In Chapter 17, we learned that with a certain set of (unrealistic) assumptions, a firm’s value and investors’ opportunities are determined by the asset side of the firm’s balance sheet (i.e., the firm’s capital budgeting decisions), and not by the particular mix of securities that a firm uses to finance those assets (i.e., the firm’s capital structure decision).

This chapter discusses how “real world” assumptions change these conclusions. Preview: we will conclude (contrary to Chapter 13 and 17) that firms should not view all financing choices as equivalent!

1) **Interest rates / Transaction Costs** (review of the discussion toward the end of Chapter 17). The assumptions outlined at the beginning of Chapter 17 specifically assume that investors have the same opportunities to borrow and lend money that firm’s have and can do so at the same interest rate. These assumptions also state that there are no transaction costs associated with executing arbitrage transactions. However, corporations can often borrow money at a lower interest rate than individuals and transaction costs are not zero. This might allow two firms with the exact same assets (managed in exactly the same way) to have different market values if they have different capital structures.

The text argues that even with this capital market imperfection, firm value should not be affected by capital structure choice (for example, see pages 489 – 490, and in particular the concluding paragraph to section 17.3 on page 490). The reasoning is simple. For example, assume that a firm can increase its value (over and above the value of another firm with the exact same assets, managed in exactly the same way) by issuing debt and buying back some of its stock. Although it may have been beneficial for the first set of firms to issue debt, the demand among investors for these highly-levered firms will quickly be satisfied as other firms also try to take advantage of this opportunity. Once demand is satisfied, additional firms cannot increase their value by issuing more debt. The same reasoning would apply to issuing other (more exotic) securities.

2) **Corporate Income Taxes (Cash Flow Effects)** - Modigliani-Miller (1963). In the U.S., corporations are subject to a corporate income tax. Interest payments to bondholders are tax deductible, but dividend (or capital gain) payments to stockholders are not tax deductible. Therefore, the corporation can lower its corporate income tax liability by using debt financing rather than equity financing. This gives a cash flow advantage to debt financing!

**Example** - Firm U has assets that produce cash flows of $30, $45, or $225 per year in perpetuity (1/3 chance of each cash flow). Thus, the expected cash flow from Firm U’s assets is $100 per year in perpetuity. Assume that there is no difference between Firm U’s cash flow and its taxable income. Therefore, since Firm U has no debt (and no interest payments), its taxable income is expected to be $100 per year. With a corporate income tax rate of 34% (T_c = 34%), the income tax liability is expected to be $34 per year, and the after-tax cash flow per year available to stockholders is expected to be $100 - $34 = $66.

<table>
<thead>
<tr>
<th>Summary for Firm U</th>
<th>Pessimistic</th>
<th>Middle</th>
<th>Optimistic</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cash flow from assets</td>
<td>$30</td>
<td>$45</td>
<td>$225</td>
<td>$100</td>
</tr>
<tr>
<td>Bondholders (interest)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Taxable income</td>
<td>$30</td>
<td>$45</td>
<td>$225</td>
<td>$100</td>
</tr>
<tr>
<td>Government (taxes)</td>
<td>($10.20)</td>
<td>($15.30)</td>
<td>($76.50)</td>
<td>($34)</td>
</tr>
<tr>
<td>Stockholders (dividends)</td>
<td>$19.80</td>
<td>$29.70</td>
<td>$148.50</td>
<td>$66</td>
</tr>
</tbody>
</table>

Firm L has the exact same assets as Firm U (managed in exactly the same way), but has $600 of perpetual / permanent risk-free debt with a 5% interest rate ($30 interest payment per year). On average, Firm L will have $100 - $30 = $70 of taxable income per year. This means that it expects to pay only $23.80 of income tax per year and the yearly expected after-tax cash flow to its stockholders = $46.20.

<table>
<thead>
<tr>
<th>Summary for Firm L</th>
<th>Pessimistic</th>
<th>Middle</th>
<th>Optimistic</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cash flow from assets</td>
<td>$30</td>
<td>$45</td>
<td>$225</td>
<td>$100</td>
</tr>
<tr>
<td>Bondholders (interest)</td>
<td>($30)</td>
<td>($30)</td>
<td>($30)</td>
<td>($30)</td>
</tr>
<tr>
<td>Taxable income</td>
<td>$0</td>
<td>$15</td>
<td>$195</td>
<td>$70</td>
</tr>
<tr>
<td>Government (taxes)</td>
<td>$0</td>
<td>($5.10)</td>
<td>($66.30)</td>
<td>($23.80)</td>
</tr>
<tr>
<td>Stockholders (dividends)</td>
<td>$0</td>
<td>$9.90</td>
<td>$128.70</td>
<td>$46.20</td>
</tr>
</tbody>
</table>
Both firms distribute the entire $100 expected cash flow generated by the assets. However Firm L provides more cash flow to its owners (bondholders and stockholders) and less money to the government. This additional expected cash flow: ($30 + $46.20) - $66 = $10.20, is equal to the extra cash flow generated by the reduction of income taxes (the difference between $34 and $23.80). The following is the formula for calculating the expected cash flows for Firm L.

$$CF_L = CF_U + \text{tax shield cash flows} = CF_U + (D)(r_D)(T_c)$$

3) **Corporate Income Taxes (Valuation Effects)** - Modigliani-Miller (1963). Use all of the Chapter 17 assumptions, except now assume that there is a corporate income tax with a deduction for interest payments. This reduction of tax liability through the use of debt financing will result in an increase in firm value. Therefore, if two firms have the exact same assets, managed in exactly the same way, but one firm uses no debt financing, and the other firm uses some debt financing, the levered firm will be more valuable.

**Example.** The value of Firm U, using a 10% discount rate (see Chapter 17 notes), is $66 / 0.10 = $660. The decrease in value from $1000 (Chapter 17) to $660 is caused by the corporate income tax liability. Therefore, any reduction of the corporate income tax liability should increase firm value. Logically, if the corporate tax liability could be reduced to zero (in all economic states), then the firm value should be restored to $1000.

Firm L has the same exact assets as Firm U, managed in the same way that Firm U manages its assets. These assets produce the same expected cash flows as Firm U (with the same risk), plus an extra $10.20 = (D)(r_D)(T_c). Therefore,

$$V_L = V_U + \text{PV of a perpetuity of cash flows expected to be equal to} \ (D)(r_D)(T_c)$$

Assuming the corporate income tax rate for the firm will remain at 34% forever, this additional cash flow is just as risky as the firm's debt.

$$V_L = V_U + [(D)(r_D)(T_c)] / r_D$$

$$V_L = V_U + (D)(T_c)$$

$$V_L = $660 + $600 (34%) = $864$$

**Where does the increase in firm value come from?** The $204 increase in value (from $660 to $864) represents a subsidy from the government for using a particular type of financing.

Government subsidy if equity financing used = $0
Government subsidy if debt financing used = (D)(T_c) = ($600) (0.34) = $204

**Implication of this equation -** Each dollar of debt increases firm value by ($1)(T_c). **Theoretically,** firms should increase the amount of debt to the point that the expected tax liability per year is reduced to zero. In the example given above, this could potentially increase the firm value to $1000 (the Chapter 17 value)!

**Another implication:** The NPV of debt financing is no longer equal to the NPV of equity financing. (If debt financing is used to financing a project instead of equity financing, the government will provide a subsidy to the firm that increases firm value!)

**Comment about tax law.** Tax law might prevent a firm from totally eliminating corporate income tax liability through the use of debt.
One final point - In the above discussion, we assume that the firm will always maintain a fixed amount of debt ($600 in the above example), that the firm can always fully use the tax deduction from the interest payments (e.g., they have at least $30 of income that can be sheltered by the $30 of interest expense), and that the marginal income tax rate always stays at the same rate (34% in the above example).

Changes to these assumptions change the conclusions. For example, the tax benefit will be lower if the firm’s marginal income tax rate (i.e., tax bracket) was lower. In the extreme, a firm with large tax deductions from other sources (e.g., large depreciation deductions) may not see any tax benefit from debt if these tax deductions reduce current and future taxable income to zero.

**Conclusion** – Firm U should issue debt, using the proceeds of the debt issue to repurchase stock (or use the proceeds to pay a dividend to the stockholders). The reduction in tax liability will increase firm value and increase the wealth of stockholders.

\[
V_U = E_U = $660 \\
V_L = D_L + E_L = $600 + $264 = $864.
\]

Total wealth of stockholders in Firm L = $264 (stock value) + $600 (cash) = $864.

4) **The Trade-off Model.** There are several possible disadvantages to debt financing that work to offset the corporate tax advantage to debt.

A. **Bankruptcy Costs** - high debt levels imply a high probability of bankruptcy. This means a high probability of incurring bankruptcy costs. In bankruptcy, the ownership and control of the firm is transferred from stockholders to bondholders. Bankruptcy costs include the direct costs of transferring this ownership and control as well as indirect costs. The combination of direct and indirect costs can be substantial.

   **Direct costs** - Lawyers' fees, accountants' fees, trustee's fees, court fees, administrative expenses, etc.
   **Indirect costs** – Managements’ time spent on the bankruptcy, lost revenues, inefficient investment strategies, losing your best employees to your competitors, etc.

   An increase in debt financing will probably mean lower income tax liabilities, but will also mean a higher probability of bankruptcy. The PV of the expected tax benefits needs to be offset with the PV of the expected bankruptcy costs. Expected Bankruptcy Costs = Probability of Bankruptcy x Estimated Bankruptcy Costs.

B. **Agency Costs** - Jensen and Meckling (1976) - Managers of firms with a lot of debt sometimes "play games" that reduce firm value creating "debt agency costs." All-equity firms do not have debt agency costs. Firms can reduce their debt agency costs by reducing the amount of debt. The book describes the types of value-reducing 'games' that managers can play in pages 516-521.

C. **The optimal capital structure will maximize firm value:**

\[
V_L = V_U + (D)(T_c) - PV (Expected Bankruptcy Costs) - PV (Expected Agency Costs)
\]

Graphically:

D. **Generalizations** - For some types of firms (or industries), bankruptcy and debt agency costs (for a given level of debt) are relatively low. For others, these costs are high. Firms with higher bankruptcy and debt agency costs will probably want to have less debt (thereby reducing the chances of incurring these costs).
See pages 520 – 521 of the text. Here, Brealey and Myers argue that bankruptcy and debt agency costs are relatively low for real estate firms and high for ‘high-tech’ firms. This could explain why real estate firms have a lot of debt and high-tech firms have very little debt.

5) Personal Income Taxes, Miller (1977), DeAngelo and Masulis (1980). Besides the disadvantages to debt financing discussed above, there is another disadvantage to debt financing – individual income taxes on debt income. Individuals pay a higher tax on income earned from bond ownership (interest income) than from stock ownership (dividends and capital gains). Capital gains on stocks held for a long period of time are taxed at relatively low rates (and are only taxed when the stock is sold).

Therefore, there is a personal tax disadvantage to debt that will counteract the corporate tax advantage to debt. In light of this, corporations need to consider the tax impact of capital structure decisions at both the corporate and personal level, as well as bankruptcy and agency costs.

This very complicated subject (discussed in detail in section 18.2 of the text) will not be discussed further.

6) The Pecking-Order Theory, Akerlof (1970), Myers (1984), Myers and Majluf (1984). If managers and investors use the same information, then capital structure decisions should be based on factors such as tax liability (corporate and personal), bankruptcy costs, and agency costs.

However, consider a situation in which management have superior information about the true value of the firm’s securities and can use this superior information to decide which type of security to issue to finance a project.

For instance, what happens if the firm can issue either risk-free debt (always correctly valued by investors) or equity (which could be under- or overvalued by investors)? Assume a firm needs to raise $60 to finance a project.

**Case A** (50% chance): Stock overvalued by $20 (insiders know it worth $40, outsiders think it is worth $60), debt correctly valued at $60

**Case B** (50% chance): Stock undervalued by $20 (insiders know it worth $80, outsiders think it is worth $60), debt correctly valued at $60

At these prices, management can benefit existing stockholders by issuing stock in Case A and debt in Case B.

Outside investors initially don’t know whether the stock is under- or overvalued. However, an announcement of a stock issue immediately indicates Case A. Since the true value is revealed before the stock issue date, the issue price will be $40. **This takes away any advantage of the stock issue.**

Under this line of reasoning, investors will suspect that any attempt to issue stock instead of correctly valued debt is an attempt to issue **overvalued** stock and they will reduce the amount they are willing to pay for the stock accordingly. (If managers are still willing to issue stock at this lower price, it must still be overvalued, resulting in a further lowering in stock price).

Thus, stock issues should be rare (at least for firms that could issue debt), and announcements of stock issues should result in a stock price decrease.

The pecking-order theory fits this story and hence outlines the order of financing sources that firms would use to finance projects in light of the fact that investors mis-price securities. According to the pecking-order theory:

- First, managers will use existing cash to finance projects. In this case, the firm does not need to issue a new security. Therefore, the problem of undervaluation or overvaluation does not present itself.

  Remember that this existing cash is probably generated from past security sales, or from internal sources (e.g., cash flow from operations that are retained in the corporation instead of being paid to stockholders as a dividend). This cash is usually stored in marketable securities (e.g., Treasury Bills). Therefore, the firm would
sell these securities to raise the cash to finance the project.

- If the firm needs to raise funds by issuing a new security to outside investors, they will first issue the securities that are least likely to be mis-priced (i.e., least likely to be under- or overvalued) before they issue other securities. Therefore, they will issue risk-free debt first, then risky-debt, then convertible debt, and finally common stock.

- A firm should use its dividend policy to help it store up extra cash for future use (so they don't need to issue new securities to finance projects).

A word of caution - The pecking-order theory implies that firms will be storing up a lot of excess cash. Managers might be tempted to waste this cash on perks that do not enhance firm value.

Chapter 18 Review Questions - Skip the discussion on "transaction costs," and "personal taxes" (the first and fifth points discussed in the Chapter 18 notes.

1. Assuming interest payments are deductible by corporations, be able to calculate cash flows paid to bondholders and stockholders at various levels of debt. What is the market value of the corporation at these various levels of debt? If interest payments are deductible by a corporation, what type of capital structure will a corporation use?

2. What are some examples of bankruptcy costs? What is the difference between direct and indirect bankruptcy costs? How is the probability of bankruptcy influenced by the amount of debt in the firm? Remember that high amounts of debt could also result in high debt agency costs. What types of firms have high (or low) bankruptcy and/or debt agency costs? What type of capital structure should a firm want to have if it has high (or low) bankruptcy and debt agency costs? Be able to graphically solve for the optimal capital structure using the tradeoff model.

3. Assume that managers have more precise information about firm value than outside investors. According to the "pecking-order theory," which financing sources will they use first, second, third, and last to finance a project? Why? Why is common stock used only as a last resort? Why is a firm's dividend policy an important part of the pecking order theory?

Chapter 18 Practice Problems

1. Refer back to the Chapter 17 practice problems. In those problems, we worked with ABC Inc. and XYZ Inc. Here are the assumptions we used: The assets of ABC Inc. produce a perpetual stream of $150 expected cash flows. The beta of these cash flows is 5/6. With a risk-free interest rate of 5% and a market-risk premium of 8.4%, the appropriate discount rate for these cash flows (using the CAPM) is 12%. This implies that the assets of ABC Inc. are worth $1250. Since ABC Inc. is all equity, then the beta for the equity is also 5/6, the required rate of return for the equity is 12%, and the market value of the equity is $1250. XYZ Inc. has the exact same assets as ABC Inc., managed in exactly the same way as ABC Inc. manages its assets. However, XYZ Inc. has $900 of perpetual, default risk-free debt (5% interest rate) and stock with a current market value of $350. Both companies have a 100% dividend payout ratio.

Now, continue to use the Chapter 17 assumptions and assume the financial markets are in equilibrium, however, assume that corporate interest payments are tax deductible and that both corporations are in the 34% tax bracket.

- What are the total expected cash flows to the owners of the two firms? ABC Inc. = $150 (1 - 0.34) = $99. Bondholders of XYZ expect to receive $45, stockholders of XYZ Inc. expect to receive ($150 - $45)(1 - 0.34) = $69.30. Total expected payments to owners of XYZ = $114.30.
- What are the income tax payments for the two firms? ABC Inc. = $51, XYZ Inc. = $35.70.
- What is the market value of ABC Inc. stock using a 12% required rate of return? $825
- What is the market value of XYZ Inc. stock and debt? Stock = $231, Debt = $900, Total = $1131
- Assume that XYZ Inc. wants to issue more debt and plans to pay the proceeds of the debt issue to their stockholders as a dividend. Ignoring bankruptcy costs and other costs of debt, what is the maximum value of XYZ Inc. if it can totally eliminate their income tax liability in all future years through the interest expense deduction? $1250.