Topic 6 : The Theory of Financial Intermediation

EE431/438

Peter D. Spencer, Chapter 8 (available at the reserve section of the library, HG173 .S637)
Douglas W. Diamond, Financial Intermediation as Delegated Monitoring: A Simple Example. Federal Reserve Bank of Richmond *Economic Quarterly*, Volume 82/3 Summer 1996, pp 51 -66

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Diversification and Delegation Cost

- Example of 2 loans bank from Diamond(1996)
- A Bank gives two loans (100 millions dollar each).
- The bank has total deposits of 200 million dollars. (Each depositor (investor) has $1 million dollars.)
- B is the face value of deposits per loan.
- F is the face value of the loan.
- $V =$
$$\begin{cases} H = \text{high outcome} = 140 & \text{success with probability } (1\text{-}\pi) = 0.8, \\ L = \text{low outcome} = 100 & \text{failure with probability } (\pi) = 0.2. \end{cases}$$
- List of all possible events and associated probability
  1. Both borrowers succeed, prob = $0.8 \times 0.8 = 0.64$.
  2. One borrower succeeds and the other fails, prob = $2 \times (0.8 \times 0.2) = 0.32$
  3. No borrower succeed, prob = $0.2 \times 0.2 = 0.04$

- When both borrowers succeed, both pay F.
- When one borrower succeed and the other fails, one pays F and the other pay L. The total payment is equal to F + L = F + 100.
- When both borrowers fail, both pay L. The total payment is equal to 2L = 200.
- Supppose banks is forced into liquidation when both loans fail. Repayment of all depositors is possible when just one loans default.
- Total payment received by all depositors will be 2B with probability 0.96 (just one loan fails or both succeed) and 0 with probability 0.4 (both fails).
- The initial capital needed to make a loan is $200 million dollars and it requires 5% expected rate of return.
- $0.96 \times 2B + 0.4 \times 0 = 200 \times (1.05)$ or 2B = 218.75. $B = 109.375$.
- Depposit rate = 9.375%.

- The bank is able to pay 218.75 when one loan defaults. When one loan defaults, the total payment is equal to F + L = F + 100.
- Hence, $F \geq 118.75$.
- The bank made loand with this face value will have the cash and the incentives to pay bank deposits in full with probability 0.96 as long as $F \geq 118.75$, or loan rate is at least 18.75%.

Will the Bank Monitor?

- The bank needs to pay $\$1.5$ million to monitor one loans.
- If the bank monitors neither loans, the bank will fail when just one loan defults and the bank will get zero.
- If one loans defaults and the other does not, the bank's return will be $100 + F - 2B = 100 + F - 218.75$.
- Monitor one loans will give the increased retrun with probability that it alone defaults 0.16.
- Monitoring of one loan is in the banker's interest so long as $0.16(100 + F - 218.75) \geq 1.5$.
- Monitor two loans will give the same increased return with probability that one of the two loans defaults with probability 0.32.
- Monitoring of both loans is in the banker's interest so long as $0.32(100 + F - 218.75) \geq 1.5 \times 2$.
- $F \geq 128.125$.
- So long as, interest rate on bank loans exceeds 28.125%, the banker is willing to invest \$1.5 M $\times$ 2 = \$3 million to monitor all loans since it increases the value of residual claims of the bank.

- The two-loab banker must earn a small profit inexcess the cost of monitoring.
- The banker gets the residual claims of $(256.25 - 218.75) = 37.5$ with probability 0.64 (both succeed).
- The banker gets the residual claims of $(128.125 + 100 - 218.75) = 9.375$ with probability 0.32 (one succeed, one defaults).
- Neither of the two loans succeed, then $(100 + 100 - 218.75) < 0$. The bank will be forced into liquidation and gets 0 with probability 0.04.
- The banker's expected value is equal to $0.64 \times 37.5 + 0.32 \times 9.375 + 0.04 \times 0 = 24 + 3 = 27$.
- The banker's expected value is equal to $\frac{27}{2} = 13.5$ M per loan.
- The banker is happy to pay \$1.5 M to monitor the two loans since it will get expected value of \$13.5 M.