



CHAPTER 16

Financial Distress, Managerial Incentives, and Information

Chapter Synopsis

In the previous two chapters it was shown that, in an otherwise perfect capital market in which firms pay taxes, the optimal capital structure includes debt such that earnings before interest and taxes equals interest. This allows the firm to avoid paying taxes and maximizes firm value. This chapter discusses how including market imperfections other than taxes in the analysis leads to the conclusion that firms should often borrow less than this amount.

16.1 Default and Bankruptcy in a Perfect Market

A firm is in **default** when it fails to make the required interest or principal payments on its debt. When a firm fails to satisfy another of the contractual requirements in the debt contract, such as an accounting ratio falling below a defined threshold, it may trigger so-called technical default. The occurrence or likelihood of either type of default often leads to a firm filing for bankruptcy protection under the 1978 Bankruptcy Reform Act to prevent creditors from immediately seizing collateral.

With perfect capital markets, Modigliani and Miller's Proposition I still applies because bankruptcy alone does not lead to a reduction in the firm's total value to investors. With perfect capital markets, bankruptcy simply shifts the ownership of the firm from equity holders to debt holders without changing the total value available to all investors.

16.2 The Costs of Bankruptcy and Financial Distress

The U.S. bankruptcy code was created to organize the bankruptcy process so that creditors are treated fairly and the value of the assets is not needlessly destroyed. According to the provisions of the 1978 Bankruptcy Reform Act, U.S. firms can file for two forms of bankruptcy protection: Chapter 7 or Chapter 11.

- In a **Chapter 7 liquidation**, a trustee is appointed to oversee the liquidation of the firm's assets through an auction. The proceeds from the liquidation are used to pay the firm's creditors, and the firm ceases to exist.
- In a **Chapter 11 reorganization**, a firm files for bankruptcy protection and all pending collection attempts are automatically suspended in a procedure called an **automatic stay**. The firm's existing management continues to operate the business and is given 120 days to propose a reorganization plan, which specifies the treatment of each creditor of the firm. In addition to cash payment, creditors may receive new debt or equity securities under the plan. The value of the cash and securities will generally be less than the amount each creditor was owed, but is hopefully more than they would receive if the firm was shut down immediately and liquidated, and any going concern value was destroyed. The creditors must vote to accept the plan using a specific process, and it must be approved by the court.

Unlike in perfect capital markets, a firm in bankruptcy generally incurs direct and indirect costs.

- **Direct costs of bankruptcy** include out-of-pocket costs associated with defaulting on the contractual obligations in a debt contract, and going through the court supervised bankruptcy processes as defined in chapter 11 (reorganization) or chapter 7 (liquidation) of the 1978 Bankruptcy Reform Act. The costs may include court, lawyer, accountant, and investment banker fees incurred in the process. While difficult to quantify, studies estimate these costs as 3-4% of asset value.
- **Indirect costs of bankruptcy** may include: a loss of customers that value post-sale services, a loss of willing suppliers, difficulty retaining and recruiting employees, and forced sales of assets at reduced prices. The costs are particularly difficult to quantify, but one study estimates these costs to be as high as 20% of firm value.

16.3 Financial Distress Costs and Firm Value

Direct and indirect costs of financial distress represent an important departure from Modigliani and Miller's assumption of perfect capital markets. Levered firms risk incurring financial distress costs that reduce the cash flows available to investors. When securities are fairly priced, the original shareholders of a firm pay the present value of the costs associated with bankruptcy and financial distress.

16.4 Optimal Capital Structure: The Trade-off Theory

In the **trade-off theory of capital structure**, debt should be chosen to maximize the value of the levered firm, V^L , which equals the value of the unlevered firm, V^U , plus the present value of any interest tax shield, net of the present value of other imperfections:

$$V^L = V^U + PV(\text{Interest tax shield}) - PV(\text{Direct costs of bankruptcy}) - PV(\text{Indirect costs of bankruptcy}) - PV(\text{Agency costs of debt}) + PV(\text{Agency benefits of debt}).$$

16.5 Exploiting Debt Holders: The Agency Costs of Leverage

Agency costs are losses in value associated with having an agent with different interests work on behalf of the principals, or owners. In the context of a firm with leverage, a conflict of interest may exist because investment decisions may have different consequences for debt holders and equity holders.

In some circumstances, managers may have an incentive to take actions, such as excessive risk taking, under-investment, or cashing out, that benefit equity holders but harm the firm's creditors and lower the total value of the firm. For example, managers acting on behalf of the shareholders may engage in excessive risk taking and accept negative NPV projects because the cost of failure is largely borne by the debt holders if the project fails to generate sufficient cash flow to pay the interest and principal, and control of the firm is effectively turned over to the debt holders.

16.6 Motivating Managers: The Agency Benefits of Leverage

Using debt financing as a source of capital can also enhance a firm's value beyond just the tax shields from interest. For example, managers (the agents of the shareholders) of unlevered firms with excessive free cash flow, beyond what is needed to fund all positive NPV projects, may be motivated to spend the cash on things that benefit themselves, such as corporate jets and value-decreasing acquisitions, for the sake of empire building. If such firms have high leverage, they will have less free cash flow and thus less of an opportunity to make such value-decreasing investments.

In addition, when managers are shareholders in their firm, shareholder concentration can be maintained by issuing new debt instead of new equity, or increased by replacing some equity with debt. Managers that own a higher percentage of a firm's equity will have a better chance of making decisions that maximize the value of the stockholders' investment.

16.7 Agency Costs and the Trade-off Theory

The trade-off theory implies that mature, low-growth firms with stable cash flows and tangible assets should use more debt because they can use the tax shields and would incur lower costs if distress occurs, while firms with unstable cash flows and lots of intangible assets should use little or no debt because the probability and cost of financial distress are high. It also implies that, if securities are fairly priced, the original shareholders of the firm pay the present value of the costs associated with bankruptcy and financial distress, so firms often try to take actions, such as including protective covenants in debt contracts, to minimize these costs.

16.8 Asymmetric Information and Capital Structure

Asymmetric information exists when managers' information about the firm and its future cash flows is superior to that of external investors. This situation can lead to **adverse selection** in which buyers tend to discount the price they are willing to pay for a firm's securities because investors cannot determine whether a firm is over- or undervalued.

In the presence of adverse selection, it has been theoretically shown that there is a tendency for only the most overvalued firms to issue securities, and investors will assume that all issuers are likely to be overvalued. This adverse selection can be attenuated if the firm can provide some kind of credible signal. One way to make a signal credible is to make it too costly for all but higher valued firms to use it. One such signal firms can use, is to adopt a high level of leverage to signal to investors that they are undervalued. This signal is too costly

for lower valued firms to send, because it will lead to higher expected costs of financial distress, causing these firm's values to fall.

The existence of asymmetric information and adverse selection is supported by three pieces of empirical evidence:

- [1] An issuer's stock price falls by about 2% to 3% when a new equity issue is announced, suggesting that the market knows that issuing firms are likely to be overvalued;
- [2] Firms tend to issue new stock after a large price run-up and, based on their post-issue performance, they appear to have been overvalued when they issued; and
- [3] Firms tend to issue new equity when the degree of information asymmetry is smallest, such as following earnings announcements.

The **pecking order hypothesis** theorizes that, due to asymmetric information and the likelihood of perceived adverse selection, managers of firms raising capital prefer using retained earnings, and then turn to less risky debt before external equity in order to avoid the market perceiving them as being overvalued, and trying to issue overvalued securities.

While difficult to test directly, this pecking order hypothesis is consistent with the finding that the vast majority of investment is funded by retained earnings, with net external financing amounting to less than 30% of capital expenditures in most years. Also, firms on average repurchase more equity than they issue, whereas they are net issuers of debt. These observations are also consistent with the trade-off theory of capital structure, but there is substantial evidence that firms do not follow a strict pecking order, as firms often issue equity even when borrowing is possible.

16.9 Capital Structure: The Bottom Line

The optimality of a firm's capital structure depends on market imperfections, such as taxes, financial distress costs, agency costs, and asymmetric information.

- Of all the different possible imperfections that drive capital structure, the most significant is likely to be taxes. The interest tax shield allows firms to repay investors and avoid the corporate tax.
- Financial distress may lead to other consequences that reduce the value of the firm. Firms must, therefore, balance the tax benefits of debt against the costs of financial distress.
- Agency costs and benefits of leverage are also important determinants of capital structure. Too much debt can motivate managers and equity holders to take excessive risks or underinvest in a firm. When free cash flows are high, too little leverage may encourage wasteful spending.
- A firm must also consider the potential signaling and adverse selection consequences of its financing choice. Because bankruptcy is costly for managers, increasing leverage can signal managers' confidence in the firm's ability to meet its debt obligations.

Finally, it is important to recognize that because actively changing a firm's capital structure (for example, by selling or repurchasing shares or bonds) entails transactions costs, firms may be unlikely to change their capital structures unless they depart significantly from the optimal level. As a result, most changes to a firm's debt-equity ratio are likely to occur passively, as the market value of the firm's equity fluctuates with changes in the firm's stock price.

Selected Concepts and Key Terms

Default

When a firm fails to make the required interest or principal payments on its debt. When a firm fails to satisfy another of the contractual requirements in the debt contract, such as an accounting ratio falling below a defined threshold, it may trigger so-called technical default. The occurrence or likelihood of either type of default often leads to a firm filing for bankruptcy protection under the 1978 Bankruptcy Reform Act to prevent creditors from immediately seizing collateral.

Bankruptcy

A court supervised reorganization of the firm's financial claims governed by the 1978 Bankruptcy Reform Act. The bankruptcy code was created to organize this process so that creditors are treated fairly and the value of the assets is not needlessly destroyed by letting creditors seize assets in a piecemeal fashion. U.S. firms can file for bankruptcy protection using the Chapter 7 Liquidation or Chapter 11 Reorganization provisions.

Chapter 7 Liquidation

A liquidation of the firm's assets as specified in Chapter 7 of the 1978 Bankruptcy Reform Act. A trustee is appointed to oversee the liquidation of the firm's assets through an auction. The proceeds from the liquidation are used to pay the firm's creditors according to their order in the legal seniority, and the firm ceases to exist.

Chapter 11 Reorganization

A reorganization of the firm's financial claims as governed by Chapter 11 of the 1978 Bankruptcy Reform Act. After a firm files for bankruptcy protection, all pending collection attempts are automatically suspended, and the firm's existing management continues to operate the business and is given the opportunity to propose a reorganization plan, which specifies the treatment of each creditor of the firm. In addition to cash payment, creditors may receive new debt or equity securities of the firm under the plan. The value of the cash and securities will generally be less than the amount each creditor was owed, but is hopefully more than they would receive if the firm was shut down immediately and liquidated and any going concern value was destroyed. The creditors must vote to accept the plan using a specific process, and it must be approved by the court.

Trade-off Theory

A theory that attempts to explain how firms should choose the capital structure that maximizes the value of the firm. In this theory, the total value of the levered firm equals the value of the firm without leverage plus the present value of the tax savings from debt, less the present value of financial distress costs (direct costs of bankruptcy, indirect costs of bankruptcy, agency costs of debt) plus the present value of the agency benefits of debt.

Agency Costs

Losses in value associated with having an agent with different interests work on behalf of the principals, or owners. In the context of a firm with leverage, a conflict of interest may exist because investment decisions may have different consequences for debt holders and equity holders. In some circumstances, managers may have an incentive to take actions, such as excessive risk taking, under-investment, or cashing out, that benefit equity holders but harm

the firm's creditors and lower the total value of the firm. For example, managers acting on behalf of the shareholders may engage in excessive risk-taking and accept negative NPV projects because the cost of failure is largely borne by the debt holders, if the project fails to generate sufficient cash flow to pay the interest and principal, and control of the firm is effectively turned over to the debt holders.

Asset Substitution Problem

When shareholders can gain by making negative-NPV investments or decisions that sufficiently increase the firm's risk.

Debt Overhang

When a firm may be unable to finance new, positive-NPV projects because it faces financial distress.

Free Cash Flow Hypothesis

The view that wasteful spending is more likely to occur when firms have high levels of free cash flow, or cash flow in excess of what is needed after making all positive NPV investments and payments to debt holders. When cash is tight, managers will be more highly motivated to run the firm as efficiently as possible. Under this hypothesis, leverage may increase firm value by reducing wasteful investment by managers because it commits the firm to making future interest payments reducing excess cash flow.

Management entrenchment

The view that managers care most about keeping their jobs, and they are more likely to engage in wasteful investment when their position within the firm is secure. Because managers are more likely to lose their job in the event of financial distress, increasing leverage and the risk of distress may help to control wasteful investment.

Asymmetric information.

Asymmetric information exists when managers' information about the firm's level of risk and its future cash flows is superior to that of outside investors. As a result, managers may have better information than investors about the true value of the firm's securities. One way an undervalued firm can credibly convey its higher value to investors is by making statements about the firm's future prospects that investors and analysts can ultimately verify. If the penalties for intentionally deceiving investors are large such that they cannot be mimicked by lower-valued firms, investors will generally believe such statements and the information asymmetry will be attenuated.

Adverse selection

The idea that buyers will tend to discount the price they are willing to pay for a good when there is asymmetric information—the seller has private information about the value of the good. In such markets, it is likely that the market will generally contain low-quality goods. In the context of capital structure, investors will discount the price they are willing to pay for a firm's securities when there is asymmetric information, because investors cannot determine whether a firm is over- or undervalued. In the presence of adverse selection, it can be shown that there is a tendency for only the most overvalued firms to issue securities.

Moral Hazard

The idea that individuals will change their behavior if they are not fully exposed to its consequences. For example, equity holders may take excessive risk or pay excessive dividends if the negative consequences will be borne by bondholders.

Signaling theory of debt

In the presence of asymmetric information, the idea that firms can use high leverage as a way to signal to investors that they are undervalued. This signal may be too costly for lower valued firms to send because it will lead to higher expected costs of financial distress, causing these firms' values to fall.

Pecking order hypothesis

The idea that in the presence of asymmetric information and the likelihood of perceived adverse selection, managers will choose to issue the safest security they can and only issue new equity as a last resort. In this theory, firms raising capital prefer using retained earnings, and then turn to debt before equity to avoid the market perceiving them as being overvalued—attempting to issue overvalued securities.

Concept Check Questions and Answers

16.1.1. With perfect capital markets, does the possibility of bankruptcy put debt financing at a disadvantage?

No. The total value to all investors does not depend on the firm's capital structure. Investors as a group are not worse off because a firm has leverage. While it is true that bankruptcy results from a firm having leverage, bankruptcy alone does not lead to a greater reduction in the total value to investors. Thus, there is no disadvantage to debt financing, and a firm will have the same total value and will be able to raise the same amount initially from investors with either choice of capital structure.

16.2.2. Does the risk of default reduce the value of the firm?

With perfect capital markets, the risk of default does not reduce the value of the firm. While it is true that bankruptcy results from a firm having leverage, bankruptcy alone does lead to a greater reduction in the total value to investors.

16.2.1. If a firm files for bankruptcy under Chapter 11 of the bankruptcy code, which party gets the first opportunity to propose a plan for the firm's reorganization?

If a firm files for bankruptcy under Chapter 11, the firm's existing management is given the first opportunity to propose a reorganization plan.

16.2.2. Why are the losses of debt holders, whose claims are not fully repaid, not a cost of financial distress, whereas the loss of customers who fear the firm will stop honoring warranties is?

The losses of debt holders whose claims are not fully repaid are not considered as the cost of financial distress, because the firms in financial distress will often attempt to avoid filing for bankruptcy, by first negotiating directly with creditors. In contrast, the loss of customers, who fear the firm will stop honoring warranties, is the indirect cost of financial distress. Because bankruptcy may enable firms to walk away from future commitments to their customers, customers may be unwilling to purchase products whose values depend on future support or service from the firms.

16.3.1. Armin incurred financial distress costs only in the event that the new product failed. Why might Armin incur financial distress costs even before the success or failure of the new product is known?

Armin may incur several financial distress costs, even before the success or failure of the new product is known, because the original shareholders of the firm pay the present value of costs associated with bankruptcy and financial distress. Although debt holders bear them in the end, shareholders pay the present value of the costs of financial distress upfront.

16.3.2. True or False: If bankruptcy cost are only incurred once the firm is in bankruptcy and its equity is worthless, then these costs will not affect the initial value of the firm.

False. The value of the firm is reduced by the present value of the expected bankruptcy costs. Thus, shareholders should be concerned about financial distress costs that will be borne by debt holders because debt holders recognize that, when the firm defaults, they will not be able to get the full value of assets. As a result, they will pay less for the debt initially.

16.4.1. What is the “trade-off” in the trade-off theory?

The trade-off theory states that the total value of a levered firm equals the value of the firm without leverage, plus the present value of the tax savings from debt, less the present value of financial distress costs. There is a trade-off between the benefits of debt and the costs of financial distress.

16.4.2. According to the trade-off theory, all else being equal, which type of firm has a higher optimal level of debt: a firm with very volatile cash flows or a firm with very safe, predictable cash flows?

According to the trade-off theory, a firm with very safe, predictable, cash flow is likely to have a higher optimal level of debt because it has a low probability of default.

16.5.1. Why do firms have an incentive to both take excessive risk and under-invest when they are in financial distress?

They may take excessive risk because they may effectively be gambling with the debt holders money. They may underinvest because they believe that the value of the projects they fund may convey to the debt holders in the event of bankruptcy.

16.5.2. Why would debt holders desire covenants that restrict the firm's ability to pay dividends, and why might shareholders also benefit from this restriction?

Debt holders put such restriction on the firm to protect themselves from being exploited by management. Shareholders might also benefit from this restriction because it prevents the firm from taking a negative-NPV project, an overinvestment problem.

16.6.1. In what ways might managers benefit by overspending on acquisitions?

Managers might benefit by overspending on acquisitions because they prefer to run large firms rather than small ones. Managers of large firms tend to earn higher salaries, and they may also have more prestige and garner greater publicity.

16.6.2. How might shareholders use the firm's capital structure to prevent this problem?

For managers to engage in wasteful investment, they must have the cash to invest. Only when cash is tight will managers be motivated to run the firm as efficiently as possible. Therefore, shareholders can increase leverage to reduce the likelihood that a firm will pursue wasteful investments. Leverage increases firm value because it commits the firm to

making future interest payments, thereby reducing excess cash flows and wasteful investment by managers.

16.7.1. Describe how the management entrenchment can affect the value of the firm.

The management entrenchment theory of capital structure states that managers choose a capital structure to avoid the discipline of debt, and to maintain their own job security. Thus managers seek to minimize leverage to prevent the job loss that would accompany financial distress, and thereby reduce the value of the firm.

16.7.2. Coca-Cola Enterprises is almost 50% debt financed, while Intel, a technology firm, has no net debt. Why might these firms choose such different capital structures?

The optimal level of debt varies with the characteristics of a firm. Firms with high research and development costs and future growth opportunities, such as Intel, typically maintain low debt levels. On the other hand, mature, low-growth firms with stable cash flows and tangible assets, such as Coca-Cola Enterprises, often fall into the high-debt category. These firms tend to have high free cash flow with few good investment opportunities. Thus the tax shield and incentive benefits of leverage are likely to be high.

16.8.1. How does asymmetric information explain the negative stock price reaction to the announcement of an equity issue?

There is asymmetric information between managers and investors. Managers know more than shareholders about the firm's profitability and future cash flows. Managers only issue equity if they have negative information about the firm's future prospects. Investors are aware that managers have private information about the firm; therefore, investors will discount the stock price they are willing to pay due to adverse selection.

16.8.2. Why might firms prefer to fund investments using retained earnings or debt rather than issuing equity?

Managers who perceive that the firm's equity is underpriced will have a preference to fund investment using retained earnings, or debt, rather than equity. This result is called the pecking order hypothesis.

16.9.1. Consider the differences in leverage across industries shown in Figure 15.7. To what extent can you account for these differences?

Leverage varies a lot across industries due to market imperfections such as taxes, financial distress costs, agency costs, and asymmetric information.

16.9.2. What are some reasons firms might depart from their optimal capital structure, at least in the short run?

The reasons that explain why firms may depart from their optimal capital structure are markets' imperfections, such as taxes, financial distress costs, agency costs, asymmetric information, and transaction costs.

Examples with Step-by-Step Solutions

Solving Problems

Problems using the concepts in this chapter can generally be solved by determining the effect on shareholders' wealth by a particular decision, by applying the equation:

$$V^L = V^U + \text{PV}(\text{Interest tax shield}) - \text{PV}(\text{Direct costs of bankruptcy}) - \text{PV}(\text{Indirect costs of bankruptcy}) - \text{PV}(\text{Agency costs of debt}) + \text{PV}(\text{Agency benefits of debt})$$

To successfully apply this equation, it is important to interpret how the information in the problem is related to the equation's terms in each application. A problem will not generally have all of these imperfections, but the equation tells you what to look for. For example, in problem 1 below, the problem states that "if the firm issues the debt, the firm estimates that the expected present value of direct costs of bankruptcy would be \$1 million" but it doesn't mention other imperfections. If a problem involves a change in the number of shares, you may need to quantify the value change on a per-share basis. Some problems have effects related to the Asymmetric Information and Capital Structure discussion; problem 3 below shows how to handle these effects in this framework.

Examples

1. **Managers of an unlevered firm that is expected to produce \$1 million in free cash flow each year are considering making a \$5 million investment that is expected to produce \$1 million in unlevered free cash flow every year forever, beginning in one year. The firm would issue \$5 million in permanent debt with a 5% annual interest rate to finance the project. The tax rate is 35%, the firm has 1 million shares, and the unlevered cost of equity is 10%. If the firm issues the debt, the firm estimates that the expected present value of direct costs of bankruptcy would be \$1 million.**

[A] Explain whether managers of the unlevered firm should take the project.

[B] If the project had a \$0 NPV, would it change your answer?

Step 1. Determine the value of the unlevered firm's shares before it makes the investment, to compare to the value per share *with* the project. The value of the firm is the present value of the firm's free cash flows at the unlevered cost of equity, and can be calculated using the present value of a perpetuity equation with $C = \$1$ million and $r = 10\%$.

$$V^U = \frac{C}{r} = \frac{\text{FCF}}{r_s^{\text{Unlevered}}} = \frac{\$1 \text{ million}}{0.10} = \$10 \text{ million}$$

So, the per share value = \$10 million/1 million = \$10.

Step 2. Determine the value per share after the firm issues the debt and makes the investment, by considering the trade-off theory equation.

$$V^L = V^U + \text{PV}(\text{Interest tax shield}) - \text{PV}(\text{Direct costs of bankruptcy}) - \text{PV}(\text{Indirect costs of bankruptcy}) - \text{PV}(\text{Agency costs of debt}) + \text{PV}(\text{Agency benefits of debt})$$

The relevant terms are the value of the unlevered firm, which now produces an expected \$2 million in unlevered free cash flow, the present value of the interest tax shield, and the direct costs of bankruptcy:

$$\begin{aligned} V^L &= V^U + \text{PV}(\text{Interest tax shield}) - \text{PV}(\text{Direct costs of bankruptcy}) - 0 - 0 + 0 \\ &= \frac{\text{FCF}}{r_s^{\text{Unlevered}}} + \frac{\text{Debt}(r_d)(t_c)}{r_d} - \text{PV}(\text{Direct costs of bankruptcy}) \\ &= \frac{\$2 \text{ million}}{.10} + \frac{\$5 \text{ million}(.05)(.35)}{.05} - \$1 \text{ million} = \$20 + \$1.75 - \$1 = \$20.75 \text{ million} \end{aligned}$$

The value of equity (net of the new debt) equals \$20.75 - \$5 = \$15.75 million.

Thus, the new stock price would be \$15.75 million/1 million = \$15.75.

The managers should take the project to maximize the shareholders' wealth. The direct costs of bankruptcy are more than offset by the increase in firm value and the tax shield.

Step 3. Determine the value per share after the firm issues the debt, if the NPV of the project was \$0. In this case, the new project would be worth \$5 million, since it must be worth exactly what it cost.

The value of the unlevered firm would be \$10 million + \$5 million = \$15 million. The value of the firm would now be:

$$\begin{aligned}
 V^L &= V^U + \text{PV}(\text{Interest tax shield}) - \text{PV}(\text{Direct costs of bankruptcy}) - 0 - 0 + 0 \\
 &= \$15 \text{ million} + \frac{\text{Debt}(r_d)(t_c)}{r_d} - \text{PV}(\text{Direct costs of bankruptcy}) \\
 &= \$15 \text{ million} + \frac{\$5 \text{ million}(.05)(.35)}{.05} - \$1 \text{ million} = \$15 + \$1.75 - \$1 = \$15.75 \text{ million}
 \end{aligned}$$

The value of equity (net of the new debt) now equals: \$15.75 - \$5 = \$10.75 million.

Thus, the new stock price would be \$10.75 million/1 million = \$10.75.

The managers should still take the project to maximize the shareholders' wealth. The direct costs of bankruptcy are more than offset by the tax shield alone.

- 2. Managers of an unlevered firm expected to generate free cash flow of \$10 million each year, are considering issuing \$25 million of permanent 10% interest debt and using the proceeds to repurchase equity. If the firm issues the debt, it expects to lose some of its best, low-cost suppliers due to the firm's lower credit quality, and thus estimates a loss of \$1 million of free cash flow per year. The firm's tax rate is 35%, and the required return on the firm's unlevered free cash flow is 10%. Explain whether managers of the unlevered firm should issue the debt.**

Step 1. Determine the value of the unlevered firm's stock so you can determine the change in value due to the project.

Using the present value of a perpetuity equation: $V^U = \frac{\$10 \text{ million}}{.10} = \100 million

So, the value per share is \$100 million/\$1million = \$100.

Step 2. Determine the value of the firm after it issues the debt, by considering the trade-off theory equation:

$$V^L = V^U + \text{PV}(\text{Interest tax shield}) - \text{PV}(\text{Direct costs of bankruptcy}) - \text{PV}(\text{Indirect costs of bankruptcy}) - \text{PV}(\text{Agency costs of debt}) + \text{PV}(\text{Agency benefits of debt})$$

The relevant terms now include the present value of the interest tax shield on the permanent debt and the present value of the indirect costs of financial distress from the loss of suppliers, which amounts to \$1 million per year:

$$V^L = V^U + \text{PV}(\text{Interest tax shield}) - 0 - \text{PV}(\text{Indirect costs of bankruptcy}) - 0 + 0$$

$$= \$100 + \frac{\text{Debt}(r_d)(t_c)}{r_d} - \frac{\text{Annual indirect cost}}{.10} = \$100 + \frac{\$25(.10)(.35)}{.10} - \frac{\$1}{.10} = \$98.75 \text{ million}$$

The value of equity (net of the new debt) now equals $\$98.75 - \$25 = \$73.75$ million.

Assuming that the shares were repurchased at the \$100 per share value found in step 1, they would have repurchased $\$25 \text{ million} / \$100 = 250,000$ shares.

Thus, the new stock price would be $\$73.75 \text{ million} / 0.75 \text{ million} = \98.33 , and the managers should not issue the debt because it will lower shareholders' wealth. The indirect costs of bankruptcy are greater than the tax shield.

- 3. Your unlevered firm is considering buying a new warehouse for \$10 million to facilitate an expansion in the same line of business. Your firm has 1 million shares valued at \$20 in the stock market, and you estimate that the present value of cash flows from the expansion is \$15 million.**

- [A] If there is symmetric information between both the firm's managers and stock market investors, what should the stock price be if the firm issues \$10 million of new stock at \$20 to immediately purchase the warehouse? Should the firm issue the stock and take the project?
- [B] Suppose there is asymmetric information between the firm's managers and stock market investors regarding the value of both the firm and the new project. Assume that investors, who are aware that overvalued firms tend to issue stock, will lower their estimate of the firm value by 3%. Also assume that the skeptical investors also assume the capital raised will be invested to earn exactly the required return (i.e. there is a zero NPV). What would the stock price be if the firm issues \$10 million of new stock after announcing the stock issuance to immediately purchase the warehouse? Should the firm issue the stock and take the project?
- [C] Suppose the firm decides to issue \$10 million of permanent 5% annual interest rate debt to finance the project, and there is symmetric information regarding the new project's value. What would the stock price be if the firm issues the debt to immediately purchase the warehouse? Should the firm issue the debt and take the project?

Step 1. To answer part A, determine the new per-share value by finding the post-issue value of the firm and the number of shares that would be issued.

The new firm value would change by the present value of cash flows from the expansion: \$15 million. So, the new firm value is $\$20(1 \text{ million}) + \$15 \text{ million} = \$35 \text{ million}$.

The firm would have to issue $\$10 \text{ million} / \$20 = 500,000$ shares, so there would be 1.5 million shares outstanding.

Thus, the new stock price would be $\$35 \text{ million} / 1.5 \text{ million} = \23.33 , and the firm should issue the stock and take the project to maximize shareholders' value. With symmetric information, firms should always take positive NPV projects.

Step 2. To answer part B, determine the new per-share value by finding the post-issue value of the firm and the number of shares that would be issued.

Investors would lower the value of the shares in the market by 3% to \$19.40, and the firm would have to issue $\$10 \text{ million} / \$19.40 = 515,464$ shares.

The new firm market value would also reflect the market's perception that the NPV of the new project is \$0. So, the new firm value is $\$20(1 \text{ million})(1 - .03) + \$10 \text{ million} + \$0 = \29.4 million .

Thus, the new stock price would be $\$29.4 \text{ million} / 1.515464 \text{ million} = \19.40 , and the firm should not issue the stock and take the project because it would reduce shareholders' wealth.

Step 3. To answer part C, determine the new per-share value by finding the post-issue value of the levered firm without the project:

$$V^L = V^U + \text{PV}(\text{Interest tax shield})$$

$$= \$20(1 \text{ million}) + \frac{\text{Debt}(r_d)(t_c)}{r_d} = \$20 \text{ million} + \frac{\$10 \text{ million}(.05)(.35)}{.05} = \$23.5 \text{ million}$$

The new market value of the firm would also increase by the present value of the cash flows from the expansion: \$15 million. So, the new firm value is $\$23.5 \text{ million} + \$15 \text{ million} = \$38.5 \text{ million}$.

The value of equity (net of the new debt) equals: $\$38.5 - \$10 = \$28.5$.

Thus, the new stock price would be $\$28.5 \text{ million} / 1 \text{ million} = \28.50 , and the firm should issue the debt and take the project because it would increase shareholders' value.

Questions and Problems

1. Coca-Cola Bottlers Inc. owns bottling plants across the country. This year, they expect to generate \$2 billion in EBIT, and they expect that EBIT will grow at a 3% annual rate beginning in the year following this coming year. The firm uses no debt financing, has 500 million shares that trade on the New York Stock Exchange, and has an equity beta of 0.5. The risk-free rate is 5%, and the market risk premium is 10%.

If it chooses, the firm can issue bonds paying an annual coupon at a 5% annual rate. If it issues bonds, it issues perpetual bonds which pay interest every year at a 5% rate but never repays principal. The tax rate is 30%.

- [A] What is the stock value per share of the (unlevered) firm?
 - [B] The firm is considering the following pure capital structure change. It plans to issue \$7 billion of debt and use the proceeds to repurchase shares at the value that you found above in part A. The firm has no probability of bankruptcy. Should the firm perform the restructuring?
2. In problem 1, if the firm's debt wasn't riskless, and the firm needed to declare bankruptcy because it could not pay its interest expense, what is the minimum present value of bankruptcy costs that would make issuing the bonds a bad idea?
 3. An unlevered firm with 1 million shares trading at \$20 in the stock market is considering issuing \$5 million of debt and using the proceeds to repurchase stock. If the firm pays 40% of its taxable income in taxes every year, and it is able to purchase the shares at the current market value, what is the most that the present value of financial distress costs could be, such that this restructuring is not a good idea?
 4. An unlevered firm with 1 million shares trading at \$20 in the stock market, is considering issuing \$5 million of debt and using the proceeds to repurchase stock. The firm pays 40% of

its taxable income in taxes every year and believes that the present value of the potential financial distress costs will be \$1 million. After the announcement of the planned restructuring, managers are concerned that the stock price may rise. What is the highest average price the firm could repurchase shares for, such that the restructuring is a good idea for the remaining shareholders?

5. The pecking order hypothesis is based on the existence of asymmetric information and the likelihood of perceived adverse selection for firms issuing equity. Discuss empirical evidence that is consistent with this theory.

Solutions to Questions and Problems

1. [A] The value of the unlevered firm is the present value of a growing perpetuity with $g = 3\%$. The free cash flow in the first year is \$2 million $(1 - t) = \$1.4$ million. The required return from the CAPM is: $5\% + .5(10\%) = 10\%$. So, the $V^U = [1.4] / (.1 - .03) = \20 million, And, the price per share = $20 / .5 = \$40$
- [B] $V^L = V^U + PV(\text{Interest tax shield}) = \$20 + [7(.05).3] / .05 = \$20 + \$2.1 = \22.1 million

The value of the equity (net of the debt) is now $\$22.1 - \$7 = \$15.1$ million.

There were $\$7 \text{ million} / \$40 = 175,000$ shares repurchased.

So, the price per share is $15.1 \text{ million} / \text{number of shares} = \$15.1 / (.5 - .175) = \$46.46$ and the firm should go forward with the restructuring.

2. $V^L = V^U + PV(\text{Interest tax shield}) - PV(\text{Direct costs of bankruptcy})$

so the maximum size of the cost of financial distress is equal to:

$$PV(\text{Interest tax shield}) = [7(.05).3] / .05 = \$2.1 \text{ million.}$$

3. Since the shares are being purchased at the pre-announcement value, any gain or loss accrues to the remaining shareholders.

$$V^L = V^U + PV(\text{Interest tax shield}) - PV(\text{Financial distress costs})$$

so the firm value will fall when $PV(\text{Interest tax shield}) < PV(\text{Financial distress costs})$

$$\text{since } PV(\text{Interest tax shield}) = \frac{\text{Debt}(r_D)\tau_c}{r_D} = 5(0.4) = \$2 \text{ million}$$

If the firm believes that the present value of the financial distress costs is above \$2 million, it should not go forward with restructuring.

4. Price per share = $\frac{V^L - D}{1 \text{ million} - (\text{repurchased shares})}$

$$= \frac{[V^U + PV(\text{Interest tax shield}) - PV(\text{Financial distress costs})] - D}{1 \text{ million} - (\text{repurchased shares})}$$

> \$20 to make it a good idea.

$V^U = \$20$ million, $D = \$5$ million, $PV(\text{Financial distress costs}) = \1 million, and

$$PV(\text{Tax shield}) = \frac{\text{Debt}(r_d)(\tau_c)}{r_d} = \frac{\$5(r_d)(0.40)}{r_d} = \$2 \text{ million}$$

$$\text{The number of repurchased shares} = \left[\frac{\$5 \text{ million}}{\text{Average price}} \right]$$

$$\text{So, set price per share} = \frac{[\$20\text{m} + 2\text{m} - 1\text{m}] - 5\text{m}}{1 \text{ million} - \left[\frac{\$5 \text{ million}}{\text{Average price}} \right]} = \$20; \text{ solve for average price.}$$

$$\Rightarrow 16\text{m} = 20 - \left[\frac{\$100 \text{ million}}{\text{Average price}} \right]$$

$$(\text{Average price})\$4 = \$100 \Rightarrow \text{Average price} = \$25.$$

If you can buy the shares for less than \$25, then the repurchase would benefit shareholders.

5. The pecking order hypothesis is consistent with the finding that the vast majority of investment is funded by retained earnings, with net external financing amounting to less than 30% of capital expenditures in most years. Also, firms on average repurchase more equity than they issue, whereas they are net issuers of debt.

The existence of asymmetric information and adverse selection is supported by three pieces of empirical evidence:

- [1] An issuer's stock price falls by about 2% to 3% when a new equity issue is announced, suggesting that the market knows that issuing firms are likely to be overvalued;
- [2] Firms tend to issue new stock after a large price run-up and, based on their post-issue performance, they appear to have been overvalued when they issued; and
- [3] Firms tend to issue new equity when the degree of information asymmetry is smallest, such as following earnings announcements.