

EE431 Economics of Financial Markets and Institutions, 2/2016

Problem Sets 6 : Theory of Financial Intermediation

1. "... Michael Dell, the founder of the world's third-largest PC-maker, announced that he planned to take his company private. ... Why does Mr. Dell, who took Dell public in a stock market in 1988, want to buy his company back again? ... Mr Dell's optimism is not shared by investors. Dell's share price fell from around \$30 in late 2007 to less than \$10 five years later ... Mr. Dell's calculation is that the shares are now undervalued. He is deciding to buy them back and take Dell private. ... "

The Economist, February 6, 2013

In the context of theory of financial intermediation, explain **possible benefits** Mr. Dell would get by buying shares back and taking Dell private.

ANSWER. (Sketch)

There are two possible benefits Mr.Dells would get by buying share back and taking Dell private.

1. **Information Dilution problem would be reduced.** As a private company, Dell corporation does not need to disclose information as much as it did if it remains a public company.
2. **Control Dilution problem would be reduced.** As a private company, Dell corporation can reduce number of shareholders. This would increase Mr.Dell's managerial control. It may reduce principal-agent, moral hazard and free-rider problem. Since now Mr.Dell's fund invested in the company would become large, he would have incentive to take a good care of the company.

- In addition, according to the signaling theory, company's signaling by buying share back may not be effective. Mr Dell's optimism is not shared by investors.

2. Describe the Financial Intermediation as Delegated Monitoring in Diamond (1996) we learnt in class.

- We consider an economy in which n identical firms seek to finance projects. Each entrepreneur owns a firm and each firm requires an investment of $m = 100$ units of capital.

- (a) The assumption is lenders are small or large in terms of capital funds they have, comparing to the capital funds the borrowers want to borrow?

Answer.

The assumption is that lenders are small in terms of capital funds they have, comparing to the capital funds the borrowers want to borrow.

- (b) Suppose each lender owns 1 unit of capital to lend out. Each borrower does not have any initial funds. They have to borrow from lenders. For one borrower, how many lenders a borrower needs to borrow from?

Answer. Each borrower needs to borrow from $m=100$ lenders.

- (c) How many lenders in the economy we need to have so that aggregate loan demand is equal to aggregate loan supply?

	Aggregate loan demand	=	Aggregate loan supply
Answer.	number of borrowers $\times$ amount of fund each borrower want	=	amount of fund each lender has $\times$ number of lenders
	$n \times m$	=	$1 \times \text{number of lenders}$
	$nm = 100n$	=	number of lenders

Number of lenders is equal to $100n$.

- (d) Borrowers have no initial capital but they have the ability to implement identical investment project. Each borrower is an entrepreneur and each entrepreneur owns a firm. The returns of each firm are identically independently distributed. The project's realized value is a random variable with realization denoted by Y . $Y = 140$ with probability 0.8 and 100 with probability 0.2.

- i. What is the expected payoff on the project?

Answer. Expected payoff of the project = $\sum prob \times outcome = 0.8(140) + 0.2(100) = 132$. the expected payoff on the project is equal to **132**.

- ii. All entrepreneurs and all lenders know the distribution of Y .

The entrepreneur observes the realization of actual Y freely.

The other cannot observe the total output of the project without paying a cost.

Is an entrepreneur willing to speak the truth about the output of his/her project? Describe the moral hazard problem in this economy.

Answer.

- Suppose the borrower promises to repay \$131.25 M.
 - When $V = 140$ M.,
 - * if the borrower speaks the truth, he/she needs to pay = 131.25 to the lenders. The entrepreneur retains $140 - 131.25 = 8.75$.
 - * if the borrower underreport his/her output - suppose the borrower reports the output of 131.25, he/she will have to pay 131.25 and the borrower retains $140 - 131.25 = 8.75$.
 - * ~ - suppose the borrower reports the output of 110 M., he/she will have to pay 110 and retains $140 - 110 = 30$.
 - * ~ -suppose the borrower reports the output of 100 M. , he/she will have to pay 100 and retains $140 - 100 = 40$.
- The smaller the outcome the borrower reports, the higher payoff the borrower would receive.
- Hence, the entrepreneur (borrower) is not willing to speak the truth about the output of the project.
- The borrower has an incentive to report the smallest possible value of outcome. This is also true for when $V = 100$ M..
- No matter what the true value of the output, the best response of the borrower is to report the smallest possible value.
- The borrower has an incentive to report the outcome of zero, no matter what the true outcome is.
- If there is no cost to the borrower of understating the amount, the borrower always does.
- Even if the investors knows the true value of the output, the borrower obtain it first and thus controls it, the lenders will not be paid unless the borrowers suffers some consequence of not paying.

- iii. If we impose a punishment system such that the entrepreneur will be forced liquidation if he/she pays equal to or lower than a specified amount, f . Assume that liquidating gives no proceeds to the lenders and the entrepreneurs. Calculate the specified amount, which will lead to payments with an expected value of 105 on a loan of 100 ($r = 5\%$). Describe how the punishment system in this question helps solving the moral hazard problem.

ANSWER.

- The borrower will pay the lowest amount that avoids liquidation and keep the rest for himself.

- The payment will never exceeds that lowest amount, f .
- This debt contract has a face value of f . f includes the promised principal and interest.
- Any f between 100 M. and 140 M. forces the borrower into liquidation when the project returns 100 M. and is paid in full when the project returns 140 M..
- This gives the lender an expected return of $0.8f$, because nothing is received when liquidation.

$$\begin{array}{rcl}
 \text{Expected payoff} & \geq & 105 \\
 0.8f & \geq & 105 \\
 - \quad f & \geq & \frac{105}{0.8}
 \end{array}$$

$$f \geq 131.25$$

- Solving for the minimum value of f , $f = 131.25$. **ANSWER1**
- After we impose the punishment system, whenever the borrower has enough money to repay the debt, they will always repay.
- Without punishment system, the borrower will always report the lowest possible outcome.
- Punishment system gives an incentive for the borrowers to repay f when they are able to do so.
- Once we impose “the punishment”, the truth about their project’s outcome will be revealed.
- By this way, punishment helps solving the moral hazard problem. **ANSWER2.**