Module 11

DESIGNING A CAPITAL STRUCTURE

Background

- Two major decisions that concern managers include determining
  - Which projects create the most value
  - Which mix of sources of capital is best for financing the firm's investments
    - The opportunities to create value through a change in the mix of debt and equity capital are more limited than those available through the selection of superior investment projects
      - Too much debt is damaging because the firm will have difficulty in servicing its debt
      - Too little debt is fiscally inefficient because of the tax deductibility of interest expenses
        - The question then, is what is the right amount of debt?
- This Module examines how managers should combine debt and equity financing to achieve an optimal or target capital structure that maximizes the value of the firm's assets

Background

- After reading this Module, students should understand:
  - How changes in capital structure affect the firm's earnings per share, market value, share price, and cost of capital
  - The trade-offs that are implied in the capital structure decision
  - How corporate taxes and the costs of financial distress affect the capital structure decision
  - Why firms in different industries and countries can have different capital structures
  - The factors, in addition to taxes and financial distress costs, that must be taken into account when establishing an optimal capital structure include
    - Agency costs
    - Presence of information asymmetry between managers and outside investors

The Capital Structure Decision: No Corporate Taxes And No Financial Distress Costs

- This section examines how changes in capital structure affect the firm's
  - Profitability
  - Market value
  - Share price
  - Cost of capital
    - In a world without corporate taxes or **financial distress costs**

Effects Of Changes In Capital Structure On The Firm's Profitability (No Taxes And No Financial Distress Costs)

- To see why and how financial **leverage** affects earnings per share (EPS), we examine the case of the Jolly Bear Company (JBC)
  - Currently all-equity financed and its CFO is considering substituting half of the equity for the same amount of debt
    - Before a decision is made the risk that EBIT and ROA will be lower than their threshold values must be considered

Effects Of Changes In Capital Structure On The Firm's Profitability (No Taxes And No Financial Distress Costs)

- **Exhibit 11.1** illustrates the effect of a **recapitalization** decision on the firm's EPS for three possible scenarios
  - Recession
  - Expected performance
  - Expansion
- The firm's EPS will increase in the expansion and expected scenarios but will decrease in the recession scenario
  - Also determine threshold values of EBIT and ROA at which the EPS is the same for both capital structure (all-equity and fifty percent debt)

EXHIBIT 11.1a:
JBC's Earnings Per Share under the Current and Proposed Capital Structures and in the Absence of Taxes.

CURRENT CAPITAL STRUCTURE: NO DEBT AND TWO MILLION SHARES AT $100 PER SHARE			
	RECESSION	EXPECTED	EXPANSION
Earnings before interest & tax (EBIT)	$10,000,000	$30,000,000	$40,000,000
Less interest expenses	0	0	0
Less tax	0	0	0
Equals net earnings	$10,000,000	$30,000,000	$40,000,000
Divided by the number of shares	2,000,000	2,000,000	2,000,000
Equals earnings per share (EPS)	$5	$15	$20

EXHIBIT 11.1b:
JBC's Earnings Per Share under the Current and Proposed Capital Structures and in the Absence of Taxes.

PROPOSED CAPITAL STRUCTURE:	BORROW $100 MILLION AT 10 PERCENT AND USE THE CASH TO REPURCHASE ONE MILLION SHARES AT $100 PER SHARE		
	RECESSION	EXPECTED	EXPANSION
Earnings before interest & tax (EBIT)	$10,000,000	$30,000,000	$40,000,000
Less interest expenses	(10,000,000)	(10,000,000)	(10,000,000)
Less tax	0	0	0
Equals net earnings	$0	$20,000,000	$30,000,000
Divided by the number of shares	1,000,000	1,000,000	1,000,000
Equals earnings per share (EPS)	$0	$20	$30

EXHIBIT 11.2:
JBC's Earnings Per Share under Different Capital Structures.

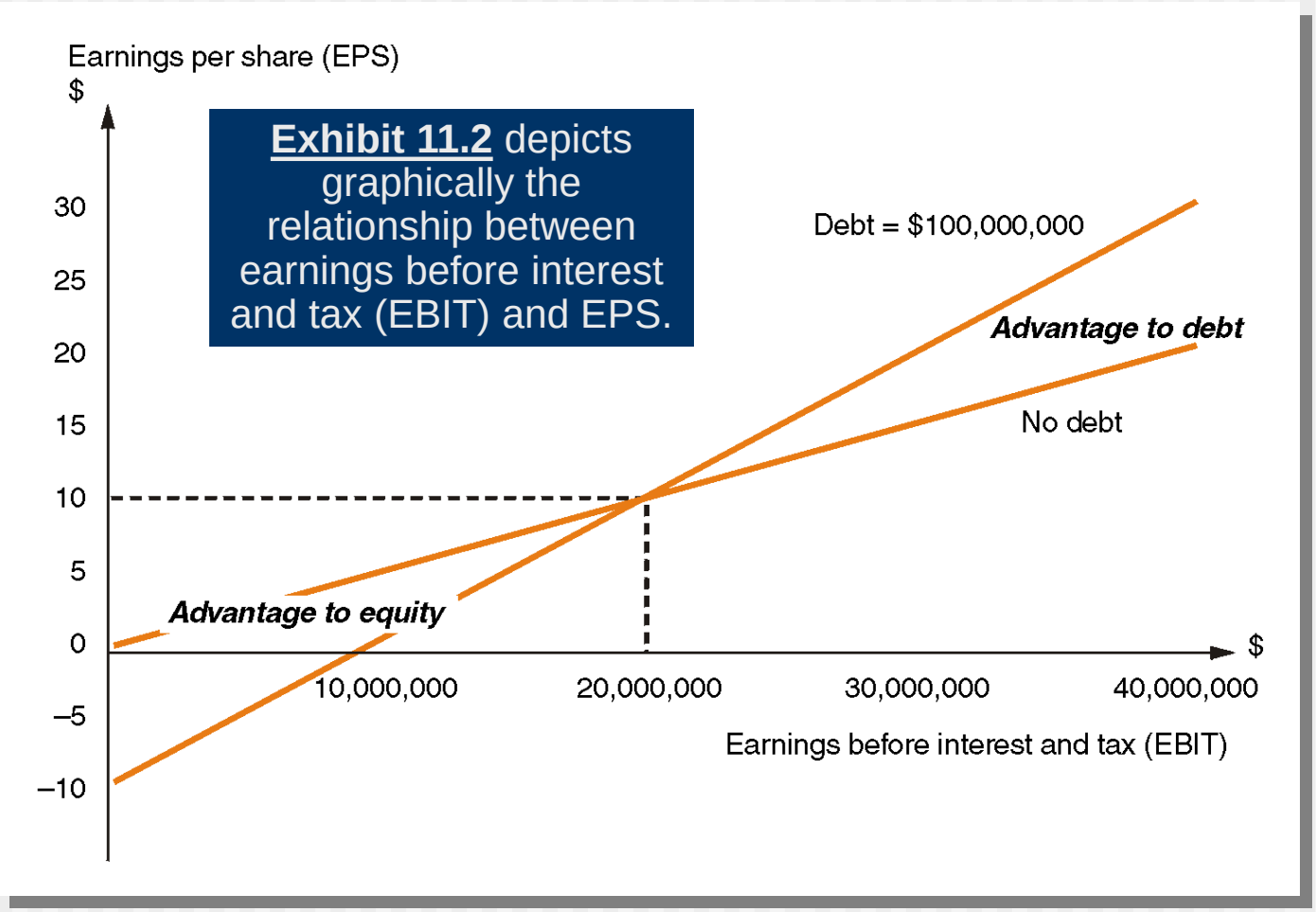
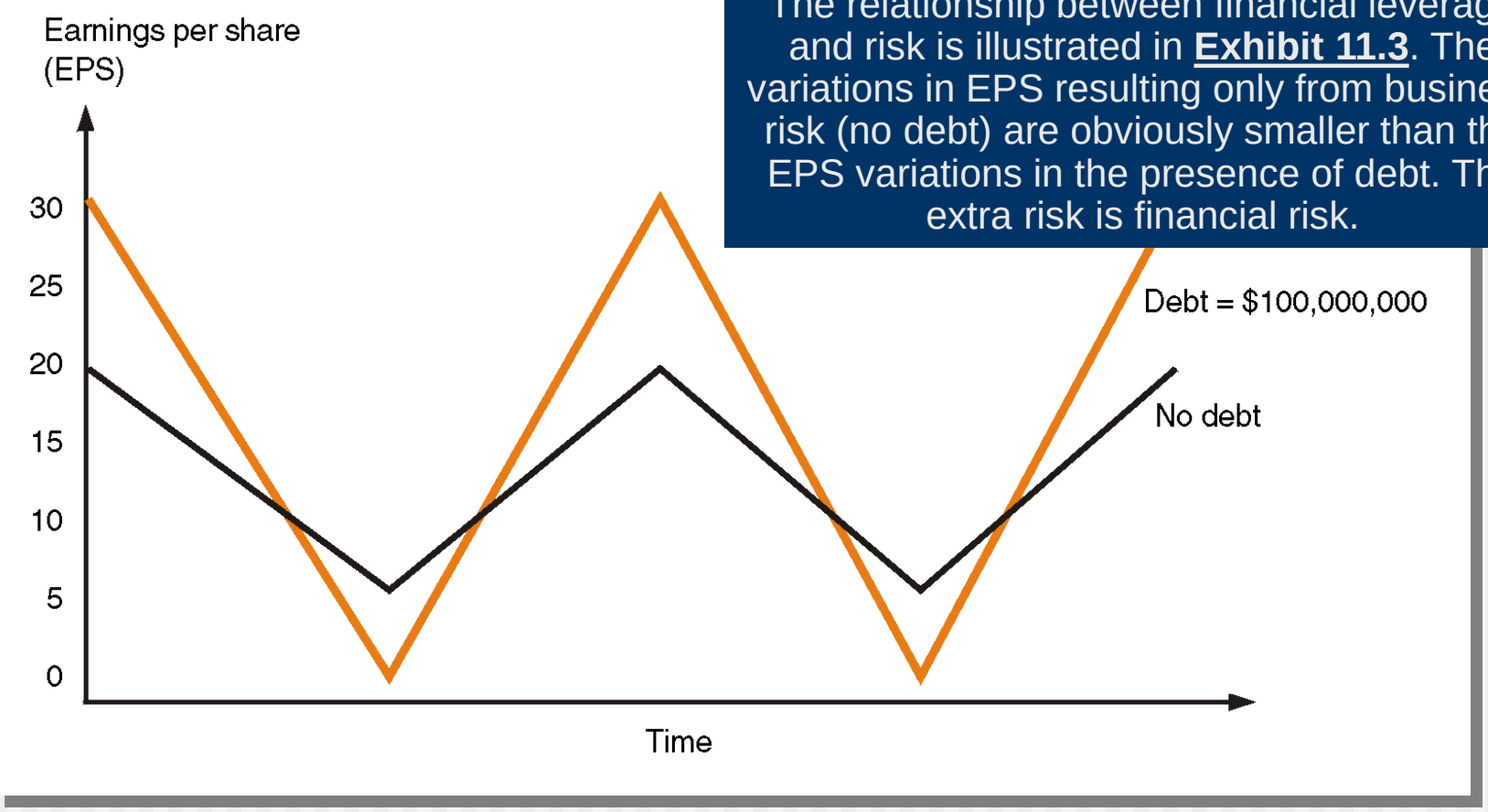


EXHIBIT 11.3:
Financial Leverage and Risk.

The relationship between financial leverage and risk is illustrated in **Exhibit 11.3**. The variations in EPS resulting only from business risk (no debt) are obviously smaller than the EPS variations in the presence of debt. The extra risk is financial risk.



The Trade-off Between Profitability And Risk

- If JBC decides to use debt, the firm will be faced with a trade-off between the following:
  - Debt can be issued to increase JBC's *expected* EPS, but then JBC's shareholders will have to take more risk
  - Stay all-equity financed, but then JBC's shareholders will end up with lower *expected* EPS
- To find out what to do, we need to determine how debt financing affects the firm's value, not just EPS
  - The pizza theory of capital structure provides the answer

Effect Of Changes In Capital Structure On The Firm's Value: The Pizza Theory

- In its culinary version, the pizza theory says that no one can increase the size of a pizza by slicing it
  - In its corporate finance version, it says that the market value of the firm's assets cannot be increased by changing the proportions of the cash flows going to the firm's shareholders and debtholders
    - Provided these cash flows are not taxed
- Modigliani-Miller developed a formal proof of the theory
  - In a world without taxes, the trade-off between risk and expected EPS does not actually exist
    - The increase in risk is exactly offset by the rise in the expected EPS the shareholders can expect from higher leverage
      - Whichever debt ratio a firm chooses, its share price will not change

EXHIBIT 11.4a:
Corporate Leverage versus Homemade Leverage.

SHAREHOLDER'S RETURN ON A $100 INVESTMENT WHEN JBC BORROWS AT $100 MILLION	RECESSION	EXPECTED	EXPANSION
JBC's net earnings with debt (from Exhibit 11.1)	$0	$20,000,000	$30,000,000
Divided by the number of shares	1,000,000	1,000,000	1,000,000
Equals earnings per share (EPS)	$0	$20	$30
Return on investment (EPS divided by $100)	0%	20%	30%

In **Exhibit 11.4** we show how the theory applies to JBC's capital structure decision. It illustrates how **homemade leverage** can result in returns that are exactly the same as those an investor would have achieved if the firm, not the investor, had levered its capital.

EXHIBIT 11.4b:
Corporate Leverage versus Homemade Leverage.

SHAREHOLDER'S RETURN ON A $100 NET INVESTMENT WHEN JBC MAINTAINS THE ALL-EQUITY CAPITAL STRUCTURE: THE INVESTOR BUYS TWO SHARES OF JBC, ONE WITH HIS OWN MONEY AND THE OTHER WITH BORROWED MONEY.

	RECESSION	EXPECTED	EXPANSION
JBC's net earnings with no debt (from Exhibit 11.1)	$10,000,000	$30,000,000	$40,000,000
Divided by the number of shares	2,000,000	2,000,000	2,000,000
Equals earnings per share (EPS)	$5	$15	$20
Earnings on two shares	$10	$30	$40
Less interest payment of 10% on 100	($10)	($10)	($10)
Net earnings	$0	$20	$30
Return on investment (net earnings divided by $100)	0%	20%	30%

Effect Of Changes In Capital Structure On The Firm's Cost Of Capital (No Taxes And No Financial Distress Costs)

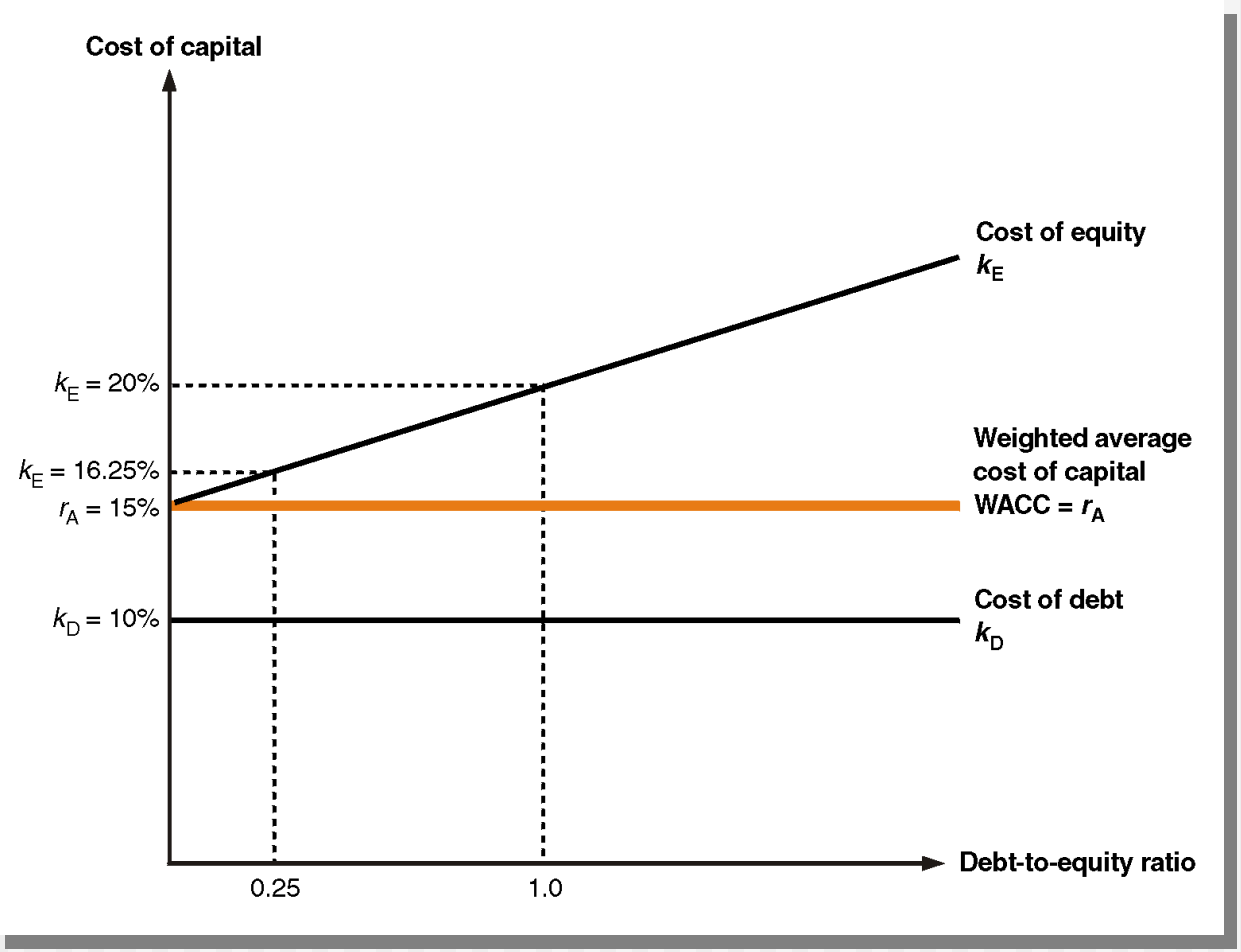
- If the firm is debt free
  - Its cost of capital is equal to the expected return on its assets
- If the firm is leveraged
  - A premium (or discount) must be added which depends upon
    - Difference between the expected return on assets and the cost of debt
    - Amount of debt relative to the amount of equity

$$k_E = r_A + (r_A - k_D)\frac{D}{E}$$

EXHIBIT 11.5:
JBC's Cost of Equity and WACC for Two Debt-to-Equity Ratios, r_A = 15% and k_D = 10%.

DEBT-TO-EQUITY RATIO	$\frac{0.20\ \text{DEBT}}{0.80\ \text{EQUITY}}$ = 0.25	$\frac{0.50\ \text{DEBT}}{0.50\ \text{EQUITY}}$ = 1.00
Cost of equity from equation 11.2	15% + (15% – 10%) × 0.25 = 16.25%	15% + (15% – 10%) × 1.00 = 20%
Weighted average cost of capital from the right side of equation 11.1	16.25% × 0.80 + 10% × 0.20 = 15%	20% × 0.50 + 10% × 0.50 = 15%

EXHIBIT 11.6:
The Cost of Capital as a Function of the Debt-to-Equity Ratio According to the Pizza Theory and in the Absence of Taxes.



As the firm replaces equity with debt, shareholders bear increasing levels of financial risk and, therefore, expect higher returns from their investment. At the same time, the firm's weighted average cost of capital (WACC) also remains the same and equal to the return expected from the firm's assets.

EXHIBIT 11.7:
JBC's Share Price for Different Capital Structure.

Capital Structure	Financial Risk	Market Value of Assets (1)	Amount of Debt Financing (2)	Market Value of Equity (1) – (2) = (3)	Number of Shares (4)	Price per Share (3)/ (4)
No debt	none	$200 million	none	$200 million	2,000,000	$100
20% debt	low	$200 million	$40 million	$160 million	1,600,000	$100
50% debt	higher	$200 million	$100 million	$100 million	1,000,000	$100

With no taxes or financial distress costs, the pizza theory of capital structure states that a firm's financial structure decision does not affect its market value or its WACC.

As a result, the firm's share price does not move.

EXHIBIT 11.8a:
Effects of Changes in Capital Structure on the Firm's Earnings Per Share, Share Price, Market Value, and Cost of Capital Without Corporate Taxes and with a 50 Percent Corporate Tax Rate.

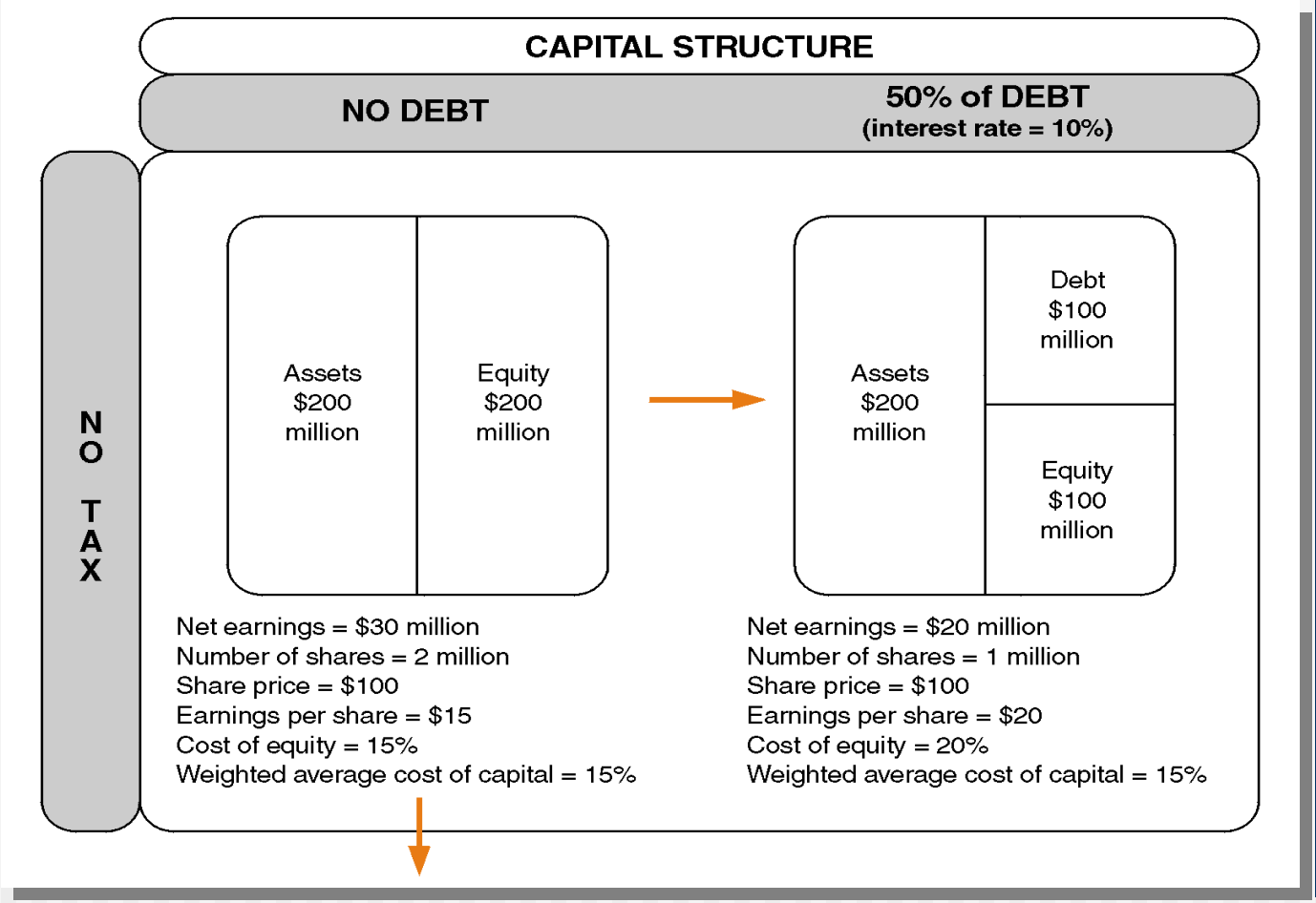
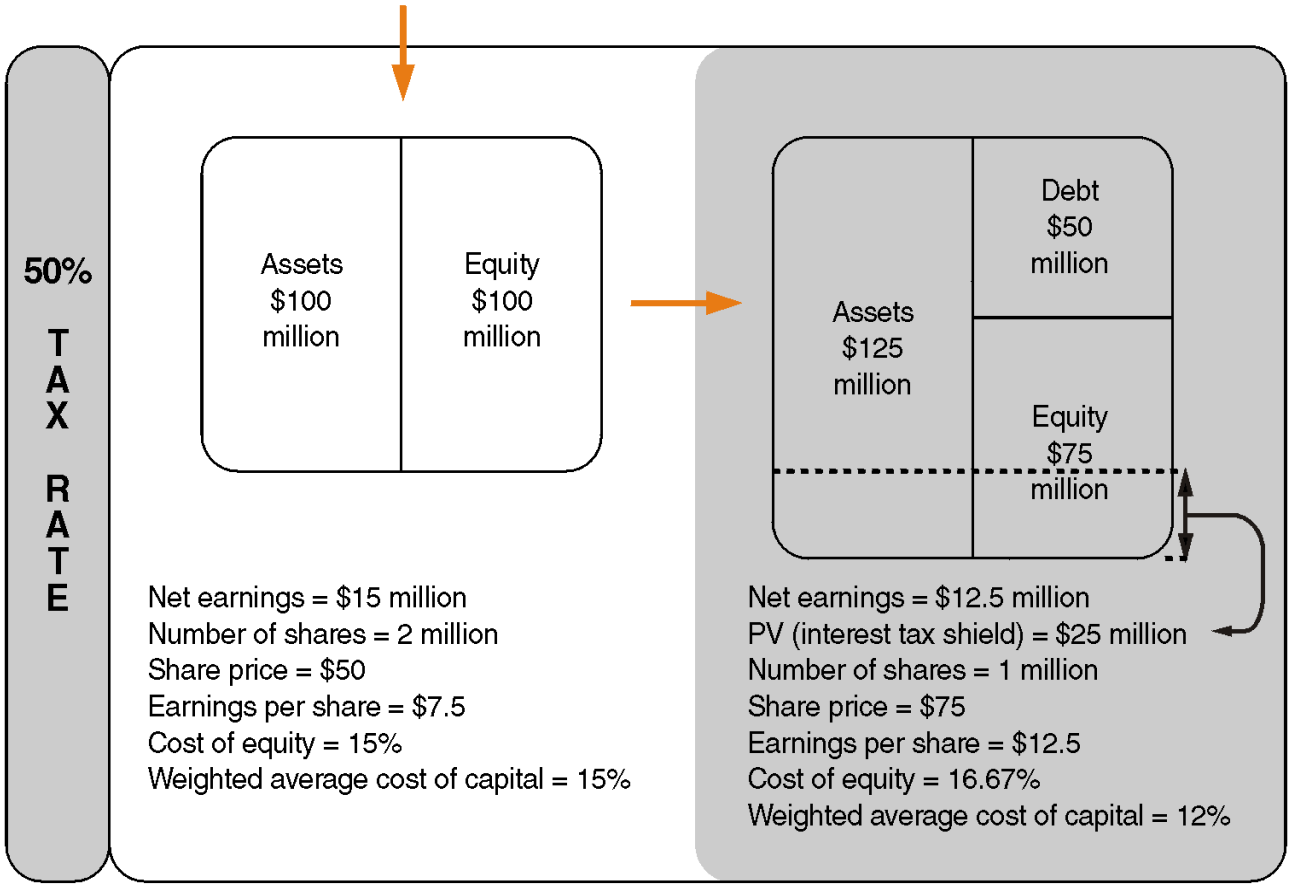


Exhibit 11.8 reproduces the results of the previous analysis of the effects of a change in capital structure on the value of the firm's assets and equity, its share price, and its cost of capital in a world when there is no corporate income tax and when the firm's profits are taxed at a rate of 50 percent.

EXHIBIT 11.8b:
Effects of Changes in Capital Structure on the Firm's Earnings Per Share, Share Price, Market Value, and Cost of Capital Without Corporate Taxes and with a 50 Percent Corporate Tax Rate.



In the presence of taxes, both the value of the firm's assets and its share price will *rise* as debt replaces equity in the firm's balance sheet.

Effect Of Changes In Capital Structure On The Value Of A Firm's Assets And Share Price Taxes And No Financial Distress Costs

- The substitution of debt financing for equity reduces the amount of tax a firm must pay
  - Increases the *aftertax* cash flow generated by the firm's assets
    - A higher cash flow from assets raises their market value, as well as the firm's share price
    - The annual interest tax shield is $T_c \times k_D \times \text{Debt}$
- Value of a firm's assets financed with debt is equal to their value if they were financed only with equity
  - Plus the present value of the interest tax shields that debt financing is expected to generate in the future
    - $V_L = V_U + PV_{rrs}$
    - The more the firm borrows, the larger the present value of the interest tax shield and the higher the value of the firm's assets

EXHIBIT 11.9:
The Value of JBC as a Function of Its Debt-Assets Ratio in the Presence of Taxes.

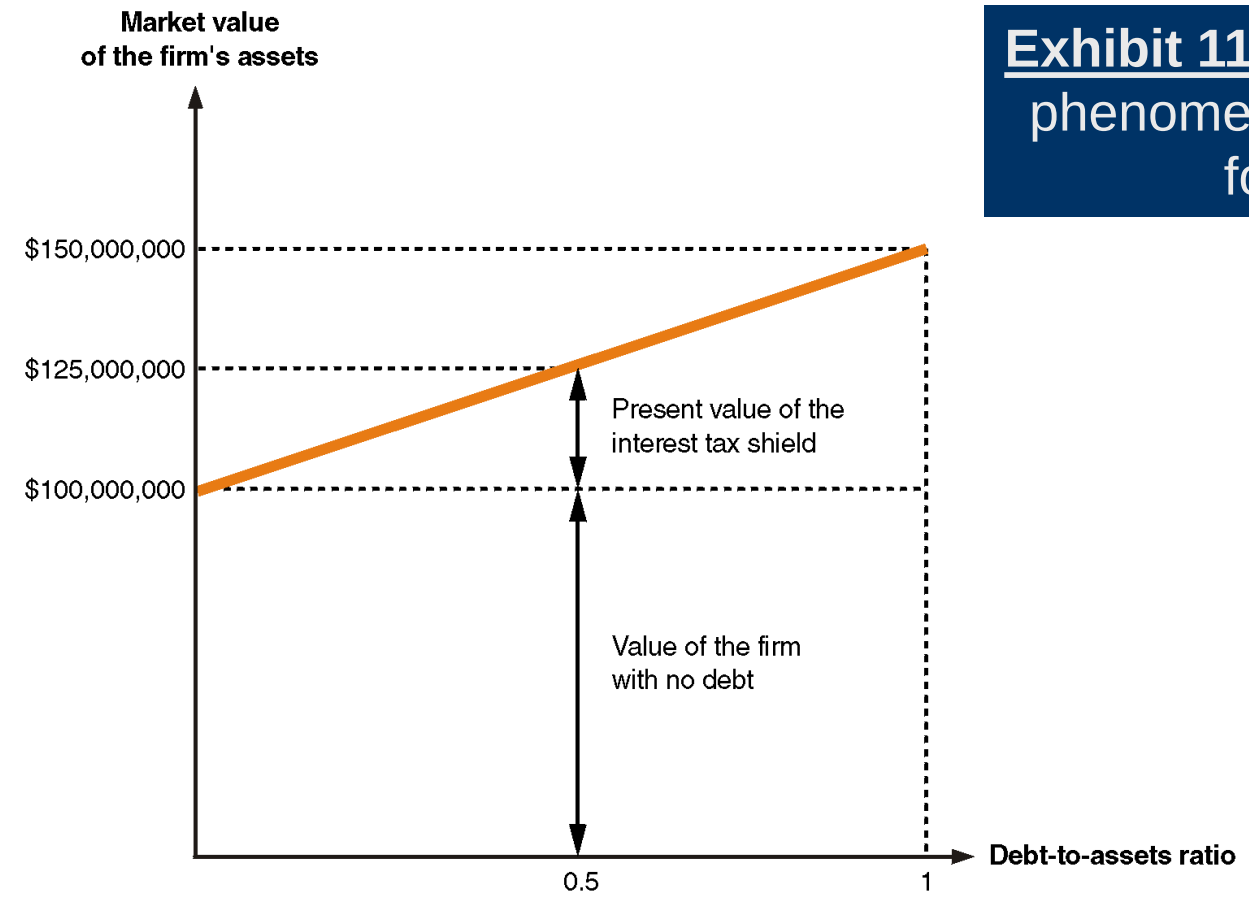


Exhibit 11.9 illustrates this phenomenon graphically for JBC.

EXHIBIT 11.10a:
JBC's Share Price for Different Capital Structures with a 50 Percent Corporate Tax Rate.

CAPITAL STRUCTURE	AMOUNT OF DEBT FINANCING (1)	NUMBER OF SHARES OUTSTANDING (2)	UNLEVERED VALUE OF ASSETS (3)
No debt	No debt	2,000,000	$100 million
20% debt	$20 million	1,600,000	$100 million
50% debt	$50 million	1,000,000	$100 million

Exhibit 11.10 illustrates the same phenomenon with the help of a numerical example.

EXHIBIT 11.10b:
JBC's Share Price for Different Capital Structures with a 50 Percent Corporate Tax Rate.

PRESENT VALUE OF INTEREST TAX SHIELD (4)	LEVERED VALUE OF ASSETS (3) + (4) = (5)	VALUE OF EQUITY (5) – (1) = (6)	SHARE PRICE (6)/(2)
Zero	$100 million	$100 million	$50
$10 million	$110 million	$90 million	$56.25
$25 million	$125 million	$75 million	$75

Effect Of Changes In Capital Structure On The Value Of A Firm's Assets And Share Price Taxes And No Financial Distress Costs)

- Opportunities to create value through changes in a firm's capital structure
  - Significantly more limited than those obtained from superior investment decisions
    - Because, after the firm has reached its **optimal capital structure**, it will no longer be able to create more value through recapitalization

Effect Of Changes In Capital Structure On The Cost Of Capital (Taxes And No Financial Distress Costs)

- The relationship between the cost of equity and the debt ratio must be adjusted to account for the tax deductibility of interest charges

$$k_E = r_A + (r_A - k_D)(1 - T_C)\frac{D}{E}$$

- The aftertax WACC is:

$$WACC = k_E \frac{E}{E+D} + k_D(1 - T_c)\frac{D}{E+D}$$

EXHIBIT 11.11:
The Cost of Capital as a Function of the Debt-to-Equity Ratio According to the Pizza Theory and in the Presence of Corporate Taxes.

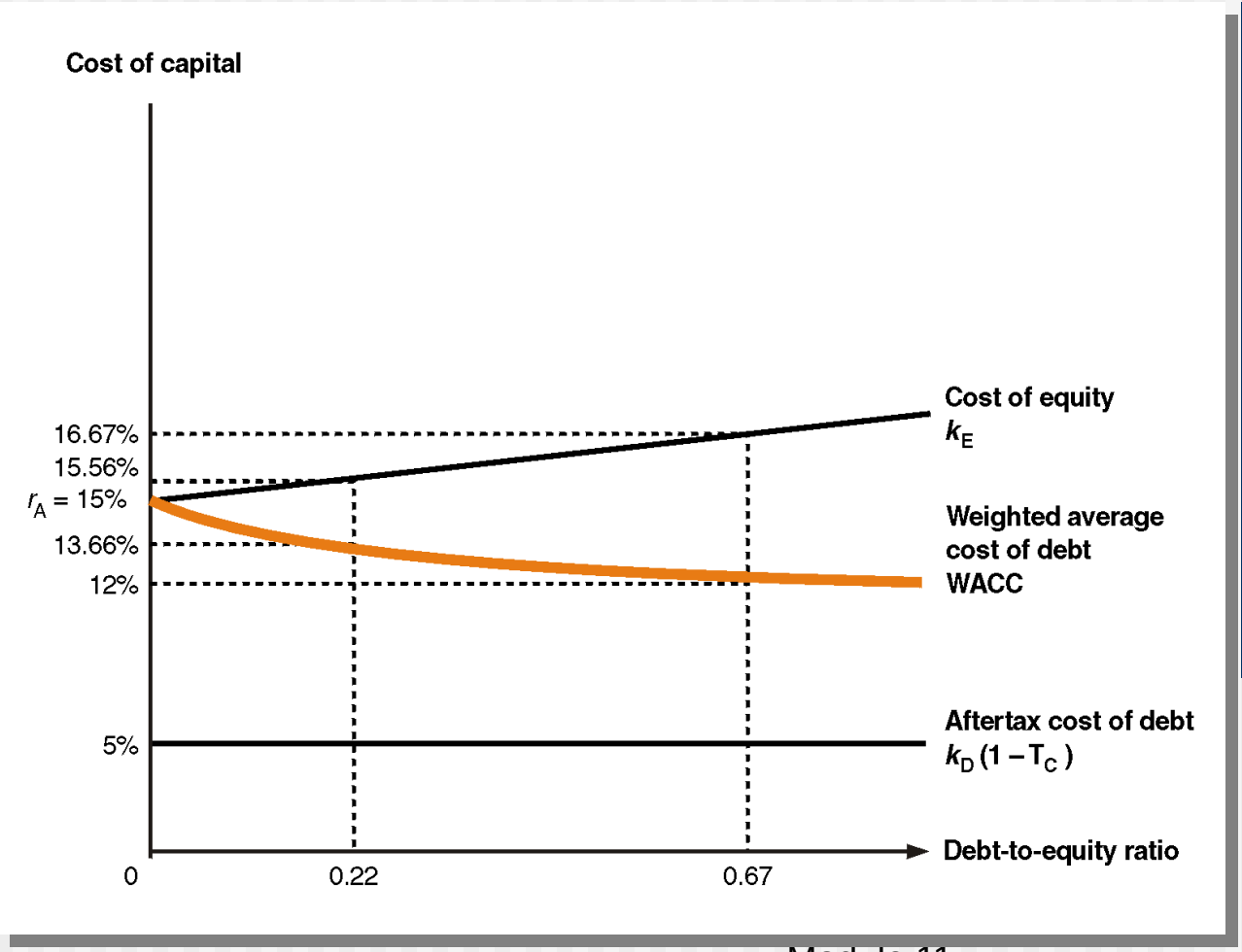


Exhibit 11.11 and **11.12** replicate **Exhibit 11.5** and **11.6** in the presence of taxes. In that case, the value of the firm increases and its WACC decreases as more and more debt replaces equity in the firm's capital structure.

EXHIBIT 11.12:
JBC's Cost of Equity and WACC for Two Debt-to-Equity Ratios, r_A = 15% and k_D = 10% and T_C = 50%. Value of Equity from Exhibit 11.11.

AMOUNT BORROWED	$20 MILLION	$50 MILLION
Value of equity	$90 million	$75 million
Debt-to-equity ratio	$\frac{\$20 \text{ million}}{\$90 \text{ million}} = 0.22$	$\frac{\$50 \text{ million}}{\$75 \text{ million}} = 0.67$
$\frac{D}{E + D}$	$\frac{\$20 \text{ million}}{\$110 \text{ million}} = 0.18$	$\frac{\$50 \text{ million}}{\$125 \text{ million}} = 0.40$
Cost of equity from equation 11.5	15% + (15% – 10%) (1 – 50%) × 0.22 = 15.56%	15% + (15% – 10%)(1 – 50%) × 0.67 = 16.67%
Weighted average cost of capital from equation 11.6	15.56% × 0.82 + 5% × 0.18 = 13.66%	16.67% × 0.60 + 5% × 0.40 = 12.00%

The Capital Structure Decision When Financial Distress Is Costly

- If a firm finds it increasingly difficult to service its debt, it will face financial distress and may ultimately go bankrupt
  - However, before a firm legally declares **bankruptcy**, it may have already incurred significant **indirect costs of financial distress**
    - These costs reduce the cash flows expected from the firm's assets
      - Then shareholders have to bear most of the financial distress costs because debtholders have a prior and fixed claim on the "smaller pizza"

EXHIBIT 11.13:
The Value of a Firm in the Presence of Corporate Taxes and Financial Distress Costs as a Function of its Debt-to-Assets Ratio.

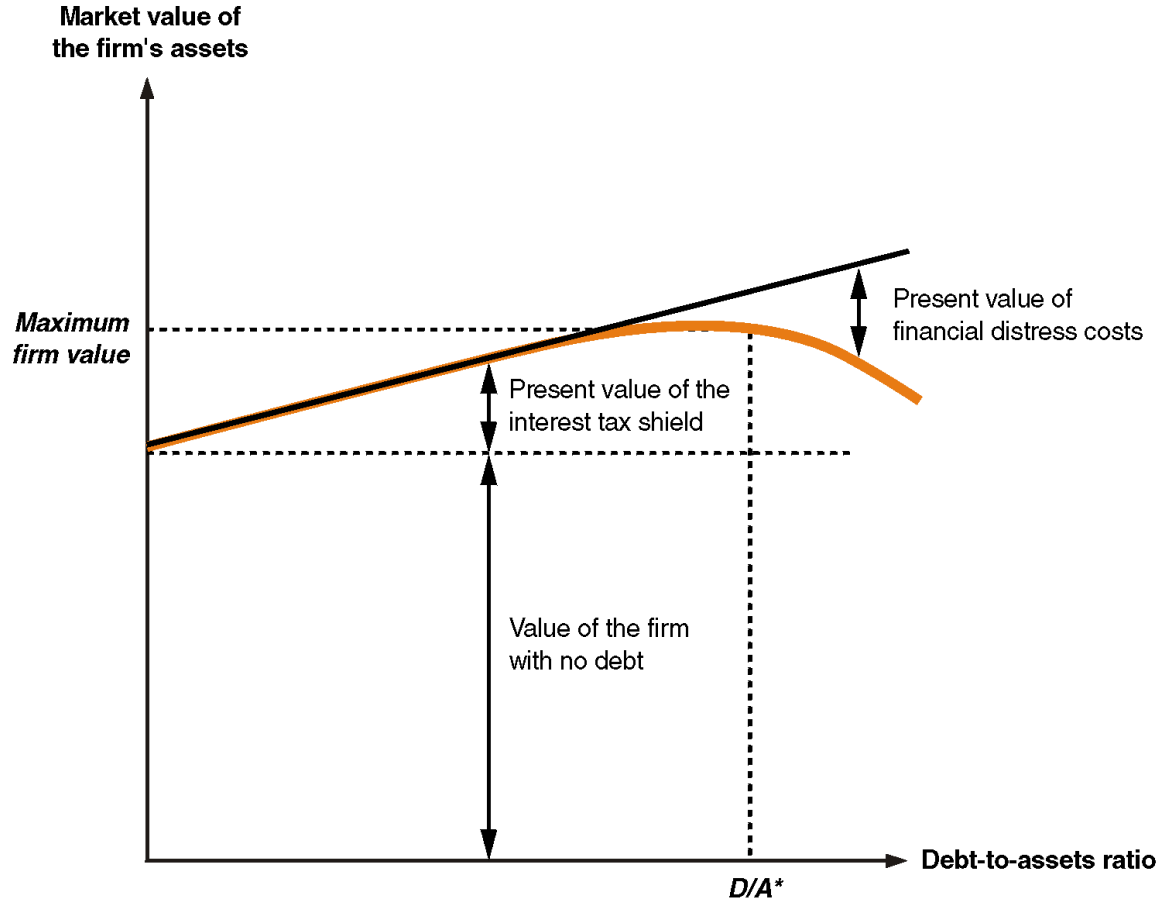


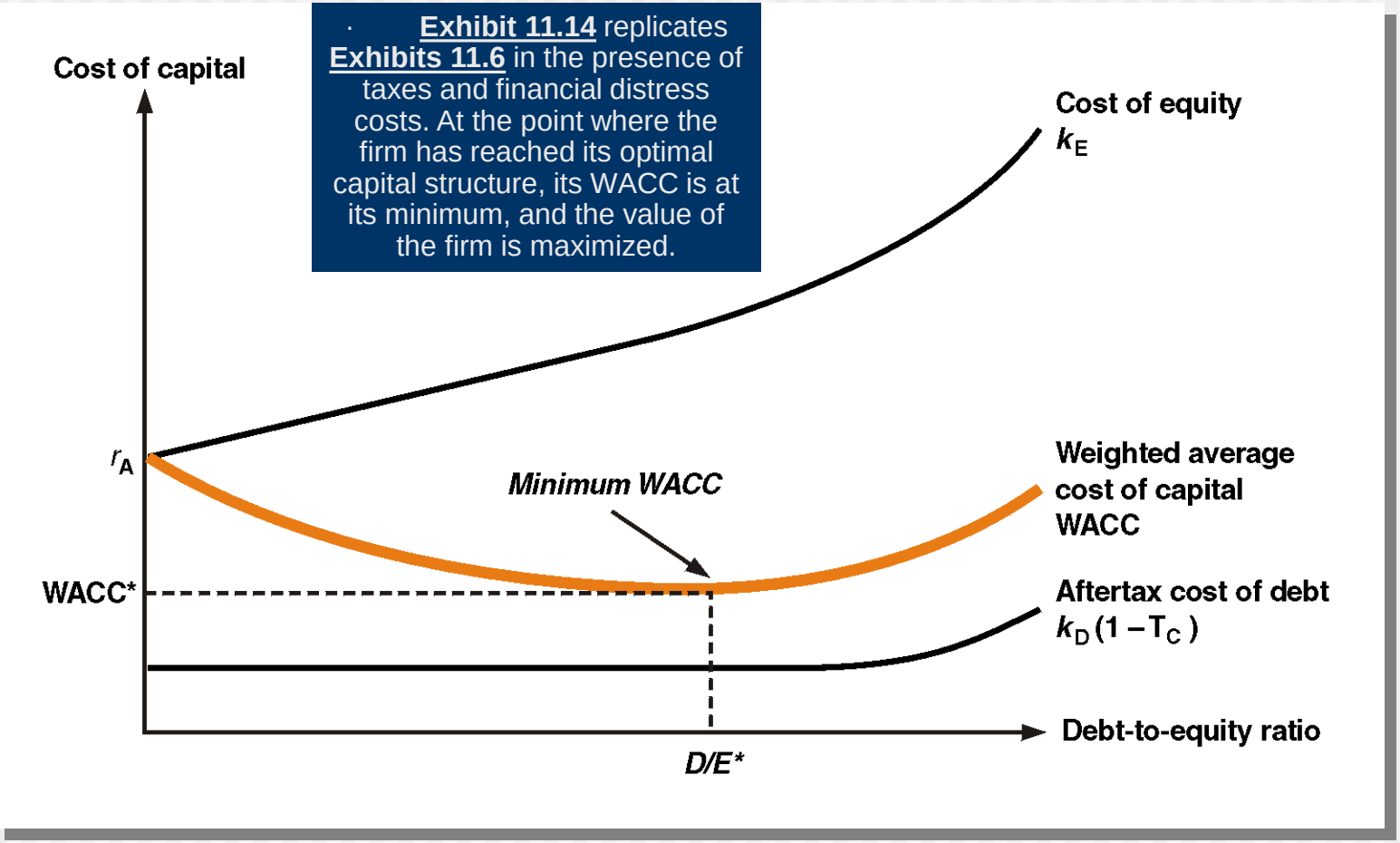
Exhibit 11.13 illustrates the negative impact of financial distress costs.

The Capital Structure Decision When Financial Distress Is Costly

- As more and more debt replaces equity, the probability of financial distress rises and the present value of the associated costs grows at an increasing rate
  - At some debt level, the increase in the present value of financial distress costs becomes equal to the increase in the present value of the interest tax shield
    - At that point the firm has reached the capital structure that maximizes its value

$$V_L = V_U + PV_{rrs} - PV_{CFD}$$

EXHIBIT 11.14:
The Cost of Capital as a Function of the Debt-to-Equity Ratio in the Presence of Corporate Taxes and Financial Distress Costs.



The Capital Structure Decision When Financial Distress Is Costly

- According to the **trade-off model of capital structure**
  - An optimal capital structure exists that is the outcome of a trade-off between
    - Benefit of the interest tax shield and the cost of financial distress arising from an increasing use of debt financing
      - The model provides a conceptual framework for formulating a capital structure policy for a firm

A Closer Look At The Trade-off Model Of Capital Structure

- The value of the interest tax shield in the presence of personal income tax

$$\text{Interest tax shield} = \left[1-\left(1-T_c\right)\times\frac{\left(1-T_E\right)}{\left(1-T_D\right)}\right]\times k_D \times \text{Debt}$$

  - When personal tax rates on debt and equity incomes are equal, the interest tax shield is the same as when personal taxes are ignored
  - When the personal tax rate on equity income is *lower* than that on interest income (which is the case most of the time)
    - Interest tax shield is lower than the one when personal taxes are not considered

Factors Affecting the Risk and Cost of Financial Distress

- Firm-specific factors that are likely to increase the probability that a firm will experience a state of financial distress
  - **Volatility of the Firm's Operating Profits**
    - A firm with high business risk faces a higher probability of financial distress than a firm that has steady operating profits and cash flows, even when the firms have the *same debt ratio*
  - **Type of Assets the Firm Holds**
    - Firms with relatively large proportions of intangible assets face higher costs of financial distress than firms that have the *same debt ratio* but that have relatively large proportions of tangible assets that can be sold in case of bankruptcy

Factors Affecting the Risk and Cost of Financial Distress

- **Type of Products or Services the Firm Sells**
  - A commodity supplier faces lower costs of financial distress than a supplier of unique goods or services with the *same debt ratio*
- **Structure of the Country's Financial System**
  - In countries where banks are owned or controlled by the state or are allowed to own shares of companies, firms usually have higher debt ratios than in countries where banks are in the private sector and must restrict their activities only to lending

Factors Other Than Taxes That May Favor Borrowing

- Reasons why a firm's owners would want to borrow that are not based on the tax advantage of debt financing
  - **Debt is a device that helps reduce the agency costs arising from the separation of ownership from control**
    - Managers may not always act in the best interest of the shareholders and this situation creates an **agency problem**
      - Causes a reduction in the firm's market value referred to as the **agency cost of equity financing**
        - For example managers may make decisions that increase their own level of comfort and satisfaction, but that reduce the firm's value
        - Moreover, managers' income and most of their wealth depend on the firm that employs them, whereas most shareholders only invest a fraction of their wealth in a single firm

Factors Other Than Taxes That May Favor Borrowing

- Because they are poorly diversified, managers are more exposed to risk than their well-diversified shareholders
- Consequently, they may be tempted to adopt a more conservative debt policy than the one that maximizes the firm's value

- Debt financing can be a partial solution to this agency problem because the service of the debt will reduce the amount of cash that could be spent by managers for their own benefit

- **Debt is a device that allows current owners to retain control**
  - If the firm needs outside funding and the current owners wish to retain control and avoid **dilution** of the firm's equity, they will prefer that the firm borrow rather than issue new shares, regardless of tax shield considerations.

Factors Other Than Taxes That May Favor Borrowing

- **Debt is a device that helps resolve the problem of information asymmetry between managers and outside investors**
  - Asymmetric information exists when management knows more about the future prospects of their firms than outside investors
  - The presence of asymmetric information may create a managerial preference for debt financing
    - Because investors may think that firms issue shares only when managers believe that the firm's equity is overvalued
      - There is evidence that share prices go down when firms announce their intention to issue new shares

Factors Other Than Financial Distress Costs That May Discourage Borrowing

- Some firms may deliberately decide to refrain from borrowing even if the financial distress costs are moderate or not significant
  - **Excessive debt may prevent firms from taking full advantage of the interest tax shield**
    - Firms that operate in capital-intensive industries can already reduce their tax liability through accelerated depreciation schedules
      - Consequently, they may not have sufficient pretax operating profits to benefit fully from the additional tax savings
    - Service-based firms can afford higher debt ratios to benefit from higher interest tax shield
      - Because they have no significant depreciation expenses that reduce their tax liability

Factors Other Than Financial Distress Costs That May Discourage Borrowing

- **Excessive debt may create costly conflicts of interest between shareholders and debtholders**
  - **Agency costs of debt**
    - Management and shareholders could collude to expropriate lenders
      - In response, the suppliers of capital require protection in the form of **restrictive covenants** to their lending
      - The more debt is used, the more restrictive are the covenants and the higher the associated costs
      - These agency costs eventually reach a point where they offset the benefit of the interest tax shield
  - The agency costs of debt financing and the agency costs of equity have opposite effects on the firm's value

Factors Other Than Financial Distress Costs That May Discourage Borrowing

- **Excessive debt may constrain the firm's ability to pay stable dividends**
  - To avoid negative **signaling effects** resulting from changes in dividend payments, managers generally prefer to adopt **stable dividend policies**
    - Unless they face a severe cash flow problem and have no choice but to cut dividends
  - Firms with excessive debt may be unable to maintain a stable dividend policy
- **Excessive debt may reduce the firm's financial flexibility and affect its credit rating**
  - Firms often build up **financial slack** in order to increase their **debt capacity** and/or to have cash available for new investment opportunities
  - Also, managers may be reluctant to increase their firm's indebtedness out of fear of a credit downgrade, even if more debt makes sense otherwise

Is There A Preference For Retained Earnings?

- There seems to be a preference on the part of managers for retained earnings over external financing
  - **Contrary to securities, retained earnings do not have issue costs**
    - Retained earnings do not have any **flotation** or **issue costs**
      - Such as the administrative costs or those of using the services of investment banks that sell the firm's securities to the public

Pecking Order

- When outside funds are sought, debt financing is usually preferred to equity financing
  - **Do firms have a preferred order in their choice of financing?**
    - Evidence that firms usually raise capital according to a **pecking order**
      - Rely first on retained earnings and then issue debt before raising new equity
      - One implication of the pecking order hypothesis is that firms may not have a particular target debt ratio or, if they have one, they do not use it consistently

Putting It All Together

- No formula that ties together all the factors that influence a firm's capital structure and that identifies an optimal debt ratio for a firm
  - Those factors are summarized in **Exhibit 11.15**
- Best starting point for the analysis of a firm's appropriate capital structure is the average debt ratio of similar firms in the industry
  - Ratio must then be adjusted upward or downward to reflect the firm's particular conditions
    - Firm does not have to maintain its target debt ratio at all times
      - Objective is to ensure that, *over time*, the firm's average debt ratio is close to its target value

EXHIBIT 11.15a:
Factors Affecting the Capital Structure Decision.

FACTORS THAT FAVOR BORROWING	
Primary factor	
Corporate income tax	**Debt is a device that allows firms to reduce their corporate income tax because interest expenses are tax deductible whereas dividends and retained earnings are not. However, the interest tax shield at the corporate level may be reduced by the impact of personal income taxes.**
Important secondary factors	
Agency costs of equity	**Debt is a device that helps *reduce* the agency costs of equity arising from the tendency of managers to make decisions that are not always in the best interest of shareholders. Debt increases the firm's value because debt servicing imposes focus and discipline on managers, who will then be less likely to "waste" shareholders' funds.**

EXHIBIT 11.15b:
Factors Affecting the Capital Structure Decision.

FACTORS THAT FAVOR BORROWING *(Continued)*	
Retention of control	**Debt allows current owners to retain control of the firm. This factor, however, may reduce share price because of the inability of outsiders to take over the company when its ownership is not dispersed.**
Information asymmetry	**Issuing debt instead of equity allows the firm to avoid the drop in share price that usually accompanies a new equity issue. This drop occurs because outside shareholders think that managers issue share only when they believe the firm's shares are overvalued.**

EXHIBIT 11.15c:
Factors Affecting the Capital Structure Decision.

FACTORS THAT DISCOURAGE (EXCESSIVE) BORROWING	
Primary factor	
Costs of financial distress	**Excessive debt increases the probability that the firm will experience financial distress. And the higher the probability of financial distress, the larger the present value of the expected costs associated with financial distress and the lower the value of the firm. Firms that face higher probability of financial distress include companies with pretax operating profits that are cyclical and volatile, companies with a relatively large amount of intangible and illiquid assets, and companies with unique products and services or with products that require after-sale service and repair.**

EXHIBIT 11.15d:
Factors Affecting the Capital Structure Decision.

FACTORS THAT DISCOURAGE (EXCESSIVE) BORROWING *(Continued)*	
Important secondary factors	
Agency costs of debt	**Additional borrowing comes with strings attached. Lenders impose increasingly constraining and costly protective covenants in new debt contracts to protect themselves against the potential misallocation of borrowed funds by managers acting on behalf of shareholders.**
Dividend policy	**Excessive debt may constrain the firm's ability to adopt a stable dividend policy.**
Financial flexibility	**Excessive debt may reduce the firm's financial flexibility, that is, its ability to quickly seize a value-creating investment opportunity.**