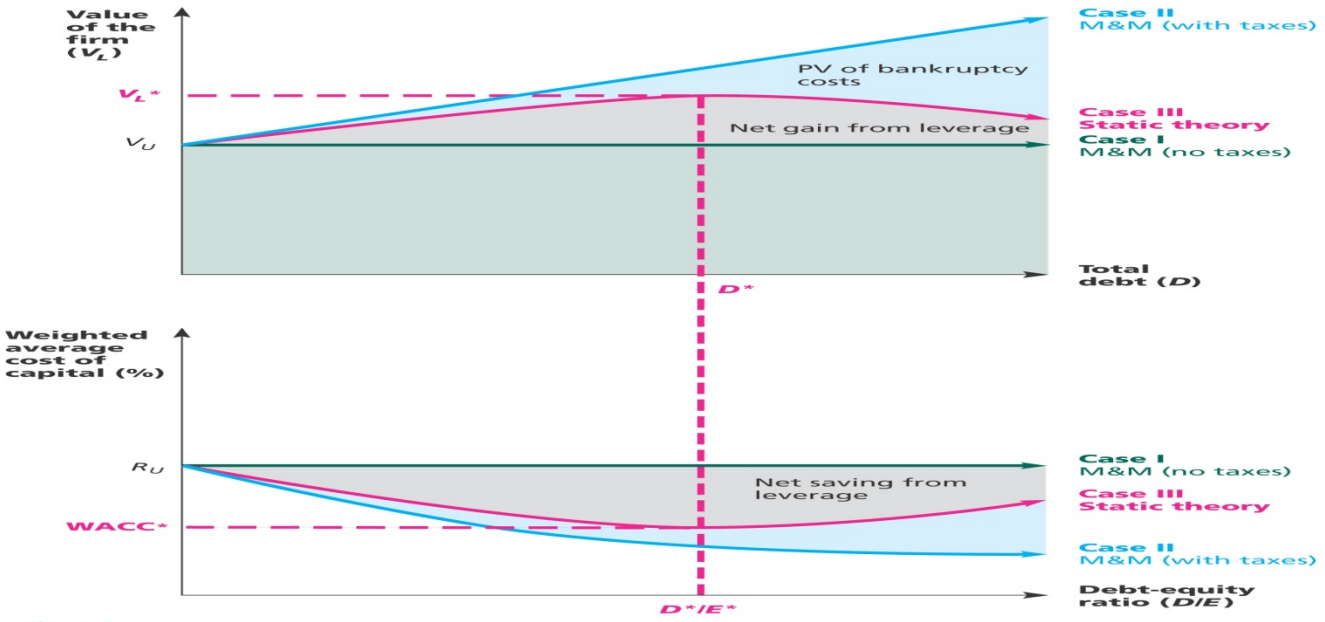


According to the static theory, the WACC falls initially because of the tax advantage of debt. Beyond the point D^*/E^*, it begins to rise because of financial distress costs.

Conclusions

- Case I – no taxes or bankruptcy costs
  - No optimal capital structure
- Case II – corporate taxes but no bankruptcy costs
  - Optimal capital structure is 100% debt
  - Each additional dollar of debt increases the cash flow of the firm
- Case III – corporate taxes and bankruptcy costs
  - 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

Figure 16.8 – Summary of 3 Cases



Case I
With no taxes or bankruptcy costs, the value of the firm and its weighted average cost of capital are not affected by capital structures.

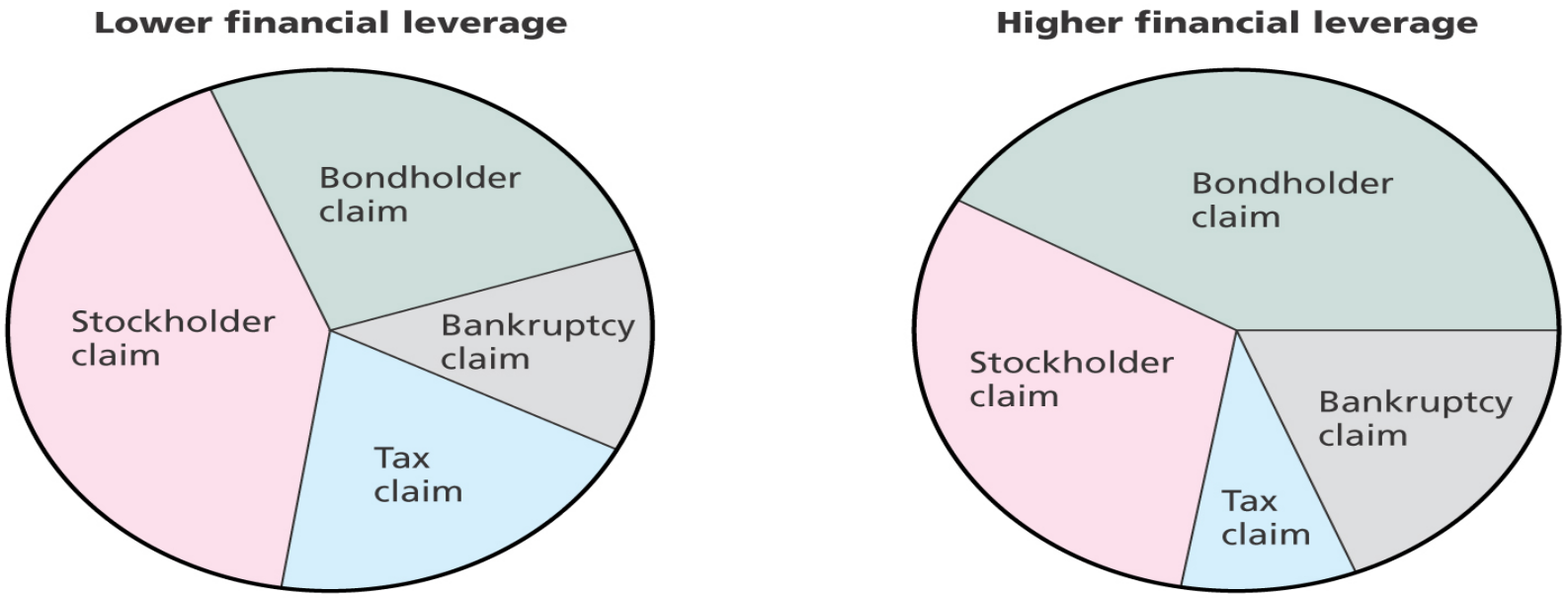
Case II
With corporate taxes and no bankruptcy costs, the value of the firm increases and the weighted average cost of capital decreases as the amount of debt goes up.

Case III
With corporate taxes and bankruptcy costs, the value of the firm, V_L, reaches a maximum at D^*, the point representing the optimal amount of borrowing. At the same time, the weighted average cost of capital, WACC, is minimized at D^*/E^*.

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. As a manager you need to understand the cost for your industry

Figure 16.9 – Extended Pie Model 16.7



In the extended pie model, the value of all the claims against the firm's cash flows is not affected by capital structure, but the *relative* values of claims change as the amount of debt financing is increased.

The Value of the Firm

- Value of the firm = marketed claims + non-marketed claims
  - Marketed claims are the claims of stockholders and bondholders
  - Non-marketed claims are the claims of the government and other potential stakeholders
- The overall value of the firm is unaffected by changes in capital structure
- The division of value between marketed claims and non-marketed claims may be impacted by capital structure decisions

Observed Capital Structures

- Capital structure does differ by industry
- Seems to be a connection between different industry's operating characteristics and capital structure
- Firms and lenders look at the industry's debt/equity ratio as a guide

Bankruptcy Process – Part I

- Business failure – business has terminated with a loss to creditors
- Legal bankruptcy – petition federal court for bankruptcy
- Technical insolvency – firm is unable to meet debt obligations
- Accounting insolvency – book value of equity is negative

Bankruptcy Process – Part II

- Liquidation
  - Covered under the Bankruptcy and Insolvency Act (1992)
  - Firm is terminated as a going concern
  - Trustee takes over assets, sells them and distributes the proceeds
- Reorganization
  - Keep firm as growing concern
  - Involves issuing new securities to replace old securities
- Depends on whether the company is worth more dead or alive