Finance 440 - Turbo Finance

Topic 9
Capital Structure

Goals for Topic 9

• Understand the irrelevance of capital structure in perfect markets
• Calculate the value of levered equity and the weighted average cost of capital (WACC) in perfect markets
• Calculate the effect of taxes on capital structure, firm valuation, and the cost of capital
• Understand the role of financial distress and bond covenants in determining financial structure
Outline of Topics

• Capital Structure in Perfect Markets
• Capital Structure in Imperfect Markets
  • Taxes
  • Costs of Financial Distress
  • Bond Covenants
• Capital Structure Implications for Project Selection

Capital Structure

... is the way a firm's assets are divided between different claimants.

Central question: Is there an optimal capital structure? ...that is, is there a set of securities that minimizes the firm's cost of capital (and hence maximizes shareholder value)?

Incremental question: Given the current capital structure and the need for funds, how should money be raised?
Overview of Part 1

Modigliani-Miller capital structure irrelevance in perfect markets

Corporate taxes and tax deductibility of corporate interest payments

Corporate and personal taxes and the capital structure decision

Leverage-related costs (LRC's): bankruptcy, distress costs

Tradeoff theory of the capital structure decision: tax savings vs. LRC's

I. Capital Structure in Perfect Markets

How does leverage affect valuation in perfect markets?
**Example 1:** Firms A, B, and C are identical in every way except their capital structures. The face values of their debt are 15, 50, and 100, respectively. The following table gives their liabilities in each of 5 possible states:

<table>
<thead>
<tr>
<th>Asset Value</th>
<th>Prob</th>
<th>D(A)</th>
<th>E(A)</th>
<th>D(B)</th>
<th>E(B)</th>
<th>D(C)</th>
<th>E(C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>.2</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td>0</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>.2</td>
<td>15</td>
<td>35</td>
<td>50</td>
<td>0</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>75</td>
<td>.2</td>
<td>15</td>
<td>60</td>
<td>50</td>
<td>25</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>.2</td>
<td>15</td>
<td>85</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>125</td>
<td>.2</td>
<td>15</td>
<td>110</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>

- Which firm is most likely to be bankrupt?
- Which firm has the most risky debt?
- Which firm is most valuable?

**Example 2:** A firm’s assets pay off
$1100 with 50% probability
$3100 with 50% probability

The risk-free rate is 5%

What would be today’s value of the firm’s assets if they were risk free?

How does the risk associated with the assets change your answer?
Suppose the current price of the firm’s assets is $1800.

What is the cost of capital of this firm?

Suppose we promise to give $525 to someone else (regardless of which payoff occurs)…

What is today’s value of that claim?

Now…

What happens to the value of the firm?
What happens to the cost of capital?

Capital Structure in Perfect Markets:

Expected Returns to Levered Equity and WACC

Even when equity-holders “own the entire firm” the value of their claim is less the greater the amount of debt in a firm’s capital structure. Why?

– Equity holders must pay part of the assets’ cash flows to debt holders.
– Since debt is senior to equity, its claim must be paid first, making the equity riskier.
What does this mean for the rate of return required by equity-holders? If you own the entire firm (i.e., all the debt and equity), your expected return is:

$$(1+r_A)V = (1+r_D)D + (1+r_E)E$$

or, equivalently,

$$r_A = \frac{D}{V} r_D + \frac{E}{V} r_E$$

This is the weighted-average cost of capital (WACC) formula used before (without deriving) when we wanted to compute the discount rate for assets when we knew the expected returns to debt and equity.

Substituting $D+E$ for $V$, and solving for $r_E$, we get

$$r_E = r_A + \frac{D}{E}(r_A - r_D).$$
The idea that more debt imposes more of the assets’ risk on equity holders also can be interpreted using the CAPM:

\[ r_i = r_f + \beta_i (r_M - r_f) \]
for \( i = A, D \) and \( E \).

Substitute the CAPM formula for \( r_i \) in for each of the returns in the formula
\[ r_E = r_A + \frac{D}{E}(r_A - r_D). \] This yields
\[ \beta_E = \beta_A + \frac{D}{E}(\beta_A - \beta_D). \]

Since \( \beta \) is the measure of risk that’s priced, adding debt to the capital structure results in equity holders holding more undiversifiable risk.

Hence equity-holders require a higher return as the share of debt increases.
These examples show that leverage changes the payoffs to equity (and therefore the value and required return of equity), but that leverage does not by itself change the value of the firm.

This “irrelevance” result is known as the Modigliani-Miller Theorem, and means that in perfect markets, capital structure has no effect on firm value.

We now consider an example of this result, and then extend our analysis imperfect markets (taxes).

<table>
<thead>
<tr>
<th></th>
<th>Current Capital Structure</th>
<th>Proposed Capital Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Value of Assets</td>
<td>$8,000,000</td>
<td>$8,000,000</td>
</tr>
<tr>
<td>Debt</td>
<td>0</td>
<td>$4,000,000</td>
</tr>
<tr>
<td>Market Value of Equity</td>
<td>$8,000,000</td>
<td>$4,000,000</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Price per share</td>
<td>$20</td>
<td>$20</td>
</tr>
<tr>
<td>Shares outstanding</td>
<td>400,000</td>
<td>200,000</td>
</tr>
</tbody>
</table>

With the change in the capital structure, the firm issues $4,000,000 of debt for which the buyers receive a claim worth $4,000,000. Since the assets must still be worth $8,000,000 the stockholders remaining claim must be worth only $4,000,000. When the firm repurchases shares, paying out $4,000,000 and remaining shares are worth only $4,000,000, the shareholders will sell at $20 per share, no more and no less. So they buy 200,000 shares at $20 leaving 200,000 shares at $20 per share.
The following table illustrates the effect of leverage on the risk and return on the equity:

<table>
<thead>
<tr>
<th></th>
<th>Current Structure:</th>
<th>Proposed Structure:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Debt</td>
<td>Debt = $4 million</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recession 5% 15% 25%</td>
<td>Recession 5% 15% 25%</td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>5% 15% 25%</td>
<td>5% 15% 25%</td>
<td></td>
</tr>
<tr>
<td>Earnings b/f int.</td>
<td>$.4 $1.2 $2.0</td>
<td>$.4 $1.2 $2.0</td>
<td></td>
</tr>
<tr>
<td>(million)</td>
<td>0 0 0</td>
<td>$0.4 $0.4 $0.4</td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>0 0 0</td>
<td>0 0 0</td>
<td></td>
</tr>
<tr>
<td>Earnings after int.</td>
<td>$.4 $1.2 $2.0</td>
<td>$.00 $0.8 $1.6</td>
<td></td>
</tr>
<tr>
<td>(million)</td>
<td>0 0 0</td>
<td>$0.0 $0.8 $1.6</td>
<td></td>
</tr>
<tr>
<td>ROE = NI/Equity</td>
<td>5% 15% 25%</td>
<td>0% 20% 40%</td>
<td></td>
</tr>
<tr>
<td>EPS</td>
<td>$1.00 $3.00 $5.00</td>
<td>$0.00 $4.00 $8.00</td>
<td></td>
</tr>
<tr>
<td>Prob.</td>
<td>.3 .4 .3</td>
<td>.3 .4 .3</td>
<td></td>
</tr>
<tr>
<td>MM rE</td>
<td>15% 20%</td>
<td>15% 20%</td>
<td></td>
</tr>
<tr>
<td>Stock Price</td>
<td>$20 $20</td>
<td>$20 $20</td>
<td></td>
</tr>
</tbody>
</table>

**Leverage and the Magnification of Risk and Return:**

The Merton-Franco company example shows the amplification of the operating risk and returns (on the EPS and ROE and market returns to equity holders) due to the presence of debt in the capital structure.

The $400,000 in interest payments is a fixed cost. When operating earnings are small, there is not much left over for equity holders and returns are very small.

When operating earnings are large, the debt holders don't share in the added income, there is a large amount left over for equity holders and returns are very large.
II. Capital Structure in Imperfect Markets: 
Modigliani-Miller with Corporate Taxes

**UNLEVERED FIRM:**
Consider the cash flow to equity of the unlevered firm:

\[
\text{cash flow to equity} = \text{EBIT}(1-\tau_c), \text{ in perpetuity}
\]
where EBIT = earnings before interest and taxes

The present value of this stream of cash flows depends on the required return on the assets of the firm if owned as an all equity firm. Call this \( r_{Eu} \), the required rate of return on unlevered firm or unlevered equity.

\[
V_u = \frac{\text{EBIT}(1-\tau_c)}{r_{Eu}}
\]

**LEVERED FIRM:**
Now consider the cash flow to all claimholders of the levered firm. Denote the coupon rate, \( R_D \), and the face value of debt \( F \):

- Cash flow to equity = \( \text{EBIT} - R_D F - \tau_c(\text{EBIT} - R_D F) \)
- Cash flow to debt = \( R_D F \)

Summing gives the total cash flow to all holders:

\[
\text{EBIT} - R_D F - \tau_c \text{EBIT} + \tau_c R_D F + R_D F
\]
\[
= \text{EBIT}(1-\tau_c) + \tau_c R_D F
\]
Using the cash flows = EBIT(1-\(\tau_c\)) + \(\tau_c R_D F\), derive the value of the firm:

The first term is the same as the cash flow to equity of the unlevered firm, we know its value from above:

\[
\text{EBIT}(1-\tau_c)/r_{Eu} = V_u.
\]

The second term \(\tau_c R_D F\) is the tax shield on the interest payment of the debt. If \(r_D\) is the opportunity cost of capital for this debt security, then the value in perpetuity of this term is

\[
\tau_c R_D F/r_D = \tau_c D
\]

(The last equality is true because the term \(R_D F/r_D\) is equal to the market value of a perpetuity of interest payments of \(R_D F\).)

Summing these terms, we find the value of the levered firm, therefore, is

\[
V_L = V_U + \tau_c D
\]

(with no leverage-related costs)

Note that the value of the firm is increasing with leverage, due to the favorable tax treatment of debt.

The next example gives a flavor of the magnitude of the tax benefit of debt financing.
Example 4: Calculating the Tax Benefits of Debt

Your company is considering opening a new production facility. If you go ahead with this project, the company will be able to take on an additional $5 million in debt. $\tau_c = .35$

a. If the interest rate on the new debt is 10%, what are the annual interest payments?

b. What are the annual tax savings?

c. If the new facility lasts indefinitely so that the debt is perpetual, what is the present value of the tax savings?

We have seen that the favorable tax-treatment of debt affects firm value; what about the cost of capital?

Tax-adjusted WACC

- Cash flows produced by assets (defined broadly to include tax shields) are the financial resources to which debt and equity holders have a claim.
- What is the cost of capital associated with these cash flows – when we account for the tax shields?
Case 1: Corporate Taxes
The tax subsidy to debt means that a $1 nominal interest payment to debt holders costs the firm only $(1 - t_c)$:

$$(1+r_A)V = (1 + (1- t_c)r_D) D + (1+r_E) E,$$

where $r_A$ is the after-corporate-tax return on each dollar of firm value (including tax shields). Rearranging gives:

$$\{V - (D + E)\} + r_A V = D (1- t_c)r_D + E r_E$$

Since $V = (D+E)$, we have the **WACC formula adjusted for corporate taxes**:

$$r_A = (D/V) (1- t_c)r_D + (E/V) r_E.$$ 

This is the formula that is usually used to calculate the expected return to a firm’s assets when the expected returns on the firm’s debt and equity securities are known.

Case 2: Corporate and Personal Taxes
When we introduce personal taxes, we have two additional tax rates to worry about:

$t_{pd} = \text{marginal personal tax rate on debt income}$
$t_{pe} = \text{marginal personal tax rate on equity income}$

Recall income on debt securities is ordinary (like dividends), while income on equity is a mixture of ordinary and capital gains (depending on the firm’s dividend policy and individuals’ portfolio strategies).
In order to assess the effect of taxes on the cost of capital, we need to ask:

*How much of each pre-tax dollar of corporate income does an investor receive?*

This depends on whether the investor holds the firm’s debt or its equity:

<table>
<thead>
<tr>
<th>$1.00 in pre-tax corporate income</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Debt Security</strong></td>
</tr>
<tr>
<td>$1 after corporate tax</td>
</tr>
<tr>
<td>(1-t_{pd})$1 after corporate &amp; personal taxes</td>
</tr>
</tbody>
</table>

How do these personal taxes affect

- The value of the firm?
- The cost of capital?
Recall that, in general,

\[ V_L = V_U + PV(\text{debt tax shield}). \]

When we take into account both corporate and personal taxes, if debt is perpetual the tax shield can be approximated by:

\[ PV(\text{debt tax shield}) = T^* D \]

where \( T^* = \frac{(1 - t_{pd}) - (1 - t_{pe})(1 - t_c)}{1 - t_{pd}}. \)

This suggests that personal taxes enter our cost of capital calculations, but

**Why should personal taxes matter for corporate financial policy?**

**Corporations pay corporate taxes, not personal taxes, right?**
**Wrong!** Corporations pay the required rates of return on their debt and equity.

- The cost to the corporation is the "before-personal tax required rate of return" on the security.

- When income on securities is taxed, investors require a higher before-tax rate of return to invest in it.

  [For example, investors can accept a lower return on tax exempt municipal bonds.]

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**Personal taxation of debt income:**

Most of debt income (interest, amortization of original issue discount, etc.) is *ordinary income*, hence is taxed at the marginal tax rate of the holder.

The relevant tax rate, $\tau_{pd}$, is the marginal rate of the bondholder *setting prices* in the debt market.

The investor who is indifferent, at the margin, between buying and not buying.

This is an important issue because $\tau_{pd}$ is not small.
Personal taxation of equity income:

The effective tax on equity, $\tau_{pe}$, is harder to estimate.

Equity income comes in the form of dividends, realized capital gains (losses) and unrealized capital gains (losses).

Dividends are now taxed at most 15% (lower for the lowest tax brackets). (Dividends are 70% excluded from income to corporate holders.)

Much of equity income is in the form of capital gains. Capital gains are not taxed until they are realized.

Realized capital gains are taxed at a lower rate than ordinary income (15% maximum rate).

The basis of stocks passed on in one's estate are stepped-up to the current price without tax incidence.

Equities, being much more volatile than most debt instruments, offer increased tax reduction opportunities.
Netting out the effects of corporate and personal taxes:

\( \tau_{pe} \) is usually much less than \( \tau_{pd} \).

Hence, while debt offers tax advantages at the corporate level (tax deductibility of interest payments), debt is tax-disadvantaged at the personal level.

Debt-holders require a larger tax premium than equity-holders, and the corporation must pay this premium.

II. Capital Structure in Imperfect Markets: Valuation with Corporate and Personal Taxation

The next set of calculations shows how the Modigliani-Miller Result is affected by Corporate and Personal taxes.
The Modigliani-Miller theory with corporate and personal taxes

Personal taxes are paid on equity income and debt income.

Define:
- $\tau_{pd}$ = marginal tax rate on personal debt income
- $\tau_{pe}$ = marginal tax rate on personal equity income
- $\tau_c$ = marginal tax rate on corporate income

The value of the levered firm equals the value of an otherwise identical but unlevered firm plus the present value of the future net tax shields taking into account both personal and corporate taxes, or

$$V_L = V_U + T^*D$$

where:

$$T^* = 1 - \frac{(1 - \tau_c)(1 - \tau_{pe})}{(1 - \tau_{pd})}$$

$D$ is the market value of the debt of the levered firm and $T^*$ measures the net tax benefit (considering both personal and corporate taxes) per dollar of debt in the capital structure.
How big is the corporate tax advantage to debt?
The tax advantage per dollar of perpetual debt is $T^*$:

$$T^* = 1 - \left[ \frac{1 - \tau_{pe}}{1 - \tau_{pd}} \right] \left[ 1 - \tau_c \right]$$

Note that $T^* = \tau_c$ if $\tau_{pd} = \tau_{pe}$

This emphasizes that personal taxes affect the capital structure decision according to the relative taxation of debt vs. equity income at the personal level.

Under what conditions is $T^* < \tau_c$?

(so that personal taxes “undo” some of the advantage given to debt by corporate taxes)

$T^* < \tau_c$ whenever $\tau_{pd} > \tau_{pe}$

and conversely, $T^* > \tau_c$ whenever $\tau_{pd} < \tau_{pe}$
Under the current tax code:
A typical value for $\tau_{pd}$ would be a high tax bracket for an individual, but unlikely to exceed the corporate tax rate, say $\tau_{pd}$ is between 30% and 35%. (Those in higher brackets would hold tax exempts.)

A typical value for $\tau_{pe}$ is debatable, but because of the flexibility of realizing capital gains and greater opportunities to trade to reduce the tax impact of stock portfolios, $\tau_{pe}$ is likely at most 15%

So, $T^*$ under the current tax code is probably 15% to 21%.

What would be the effect of the Congressional initiative to lower the capital gains tax rates to zero?

Value of the firm assuming corporate taxes and no bankruptcy (or other leverage related costs)
A firm has a machine that generates $100 per year risk-free before tax cashflows in perpetuity. Currently the firm is 100% equity financed, with 200 shares outstanding.

Case 1: Corporate taxes only -- $\tau_c = 34\%$, $\tau_{pd} = \tau_{pe} = 0$. All investors demand a return on risk-free assets of 3% after personal taxes.

What is the total market value of the firm's equity?

$$V =$$

price per share =
The firm decides to raise $2,000 by issuing perpetual debt, and announces it will use the proceeds to repurchase equity. **What happens to share prices?**

Fairly priced debt implies annual interest payments of \( .03(2,000) = $60 \).

**Balance Sheet Just After Debt Issue but Before Repurchase**

\[
\begin{array}{c|c}
\text{A} & \text{L} \\
2,000 \text{ cash} & 2,000 \text{ debt} \\
\text{A.T. annual CFs} = & ? \text{ equity} \\
$100(1-.34) + .34($60) & \\
\end{array}
\]

The value of the equity is the present value of the after-tax (AT) cashflows:

\[ E_L = \]

The new price per share is

\[ \# \text{ shares repurchased} = \]
Case 2: Corporate taxes and personal taxes with $\tau_c = 34\%$, $\tau_{pd} = 30\%$, $\tau_{pe} = 18\%$. All investors demand a return on risk-free assets of 3% after personal taxes.

What is the total market value of the firm's equity before the recap?

\[ V_u = \text{price per share} = \]

Again the firm decides to raise 90.91% of this value by issuing perpetual debt, and announces it will use the proceeds to repurchase equity. What happens to share prices?

Since debt-holders require an after-tax return of 3%, the before-tax rate must solve:

Fairly priced debt implies annual interest payments of
Balance Sheet Immediately After Debt Issue but Before Repurchase

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,640 cash</td>
<td>1,640 debt</td>
<td></td>
</tr>
</tbody>
</table>

firm annual CFs = $100(1-.34) + .34($70.36)

The value of the equity is the present value of the after-tax (AT) cashflows:

\[ E_L = \]

(This assumes that cash paid out in repurchase is not taxed.)

The new price per share is

# shares repurchased =

---

Balance Sheet Immediately After Repurchase:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,640 debt</td>
<td></td>
</tr>
</tbody>
</table>

A.T. annual CFs = $100(1-.34) + .34($70.36)

Value of remaining equity =

Remaining shares =

Price per share of remaining shares =
III. Capital Structure in Imperfect Markets
- Costs of Financial Distress

The last few examples we have worked show that capital structure can affect firm value because of the asymmetric tax treatment of debt and equity.

Capital structure can also affect firm value if there are costs of financial distress....
Costs of Financial Distress

– The firm’s optimal capital structure choice is a trade-off between its own costs of financial distress and the tax benefits of debt.
– Costs of financial distress (leverage related costs)

• In bankruptcy, a firm cannot meet its debt liabilities.
• Some argue that bankruptcy costs are small because firms can be liquidated inexpensively
• Others point to large direct and indirect costs.
  – Direct costs
    • lawyer's fees, administrative fees
  – Indirect costs (effects on productivity)
    • lost sales due to service or continued relationship
    • lost employees
    • credit availability before Chapter 11
    • business decisions reviewed by trustee in Chapter 11 (pass up NPV > 0 projects)
    • cash demands by suppliers
Famous Case: Litigation between Texaco and Pennzoil

- Pennzoil had agreed to purchase 3/7 of Getty Oil
- Texaco entered into agreement subsequently to pay a higher price for all of Getty Oil and indemnified Getty's directors against liability

- Not surprisingly, Pennzoil sued.
- Tried in mid-1985, and a Texas court ruled in favor of Pennzoil and ordered Texaco to pay $12 billion ($10.5 before interest charges)

The outcome was ridiculous. $12 billion was the replacement value of all oil Pennzoil could have gotten from Getty, but did not subtract out what they would have to pay Getty to get it (and also ignored discounting!).
• Texaco fought the settlement through several appeals, but ultimately had to declare bankruptcy in Chapter 11.

• Finally, the shareholders of Texaco, led by Carl Icahn, settled with Pennzoil for $3 billion

• **Important dates in Pennzoil case**
  – The dollar changes are changes in market value (millions of dollars) of the companies from one day before an announcement to five days after the announcement (after subtracting off the *expected price change based on the market movement*).

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Texaco</th>
<th>Pennzoil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original jury finding</td>
<td>11/19/85</td>
<td>-1,124</td>
<td>483</td>
<td>-731</td>
</tr>
<tr>
<td>Judge refuses to overrule</td>
<td>12/10/85</td>
<td>-807</td>
<td>-138</td>
<td>-946</td>
</tr>
<tr>
<td>Supreme court overturns ruling favorable to Texaco</td>
<td>4/6/87</td>
<td>-1,257</td>
<td>499</td>
<td>-759</td>
</tr>
<tr>
<td>Texaco files for bankruptcy</td>
<td>4/12/87</td>
<td>-308</td>
<td>-646</td>
<td>-954</td>
</tr>
<tr>
<td>Total 11/85 - 10/87</td>
<td></td>
<td>-2428</td>
<td>-1307</td>
<td>-3735</td>
</tr>
<tr>
<td>Total 11/87 - 12/87</td>
<td></td>
<td>+1,766</td>
<td>868</td>
<td>2625</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-622M</td>
<td>-439M</td>
<td>-1110</td>
</tr>
</tbody>
</table>
The existence of bond covenants suggests that bondholders need to protect themselves when a firm is in financial distress.

What is the purpose of these covenants?

Over-investment Example:

Suppose that debt value $F = 100$.
Share holders know that the assets are worth $101$.

They have two choices, pay off debt holders and keep the $1$ residual or sell $20$ worth of assets and go to Las Vegas.

If they go to Vegas, there is a $2/3$ chance they will lose the $20$; and a $1/3$ chance they will return with $30$.

For simplicity ignore discounting.

This gamble would affect:

**Expected Value of the Firm’s Assets =**

$$2/3 (-20) + 1/3(10) = -$10.00$$

**Expected Payoff to Stock holders =**

$$2/3(-1) + 1/3(10) = $2.67$$

**Expected Payoff to Bond holders =**

$$2/3(-19) + 1/3(0) = -$12.67$$
Under-investment Example:

Suppose that $F = 100$ and that shareholders know that the assets are worth only $80$ (the managers know the firm is bankrupt).

A project comes along that costs $5$, and will pay off $15$ for sure.

This is clearly a good project for the firm, but since it does not enhance the value of shareholders managers will be indifferent to taking it.

If they have another use for the funds (like a risky negative NPV project), they would reject this project. This, too, destroys asset value.

There are many other strategies to compromise debt-holders (to the advantage of equity holders), such as...

**Cashing Out**
Directors continue declaring dividends after they know the firm's assets will not be sufficiently valuable to meet the future payments promised to bondholders.

**Bait and Switch**
If shareholders in a levered firm increase substantially the amount of debt they have outstanding (without making it subordinate to the existing debt), the claim of the existing debt-holders becomes more risky without providing them with compensation for this risk.
Thus, an important indirect cost of the possibility of bankruptcy arises because of Conflict of Interest Between Stockholders and Bondholders.

Managers running the company to maximize current shareholder wealth may sometimes do so at the expense of other claimants (existing bondholders, other employees, etc.)

These potential conflicts impose costs on equity holders...

- higher interest costs
- possibility of credit rationing

and help explain
- why start-ups use little debt
- why firms with stable earnings have relatively more debt
Debt Covenants are used to mitigate these costs arising from conflicts between equity and debt-holders

Common forms of debt covenants:

Me-first rules: often debt covenants will restrict the company from issuing new long term debt with maturity earlier or the same maturity (and equal priority) as the debt issue.

Restrictions on: merger and acquisition and divestiture activity; payment of dividends, or payments to shareholders; increases in compensation to executives; financial ratios related to riskiness of debt, such as Debt/Total Capital, Current Ratio, Quick Ratio, Interest Coverage Ratios, Working Capital levels, etc.

But debt covenants do not completely eliminate the agency costs of conflicts among bondholders and stockholders.

We still see
• event risk bonds, and
• the existing bondholders of firms that do LBO's or leveraged recapitalizations take large losses.
In sum, the tension between tax savings from debt and debt-related costs leads to the tradeoff theory of capital structure:

\[ V_L = V_U + PV(\text{tax shield}) - PV(\text{costs of financial distress}) \]
Key Concepts

In perfect markets, capital structure does not affect firm value.
Leverage increases the risk of equity holding and increases the required return to equity.
Since debt is paid out of pre-tax profits, corporate taxation favors debt finance. Thus, capital structure affects firm valuation and the cost of financing.
Personal taxation affects the required returns to debt and equity. Thus, personal taxes affect the firm’s cost of capital and valuation through the value of tax shields.
While corporate taxation tends to favor debt finance, costs of financial distress may impose limits on the benefits of leverage.
Moreover, conflict of interest between debt- and equity-holders has to be dealt with, for example with bond covenants.

Notation

WACC formula adjusted for corporate taxes:

\[ r_A = (D/V) (1- t_c) r_D + (E/V) r_E. \]
Notation

In general, $V_L = V_U + PV(\text{debt tax shield})$. Including both corporate and personal taxes, if debt is perpetual, the tax shield can be approximated by $PV(\text{debt tax shield}) = T^* D$, where

$$T^* = 1 - \frac{(1 - \tau_c)(1 - \tau_{pe})}{(1 - \tau_{pd})}$$

gives net tax benefit per dollar of perpetual debt in the capital structure.

Next Time:

- The interaction between investment and financing decisions:
- If financing affects the cost of capital, then don’t we have to account for it when analyzing projects? **YES!**