1. Introduction

A business invests in new plant and equipment to generate additional revenues and income, which is the basis for its future growth. The funds raised from sources, such as long-term debt and equity, are referred to as capital, which invested in long-lived assets to generate future cash flows.

One way to pay for investments is to generate capital from the firm's operations. Earnings belong to the owners and can either be paid to them -- in the form of cash dividends -- or plowed back into the firm. The owners' investment in the firm is referred to as owners' equity or, simply, equity. If management plows earnings back into the firm, the owners expect it to be invested in projects that will enhance the value of the firm and, hence, enhance the value of their equity. Therefore, funds from reinvested earnings represent capital from equity.

But earnings may not be sufficient to support all profitable investment opportunities. In that case the firm is faced with a decision: forgo profitable investment opportunities or raise additional capital. A firm can raise new capital either by borrowing (i.e., incurring debt) or by selling additional ownership interests (i.e., equity) or both.

The combination of debt and equity used to finance a company's projects is referred to as capital structure. The capital structure of a firm is some mix of debt, internally generated equity, and new equity. But what is the right mixture?
What is the best capital structure depends on several factors. If a firm finances its activities with debt, the creditors expect the amount of the interest and principal -- fixed, legal commitments -- to be paid back as promised. Failure to pay may result in legal actions by the creditors.

Suppose you borrow $100 and promise to repay the $100 plus $5 in one year. Consider what may happen when you invest the $100:

- If you invest the $100 in a project that produces $120, you pay the lender the $105 you owe and keep the $15 profit.
- If your project produces $105 back, you pay the lender $105 and keep nothing.
- If your project produces $100, you pay the lender $105, with $5 coming out of your personal funds.

If you reinvest the funds and get a return more than the $5 (the cost of the funds), you keep all the profits. But if you get a return of $5 or less, the lender still gets her or his $5 back. This is the basic idea behind **financial leverage** -- the use of financing that has a fixed, but limited payments.

- If the firm has abundant earnings, the creditors are paid a fixed amount and the owners reap all what remains of the earnings after the creditors have been paid.
- If earnings are too low, the creditors must be paid what they are due, leaving the owners nothing out of earnings.

Failure to pay interest or principal as promised may result in financial distress. **Financial distress** is the condition where a firm makes decisions under pressure to satisfy its legal obligations to its creditors. These decisions may not be in the best interests of the owners of the firm. With equity financing there is no obligation. Though the firm may choose to distribute funds to the owners in the form of cash dividends there is no legal requirement to do so. Furthermore, interest paid on debt is deductible for tax purposes, whereas dividend payments are not tax deductible.

A distressed company may enter **bankruptcy**, which is a legal status that permits the restructuring of its obligations in the expectation that the company may be able to survive this status and emerge from bankruptcy as a healthy, going concern. If a company is deemed by the bankruptcy courts as not able to survive as a going concern, the company may be **liquidated**.

One measure of the extent debt is used to finance a firm is the **debt ratio**, the ratio of debt to equity:

\[
\text{Debt ratio} = \frac{\text{Debt}}{\text{Equity}}
\]

The greater the debt ratio, the greater the use of debt for financing operations vis-à-vis equity financing. Another measure is the **debt-to-assets ratio**, which is the extent to which the assets of the firm are financed with debt:

\[
\text{Debt-to-assets} = \frac{\text{Debt}}{\text{Assets}}
\]

There is a tendency for companies in some industries to use more debt than others. We see this looking at the capital structure for different industries in Exhibit 2, where the proportion of assets financed with debt and equity are shown graphically for several industries.
We can make some generalizations about differences in capital structures across industries from this figure:

- Industries that are more reliant upon research and development for new products and technology -- for example, chemical companies -- tend to have lower debt-to-asset ratios than companies without such research and development needs -- for example, grocery stores.

- Industries that require a relatively heavy investment in fixed assets, such as iron and steel foundries, tend to have lower debt-to-asset ratios.

- Industries with more volatile operating earnings (such as electronic computer companies) tend to finance assets more with equity than with debt.

Yet within each industry there is variation of debt ratios. The amount of the book value of long-term debt and the book value of equity for 2003 for individual companies in the air transport industry are graphed in Exhibit 3.

In the case of Delta Air Lines and Northwest Airlines, the book value of shareholders' equity is negative. We get a different picture of the debt burden of companies if we use the market value of equity, as shown in Exhibit 4. For example, using the book value of equity, Jet Blue has a long-term debt to equity ratio of 1.5, whereas using the market value of equity, we see that Jet Blue has a long-term debt to equity ratio of 0.3. It is preferable to use the market value of equity in describing a company's financial leverage because it is a better representation of a company's reliance on debt.

1 Negative book equity is possible and usually results from a series of severe net losses.
Why do some industries tend to have companies with higher debt ratios than other industries? Why do some companies choose to have different capital structures than other companies in the same industry? By examining the role of business risk, financial leveraging, financial distress, and taxes, we can explain some of the variation in debt ratios between industries. And by analyzing these factors we can explain how the firm's value may be affected by its capital structure.

Exhibit 4  Capital structure within industries, using the market value of shareholders' equity, 2003

<table>
<thead>
<tr>
<th>Company</th>
<th>Debt</th>
<th>Market value of equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMR Corporation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continental Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta Air Lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JetBlue Airways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest Air Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwest Airlines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwest Airlines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Value Line Investment Survey

2. Capital structure and financial leverage

Debt and equity financing create different types of obligations for the firm. Debt financing obligates the firm to pay creditors interest and principal -- usually a fixed amount -- when promised. If the firm earns more than necessary to meet its debt payments, it can either distribute the surplus to the owners or reinvest. Equity financing does not obligate the firm to distribute earnings. The firm may pay dividends or repurchase stock from the owners, but there is no obligation to do so.

The fixed and limited nature of the debt obligation affects the risk of the earnings to the owners. Consider the Sample Corporation that has $20,000 of assets, all financed with equity. There are 1,000 shares of Sample stock outstanding, valued at $20 per share. The firm's current Balance Sheet is simple:

Sample Corporation balance sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>$20,000</th>
<th>Liabilities</th>
<th>$ 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity (1,000 shares)</td>
<td>20,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Suppose Sample Corporation has investment opportunities requiring $10,000 of new capital. Further suppose Sample can raise the new capital either of three ways:
Alternative A: Issue $10,000 equity (500 shares of stock at $20 per share)

Alternative B: Issue $5,000 of equity (250 shares of stock at $20 per share) and borrow $5,000 with an annual interest of 5 percent and

Alternative C: Borrow $10,000 with an annual interest of 5 percent

The balance sheet representing each financing method is shown in Exhibit 5. The only difference between the three alternative means of financing is with respect to how the assets are financed:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Assets</th>
<th>Liabilities</th>
<th>Equity</th>
<th>Debt ratio</th>
<th>Debt to assets ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$30,000</td>
<td>$0</td>
<td>$30,000</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>B</td>
<td>$30,000</td>
<td>$5,000</td>
<td>$25,000</td>
<td>20%</td>
<td>16.7%</td>
</tr>
<tr>
<td>C</td>
<td>$30,000</td>
<td>$10,000</td>
<td>$20,000</td>
<td>50%</td>
<td>33.3%</td>
</tr>
</tbody>
</table>

How do we interpret these ratios? Let's look at Alternative B. The debt ratio of 20 percent tells us that the firm finances its assets using $1 of debt for every $5 of equity. The debt-to-assets ratio tells us that 16.7 percent of the assets are financed using debt or, putting it more clearly, almost 17¢ of every $1 of assets is financed with debt.

Suppose Sample has $4,500 of operating earnings. This means it has a $4.500/$30,000 = 15 percent return on assets (ROA = 15%). And suppose there are no taxes. The earnings per share (EPS) differs under the different alternatives, as shown in Panel A of Exhibit 6, with the higher financial leverage alternative, Alternative C, producing the greatest earnings per share.

If we are earning a return that is the same as the cost of debt, 10 percent, the earnings per share are not affected by the choice of financing, as shown in Panel B. Now suppose that the return on assets is 5 percent. In this case, shown in Panel C, earnings per share are the lowest for Alternative C.

Comparing the results of each of the alternative financing methods provides information on the effects of using debt financing. As more debt is used in the capital structure, the greater the "swing" in EPS.

It may be unrealistic to assume that the interest rate on the debt in Alternative C will be the same as the interest rate for Alternative B since in Alternative C there is more credit risk. For purposes of illustrating the point of leverage, however, let's keep the interest rate the same.
In our example, if the return on assets is 15 percent, Alternative C has the highest earnings per share, but if the return on assets is 5 percent, Alternative C has the lowest earnings per share.

We cannot say ahead of time what next period's earnings will be. So what can we do? Well, we can make projections of earnings under different economic climates, and make judgments regarding the likelihood that these economic climates will occur.

When debt financing is used instead of equity (Alternative C in our example), the owners don't share the earnings -- all they must do is pay their creditors the interest on debt. But when equity financing is used instead of debt (Alternative A), the owners must share the increased earnings with the additional owners, diluting their return on equity and earnings per share.

A. The leverage effect

Equity owners can reap most of the rewards through financial leverage when their firm does well. But there is a down side they may suffer when the firm does very poorly. What happens if earnings are down so low they are not enough to pay interest? Interest must be paid no matter how low the earnings. Where does the money come from to pay interest when earnings are insufficient? It comes from:

- reducing the assets in some way, such as using working capital needed for operations or selling buildings or equipment;
- taking on more debt obligations; or
- issuing more shares of stock.

Whichever the firm chooses, the burden ultimately falls upon the owners.

This leveraging effect is illustrated in Exhibit 7 for Sample Corporation where we have broadened the number of possible return on asset outcomes ranging from 0 percent to a 30 percent. Alternative C provides for the most upside potential for the equity holders, it also provides for the most downside potential as well. Hence, Alternative A -- all equity -- offers the more conservative method of financing operations.
The three alternatives have identical earnings per share when there is a 10 percent return on assets. Sample Corporation's 10 percent return on assets is referred to as the **EPS indifference point**: the return where the EPS are the same under the financing alternatives.

Above a 10 percent return on assets (that is, above operating earnings of $3,000), Alternative C offers the most to owners. But Alternative C also has the most downside potential, producing the worst earnings to owners below this 10 percent return on assets.

**B. Quantifying the leverage effect**

We can see the effects of financial leverage by putting numbers to this uncertainty of possible outcomes. Consider once again the three return-on-assets outcomes -- 5 percent, 10 percent and 15 percent -- but this time we are attaching probabilities we're guessing (somehow) that each of these will happen. Suppose that the probability associated with each outcome is:

<table>
<thead>
<tr>
<th>Economic climate</th>
<th>Return on assets</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow</td>
<td>5%</td>
<td>20%</td>
</tr>
<tr>
<td>Normal</td>
<td>10%</td>
<td>60%</td>
</tr>
<tr>
<td>Boom</td>
<td>15%</td>
<td>20%</td>
</tr>
</tbody>
</table>

We can measure the risk associated with each alternative by calculating the standard deviation of the possible earnings per share. The larger the standard deviation, the greater the uncertainty associated with the alternative.

The calculations of the expected EPS, the standard deviation of EPS, and the coefficient of variation are shown in Exhibit 8 for each of the three alternative financing arrangements. Though each alternative has the same expected earnings per share, they differ in terms of the risk associated with these expected earnings per share.
C. Comparing risk among alternatives

In the Sample Corporation example, the expected values for alternatives are the same. However, if we are trying to compare risk among different probability distributions that have different expected values, we need to scale the standard deviation to make each comparable. We do this dividing the standard deviation by the expected value, giving us a scaled down value of dispersion, referred to as the coefficient of variation, CV: $\sigma(\text{EPS}) / \mu(\text{EPS})$. The larger the coefficient of variation, the greater the risk. See Appendix D for details on the calculation and interpretation of CV.

It happens that each alternative has the same expected EPS, but the standard deviations differ. The all-debt financing (Alternative C) results in the highest standard deviation of EPS. This result supports the notion that financial leverage increases the returns to owners, but also increases the risk associated with the returns to owners.
3. Capital structure and taxes

A. What we learn from Modigliani and Miller

The value of a firm -- meaning the value of all its assets -- is equal to the sum of its liabilities and its equity (the ownership interest). Does the way we finance the firm's assets affect the value of the firm and hence the value of its owners' equity? It depends.

The basic framework for the analysis of capital structure and how taxes affect it was developed by two Noble Prize winning economists, Franco Modigliani and Merton Miller. Modigliani and Miller reasoned that if the following conditions hold, the value of the firm is not affected by its capital structure:

Condition #1: Individuals and corporations are able to borrow and lend at the same terms (referred to as "equal access");

Condition #2: There is no tax advantage associated with debt financing (relative to equity financing); and

Condition #3: Debt and equity trade in a market where assets that are substitutes for one another, they trade at the same price. This is referred to as a perfect market. If assets are traded in a perfect market, the value of assets with the same risk and return characteristics trade for the same price.

Under the first condition, individuals can borrow and lend on the same terms as the business entities. Therefore, if individuals are seeking a given level of risk, they can either (1) to borrow or lend on their own or (2) invest in a business that borrows or lends. In other words, if an individual wants to increase the risk of her investment, she could choose to invest in a company that uses debt to finance its assets. Or, the individual could invest in a firm with no financial leverage and take out a personal loan -- increasing her own financial leverage.

The second condition isolates the effect of financial leverage. If deducting interest from earnings is allowed in the analysis, it would be difficult to figure out what effect financial leverage itself has on the value of the firm. The third condition insures that assets are priced according to their risk and return characteristics.

Under these conditions, the value of Sample Corporation is the same, no matter which of the three financing alternatives it chooses. The total income to owners and creditors is the same. For example, if the return on assets is expected to be 15 percent, the total income to owners and creditors is $4,500 under each alternative:

<table>
<thead>
<tr>
<th>Financing</th>
<th>Income to owners</th>
<th>Income of creditors</th>
<th>Total income to owners and creditors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative A: $10,000 equity</td>
<td>$4,500</td>
<td>$0</td>
<td>$4,500</td>
</tr>
<tr>
<td>Alternative B: $5,000 equity, $5,000 debt</td>
<td>$4,000</td>
<td>$500</td>
<td>$4,500</td>
</tr>
<tr>
<td>Alternative C: $10,000 debt</td>
<td>$3,500</td>
<td>$1,000</td>
<td>$4,500</td>
</tr>
</tbody>
</table>

---

Assume that the expected return on assets is 15 percent, for each period, forever. It follows that the value of Sample can be determined using the formula for the valuation of a perpetuity, \( PV = \frac{CF}{r} \). Expressing this in terms of the value of the firm:

\[
\text{Value of the company} = \frac{\text{expected earnings per period}}{\text{capitalization rate}}.
\]

The discount rate is referred to as the **capitalization rate**, which is the discount rate that translates future earnings into a current value. The capitalization rate reflects the uncertainty associated with the expected earnings in the future. The more uncertain the future earnings, the less a dollar of future income is worth today and the greater the capitalization rate. But the uncertainty regarding the earnings on the assets is not affected by how the assets are financed. How the assets are financed affects who gets what.

Assume the appropriate discount rate for Sample Corporation's future income is 15 percent. Then:

\[
\text{Value of Sample Corporation} = \frac{\$4,500}{0.15} = \$30,000.
\]

Because there are no creditors to share with in the case of all-equity financing (Alternative A), the value of equity for Sample is the present value of earnings stream of $4,500 per period discounted at 15 percent, or $30,000. However, the value of Sample Corporation with debt financing (Alternatives B and C), is a bit more difficult.

In the case of Alternatives B and C, Sample Corporation's owners view their future earnings streams as more risky than in the case of no debt. Hence, the discount rate should be higher, reflecting the debt used.

Modigliani and Miller show that the discount rate for the earnings to equity owners is higher when there is the use of debt and the greater the debt the higher the discount rate. Specifically, they show that the discount rate of the earnings to owners is equal to the discount rate of a firm with no financial leverage plus the compensation for bearing risk appropriate to the amount of debt in the capital structure.

The compensation for bearing risk, as reasoned by Modigliani and Miller, should be the risk premium weighted by the relative use of debt in the capital structure. The **risk premium** is the difference between the discount rate for the net income to owners and the discount rate on earnings to creditors (the interest), which is assumed to be risk-free. Interest is paid to creditors no matter how well or how poorly the firm is doing; hence, it is considered risk-free to creditors. And the greater the use of debt, the greater the risk premium.

Let \( r_s \) be the discount rate for risky earnings to owners and let \( r_d \) be the discount rate for risk-free debt earnings. The risk premium is equal to \( r_s - r_d \). The discount rate that should be applied to the earnings to owners is:

\[
\text{Capitalization rate} = r_s + \left( r_s - r_d \right) \left( \frac{\text{debt}}{\text{equity}} \right).
\]

In the case of the Sample Corporation, the equity discount rate for the financing alternatives is calculated by adjusting the discount rate of the earnings stream, \( r_s = 15 \) percent, for risk associated with financial leveraging. If the interest rate on debt, \( r_d \), is 10 percent,
We calculate the value of Sample Corporation equity under each alternative valuing the earnings to owners' stream, using the appropriate capitalization rate.

Alternative A: Value of equity = \( \frac{4,500}{0.15} = 30,000 \).

Alternative B: Value of equity = \( \frac{4,000}{0.16} = 25,000 \).

Alternative C: Value of equity = \( \frac{3,500}{0.175} = 20,000 \).

Modigliani and Miller show that the value of the firm depends on the earnings of the firm, not on how the firm's earnings are divided between creditors and shareholders.

Summarizing,

<table>
<thead>
<tr>
<th></th>
<th>Alternative A</th>
<th>Alternative B</th>
<th>Alternative C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of debt</td>
<td>$0</td>
<td>$5,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Value of equity</td>
<td>$30,000</td>
<td>$25,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Value of the firm</td>
<td>$30,000</td>
<td>$30,000</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

An implication of the Modigliani and Miller analysis is that the use of debt financing increases the expected future earnings to owners. But it also increases the risk of these earnings and, hence, increases the discount rate investors use to value these future earnings. Modigliani and Miller reason that the effect that the increased expected earnings has on the value of equity is just offset by the increased discount rate applied to these riskier earnings.

**Bottom Line:** In the absence of taxes, the value of the firm - the "pie" -- is not affected by how you slice it.

**B. Interest deductibility and capital structure**

The use of debt has a distinct advantage over financing with stock, thanks to Congress. The Internal Revenue Code, written by Congress, allows deducting interest paid on debt to determine taxable income. This deduction represents a form of a government subsidy of financing activities. By allowing interest to be deducted from taxable income, the government is sharing the firm's cost of debt.

To see how this subsidy works, compare three companies: Firm U (unlevered), Firm L (levered) and Firm LL (lots of leverage). Suppose all have the same $5,000 taxable income before interest and taxes. Firm U is financed entirely with equity, whereas Firm L is financed with $10,000 debt that
requires an annual payment of 10 percent interest. If Firm LL (Lots of Leverage) has the same operating earnings and tax rate as Companies U and L, but uses $20,000 of debt (at the 10 percent interest rate). If the tax rate for all companies is 30 percent, the tax payable and net-income-to-owners are calculated as follows:

<table>
<thead>
<tr>
<th></th>
<th>Firm U no debt</th>
<th>Firm L $10,000 debt</th>
<th>Firm LL $20,000 debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxable income before taxes &amp; interest</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Less: interest expense</td>
<td></td>
<td>0</td>
<td>-2,000</td>
</tr>
<tr>
<td>Taxable income before taxes</td>
<td>$5,000</td>
<td>$4,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>Less: taxes @ 30%</td>
<td>-1,500</td>
<td>-1,200</td>
<td>-900</td>
</tr>
<tr>
<td>Net income to owners</td>
<td>$3,500</td>
<td>$2,800</td>
<td>$2,100</td>
</tr>
<tr>
<td>Income to creditors</td>
<td>$0</td>
<td>$1,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>Income to owners</td>
<td>3,500</td>
<td>2,800</td>
<td>2,100</td>
</tr>
<tr>
<td>Income to creditors and owners</td>
<td>$3,500</td>
<td>$3,800</td>
<td>$4,100</td>
</tr>
</tbody>
</table>

By financing its activities with debt, paying interest of $1,000, Firm L reduces its tax bill by $300 -- the difference between Firm U's $1,500 tax bill and Firm L's $1,200 tax bill. In the case of Firm L, the creditors have $1,000 of income, the government receives $1,200 of income, and the owners receive $2,800. The $300 represents money Firm L does not pay because they are allowed to deduct the $1,000 interest. This reduction in the tax bill is a type of subsidy.

Comparing Firm LL to Firm L, we see that creditors' income (the interest expense) is $2,000 ($1,000 more than Firm L), taxes are $900 ($300 lower than Firm L's $1,200 taxes) and the net income to owners $2,100 ($700 lower than Firm L's net income). If Firm L were to increase its debt financing from $10,000 to $20,000, like Firm LL's, the total net income to the suppliers of capital -- the creditors and owners -- is increased $300, from $3,800 to $4,100.

The distribution of incomes differs among Firms U, L, and LL. In the case of Firm U, 70 percent of the income goes to owners and 30 percent goes to the government in the form of taxes. In the case of Firm LL, 42 percent of the income goes to owners and 18 percent goes to taxes, with the remaining 40 percent going to creditors.

Extending this example to different levels of debt

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4 We are assuming, for simplicity, that the cost of debt (10 percent) remains the same for all levels of debt financing. And this would be the case in a perfect market.
financing, as shown in Exhibit 9, a pattern emerges. The government subsidy for debt financing grows as the level of debt financing grows. With increases in the use of debt financing, the creditors' share of earnings increases and the owners' and the government's share decrease.

An interesting element introduced into the capital structure decision is the reduction of taxes due to the payment of interest on debt. We refer to the benefit from interest deductibility as the interest tax shield, since the interest expense shields income from taxation. The tax shield from interest deductibility is:

\[
\text{Tax-shield} = (\text{Tax rate}) \left(\text{Interest expense}\right).
\]

If Firm L has $10,000 of 10 percent debt and is subject to a tax of 30 percent on net income, the tax shield is:

\[
\text{Tax-shield} = 0.30 \times [10,000 \times 0.10] = 3,000.
\]

A $1,000 interest expense means that $1,000 of income is not taxed at 30 percent.

Recognizing that the interest expense is the interest rate on the debt, \( r_d \), multiplied by the face value of debt, \( D \), the tax shield for a firm with a tax rate of \( \tau \) is:

\[
\text{Tax-shield} = (\text{Tax rate}) \left(\text{Interest rate on debt}\right) \left(\text{Face value of debt}\right) = \tau r_d D.
\]

How does this tax-shield affect the value of the firm? The tax shield is valuable since it reduces the net income of the firm that goes to the government in the form of taxes.

We should specify that the tax rate is the marginal tax rate -- the tax rate on the next dollar of income. Suppose you have a salary of $20,000 a year. And suppose the first $20,000 of income is taxed at 20 percent and any income over that is taxed at 30 percent. If you are considering making an investment that will generate taxable income above $20,000, what tax rate do you use in making your decision? You use 30 percent, because any income you earn above the $20,000 will be taxed at 30 percent, not 20 percent. And since we are concerned with how interest protects income from taxation, we need to focus on how it shields taxable income beyond the income that is shielded by all other tax deductible expenses. Suppose you have income of $20,000 and deductible expenses other than interest of $20,000. If you are considering borrowing, does the interest expense shield anything? No, so the marginal tax rate is 0 percent.

If we used the average tax rate (that is, the ratio of taxes to taxable income) instead of the marginal tax rate, we would understate the benefit from the interest deduction.
If the level of debt financing, \( D \), is considered permanent (that is, when the current debt matures, new debt in the same amount is issued to replace it), and if the interest rate on the debt, \( r_d \), is considered fixed, and if the tax rate on the net income is considered to remain constant at \( \tau \), then the tax shield is expected to be generated in each period, forever. Therefore, the tax shield represents a perpetual stream whose value is:

\[
\text{Present value of a perpetual stream} = \frac{\text{Periodic stream}}{\text{Discount rate}}.
\]

The discount rate is the interest rate on the debt and the periodic stream is the tax shield each period. The present value of the interest tax shield (PVITS) is:

\[
\text{PVITS} = \frac{(\text{Tax rate})(\text{Interest rate on debt})(\text{Face value of debt})}{(\text{Interest rate on debt})} = \frac{\tau r_d D}{r_d}.
\]

Simplifying,

\[
\text{PVITS} = (\text{Tax rate})(\text{Face value of debt}) = \tau D.
\]

This means Firm L with $10,000 of debt at an interest rate of 10 percent and a tax rate on income of 30 percent, has a $3,000 tax-shield:

\[
\text{PVITS} = (0.30) \times 10,000 = 3,000.
\]

The fact that the Internal Revenue Code allows interest on debt to reduce taxable income increases the value of Firm L by $3,000.

Tax shields from interest deductibility are valuable: if a firm finances its assets with $50,000 of debt and has a tax rate of 30 percent, the tax shield from debt financing (and hence the increase in the value of the firm) is $15,000!

If the firm is expected to maintain the same amount of debt in its capital structure,

\[
\text{Value of the firm} = \text{Value of the firm if all equity financed} + \tau D
\]

Therefore, the value of the firm is supplemented by the tax subsidy resulting from the interest deducted from income.
**Bottom Line:** Companies that use debt benefit because of the tax-deductibility of interest on debt because, essentially, the government is subsidizing this form of financing.

C. Personal taxes and capital structure

A firm's corporate taxes and debt affects its value: the more debt it uses, the more interest is deductible, the more income is shielded from taxes.

But personal taxes also enter into the picture. Who is going to buy this debt? Investors. But investors face personal taxes and have to make decisions about what investments they want to buy. And if their income from debt securities -- their interest income -- is taxed differently from their income on equity securities -- their dividends and capital appreciation -- this may affect how much they are willing to pay for the securities. This affects the return the firm must offer investors on debt and equity to entice them to buy the securities.

We won't go through the mathematics of how personal taxes affect the interest rates a firm must offer, but we can look at the major conclusions regarding personal taxes and capital structure:

- If debt income (interest) and equity income (dividends and capital appreciation) are taxed at the same rate, the interest tax shield is still $\tau_D$ and increasing leverage increases the value of the firm.

- If debt income is taxed at rates higher than equity income, some of the tax advantage to debt is offset by a tax disadvantage to debt income. Whether the tax advantage from the deductibility of interest expenses is more than or less than the tax disadvantage of debt income depends on: the firm's tax rate; the tax rate on debt income; and the tax rate on equity income. But since different investors are subject to different tax rates (for example, pension funds are not taxed), determining this is a problem.

- If investors can use the tax laws effectively to reduce to zero their tax on equity income, companies will take on debt up to the point where the tax advantage to debt is just offset by the tax disadvantage to debt income.$^5$

**Bottom Line:** There is a benefit from using debt, though it may not be as large as $\tau_D$ because of personal taxes.

D. Unused tax shields

The value of a tax shield depends on whether or not the firm can use an interest expense deduction. In general, if a firm has deductions that exceed income the result is a net operating loss. The firm does not have to pay taxes in the year of the loss and may "carry" this loss to another tax year.

This loss may be applied against previous years' taxable income (with some limits). The previous years' taxes are recalculated and a refund of taxes previously paid is requested. If there is insufficient previous years' taxable income to apply the loss against, any unused loss is carried over into future years (with some limits), reducing future years' taxable income.$^6$

---

$^5$ This reasoning was developed by Merton Miller in "Debt and Taxes," *Journal of Finance*, May 1977) pp. 261-276.

$^6$ The tax code provisions, with respect to the number of years available for net operating loss carry backs and carryovers have changed frequently. In 2004, for example the code permits a carry back for two previous tax
Therefore, when interest expense is larger than income before interest, the tax shield is realized immediately -- if there is sufficient prior years' taxable income. If prior years' taxable income is insufficient (that is, less than the operating loss created by the interest deduction), the tax shield is less valuable because the financial benefit is not received until some later tax year (if at all). In this case, we discount the tax shield to reflect both the uncertainty of benefiting from the shield and the time value of money.

To see how the value of an interest tax shield may become less valuable, let's suppose The Dismal Firm has the following financial results:

<table>
<thead>
<tr>
<th>The Dismal Firm</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxable income before interest</td>
<td>$7,000</td>
<td>$8,000</td>
<td>$6,000</td>
</tr>
<tr>
<td>Interest expense</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Taxable income</td>
<td>$2,000</td>
<td>$3,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Tax rate</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>Tax paid</td>
<td>$800</td>
<td>$1,200</td>
<td>$400</td>
</tr>
</tbody>
</table>

Suppose further that the Dismal Firm has the following result for Year 4:

<table>
<thead>
<tr>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxable income before interest</td>
</tr>
<tr>
<td>Interest expense</td>
</tr>
<tr>
<td>Taxable income</td>
</tr>
</tbody>
</table>

Suppose the tax code permits a carry back of two years and a carryover of fifteen years. Unfortunate Firm can take the net operating loss of $7,000 and apply it against the taxable income of previous years, beginning with Year 1:

<table>
<thead>
<tr>
<th>The Dismal Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation of Tax Refunds Based on Year 4 Net Operating Loss</td>
</tr>
<tr>
<td>Year 1</td>
</tr>
<tr>
<td>Taxable income before interest</td>
</tr>
<tr>
<td>Interest expense</td>
</tr>
<tr>
<td>Taxable income - original</td>
</tr>
<tr>
<td>Application of Year 4 loss</td>
</tr>
<tr>
<td>Taxable income - recalculated</td>
</tr>
<tr>
<td>Tax due - recalculated</td>
</tr>
<tr>
<td>Refund of taxes paid</td>
</tr>
</tbody>
</table>

By carrying back the part of the loss, the Dismal Firm has applied $4,000 of its Year 4 loss against the previous years' taxable income: 3,000 (Year 2) + 1,000 (Year 3) and receives a tax refund of $2,400 (=1,200 + 400 = $1,600). There remains an unused loss of $3,000 ($7,000 - $4,000). This loss can be applied toward future tax years' taxable income, reducing taxes in future years. But since we don't get the benefit from the $3,000 unused loss -- the $3,000 reduction in taxes -- until sometime in the future, the benefit is worth less than if we could use it today.
The Dismal Firm, with an interest deduction of $8,000, benefits from $5,000 of the deduction; $1,000 against current income and $4,000 against previous income. Therefore, the tax shield from the $8,000 is not $3,200 (40 percent of $8,000), but rather $1,600 (40 percent of $4,000), plus the present value of the taxes saved in future years. The present value of the taxes saved in future years depends on:

1. the uncertainty that the Dismal Firm will generate taxable income and
2. the time value of money.

The Dismal Firm's tax shield from the $8,000 interest expense is less than what it could have been because we couldn't use all of it now. The bottom line of the analysis of unused tax shields is that the benefit from the interest deductibility of debt depends on whether or not the firm can use the interest deductions.

Bottom Line: If a company does not generate sufficient taxable income to use the benefit from interest deductibility, the value from using debt financing is less than $D and may not in fact have any benefit.

4. Capital structure and financial distress

A firm that has difficulty making payments to its creditors is in financial distress. Not all companies in financial distress ultimately enter into the legal status of bankruptcy. However, extreme financial distress may very well lead to bankruptcy.  

A. Costs of financial distress

The costs related to financial distress without legal bankruptcy can take different forms. For example, to meet creditors' demands, a firm takes on projects expected to provide a quick payback. In doing so, the financial manager may choose a project that decreases owners' wealth or may forgo a profitable project.

Another example of a cost of financial distress is the cost associated with lost sales. If a firm is having financial difficulty, potential customers may shy away from its products because they may perceive the firm unable to provide maintenance, replacement parts, and warranties. If you are arranging your travel plans for your next vacation, do you want to buy a ticket to fly on an airline that is in financial difficulty and may not be around much longer? Lost sales due to customer concern represent a cost of financial distress -- an opportunity cost, something of value (sales) that the firm would have had if it were not in financial difficulty.

Still another example of costs of financial distress is costs associated with suppliers. If there is concern over the ability of the firm to meet its obligations to creditors, many suppliers may be unwilling to extend trade credit or, if willing, may extend trade credit at less favorable terms. Also, suppliers may be unwilling to enter into long-term contracts to supply goods or materials. As a firm loses its long-term guarantees to certain goods or materials, the greater the uncertainty it will be

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7 Whereas bankruptcy is often a result of financial difficulties arising from problems in paying creditors, some bankruptcy filings are made prior to distress, when a large claim is made on assets (for example, class action liability suit).

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able to obtain these items in the future and the higher will be the costs associated with renegotiating contracts.

B. The role of limited liability

Limited liability limits owners' liability for obligations to the amount of their original investment in the shares of stock. Limited liability for owners of some forms of business creates a valuable right and an interesting incentive for shareholders. This valuable right is the right to default on obligations to creditors -- that is, the right not to pay creditors. Because the most shareholders can lose is their investment, there is an incentive for the firm to take on very risky projects: if the projects turn out well, they pay creditors only what is owed and keep the rest, and if the projects turn out poorly, they pay creditors what is owed -- if there is anything left.

We can see the benefit to owners from limited liability by comparing the Unlim Company, whose owners have unlimited liability, and the Lim Company, whose owners have limited liability. Suppose that the two companies have the following, identical capital structure in Year 1:

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Unlim Company</th>
<th>Lim Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Equity</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Total value of firm's assets</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
</tbody>
</table>

Owners' equity is $3,000 in both cases.

If the value of the assets of both companies in Year 2 is increased to $5,000, the value of both debt and equity is the same for both companies:

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Unlim Company</th>
<th>Lim Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Equity</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Total value of firm's assets</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
</tbody>
</table>

Now suppose the total value of both firm's assets in Year 2 drops to $500. If there are insufficient assets to pay creditors the $1,000 owed them, the owners with unlimited liability must pay the difference (the $500); if there are insufficient assets to pay creditors the $1,000 owed them, the owners with limited liability do not make up the difference and the most the creditors can recover is the $500.

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Unlim Company</th>
<th>Lim Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>$1,000</td>
<td>$500</td>
</tr>
<tr>
<td>Equity</td>
<td>-500</td>
<td>0</td>
</tr>
<tr>
<td>Total value of firm's assets</td>
<td>$500</td>
<td>$500</td>
</tr>
</tbody>
</table>

In this case, the Unlim Company's owners must pay $500 to its creditors because the claim of the creditors is greater than the assets available to satisfy their claims. The Lim Company's creditors do not receive their full claim and since the owners are shielded by limited liability -- the creditors cannot approach the owners to make up the difference.

We can see the role of limited liability for a wider range of asset values by comparing the creditors' and owners' claims in Figure 13-6 for the Unlim Company (Panel a) and the Lim Company (Panel b). The creditors make their claims at the expense of owners in the case of the Unlim Company for asset values of less than $1,000. If the value of assets of the Unlim Company is $500, the creditors recover the remaining $500 of their claim from the owners' personal assets (if there are any such
assets). In the case of Lim Company, however, if the assets' value is less than $1,000, the creditors cannot recover the full $1,000 owed them -- they can't touch the personal assets of the owners!\footnote{Lenders are aware of this dilemma and, for small businesses, often require managers (who are also shareholders) to be \textit{personally} liable for the corporation's debts. This allows lenders to avoid the problem of limited owners' liability.}

The fact that owners with limited liability can lose only their initial investment -- the amount they pay for their shares -- creates an incentive for owners to take on riskier projects than if they had unlimited liability: they have little to lose and much to gain. Owners of the Lim Company have an incentive to take on risky projects because they can only lose their investment in the firm. But they can benefit substantially if the payoff on the investment is high.

For companies whose owners have limited liability, the more the assets are financed with debt, the greater the incentive to take on risky projects, leaving creditors "holding the bag" if the projects turn out to be unprofitable. This is a problem: there is a conflict of interest between shareholders' interests and creditors' interests. The investment decisions are made by managers (who represent the shareholders) and, because of limited liability, there is an incentive for managers to select riskier projects that may harm creditors who have entrusted their funds (by lending them) to the firm.

However, creditors are aware of this and demand a higher return on debt (and hence a higher cost to the firm). The result is that shareholders ultimately bear a higher cost of debt.

\section*{C. Bankruptcy and bankruptcy costs}

When a firm is having difficulty paying its debts, there is a possibility that creditors will foreclose (that is, demand payment) on loans, causing the firm to sell assets which could impair or cease operations. But if some creditors force payment, this may disadvantage other creditors. So what has developed is a way of orderly dealing with the process of the firm paying its creditors -- the process is called \textit{bankruptcy}.

Bankruptcy in the U.S. is governed by the Bankruptcy Code, created by the Bankruptcy Reform Act of 1978. A firm may be reorganized under Chapter 11 of this Code, resulting in a restructuring of its claims, or liquidated under Chapter 7.\footnote{Public law 95-598, TITLE I, SEC 101, November 6, 1978, 92 STAT. 2549.}

\begin{center}
\begin{tabular}{|l|}
\hline
\textbf{U.S. Code, Title 11 - Bankruptcy} \\
\textbf{Chapter 1} General provisions \\
\textbf{Chapter 3} Case Administration \\
\textbf{Chapter 5} Creditors, the debtor, and the estate \\
\textbf{Chapter 7} Liquidation \\
\textbf{Chapter 9} Adjustment of debts of a municipality \\
\textbf{Chapter 11} Reorganization \\
\textbf{Chapter 12} Adjustment of debts of a family farmer with regular annual income \\
\textbf{Chapter 13} Adjustment of debts of an individual with regular income \\
\hline
\end{tabular}
\end{center}

Chapter 11 bankruptcy provides the troubled firm with protection from its creditors while it tries to overcome its financial difficulties. A firm that files bankruptcy under Chapter 11 continues as a going concern during the process of sorting out which of its creditors get paid and how much. On the other hand, a firm that files under bankruptcy Chapter 7, under the management of a trustee, terminates its operations, sells its assets, and distributes the proceeds to creditors and owners.
We can classify bankruptcy costs into direct and indirect costs. Direct costs include the legal, administrative, and accounting costs associated with the filing for bankruptcy and the administration of bankruptcy. These costs are estimated to be 6.2 percent of the value of the firm prior to bankruptcy. For example, the fees and expenses for attorneys representing shareholders and creditors’ committees in the Texaco bankruptcy were approximately $21 million.

The indirect costs of bankruptcy are more difficult to evaluate. Operating a firm while in bankruptcy is difficult since there are often delays in making decisions, creditors may not agree on the operations of the firm, and the objectives of creditors may differ from the efficient operation of the firm to maximize the wealth of the owners. One estimate of the indirect costs of bankruptcy, calculated by comparing actual and expected profits prior to bankruptcy, is 10.5 percent of the value of the firm prior to bankruptcy.

Another indirect cost of bankruptcy is the loss in the value of certain assets. Because many intangible assets derive their value from the continuing operations of the firm, the disruption of operations in bankruptcy may change the value of some companies in a manner different than other companies. For example, if part of a firm’s value is attributed to its expertise in research and development, disrupting these activities due to reorganizing (for example, reducing investment in new products) may reduce the value of the firm.

The extent the value of a business enterprise depends on intangibles varies among industries and among companies, so the potential loss in value from financial distress varies as well. For example, a drug company may experience a greater disruption in its business activities than, say, a steel manufacturer, since much of the value of the drug company may be derived from research and development, leading to new products.

### D. Financial distress and capital structure

The relationship between financial distress and capital structure is simple: as more debt financing is used, fixed, legal obligations increase (interest and principal payments), and the ability of the firm to satisfy these increasing, fixed payments decreases. Therefore, as more debt financing is used, the probability of financial distress and then bankruptcy increases.

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12 The indirect cost estimate is taken from Altman, *ibid.* (page 1077).
For a given decrease in operating earnings, a firm that uses debt to a greater extent in its capital structure (that is, a firm that uses more financial leverage), has a greater risk of not being able to satisfy the debt obligations and increases the risk of earnings to owners.

Another factor to consider in assessing the probability of distress is the business risk of the firm. Business risk is the uncertainty associated with the earnings from operations and is the uncertainty inherent in the type of business.

Business risk is comprised of sales risk and operating risk. Sales risk is the risk associated with sales, as a result of economic and market forces that affect the volume and prices of goods or services sold. Operating risk is the risk associated with the operating cost structure of the business. A cost structure is comprised of both fixed and variable costs; the greater the use of fixed costs, relative to variable costs, the greater the operating risk. If sales were to decline, the greater use of fixed costs in the operating cost structure results in an exaggerated affect on operating earnings. When an airline flies between any two cities, most of its costs are the same whether there is one passenger or one hundred passengers. Its costs are mostly fixed (fuel, pilot, gate fees, et cetera), with very little in the way of variable costs (the cost of the meal). Therefore, an airline's operating earnings are very sensitive to the number of tickets sold.

The effect of the mixture of fixed and variable costs on operating earnings is akin to the effect of debt financing (financial leverage) on earnings to owners. Here it is referred to as operating leverage; the greater the fixed costs in the operating cost structure, the greater the leveraging affect on operating earnings for a given change in sales. The greater the business risk of the firm, the greater the probability of financial distress.

The concern in assessing the effect of distress on the value of the firm is the present value of the expected costs of distress. And the present value depends on the probability of financial distress: the greater the probability of distress, the greater the expected costs of distress.

The present value of the costs of financial distress increase with the increasing relative use of debt financing because the probability of distress increases with increased financial leverage. In other words, as the debt ratio increases, the present value of the costs of distress increases, lessening some of the value gained from the use of tax deductibility of interest expense.

Summarizing the factors that influence the present value of the cost of financial distress:

1. The probability of financial distress increases with increases in business risk.
2. The probability of financial distress increases with increases in financial risk.
3. Limited liability increases the incentives for owners to take on greater business risk.
4. The costs of bankruptcy increase the more the value of the firm depends on intangible assets.

We do not know the precise manner in which the probability of distress increases as we increase the debt-to-equity ratio. Yet, it is reasonable to think the probability of distress increases as a greater proportion of the firm's assets are financed with debt.

5. Assembling the pieces of theory

As we increase the relative use of debt in the capital structure, we see that the value of the firm increases as a result of the tax-shield of interest deductibility but this benefit is eventually offset by the expected costs of financial distress. Putting together the tax shield from interest together with the costs of financial distress we can see that there is some ratio of debt to equity that maximizes the value of the firm. Since we do not know the precise relationship between the tax-shield and
distress costs, we cannot specify, for a given firm, what the optimal debt to equity ratio should be. And although we have not yet considered other factors that may play a role in the determining the value of the firm, we can say:

- The benefit from the tax deductibility of interest increases as the debt to equity ratio increases.
- The present value of the cost of financial distress increases as the debt to equity ratio increases.

This "trade-off" between the tax deductibility of interest and the cost of distress can be summarized in terms of the value of the firm in the context of the Modigliani and Miller model:

\[
\text{Value of the firm} = \text{Value of the firm if all equity financed} + \text{Present value of the interest tax-shield} - \text{Present value of financial distress}
\]

The value of the firm is affected by taxes and the costs of financial distress. As a firm becomes more financially levered (using more debt financing relative to equity financing), its value is increased. And the costs associated with financial distress (both direct and indirect costs) reduce the value of the firm as financial leverage is increased. Hence, the trade-off between the tax deductibility of interest and the costs of financial distress.

These considerations help to explain the choice between debt and equity in a firm's capital structure. As more debt is used in the capital structure, the benefit from taxes increases the firm's value, while the detriment from financial distress decreases its value. This trade-off is illustrated in the three graphs in Exhibit 8.

Case 1: The value of the firm versus the debt ratio, with no interest tax deductibility and no costs to financial distress.

Case 2: The value of the firm versus the debt ratio, with the tax deductibility of interest, but with no costs to financial distress.

Case 3: The value of the firm versus the debt ratio, with the tax deductibility of interest and with costs to financial distress.
Case 3 is the most comprehensive and realistic case. At moderate levels of financial leverage (low debt ratios), the value contributed by tax shields more than offsets the costs associated with financial distress. However, at some debt ratio the detriment from financial distress may outweigh the benefit from corporate taxes, reducing the value of the firm as more debt is used. Hence, the value of the firm increases as more debt is taken on, up to some point, and then decreases.

At that point, the value of the firm begins to diminish as the probability of financial distress increases, such that the present value of the costs of distress outweigh the benefit from interest deductibility. The mix of debt and equity that maximizes the value of the firm is referred to as the optimal capital structure. This is the point where the benefit from taxes exactly offsets the detriment from financial distress. The optimal capital structure is that mix of debt and equity that produces the highest value of the firm.

At first glance, the value enhancement from tax shields appears simple to calculate: multiply the corporate tax rate times the face value of debt. However, it is not that simple, for many reasons. The use of the $\tau_D$ for valuation assumes:

1. A constant marginal corporate tax rate;
2. Refinancing debt at current interest rates; and
3. The firm will earn sufficient taxable income (before interest payments) to be able to use the interest deduction.

Marginal corporate tax rates change frequently, at the discretion of Congress. Interest rates change through time and it is very unlikely that refinancing in, say, twenty years will be at current interest rates. Further, you cannot always predict that a company will generate future income that will be sufficient to cover the interest expenses.

And the expected costs of financial distress are difficult to calculate. You cannot simply look at a firm and figure out the probability of distress for different levels of financial leverage. The probability of distress at different levels of debt financing may differ among companies, dependent upon their business risk. The costs of distress are also difficult to measure. These costs will differ from firm to firm, depending on the type of asset (that is, intangibles versus tangibles) and the nature of the firm's supplier and customer relationships.
6. Reconciling theory with practice

So what good is this analysis of the trade-off between the value of the interest tax-shields and the costs of distress if we cannot apply it to a specific firm? Whereas we cannot specify a firm’s optimal capital structure, we do know the factors that affect the optimum. The bottom line? There is a benefit from taxes but, eventually, this benefit may be reduced by costs of financial distress.

A. Capital structures among different industries

The analysis of the capital structure trade-off leaves us with several financial characteristics of companies that affect the choice of capital structure:

- The greater the marginal tax rate, the greater the benefit from the interest deductibility and, hence, the more likely a firm is to use debt in its capital structure.
- The greater the business risk of a firm, the greater the present value of financial distress and, therefore, the less likely the firm is to use debt in its capital structure.
- The greater extent that the value of the firm depends on intangible assets, the less likely it is to use debt in its capital structure.

It is reasonable to expect these financial characteristics to differ among industries, but be similar within an industry. The marginal tax rate should be consistent within an industry because:

- the marginal tax rates are the same for all profitable companies;
- the tax law provides specific tax deductions and credits (for example, depreciation allowances and research and development credits) creates some differences across industries, but generally apply to all companies within an industry since the asset structure and the nature of investment is consistent within an industry; and
- the companies in an industry are subject to the same economic and market forces that may cause tax shields to be unusable. Therefore, it is reasonable to assume that capital structures be similar within industry groups.

B. Capital structures within industries

The capital structures among companies within industries differ for several possible reasons. First, within an industry there may not be a homogeneous group of companies. For example, Walt Disney Company, Caesars World, and Bowl America are all considered members of the amusement industry, but they have quite different types of business risk. The problem of industry groupings is exasperated by the fact that many companies operated in many different lines of business.

Adding to the difficulty in comparing Companies is the recent Financial Standards Accounting Board (FASB) requirement that Companies consolidate the accounting data of majority-owned subsidiaries. The capital structure of the automobile manufacturers (for example, General Motors and Ford Motor Company) look quite different when the financing subsidiaries and included in the calculation of their debt ratios.

Another reason an industry may appear to comprise Companies having different capital structures is the way the debt ratio is calculated. It makes a difference if we are using the book value of equity or the market value of equity in our comparison with the amount of debt that a firm carries. The book
the value of equity, also referred to as stockholders' equity, is the amount of stockholders' equity reported in the balance sheet. The book value of equity is the sum of the capital stock, paid-in capital, and retained earnings accounts -- which all reflect historical values, not current values. The market value of equity is the value of owners' equity in the financial marketplace. We calculate it by multiplying the market price per share of stock times the number of shares outstanding.

C. Trade-off theory and observed capital structures

The trade-off theories can explain some of the capital structure variations that we observe. Companies whose value depends to a greater extent on intangibles, such as in the semiconductor and drug industries, tend to have lower debt ratios. Companies in more volatile product markets, such as the electronics and telecommunications industries, tend to have lower debt ratios.

However, the trade-off theories cannot explain all observed capital structure behavior. We observe several profitable companies in the drug manufacturing industry that have no long-term debt (American Home products, Forest Laboratories, and Marion Laboratories). Though these companies do have a large investment in intangibles, they choose not to take on any debt at all. By taking on some debt, they can enhance the value of their companies. Yet they choose not to do so.

We also see companies that have high business risk and high debt ratios. Companies in the air transportation industry experience a volatile product market, with a high degree of operating leverage. Companies in this industry must invest heavily in jets, airport gates, and reservations systems, and have a history of difficulty with labor. However, these companies also have high debt ratios. One possible explanation for airlines taking on a great deal of financial leverage on top of their already high operating leverage is that their assets, such as jets and gates, can be sold quickly, offsetting the effects of their greater volatility in operating earnings. Whereas the high business risk increases the probability of financial distress, the liquidity of their assets reduces the probability of distress. But hindsight tells us more about the airline industry. The overcapacity of the industry just prior to the recession of 1989-91 meant that there wasn't much of a market for used jets and planes. The airlines suffered during this economic recession: of the fourteen companies in existence just prior to 1989, four companies entered bankruptcy (Continental, Pan Am, Midway, and America West), and two were liquidated (Eastern Airlines and Braniff).

D. Factors important in selecting a capital structure

The analysis of the trade-off and pecking order explanations of capital structure suggests that there is no satisfactory explanation of capital structure. What we learn from examining these possible explanations is that there are several factors to consider in making the capital structure decision:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxes</td>
<td>The tax deductibility of taxes makes debt financing attractive. However, the benefit from debt financing is reduced if the firm cannot use the tax shields.</td>
</tr>
<tr>
<td>Risk</td>
<td>Since financial distress is costly, even without legal bankruptcy, the likelihood of financial distress depends on the business risk of the firm, in addition to any risk from financial leverage.</td>
</tr>
<tr>
<td>Type of assets</td>
<td>The cost of financial distress is likely to be more for companies whose value depends on intangible assets and growth opportunities.</td>
</tr>
</tbody>
</table>

The financial manager's task is to assess the business risk of the firm, predicting the usability of tax deductions in the future, evaluating how asset values are affected in the event of distress, and estimating the relative issuance costs of the alternative sources of capital. In the context of all these
considerations, the financial manager can observe other companies in similar situations, using their decisions and consequences as a guide.

7. Summary

Financial leverage is the use of fixed cost sources of funds. The effect of using financial leverage is to increase both the expected returns and the risk to owners. Taxes provide an incentive to take on debt, since interest paid on debt is a deductible expense for tax purposes, shielding income from taxation. But the possibility of incurring direct and indirect costs of financial distress discourages taking on high levels of debt.

Taxes and financial distress costs result in a trade-off. For low debt ratios, the benefit of taxes more than overcomes the present value of costs of distress, resulting in increases in the value of the firm for increasing debt ratios. But beyond some debt ratio, the benefit of taxes is overcome by the costs of financial distress; the value of the firm decreases as debt is increased beyond this point.

An explanation for the capital structures that we observe is that companies prefer to raise capital internally, but will raise capital externally according to a pecking order from safe to riskier securities. Though we cannot figure out the best capital structure for a firm, we know what factors to consider in the capital structure decision: taxes, business risk, asset type, issuance costs, and investor interpretations of security issuance announcements.