Financial Intermediaries and Monitoring

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Financial Intermediaries

- Financial intermediary: Agent that channels funds from those who want to save or lend to those who want to invest or borrow.
  - This activity typically involves the trading of financial assets either on the agent's own account or on the account of its customers.
- Bank (traditional): Financial intermediary that performs its function by receiving deposits and making loans.
  - Great quantitative importance (now and in the past)
  - Traditional banking business is well-defined
  - Actual boundaries of the business are blurred
  - Heavily regulated (now and in the past)
  - Intertwined with the transmission of monetary policy

Role of Financial Intermediaries

- Why do financial intermediaries exist?
- Do they create value for society?
- Should we regulate them? How?

Possible roles of Financial Intermediaries

- Method of payment
- Transforming assets (maturity, size, etc) from borrower to investor
- Monitoring or screening - This chapter
- Providing liquidity to depositors - Later in the course

Possible roles of Financial Intermediaries

- Focus on one explanation of existence of banks
  - Banks as monitors (Diamond 84, Holmström and Tirole 1997)
  - More references Leland-Pyle (JF, 77), Boyd-Prescott (JET, 86), Calomiris-Khan (AER, 91)]
- Bank is only one type of financial intermediary
  - Venture capitalists etc.

Banks as monitors

- Extended view of monitoring
- Banks can learn about the activities of a firm
  - Also about the actual returns a firm has
- Banks can sue a firm if it does not pay
  - Make that information available (credit register)
- They have the ability of making entrepreneurs behave
  - They can oversee the activities of the entrepreneurs
  - They can make their private benefits less attractive
    - Credible threats to take to court, they have the expertise
    - Not dispersion in monitoring (no free riding problems)
- Monitoring, in reality, can be a lot of things
  - Inspection of potential cash flow from the firm
  - Its balance sheet position
  - Its managerial activities
  - Firm complies with covenants (minimum solvency or liquidity ratio)
  - etc.

Diamond 1984 main idea: Delegated monitoring

- Diamond (1984)'s key idea:
  - intermediaries perform delegated monitoring
  - delegation to a single agent allows to save on monitoring costs
  - [associated with the imperfect observability of borrowers' cash flows (ex-post asymmetric information)]
- The idea can be extended to any informational asymmetry that can be reduced at some cost:
  - ex-ante asymmetries: reducible by prior assessment / screening
  - interim asymmetries: reducible by supervision / corrective actions
- Note: Originally Diamond considers a world with unverifiable cash flows and non-pecuniary penalties for the entrepreneurs who do not repay.
  - Instead, we develop his model in costly state verification setup.

Diamond 1984: main idea

- The savings come from avoiding:
  - duplicating monitoring/screening/supervision costs
  - free-riding among lenders
- BUT who monitors the monitor?
- Perhaps monitoring the monitor implies costs at least as high as the direct monitoring of the borrower by all lenders
  - In fact it does NOT, because there is a natural scale economy:
  - Diversification reduces the costs of monitoring the monitor (by washing away the impact of borrowers' idiosyncratic risk on the monitor's risk).

The model

- Two dates ($t = 0, 1$), risk-neutrality, and a riskless rate r
- Many entrepreneurs and many savers
- Entrepreneurs, indexed by $i = 1, 2, ...$, are penniless and want to undertake a project

$$-1(\text{at } t = 0) \rightarrow xi \in [0, \infty)(\text{at } t = 1)$$

- with xi iid $F(x)$ and $E(xi) > 1 + r$
- Savers, indexed by$j = 1, 2, ...$ have an initial wealth $1/m$ each,
  - with $m \in \{2, 3, ...\}$, and can invest at the riskless rate
- Information structure is as in Gale-Hellwig (1985) (Costly state verification):
- Each entrepreneur i costlessly observes the realization of xi
- Any other agent has to incur a cost $\varphi > 0$ to verify xi

Allocation problem

- Allocation problem
  - Each project requires funds from $m \geq 2$ savers
  - For some realizations of xi someone will have to incur φ
- Consider two possible arrangements (modes of financing) with symmetric contracts:
- Direct financing: m savers directly fund one of the entrepreneurs,
  - incurring $m\varphi$ when verifying xi.of each of the n entrepreneurs
- Intermediated financing: nm savers delegate to a single "bank" the verification of the cash flows xi of n entrepreneurs.
- How to proceed:
  - we first characterize the optimal contracts for each financing mode
  - we then find which financing mode is cheaper/more efficient

Direct financing

- Gale-Hellwig (1985) show that the use of standard debt contracts is optimal in this setup.
- There would be a contract per each saver-entrepreneur pair.
- For an entrepreneur as a whole, we would have:
- A total repayment B promised to his lenders
  - if B is paid, xi is not verified
  - otherwise, xi is verified $\rightarrow$each of his m lenders incurs φ
- The m lenders as a whole obtain $min\{B, xi\} - verificationcosts$
- On expectation

$$\begin{aligned} R_m(B) &= \int_0^B (x - m\varphi) dF(x) + \int_B^\infty B dF(x) \\ &= B - \int_0^B F(x) dx - m\varphi F(B) \end{aligned}$$

Direct finance

- Direct financing is feasible if and only if

$$\max_{B} R_m(B) \geq 1 + r$$

- If feasible, competition between lenders implies

$$B^* = min\{B : R_m(B) = 1 + r\}$$

- The associated information costs are:

$$c_m = m\varphi F(B^*).$$

Intermediated financing

- No change in the information structure
  - Bank-entrepreneur relationships and savers-bank relationships are subject to informational problems of the same qualitative nature as those of savers-entrepreneur relationships under direct financing
- It is optimal to use debt contracts:
- Bank-entrepreneur relationships are based on loans
  - Loan conditions are set by banks, but...
  - Entrepreneurs only accept $B \leq B^*$
- Savers-bank relationships are based on deposits
  - Deposits impose the bank an obligation to repay D^*
  - Such a repayment must compensate the savers for
  - the opportunity cost of their funds + the expected verification costs

Intermediated financing

- Let s_n denote the marginal cost of funds for the bank
  - $=$ the required rate of return per unit of deposits.
- Can the bank profit from offering loans with $B < B^*$?
  - Sufficient to verify whether the bank would get positive profits by charging B*

Intermediated financing

- Check if bank can make profits charging $B = B^*$
- Bank profits

$$\begin{aligned}
\Pi_n(B^*) &= n\Big[B^* - \int_0^{B^*} F(x)dx - \varphi F(B^*) - (1+s_n)\Big] \\
\text{given } 1+r &= B^* - \int_0^{B^*} F(x)dx - m\varphi F(B) \\
\Pi_n(B^*) &= n\big[r - s_n + (m-1)\varphi F(B^*)\big]
\end{aligned}$$

$$\text{Hence } \Pi_n(B^*) > 0 \Leftrightarrow s_n + \varphi F(B^*) < r + m\varphi F(B^*)$$

in economic terms?

Diamond 1984 main result

- Diamond showed that

$$\begin{aligned} \lim_{n\to\infty} s_n &= r \to \\ \lim_{n\to\infty} \frac{\Pi_n(B^*)}{n} &> 0 \text{ for } m \geq 2 \end{aligned}$$

- This result is due to diversification:
  - By the strong law of large numbers, for large n, the bank's loan portfolio becomes riskless
  - $\to$the banks is solvent (almost surely) - save on verification costs.

How to reach the result

- The gross returns of a portfolio of n loans with B^* are

$$Y_n = \sum_{i=1}^{n} y_i \text{ with } y_i = \min(B^*, xi) - \varphi\Delta(xi < B^*)$$

- By the strong law of large numbers: when $n \longrightarrow \infty$

$$\begin{aligned} Y_n \quad &\longrightarrow \quad E(y_i) = B^* - \int_0^{B^*} F(x)dx - \varphi F(B^*) \\ &= \quad 1 + r + (m-1)\varphi F(B^*) \end{aligned}$$

- The bank signs a contract with each saver. As a whole, this implies a promised repayment D such that
  - if D is paid, Y_n is not verified
  - otherwise, Y_n is verified $\longrightarrow$ each of the mn savers incurs φ
- Thus savers' net payments are $min\{D, Y_n\} - verificationcosts$.

How to reach the result

- On expectations savers receive

$$\begin{aligned} P_{mn}(D) &= \int_0^D [Y - \varphi mn] dG_n(Y) + \int_D^\infty D dG_n(Y) \\ &= D - \int_0^D G_n(Y) dy - \varphi mn G_n(D) \end{aligned}$$

$G_n(Y)$ is the distribution of Y

- If feasible the optimal contract implies

$$\begin{aligned} D &= \min\{D : P_{mn}(D) = (1+r)n\} \\ &= 1 + r + (m-1)\varphi F(B^*) \end{aligned}$$

- Hence $1 + s_n = 1 + r + \varphi m G_n(D)$

The main proposition

- Proposition

$$\lim_{n\to\infty} s_n = r$$

- Proof

$$G_n(D) = prob[Y_n < D] = prob[\frac{Y_n}{n} < \frac{D}{n}]$$

- Assume $D^* = (1+r)n$ then

$$\lim_{n\to\infty} \frac{G_n(D^*)}{n} = \lim_{n\to\infty} prob[\frac{Y_n}{n} < 1+r] = 0$$

- which means

$$\lim_{n\to\infty} \frac{P_{mn}(D^*)}{n} = \lim_{n\to\infty} \frac{D^*}{n} = 1+r$$

- And setting $D^* = (1+r)n$ is optimal and leads to the proposition

Some comments about Diamond 1984

- Institutional implementation
  - What is the objective function of the bank? Which agents manage this institution?
- There is a natural scale economy: diversification gains
  - Can a bank work as any other firm?
  - Is there a natural monopoly situation?
  - Is it compatible with perfect competition in banking?
  - Does it need to be regulated?
- Robustness
  - Will the presence of systematic risk change the conclusions?
  - Will a profit-maximizing bank diversify at a socially optimal level?
  - Can the model be extended to explain the co-existence of direct and intermediated finance?

A simple question

- For which of these entrepereneurs would bank finance exist
  - Perfectly safe entrepreneurs
  - Risky and very correlated entrepreneurs
  - Risky and not so correlated entrepreneurs