Chapter 16: Financial Distress, Managerial Incentives, and Information

Fundamental Question: What affects a firm’s optimal capital structure besides taxes?

16.1 Default and Bankruptcy in a Perfect Market

A. Armin Industries: Leverage and the Risk of Default

1. Scenario 1: New Project Succeeds
2. Scenario 2: New Project Fails
3. Comparing the Two Scenarios

B. Bankruptcy and Capital Structure

Key: if markets are perfect, bankruptcy simply means that bondholders take over the firm
without any loss of value and no costs

=> for bankruptcy to affect a firm’s optimal capital structure, must look at cash flows that
go to someone besides stockholders and bondholders if the firm goes bankrupt

Ex. Assume Zorgar Inc. has assets that will pay either $400 million or $100 million
depending on whether the firm’s new product succeeds or fails. Assume there is a 70% chance
that the product will succeed. Assume also that all of the risk is company specific
(the beta is zero) and that the risk-free rate is 7%. What is the value of the firm if funded
with equity? What is the value of the firm if it is funded with a combination of debt that
matures in one year for $150 million and with equity?

Payoffs (millions) to security holders:

<table>
<thead>
<tr>
<th>Payoff to:</th>
<th>w/o leverage</th>
<th>w/ leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Success</td>
<td>Failure</td>
</tr>
<tr>
<td>Debt</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>Equity</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>100</td>
</tr>
</tbody>
</table>

Value of firm:

If funded with equity: \( E = \frac{7 \times 400 + 3 \times 100}{1.07} = 289.7196 \)

If funded with debt and equity:

\( D = \frac{7 \times 150 + 3 \times 100}{1.07} = 126.1682 \)

\( E = \frac{7 \times 250 + 3 \times 0}{1.07} = 163.5514 \)

Total = 126.1682 + 163.5514 = 289.7196

=> value of firm is unaffected by leverage

[Video Solution]

Concept Check: 2
16.2 The Costs of Bankruptcy and Financial Distress

A. The Bankruptcy Code

Khan Academy:

- [Chapter 7: Bankruptcy liquidation](#)
- [Chapter 11: Bankruptcy restructuring](#)

B. Direct Costs of Bankruptcy

=> 3 – 4% of pre-bankruptcy value

=> 12% of small firms

C. Indirect Costs of Bankruptcy

=> loss of customers, employees, suppliers, receivables, value of assets when fire sale.

1. Overall Impact of Indirect Costs

=> 10 – 20% of firm value

Concept Check:
16.3 Financial Distress Costs and Firm Value

Ex. As on p. 1, assume Zorgar Inc. has assets that will pay either $400 million or $100 million depending on whether the firm’s new product succeeds or fails. There is a 70% chance that the product will succeed. All of the risk is company specific (the beta is zero) and that the risk-free rate is 7%.

In addition, assume that financial distress costs equal $40 million.

=> $40 million of the firm’s value is lost if firm is unable to meet debt payments

What is the value of the firm if funded with equity? What is the value of the firm if it is funded with a combination of debt that matures in one year for $150 million and with equity?

Payoffs to security holders:

\[
\begin{align*}
\text{Debt} & \quad \text{Success} \quad \text{Failure} \\
\text{Equity} & \quad 400 \quad 100 \\
\text{Total} & \quad 400 \quad 100
\end{align*}
\]

If funded with equity:

Value (millions): \( E = \frac{0.7 \times 400 + 0.3 \times 100}{1.07} = 289.7196 \)

If funded with debt and equity:

Values (millions):

\[
\begin{align*}
D & = \frac{0.7 \times 150 + 0.3 \times 60}{1.07} = 114.9533 \\
E & = \frac{0.7 \times 250 + 0.3 \times 0}{1.07} = 163.5514
\end{align*}
\]

Total = 114.9533 + 163.5514 = 278.5047

=> value of firm $11.2149 lower if funded with debt and equity

Video Solution

A. Armin Industries: The Impact of Financial Distress

B. Who Pays for Financial Distress Costs

=> stockholders end up paying the cost of financial distress.
Ex. Assume Zorgar is currently funded with equity and is thinking about issuing the debt and using proceeds to repurchase stock.

Wealth before: value of stock = $289.7196

Debt issue: firm issues bonds for $114.9533 and repurchases $114.9533 of stock

Wealth after:

Cash = $114.9533
Stock = $163.5514
Total = $278.5047 = 114.9533 + 163.5514

=> wealth of stockholders drops by $11.2149 (289.7196 – 278.5047) if firm issues the debt and repurchases stock

Reason: cash received from issuing bonds is less than the drop in the value of the stock from the issue.

Video Solution
Another way to look at it:

=> if Zorgar issues debt, it is selling the claim on the first $150 of cash flows to the bondholders for the stockholders

Q: What is the value of these cash flows to the stockholders?

Note: if had kept claim, would have had $150 if the product is a success and $100 if the product is a failure

Value = \frac{7 \times 150 + 3 \times 100}{1.07} = 126.1682

Note: No financial distress if no debt

Q: What is the value of these cash flows to bondholders?

Value = \frac{7 \times 150 + 3 \times 60}{1.07} = 114.9533 = 126.1682 - \frac{3 \times 40}{1.07}

Note: Distress costs equal $40 if debt and product fails

=> claim to cash flows worth $11.2149 (126.1682 – 114.9533) more to stockholders than to bondholders

=> stockholders worse off if firm sells the claim to bondholders by issuing bonds.

Video Solution
Example 16.3 from text: Another way to look at this example

Ex. 16.3 Armin has 10 million shares outstanding and no debt, but announces plans to issue one-year debt with a face value of $100 million and use proceeds to repurchase shares. Armin’s asset will pay $150 or $80. But distress costs will reduce the payment to bondholders to $60 in default.

=> if Armin issues debt, it is selling the claim on the first $100 million of cash flows to the bondholders for the stockholders

Q: What is the value of these cash flows to stockholders?

Note: If had kept claim, would have had $100 if the product is a success and $80 if the product is a failure.

\[
\text{Value} = \frac{\frac{1}{2}(100) + \frac{1}{2}(80)}{1.05} \approx \$85.71 \text{ million}
\]

Q: What is the value of these cash flows to bondholders?

\[
\text{Value} = \frac{\frac{1}{2}(100) + \frac{1}{2}(60)}{1.05} \approx \$76.19 \text{ million}
\]

=> claim to cash flows worth more 9.52 million more (85.71 – 76.19) to stockholders than to bondholders

=> stockholders worse off if firm sells the claim to bondholders by issuing bonds

**Video Solution**

Concept Check: all

16.4 Optimal Capital Structure: The Trade-Off Theory

\[
V^L = V^U + PV(ITS) - PV(FDC)
\]

(16.1)

where:

- \( V^L \) = value of leveraged firm
- \( V^U \) = value of unlevered firm
- \( PV(ITS) \) = present value of interest tax shield (ch. 15)
- \( PV(FDC) \) = present value of financial distress costs

Note: \( PV(FDC) \) depends on:

1) probability of financial distress
2) cost of financial distress
3) discount rate

A. The Present Value of Financial Distress Costs

Note: Text states that the beta of distress costs has the opposite sign of the beta of the firm since distress costs are high when the firm does poorly. Thus, high beta firms have more negative betas for distress costs and thus lower costs of capital which increases the present value of distress costs.

Rationale: The lower the interest rate, the higher the present value of future cash flows (in this case, outflows).

B. Optimal Leverage

=> as increase debt, the present value of interest tax shields rises at first, but the benefit eventually gets smaller and eventually turns negative (due to loss of corporate tax shield and higher personal taxes)

=> as increase debt, the present value of financial distress costs begins small but grows as debt increases

=> optimal leverage occurs when value of firm maximized

Ex. Assume you have constructed a graph of the value of the firm as a function of the level of debt.
=> Optimal debt:

If only consider tax implications: $70,000 of debt
If consider tax and distress costs: $40,000 of debt

Concept Check: all

16.5 Exploiting Debt Holders: The Agency Costs of Leverage

Note: agency conflicts primarily stem from the way that the costs and benefits of some action by the firm are shared

A. Excessive Risk-Taking and Asset Substitution

Basic idea: shareholders may gain at the expense of bondholders if the firm invests in high risk projects even if the project has a negative NPV

Reason: stockholders and bondholders don’t equally share the upside and downside risk of corporate decisions

1) Bondholder claim: fixed

=> downside risk: hurts them since can get paid less than owed
=> upside risk: doesn’t really help them since not going to get paid more than owed

2) Stockholder claim: residual with limited liability

=> upside risk: stockholders benefit from upside since keep everything above what owed bondholders
=> downside risk: doesn’t hurt once value falls below what owed the creditors since getting nothing from firm anyway

=> net result: stockholders prefer high risk while bondholders prefer low risk if firm partially funded with debt
Ex. Assume two projects cost $100 each. Assume also that a year from today there is a 50% chance that Project #1 will pay off $120 and a 50% chance that Project #1 will pay off $90. Finally, assume that a year from today there is a 50% chance that Project #2 will pay off $121 and a 50% chance that Project #2 will pay off $0.

Note: Expected payoff on #1 is 105 and on #2 is 60.5.

Q: Which is the better project for stockholders if firm has no debt?

<table>
<thead>
<tr>
<th>Project</th>
<th>Poor</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>121</td>
</tr>
<tr>
<td>Difference</td>
<td>-90</td>
<td>1</td>
</tr>
</tbody>
</table>

=> stockholders are better off with project 1

Q: Which is the better project for stockholders if firm owes $100 to bondholders?

<table>
<thead>
<tr>
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</tr>
</thead>
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</tr>
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<td>100</td>
</tr>
<tr>
<td>Difference</td>
<td>-90</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Payoff to stockholders (t=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>Difference</td>
</tr>
</tbody>
</table>

=> stockholders are better off with project 2

**Video Solution**

B. Debt Overhang and Under-Investment

Basic idea: stockholders MAY prefer the firm reject positive NPV projects

Reason:

1) if default is likely, bondholders get much (even all) of the project’s benefit
   => bondholders paid first
   => stockholders may have net loss if they provide funding

2) problem can be solved if can get creditors to help fund the project
   => will be hard to get more money from lenders since default already likely
Ex. Assume a firm has no cash but existing assets that have a 50% chance of paying $120 and a 50% chance of paying $80. A project costing $10 will provide an immediate risk-free payoff of $20.

Q: Will stockholders provide $10 of funding so project can be accepted if the firm has no debt?

\[
\begin{array}{c|c|c}
\text{Payoff to stockholders (t=1)} & \text{Poor} & \text{Good} \\
\hline
\text{Reject} & 80 & 120 \\
\text{Accept} & 100 & 140 \\
\hline
\text{Difference} & 20 & 20
\end{array}
\]

=> stockholders better off if fund project

Q: Will stockholders provide $10 of funding so project can be accepted if the firm owes $130 to bondholders?

\[
\begin{array}{c|c|c|c|c|c}
\text{Payoff to bondholders (t=1)} & \text{Payoff to stockholders (t=1)} \\
\hline
\text{Poor} & \text{Good} & \text{Poor} & \text{Good} \\
\hline
\text{Reject} & 80 & 120 & 0 & 0 \\
\text{Accept} & 100 & 130 & 0 & 10 \\
\hline
\text{Difference} & 20 & 10 & 0 & 10
\end{array}
\]

=> stockholders worse off if fund project

=> 50% chance of only getting back what invested and 50% chance of getting nothing back

**Video Solution**

1. Cashing Out

Basic idea: stockholders gain at the expense of bondholders when the firm pays out cash to stockholders

Reason: when firm pays out cash, the combined value of the firm’s outstanding stock and bonds falls by the amount of cash paid out

=> as long as bonds drop in value, the drop in stock value < cash paid out

=> since stockholders get all of the cash paid out (dividends, stock repurchases), stockholders have a net gain
Ex. Assume a firm has $10 of cash and assets that will pay $120 or $150 a year from today. Assume the interest rate equals 10%.

Q: Are stockholders better or worse off if the firm pays out a $10 dividend today?

Payoff to stockholders (t=1)

<table>
<thead>
<tr>
<th>Project</th>
<th>Poor</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>No dividend now</td>
<td>131</td>
<td>161</td>
</tr>
<tr>
<td>Dividend now</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td>Difference</td>
<td>-11</td>
<td>-11</td>
</tr>
</tbody>
</table>

=> stockholders are indifferent to the dividend
=> receive $10 now but give up $11 a year from today
=> same present value

Q: How does the answer change if the firm owes $150 to bondholders?

Payoff to bondholders (t=1)

<table>
<thead>
<tr>
<th>Project</th>
<th>Poor</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>No dividend now</td>
<td>131</td>
<td>150</td>
</tr>
<tr>
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<td>150</td>
</tr>
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<td>Difference</td>
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<td>0</td>
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</table>

Payoff to stockholders (t=1)

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<th>Project</th>
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</tr>
<tr>
<td>Difference</td>
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</tbody>
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=> stockholders better off with dividend now

=> receive $10 now for sure
=> if economy good, give up $11 a year from today (PV equals $10)
=> if economy weak, give up nothing

Video Solution

2. Estimating the Debt Overhang

Let:

\[ NPV = \text{net present value of investment opportunity} \]
\[ I = \text{investment required to undertake investment} \]
\[ \beta_D = \text{beta of firm’s debt} \]
\[ \beta_E = \text{beta of firm’s equity} \]
\[ D = \text{market value of firm’s debt} \]
\[ E = \text{market value of firm’s equity} \]

=> stockholders only benefit from a new investment if equation (16.2) holds

\[ \frac{NPV}{I} > \frac{\beta_D D}{\beta_E E} \] (16.2)
Notes:

1) Equation (16.2) is an approximation not an exact relationship
2) Text states that the required cutoff in minimum acceptable NPV is positive and increases with the firm’s leverage.

Ex. Assume the existing assets of a firm have a market value of $1000. Assume that the beta of the firm’s assets and any new projects equals 1.2. Assume also that the firm has an investment opportunity requiring an investment of $100. How does the minimum acceptable NPV on the project vary with the amount of debt the firm has outstanding?

Note: As the firm has more outstanding debt, the firm’s debt will become riskier. Assume (for simplicity) that the beta of debt equals % of firm funded by debt multiplied by the firm’s asset beta and that the equity beta can be calculated using equation (14.9).

Note: Using equation (16.2), stockholders only benefit if \( NPV > \left( \frac{\beta_D D}{\beta_E E} \right) \times I \)

1) Assume no debt: \( NPV > \left( \frac{0}{1.2 \times 100} \right) \times 100 = 0 \)
   \( \Rightarrow \) stockholders gain if \( NPV > 0 \)

2) Assume debt = $100
   \( \beta_D = \left( \frac{100}{1000} \right) 1.2 = 0.12 \)
   \( \beta_E = \beta_U + \frac{D}{E} (\beta_U - \beta_D) \) (14.9)
   \( \Rightarrow \beta_E = 1.2 + \frac{100}{900} (1.2 - 0.12) = 1.32 \)
   \( NPV > \frac{12(100)}{1.32(900)} 100 = 1.01 \)
   \( \Rightarrow \) if debt = $100, stockholders only want project undertaken if \( NPV > 1.01 \)

3) Assume debt = $200
   \( \beta_D = \left( \frac{200}{1000} \right) 1.2 = 0.24 \)
   \( \beta_E = 1.2 + \frac{200}{800} (1.2 - 0.24) = 1.44 \)
   \( NPV > \frac{24(200)}{1.44(800)} 100 = 4.17 \)
   \( \Rightarrow \) if debt > $200, stockholders only want project undertaken if \( NPV > 4.17 \)
Graph of all debt levels from 0 to $750:

Notes:

1) the more leverage a firm has, the greater the incentive for firms to bypass positive NPV projects  
2) the effect is nonlinear...the problem gets worse at an ever increasing rate!  
3) equation (16.2) can also be used to measure acceptable loss from selling assets to pay dividend 
   => dividend is like a negative investment 
   => NPV = loss as liquidate assets for less than value 
   => negatives cancel out in equation

C. Agency Costs and the Value of Leverage

D. The Leverage Ratchet Effect

1) when firm initially issues debt, agency and bankruptcy costs built into the issue price of bonds 
   
   => stockholders bear the costs

2) if debt already outstanding, existing bondholders bear some of these costs 
   
   => once debt outstanding, firms have an incentive to issue even more debt

3) when firm attempts to repurchase outstanding debt, bondholders will demand a premium so they capture benefit of reduced agency and bankruptcy costs 

   => when debt too high, firms may have an incentive to issue even more debt and to not retire any of existing debt
Key driver: when issuing or repurchasing securities, the price will reflect the value of the security after the repurchase rather than its current price.

=> if try to sell for more, no one will buy
=> if try to offer less, no one will sell

E. Debt Maturity and Covenants

ST Debt => lower agency costs, higher refinancing risk, higher risk of financial distress
Benefit to stockholders of debt covenants: increases issue price (lower interest rate) for debt compared to if bondholder interests are not protected
Cost to stockholders of debt covenants: reduces management flexibility so that some positive NPV opportunities lost

Concept Check: all

16.6 Motivating Managers: The Agency Benefits of Debt

Key issue: if a manager does not own all of the firm’s equity, there is a potential conflict between the owner and manager if there is an unequal sharing of the costs and benefits of decisions

=> this is almost always the case

A. Concentration of Ownership

1. Management effort
   a. Conflict: management will want to expend less effort than is optimal for stockholders
   b. Reason: management bears the cost of effort but shares the benefit of effort with stockholders

2. Perks and pay
   a. Conflict: management will want more pay and perks than is optimal for shareholders
   b. Reason: management gets the pay and perks, but stockholders bear the cost

Note: higher pay and perks may also benefit stockholders as attract better, more motivated employees
3. How debt helps resolve these conflicts

1) allows owner/manager to retain all equity and so avoid issuing equity to outsiders

2) fear of bankruptcy motivates management to work harder, run firm more efficiently, and accept lower pay and perks

Note: new equity must be sold at a discount to its value because of expected conflicts of interest

B. Reduction in Wasteful Investment

1. Empire Building:
   a. Conflict: management will want to expand the firm more than is optimal for shareholders

   Notes:

   1) may result in negative NPV capital spending or expansions and failure to shut wealth-destroying divisions
   2) this problem may also stem from management overconfidence
   3) problem tends to be worse when firms have high free cash flow in excess of what is needed for positive NPV projects

   b. Reason: personal gains to managers of larger firm include: more prestige, pay, perks, publicity, power and less risk

   c. How debt helps resolve these conflicts

   1) debt service reduces surplus cash and wasteful capital spending by managers

      Note: must issue debt and use proceeds to repurchase shares

      => otherwise there is even more cash (from debt issue) for management to waste

   2) threat of bankruptcy keeps management focused on efficient operation of firm

   3) creditors help monitor management

C. Leverage and Commitment

1. Firms with leverage may be more aggressive and so scare off competitors
2. Firms with more leverage may be for financial fragile and so attract competitors
Concept Check: all

16.7 Agency Costs and the Trade-Off Theory

\[ V_L = V_U + PV(ITS) - PV(FDC) - PV(ACD) + PV(ABD) \]  

(16.3)

where:

- \( V_L \) = value of leveraged firm
- \( V_U \) = value of unlevered firm
- \( PV(ITS) \) = present value of interest tax shield (ch. 15)
- \( PV(FDC) \) = present value of financial distress costs
- \( PV(ACD) \) = present value of agency costs of debt
- \( PV(ABD) \) = present value of agency benefits of debt

Note: don’t need equation (16.1) since this equation includes and adds onto it

A. The Optimal Debt Level

=> Optimal debt:

- if perfect markets, no optimal since value isn’t affected by debt
- if only consider tax implications: $70,000 of debt
- if also consider tax and distress costs: $40,000 of debt
- if also consider agency issues: $30,000 of debt

1. R&D-Intensive Firms

2. Low-Growth, Mature Firms

B. Debt Levels in Practice

Key issue: management controls the firm and may want less-than-optimal leverage to avoid the discipline of debt

Concept Check: all

16.8 Asymmetric Information and Capital Structure

A. Leverage as a Credible Signal

B. Issuing Equity and Adverse Selection

1. Key ideas:

   1) sellers typically know more about the quality of an item than buyers
   2) at any given price, those who have low quality goods will be more eager to sell

2. Results:

   1) products available for sale are likely below average quality
   2) buyers will demand a discount when buying

Note: 1) and 2) feed off each other

C. Implications for Equity Issuance

D. Implications for Capital Structure

1. Pecking Order Hypothesis: firms prefer to fund expansion with retained earnings and will only issue equity as a last resort.

   => firms have no optimal capital structure
   => capital structure is simply an accumulation of past optimal funding decisions

2. Market Timing: firms issue stock when overvalued and repurchase shares when undervalued

   => similarly, firms issue bonds when interest rates too low (prices too high)
capital structure is again a simple accumulation of past optimal funding decisions

Concept Check: all

16.9 Capital Structure: The Bottom Line

basic idea: capital structure is driven by a number of factors and it is difficult to separate them out

Concept Check: all