Chapter 2: Agency costs and the amount of leverage

Corporate Finance - MSc in Finance (BGSE)

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In this chapter...

- What are “agency costs”? 
- Conflicts of interest between debt holders & shareholders 
- Conflicts of interest between managers & shareholders 
- What is the optimal capital structure? 
- A model of agency costs (Holmstrom and Tirole, 1979) 
- Underinvestment (“debt overhang”) model (Myers, 1977)
Agency problems

- In an “agency relationship”...
  - a principal engages an agent to perform a task on his or her behalf
  - involves delegating authority by the principal

- Examples?

- Questions:
  - Will the agent act in the best interest of the principal?
  - What will the principal need to do? And the agent?

- Agency costs: costs of these conflicts of interest
Conflicts of interest between debt holders & shareholders

- Managers...
  - often own shares and are elected by shareholders
  - generally maximise shareholder’s wealth, sometimes at the expense of other investors (debt holders) and even at expense of the firm’s value

- We will now see some examples, e.g.:
  - Over-investment: Shareholders can gain by taking a negative-NPV project, if sufficiently risky
  - Under-investment (debt overhang): Shareholders might not invest in positive NPV projects because value of taking it goes to debtholders

- How should one adjust the capital structure?
Over-investment at Baxter, Inc.?

- Loan of $1 million due at the end of the year
- Without any change...  
  - Market value of its assets will be $900,000 at that time  
  - Therefore the firm will default on its loan and go bankrupt
- New strategy is possible:  
  - No up-front investment and 50% chance of success  
  - If strategy is successful, value of the firm’s assets: $1.3 million  
  - If not, value of the firm’s assets: $300,000
- Should Baxter adopt the new strategy? According to...?
Under-investment at Baxter, Inc.?

- Loan of $1 million due at the end of the year
- Without any change,...
  - market value of its assets will be $900,000
  - Therefore the firm will default on its loan and go bankrupt

- New strategy (2):
  - Initial investment: $100,000 and risk-free 50% return
  - Risk free-interest rate: 5%

- Should Baxter adopt this strategy?
- If so, how to pay for it (no cash available)? New equity?
Other agency costs

- Cashing out:
  - incentives to withdraw money just before default (e.g. sell assets below market value and use funds to pay immediate dividend)

- Shortsighted investment problem:
  - tendency to take up projects that pay up early

- Reluctance to liquidate problem:
  - keep firm operating even if liquidation exceeds operation value
In sum,...

- Leverage can encourage insiders to take actions that...
  - increase shareholders’ value
  - but reduce debt and firm’s value

- Who bear the costs?
  - debt holders less willing to pay for new debt
  - less money to distribute to shareholders

- This represents another cost of increasing leverage

- Solutions:
  - issue debt with shorter maturity (drawbacks?)
  - “debt covenants”: restrictions on actions (drawbacks?)
Conflicts of interest between managers & shareholders

- Separation of ownership and control. Managers...
  - own small participations (median of 0.25% Jensen and Murphy, 1990)
  - are rarely dismissed (Warner et al., JFE 1988)
  - but control the corporation. Why?

- Managers care about...
  - Investors (equity and debt holders)
  - Customers and suppliers, employees
  - Themselves!

- Can capital structure help solving the potential interest conflict?
What should the corporate structure be?

- An entrepreneur (initial owner) needs funds to expand:
  - borrow money or
  - issue shares (needs to sell 40% of the shares)
- How does each option *changes* his incentives to...
  - exert personal effort in running the firm?
  - enjoy perks (corporate jet, large office,...)?
- Who pays for these “agency” costs?
A simple example

Jensen and Meckling, JFE 1976

- Two-period setting \((t = 0, 1)\) and a firm with
  - cash flow \(x\) at \(t = 1\)
  - equity and debt \((B\) repayment promised at \(t = 1)\)

- Manager receives compensation only through her fraction \(1 - \alpha\) of the equity \((\alpha\) fraction of equity held by outsiders)

<table>
<thead>
<tr>
<th>Stake</th>
<th>Payoffs at (t = 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>(\min{B, x})</td>
</tr>
<tr>
<td>Outside equity</td>
<td>(\alpha \max{x - B, 0})</td>
</tr>
<tr>
<td>Inside equity</td>
<td>((1 - \alpha) \max{x - B, 0})</td>
</tr>
</tbody>
</table>

- Additionally, she can...
  - take an unobservable action at \(t = 0\) (“effort”, \(e \in \{0, 1\}\))
  - if effort exerted \((e = 1)\) payoff increased by 1 unit at \(t = 1\)
  - but exerting effort has a personal cost
Incentives to exert effort in the two polar cases?

<table>
<thead>
<tr>
<th>Outsiders</th>
<th>Only debt ((B &gt; 0, \alpha = 0))</th>
<th>Only equity ((B = 0, \alpha &gt; 0))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
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<tr>
<td></td>
<td><img src="image3.png" alt="Graph" /></td>
<td><img src="image4.png" alt="Graph" /></td>
</tr>
</tbody>
</table>
Incentives depend on $x$

<table>
<thead>
<tr>
<th>Increase in $x$</th>
<th>Incentives with debt</th>
<th>Incentives with equity</th>
<th>Best?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 \rightarrow 1$</td>
<td>None</td>
<td>Some</td>
<td>Equity</td>
</tr>
<tr>
<td>$1 \rightarrow 2$</td>
<td>Some</td>
<td>Some</td>
<td>Ambiguous</td>
</tr>
<tr>
<td>$2 \rightarrow 3$</td>
<td>Full</td>
<td>Some</td>
<td>Debt</td>
</tr>
</tbody>
</table>
Results

- Distinction between inside and outside financing:
  - Outside finance has potential agency costs
  - Maximum inside participation desirable but has limits:
    - Managerial wealth
    - Managerial risk aversion (no diversification)

- Securities used for outside finance matter:
  - Capital structure should minimise agency costs
  - Debt is better if bankruptcy not likely
  - Equity is better if bankruptcy is likely

- Rationale for “financial restructurings” (equity for debt) in bad times
Other conflicts between ownership and control

- Investment in negative NPV projects:
  - Empire building: increase size of the firm
  - Overconfidence

- Free cash flow (FCF) hypothesis (Jensen, AER 86):
  - Wasteful spending more likely if large FCF
  - Leverage...
    - (i) commits firm to make interest payments
    - (ii) reduces manager’s ability to misbehave
    - (iii) forces debtholders to monitor more
  - As a result, it increases the firm’s value
Leverage and commitment

- Leverage and bankruptcy threat might...
  - Force them to negotiate more vigourously with unions or suppliers (Perotti and Spier, AER 1993)
  - Force them to compete more aggressively in the product market (Brander and Lewis, AER 1986)

- They represent other benefits from leverage
Summarising Agency Conflicts

- Conflict of interest between shareholders and debtholders:
  - Managers maximise shareholder’s wealth, sometimes at the expense of debt holders and even at expense of firm’s value
  - This tends to be the case when the firm is close to bankruptcy
  - Firm can reduce the possibility of bankruptcy reducing the leverage

- Conflict of interest between managers and shareholders:
  - Managers also care about customers, ... and themselves!
  - Higher equity stake encourages them to increase firm’s value
  - External financing in debt gives more incentives than in equity (in normal times)
What is the optimal capital structure?

Leverage with Taxes, Financial Distress, & Agency Costs

![Graph showing the value of a levered firm (VL) and the relationship between the value of debt (D) and the optimal capital structure (D*)](image)

Key Points:
- **Too Little Leverage**
  - Lost Tax Benefits
  - Excessive Perks
  - Wasteful Investment
  - Empire Building

- **Too Much Leverage**
  - Excess Interest
  - Financial Distress Costs
  - Excessive Risk Taking
  - Under-investment

The graph illustrates the trade-off between debt and equity, highlighting the optimal capital structure where the value of the firm is maximized.
The Optimal Debt Level

- R&D-intensive firms
  - High R&D costs and future growth opportunities, low debt levels
  - Low current free cash flows and risky business strategies

- Low-growth, mature firms:
  - Stable cash flows and tangible assets often carry high-debt
  - High free cash flows with few good investment opportunities
A model of agency conflicts
Holmstrom and Tirole, 1979

- Formalise conflicts between managers and investors
- Setup:
  - “Entrepreneur” needs external financing for a project
  - Investors are competitive (many investors)
  - Conflict of interest between entrepreneur and investors
  - Asymmetric information leads to “moral hazard”

- Questions:
  - What is the “optimal contract”?
  - Does it resemble debt or equity?
A Simple Model

- Entrepreneur has a project that requires investment $I$ but her assets are only worth $A < I$ (needs to borrow $I - A$)
- Project may be successful (probability $p$) and yield $R > 0$ or fail (probability $1 - p$) and yield $0$
- Entrepreneur may exert effort ($p = p_H$) or shirk ($p = p_L$), with $\Delta p = p_H - p_L > 0$
- If she shirks she obtains private benefits $B > 0$
- Moreover,...
  - Entrepreneur has limited liability (no punishment for failure)
  - Investors are competitive (many, make zero profit)
  - Both entrepreneur and potential investors are risk neutral
  - There is no discounting
**Optimal Contract**

- Optimal contract specifies how profit shared:
  - Both should get 0 in case of failure (limited liability)
  - In case of success, define sharing rule as $R_b + R_l = R$

- Competitive lending implies (assuming effort exerted): $p_H R_l = 1 - A$

- Investors’ return is given by...
  - $(1 + i)(1 - A) = R_l$ or $1 + i = 1/p_H$
  - Hence, unless $p_H = 1$, we have $i > 0$ (default premium)

- Assume:
  - (a) project has positive NPV if effort exerted, $p_H R - l > 0$
  - (b) negative NPV if not, $p_L R - l + B < 0$ (even adding $B$)
  - Rewriting, $p_L R_l - (1 - A) + p_L R_b + B - A < 0$ (effort necessary)
Summary: Timing

1. Agreement (sharing rule in the case of success)
2. Investment
3. Moral hazard (effort or shirk?, unobservable)
4. Outcome and payments
Credit Analysis

- Need to ensure that entrepreneur exerts effort
  - Trade-off: private benefits vs. higher probability of success
- Incentive compatibility constraint:

\[ p_H R_b \geq p_L R_b + B \]

or

\[ R_b \geq \frac{B}{\Delta p} \]

- This is the minimum entrepreneur must keep (rent)
- Maximum that can be pledged (promised to investors) is

\[ R - R_b = R - \frac{B}{\Delta p} \]
Since this is paid only in the case of success, she is financed only if

$$p_H \left( R - \frac{B}{\Delta p} \right) \geq I - A$$

or

$$A \geq I - p_H \left( R - \frac{B}{\Delta p} \right) = p_H \frac{B}{\Delta p} - (p_H R - I) \equiv \bar{A}$$

To make things interesting assume that $\bar{A} > 0$ or

$$p_H \frac{B}{\Delta p} > p_H R - I$$

i.e. the NPV is smaller than the necessary rent

Thus financing is possible only when $A \geq \bar{A}$, even if, when $A < \bar{A}$, the project also has positive NPV.
Lenders may not grant a loan even if entrepreneur is willing to give a high fraction of the return.

The entrepreneur needs to have enough assets to be financed \((A \geq \overline{A})\).

In this case, entrepreneur’s stake is given by:

\[
R - R_I = R - \frac{l - A}{p_H} \geq R - \frac{l - \overline{A}}{p_H} = \frac{B}{\Delta p}
\]

Entrepreneur’s net payoff (subtracting \(A\)) is given by:

\[
\begin{cases}
0 & \text{if } A < \overline{A} \\
p_H R_b - A = p_H(R - R_I) - A = p_H R - I & \text{if } A \geq \overline{A}
\end{cases}
\]

She receives entire surplus if project funded (lender breaks even).
Debt or equity?

- Optimal contract was a profit sharing agreement
- In this simple binary example, this can be thought as a “debt” contract:
  - Borrow $I - A$ in exchange of a repayment of $R_I$
  - In case of success, borrower keeps $R_b = R - R_I$
  - In case of failure, borrower (and lender) get 0
- ...or as an equity contract:
  - Entrepreneur’s share $\alpha = R_b / R$ and investors’ $1 - \alpha = R_I / R$
Conclusions

In summary,

- Because of moral hazard there is a limit to pledgeable income
- Projects with positive NPV may not be funded
- The entrepreneur needs to have enough assets to be financed
- Higher private benefits, higher threshold for financing

This model can also explain the “credit rationing” puzzle:

- Lenders are not willing to raise interest rates even if the demand for loans exceeds their supply at the prevailing rates
- Loan markets are personalised

Explanation:

- Higher interest rates reduces the stake of the entrepreneur
- Reduced stake may demotivate the entrepreneur and may lower the probability of repayment (moral hazard)
- Alternative: If lenders cannot distinguish good from bad borrowers, higher interest rates may attract worse borrowers (adverse selection)
Remember Baxter?

- Loan of $1 million due at the end of the year
- Without any change,...
  - market value of its assets will be $900,000
  - Therefore the firm will default on its loan and go bankrupt
- New strategy (2):
  - Initial investment: $100,000 and risk-free 50% return
  - Risk free-interest rate: 5%
- Should Baxter adopt this strategy?
- If so, how to pay for it (no cash available)? New equity?
Debt Overhang Problem
Myers, 1977

- Borrower debt-ridden and unable to raise funds for an otherwise profitable project
- Here we will formalise the idea using the previous framework
- Previous investors’ collateral claim on firm’s assets reduces the net worth: project produces too little pledgeable income and so investment does not take place
- Are investors willing to renegotiate?
Reduce of Net Worth

- Same project (NPV > 0)
- Agent has again $A$ but now owes $D$ such that $A > \bar{A} > A - D \geq 0$
  i.e. without $D$ agent could get financed but she’s denied ’cause of $D$
- More precisely, pledgeable income net of investment cost is
  \[ p_H \left( R - \frac{B}{\Delta p} \right) - I \]
- Initial investors need at least $D$ (will get this if project is not financed)
  Therefore new investors will get at most,
  \[ p_H \left( R - \frac{B}{\Delta p} \right) - I - D + A = -\bar{A} - D + A < 0 \]
  New investors lose money and thus are not willing to fund
- Initial investors would also prefer to obtain $D$ rather than fund it
Lack of Renegotiation

- Model as before but assume that:
  (i) $\overline{A} < 0$ and therefore the project can be financed even if $A = 0$
  (ii) Debt obligation is senior (serviced first)
  (iii) $A = 0$ (thus cannot repay $D$)
  (iv) $\overline{A} + p_H D > 0$
Initial Investors

- Initial investors are willing to participate as long as they break even (get 0 otherwise)
- For example if they forgive initial debt and demand all the cash-flow rights in the case of success they obtain

\[ p_H \left( R - \frac{B}{\Delta p} \right) - l = -\bar{A} > 0 \]

- Borrower also accepts because she obtains \( p_H \frac{B}{\Delta p} \) rather than 0 (if the project is not funded)
New Investors

- What if initial investors do not have more cash? Are new investors willing to fund?
- Given that initial debt is senior and a minimum rent needs to be left to borrowers, the maximum pledgeable income is
  
  $$R - \frac{B}{\Delta p} - D$$

- They will provide funding if only if
  
  $$p_H \left( R - \frac{B}{\Delta p} - D \right) \geq I \quad \text{or} \quad \bar{A} + p_H D \leq 0$$

  contradicting (iv)

- Thus, agent cannot raise finance if there is no renegotiation with initial investors
Renegotiation

- Suppose that initial investors accept \( d < D \) where \( \bar{A} + p_H d = 0 \)
- New investors receive \( R - \frac{B}{\Delta p} - d \) in the case of success and will finance since

\[
p_H \left( R - \frac{B}{\Delta p} - d \right) = I
\]

Agent receives agency rent

\[
p_H \frac{B}{\Delta p}
\]

And initial investors receive

\[
p_H d = -\bar{A} > 0
\]

- Thus renegotiation makes everyone better off
Summary and Conclusions

- Previous debt makes it more difficult to obtain funding
- Previous debt reduces an entrepreneur’s net worth
- Successful renegotiation of debt obligations is key
- Debt forgiveness can vary from $D - d$ to $D$, depending on relative bargaining power