

Topic 8 : The Theory of Financial Intermediation

EE431/438

Peter D. Spencer, Chapter 8
(available at the reserve section of the library, HG173 .S637)

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Shortcomings of direct finance

- Having an intermediary is costly. Why do we need a financial intermediary?
- Financial market : asymmetric information
- Direct lending (finance) is the case where lenders contract borrowers directly.
- Think about a simple world where N investors have excess funds to jointly provide financing to an entrepreneur E 's project
- Before making a decision to fund the project, the investors should be convinced to the value/quality of the project
- Otherwise, the cost of funding would be high : “adverse selection” problem
- Credit rating agency help mitigating the information problem
- Reveal the information $\Rightarrow$ “Transparency”

“Information dilution” problem

- However, information revealed may benefit their rivals.
- Knowledge-based industries try to remain private as long as they can ; i.e. pharmaceutical industries etc.
- Company’s signalling by buying share back may not be effective
- What are the other problems?

“Control dilution” problem

- There will be so many shareholders and creditors.
- Equity issues reduce the entrepreneur’s managerial control.
- It also causes “**Principal-Agent**” problem and “**Moral Hazard**” problem
- If each investor’s funds are so small, no investor has the incentive to monitor entrepreneur E because the cost is likely more than the benefit (which is sharing among N investors)
- There will be no monitoring activities. This is the well-known “**free-rider problem**”.

- Some ways to solve the problems:
 - venture capitalist (providing finance and getting involve in management) can solve “information dilution” but not “control dilution”
 - equity participation contract : motive to overstate profits
- Capital market need a strong legal and accounting system to overcome these problems
- If the legal and accounting system is not strong enough, intermediaries like banks may have the advantage
- literature on bank-based versus market-based financial system

Table 8.1 : Key features of banking and capital markets (pp 160, Peter D. Spencer)

	Capital Market	Banking Market
Tranparency	Open	Confidential
Typical investors	Small	Large
Contracts	Equity and bond	Loan and deposit

How banks help to resolve the problem?

1. Confidentiality and the banking relationship

- Two schools of thoughts

- 1 Confidentiality and the banking relationship : banking relationship is highly confidential
- 2 Economies of scale and economies of scope : cost of screening and monitoring the borrowers is reduced due to large scale of lending, risk is also reduced due to portfolio diversification

1. Confidentiality and the banking relationship :

- Banks are given access to insight information which allows them to finance a company privately without revealing its trade secrets to the market or their rivals
- A business which its stock are undervalued by the market : a share buyback, raising funds through direct financing is too costly (signaling is not a good option since it may not be effective or it might benefit their rivals)

- Businesses usually trust a bank, they are willing to reveal their trade secrets to a bank.
- By law, financial institutions can do only financial businesses.
- They keep their's customer's secrets and establish the “**long term customer relationship**”.
- This benefits the banks by reducing asymmetric information problem through “**economy of scope**”.
- The company's bank account provides an excellent indicator of cashflow and financial viability.
- By doing both deposits and loans services, the cost of screening and monitoring reduces.
- When a company is given a large sum of bank loans, this signals that the company has a growth potential and hence mitigating the security mispricing problem.
- **The bank's signalling** is effective while the company's signalling may not.

- Banks usually lend on fix. Potential upside gains accrue to shareholders and should be reflected in higher share prices.
- Banks may require the company to finance their new project partly by new equity issuance and partly by bank loans. Why?
- “**equity cushion**” preventing banks from downside risk
- “This allows the bank and the company to turn the financial free-rider problem to their advantage”

- Evidence for the signalling role of the banks (Peter D. Spencer pp 162 - 163)
 - James (1987) : effect of announcements of bank loans to US firms on their share prices
 - announcement $\Rightarrow$ share price $\uparrow$ 1.5%
 - this result is contradict to studies of public bonds issues : public bonds issues $\Rightarrow$ share price $\downarrow$
 - Lummer and McConnell (1989)
 - announcement to new borrowers $\Rightarrow$ effect on share price is insignificant
 - favourable revisions to existing borrowers $\Rightarrow$ a positive effect on share price (and vise versa)
 - This explains why even large company with AAA ratings borrow from banks as well as the bond market
 - UK and Europe : formal loan announcement is less common $\Rightarrow$ hard to test the existence of the effect
- more recent evidence $\Rightarrow$ abundant literature on loan announcement and bank loan relationship

2. Economies of scale

- Financial Intermediation as delegated monitoring
- Asymmetric information between lenders and borrowers $\Rightarrow$ moral hazard and adverse selection problem
- monitoring can improve efficiency
- “monitoring” means
 - screening : we need to know about the borrower’s business in order to determine its potential profitability, in the context of adverse selection
 - preventing : observing the borrower in order to ensure that the borrower will invest the funds in the investment project as promised
 - punishing or auditing : to punish the borrowers who fails to meet the contractual obligation. It is sometimes costly to verify the borrower’s performance. Though the project succeeds, the borrower may declare that the project fails and may default on the loan. This is the context of “costly state verification”
- monitoring can be done by both individual lenders and the bank

- Direct lending (finance) is the case where lenders contract borrowers directly. If there is one-to-one mapping between the lenders and the borrowers, each lender may be able to monitor each own borrower.
- Generally, the capacity to lend of the each lender are small relative to the size of investment project of the borrowers. Direct lending may not be effective.
- Diamond(1984) suggests that banks have a comparative advantage in monitoring activities
 - small capacity of the lenders
 - scale economies in monitoring
 - low cost of delegation
- A simplified version of Diamond(1984) by Peter D. Spencer (2000)
- compare two financial system, direct financing and intermediated(bank) financing

- Consider an economy where

- There are n borrowers each with a project requiring capital of $I = m > 1$
- There are $N = nm$ lenders each with wealth = 1

Figure 1: Direct Finance: Each lender monitors its borrower

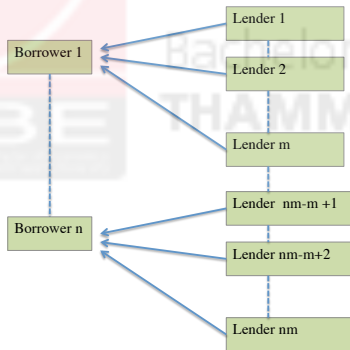
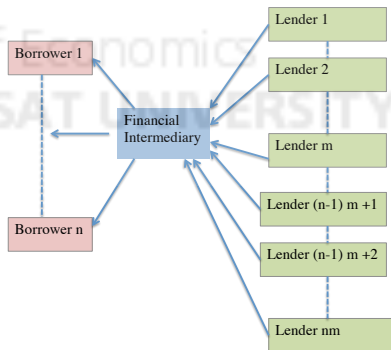


Figure 2. Intermediated Finance as delegated monitoring



- The project's realized value is a random variable with realization denoted by $\tilde{Y}$; for example, $\tilde{Y} = \begin{cases} \text{High} & \text{with probability } 1-\pi, \\ \text{Low} & \text{with probability } \pi. \end{cases}$
- Project returns are identically and independently distributed. The distribution of $\tilde{Y}$ is known to all borrowers and lenders
- Borrowers do not have personal capital
- L denote loan repayment promised by each firm (not achieved if $\tilde{Y} < L$). $L \geq I$
- Y is the ex post yield of project declared by the borrower, so the actual loan repayment is $X = \min(L, Y)$.
For example. Let $m = 1,000,000 = 1$ million. $L = 1.1$ million (i.e. loan rate is 10%). $\tilde{Y} = \begin{cases} 1.4 & \text{with probability } 0.8, \\ 1 & \text{with probability } 0.2. \end{cases}$ If $Y = 1.4$,
 $X = \dots$ If $Y = 1$, $X = \dots$
- $\pi = \pi(L)$ is the probability of borrower default
- $\tilde{Y}$ is borrowers' private information $\Rightarrow$ moral hazard problem

- There are two ways to cope with the moral hazard problem.
 - Lender monitors/audits each borrower at cost K , or
 - impose penalty of a monetary equivalent of P for debt default.
 - Examples of penalty are imprisonment, filing the company for bankruptcy.
 - The borrower will lose his freedom or his reputation, which are non-monetary.
 - However, this is costly to both the economy and the borrower himself.
 - Penalty cost (P) must be high enough so that the borrower will always report his outcome truthfully when $Y > L$. $P \geq L$.
- For example. Let $m = 1,000,000 = 1$ million. $L = 1.1$ million (i.e. loan rate is 10%). $\tilde{Y} = \begin{cases} 1.4 & \text{with probability } 0.8, \\ 1 & \text{with probability } 0.2. \end{cases}$
- $Y = 1.4$. If the borrower reports his outcome truthfully he would receive $1.4 - \dots = 0.3$. He may decide to falsely declare $Y = 0$. Without any penalty, he would get 1.4. With penalty cost P , he would get $1.4 - \dots$. Thus, if $P > L$, he is better off by reporting his outcome truthfully.
- It is assumed that $K < P$. Monitoring is more cost-efficient.

- Direct finance

- Each of the m lender monitor the firm she has financed. Total monitoring cost is
- Punishment cost is equal to
- Which method is more cost effective?

- Intermediated finance

- Bank can choose to monitor each firm. Therefore, the bank is the delegated monitor. The Bank monitors the borrowers on the behalf of the lenders. Total monitoring cost is
- Punishment cost is equal to
- Which method is more cost effective?

Method	Direct financing	Intermediated financing
Monitoring	NK	nK
Punishment	$nP\pi$	$nP\pi$

- Monitoring cost is lower for intermediated financing due to ***economies of scale***.
- Can we trust the bank? Assuming that the bank's performance is its own private information, the bank has an incentive to misreport its outcome.
- We may need to pay a cost to monitor the bank.
- There is a cost of monitoring the bank. Direct monitoring of the bank by each lender would clearly be inefficient.
- Therefore, we consider “nonmonetary penalty” to the defaulted bank.
- However, it will be shown later that if we impose an appropriate nonmonetary penalty, the bank will never default.
- Therefore, there is no cost to punish the defaulted bank.

- nL is the total loan repayment promised to the bank. The actual repayment the bank received is less than nL because some borrowers will fail to repay.
- Let Y_i is the actual realization value of borrower i 's project. X_i is the actual repayment the bank receive from borrower i .
- $X_i = \min(L, Y_i)$. $E(X_i) = E[\min(L, Y_i)] < L$

For example. Let $m = 1,000,000 = 1$ million. $L = 1.1$ million (i.e.

loan rate is 10%). $\tilde{Y} = \begin{cases} 1.4 & \text{with probability 0.8,} \\ 1 & \text{with probability 0.2.} \end{cases}$

If $Y_i = 1.4$, $X_i = \dots\dots\dots$

If $Y_i = 1$, $X_i = \dots\dots\dots$

Then, $E(X_i) = 1.1 * 0.8 + 1 * 0.2 = 1.08 < 1.1$

- Bank's total income from lending is equal to $\sum_{i=1}^n X_i - nK$.
- Bank's expected total income from lending is equal to $\sum_{i=1}^n E(X_i) = nE(X_i)$

- Total repayment the bank can promise its depositor ex ante is at most $nE(X_i) - nk$
- Let R_D denote total deposit repayment the bank promises to its depositors.
- Bank's profit is equal to $\sum_{i=1}^n X_i - nK - R_D$
- Let P_B is the penalty cost to the bank. Penalty cost (P_B) must be high enough so that the bank will always report its outcome truthfully when it has a positive profit.
- Intermediated finance is more cost efficient when $nK + P_B < nmK$.
- Is there any chance for the bank to default?

- The bank will default when $\sum_{i=1}^n X_i - nK < R_D$.
- From the law of large number, as $n \rightarrow \infty$, $\sum_{i=1}^n X_i \rightarrow nE(X_i)$.
- Total repayment the bank can promise its depositor ex ante is at most $nE(X_i) - nk$. The bank will never default.
- This is called the benefit from **portfolio diversification**. All depositors get their deposit repayment in full amount. (For direct finance case, not all the lenders get their loan repayment in full amount)
- There will be no punishment to the bank and hence there would be no actual punishment cost .
- Diamond(1984): one necessary condition for intermediated finance to dominate direct finance is that n has to be large enough (diversification)

- Example. Let $m = 1,000,000 = 1$ million. $L=1.1$ million (i.e. loan rate is 10%). $\tilde{Y} = \begin{cases} 1.4 & \text{with probability 0.8,} \\ 1 & \text{with probability 0.2.} \end{cases}$
- The bank finances n borrowers. As $n \rightarrow \infty$, the bank can estimate the loan repayment correctly. 80% of the bank's borrowers can pay 1.1 million. 20% of the bank's borrowers can pay only 1 million. Therefore, the bank's income from lending (ex ante, ex post) is equal to $[(0.8 \times \dots) + (0.2 \times \dots)] \times n = 1.08n$ (million).
- The bank has nm depositors. Each depositor deposits \$1.
- The bank expects to get $1.08n$ million dollars repayment from the borrowers. The maximum repayment the bank can promise its depositors is $1.08n$ million dollars. Each depositor will get at most 1.08 dollars.
- If the repayment the bank promise to each depositor is less than or equal to 1.08 dollars, the bank will never default.

- Limitations of the model

- In practice, it is difficult to estimate real non-monetary penalty cost. It is probably not incentive-efficient.
 - The bank still has an incentive to misreport.
 - The simplified version: contract design
- There is no adverse selection problem in the model (topic 9)
- There is no liquidity problem. In practice, depositors may withdraw their money at any time. The bank is subject to liquidity problem (topic 10).

- Shortcomings of direct finance
 - Information dilution
 - Control dilution
 - Venture capitalist may resolve information dilution but not control dilution
 - Equity participation contract may help resolve the principal-agent problem, leave incentive to overstate profits
 - Direct financing needs very strong accounting and legal system to overcome the problems resulting from asymmetric information
 - If legal and accounting system is not strong enough, intermediated finance is a better choice than direct finance.

Summary (cont)

- Financial Intermediation may help resolve the problems
 - Confidentiality and the banking relationship
 - The bank keeps their's customer's secrets and establish the “**long term customer relationship**”.
 - The bank is better than individual lenders in monitoring the borrowers due to “**economy of scope**”.
 - Bank's signaling is effective while the company's signaling is not. This helps mitigating the mispricing problem.
 - Economies of scale and economies of scope: the model shows that
 - Compare two systems; direct finance and intermediated finance
 - Intermediated finance: economies of scale in monitoring the borrowers. Monitoring activity is more likely to be implemented.
 - Double layers of monitoring? monitor the banks and monitor the borrowers
 - The benefits of diversification