Monitoring and the acceptability of bank money

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The views expressed here are my own and should not necessarily be interpreted as those of the Banque de France or the Eurosystem.

Motivation (1)

Question 1: How do banks create liquidity?

- core function of banks, both historically and today
- bank issue liquid liabilities that are redeemable / can be used by agents to transact ("inside money")

Question 2: Complementarity between liquidity creation and credit monitoring?

- banks provide intermediated credit, and have private information about borrowers
- special feature of banks is the combination of both activities (/ MMMFs, VCs...)
- contemporary financial intermediation theory provides few explanations.
  - focus on either the liability (e.g. Diamond and Dybvig (1983)) or asset (Diamond (1984)) side.
  - older literature emphasized close connection between bank credit and money creation (Schumpeter (1934), Gurley and Shaw (1960))

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Motivation (2)

- Combination of activities exposes banks to liquidity risks.
- Instability in credit can have undesirable effects on the supply of (bank) money.
- Implication for "efficient" bank structure
  - Should liquid liabilities be funded by "transparent" assets?
  - Should bank regulation separate those activities into different institutions?
  - Narrow banking proposals, 100% reserve (Fisher 1936, Friedman, 1959)
- Is it optimal in some way that banks combine both activities?

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Complementarity between liquidity creation and credit

- Management of deposit accounts generates information relevant to the lending activity.
  - Nakamura (1993), Berlin and Mester (1999)
- Provision of insurance against unobservable liquidity shocks on both sides of the balance sheet (demand deposits / credit lines)
  - Joint production efficient if firms and households shocks are not perfectly correlated (Kashyap, Rajan and Stein (2002))
- Fragility of bank balance sheet allows banker to commit his relationship capital to obtain repayment from borrowers (Diamond and Rajan (2001))
  - Threat of run by demandable deposits act as disciplining device
  - Negative effect of deposit insurance
  - Inefficient runs?

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This paper (1)

- Develop an alternative explanation for the combination of liquidity creation and credit monitoring
- Emphasize tradeoff between monitoring and liquidity
  - investors value liquidity
  - productive efficiency requires monitoring of long-term investments
  - but monitoring creates information asymmetries that reduce the ability to sell before maturity

  $\Longrightarrow$ monitoring has both a *positive* and a *negative* side
- with direct investment, investors suffer from the dark side of monitoring

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This paper (2)

- intermediation as a solution to the monitoring-liquidity tradeoff
- fraction of agents specialize as delegated monitors ("intermediaries")
- other agents deposit their endowment and hold a claim on the intermediary's portfolio ("depositors")
- contract ensures that intermediaries have incentives to monitor
  $\Longrightarrow$ their assets are illiquid because of informational asymmetries
- depositors do not monitor and have no private information
  $\Longrightarrow$ hold claims (liabilities of intermediaries) that can be easily used to transact
- concentration of private information in banks insulates final investors from the dark side of monitoring/information
- intermediation only useful if monitoring generates private information

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Outline of the talk

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Agents

- Three date economy $(t = 0, 1, 2)$
- Group 1 agents.
  - born in $t = 0$, live for two periods. Endowment $e_0 = 1$.
  - preference for liquidity:

$$\mathbb{E}_{t=0}\left[\tilde{\phi} c_1 + c_2\right]$$

with preference shock at $t = 1$:

$$\tilde{\phi} = \begin{cases} 1 & \text{w.p.} \quad 1-\lambda, \quad \text{“patient”}, \\ \rho > 1 & \text{w.p.} \quad \lambda, \quad \text{“impatient”}. \end{cases}$$

Let $\bar{\rho} = \lambda\rho + 1 - \lambda = \mathbb{E}\left[\tilde{\phi}\right]$

- Group 2 agents. “buyers”:
  - born in $t = 1$. Large endowment $e_1 >> y$ at $t = 1$.
  - maximize $\mathbb{E}_{t=1}\left[c_2\right]$

Technologies

- storage
  - short-term $1 \longrightarrow 1$ from t to $t+1$.
  - available to everyone.
- long-term projects
  - available to Group 1 agents
  - fixed investment 1 at $t=0 \longrightarrow$ output y at $t=2$ if successful.
  - positive NPV if and only if monitored
  - monitoring has two effects:
    - raises probability of success from π^L to $\pi^H \equiv \pi^L + \Delta\pi$
    - generates *private* information about future payoff. (perfect signal for simplicity)
- (projects as loans: closely following the borrower during the relationship, e.g. to prevent misbehavior provides information useful to predict future profitability).

Monitoring - liquidity tradeoff

- Date 1: opportunities for (Pareto improving) trades between impatient group 1 and group 2 agents
- Welfare of group 1 agents under First Best
  - preference shocks observable
  - monitoring effort contractible, signal observable.

$$V^{FB} = \bar{\rho}\pi^{H}y - c$$

- Assumptions
  - preference shocks are private information
  - monitoring effort unobservable (moral hazard)
  - information generated through monitoring is private
- Creates a tradeoff between monitoring and liquidity
  - Monitoring improves productive efficiency
  - Dark side of monitoring: private information hampers liquidity

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Analyze two situations

- "market arrangement"
  - Market at date 1 where agents can sell claims to future output to buyers
  - Usual way to introduce a market in Diamond-Dybvig setup (Jacklin (1987))

- "intermediated arrangement"
  - Some agents specialize in monitoring of projects (delegated monitors)
  - Collects endowments of other agents (depositors) in exchange for claims on intermediary's portfolio
  - Depositors can use this claim to transact/trade with Group 2 agents.

- Question: When can projects be undertaken and monitored under both arrangements? Amount of liquidity created out of projects?

A market-based solution

- A group 1 agent invest his endowment in a long-term project
- Market opens at date 1 where claims on projects' output can be traded
- Projects must be monitored in equilibrium
- Characterize conditions for investment in projects

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Analysis of the market for claims (1)

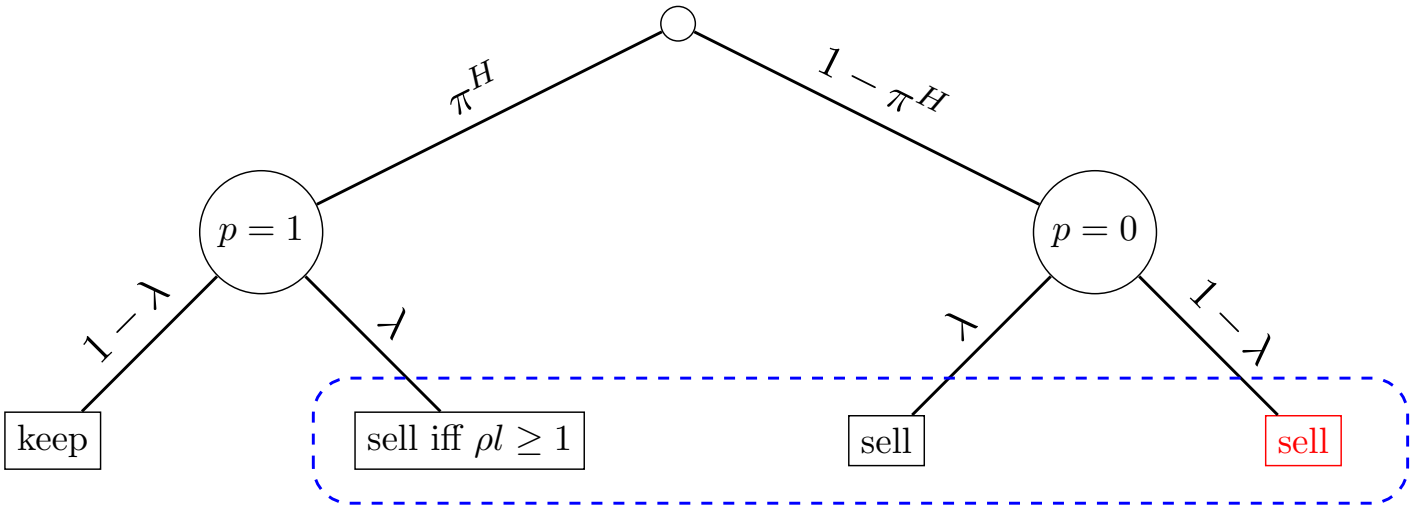
- When market opens, agents have private information on the probability of success p of their project
- Allow agents to retain a fraction $1-q$ of his claim to signal their type
- Buyers (group 2 agents) rationally anticipate the value of projects in the market

$$l(q) = \mathrm{E}_{t=1}[p|q]\, y. \tag{1}$$

Analysis of the market for claims (2)

- Selling behavior depends on preference shock (ϕ) and private information ($p = 0/1$))

$$\max\left\{\phi q l + (1-q)\, py, py\right\}$$



Analysis of the market for claims (3)

Proposition Let

$$l^1 \equiv \frac{\lambda}{\lambda + (1 - \pi^H)(1 - \lambda)} \cdot \pi^H$$

1. If $\rho l^1 < 1$, there is no equilibrium where high quality claims are traded.
2. If $\rho l^1 \geq 1$, the set of equilibria in which valuable claims are traded is given by "full pooling" equilibria where all types but patient investors with a high quality claim sell the same fraction q at the (unit) price $l^1.y$, for any $q \in [0, 1]$.

Analysis of the market for claims (4)

- For case 1 ($\rho l^1 < 1$), the market collapses for private information reasons (Akerlof's (1970) lemon problem) as patient agents use the market to strategically sell claims on worthless projects.
- For case 2, the market is (can be) active, but the price incorporates a "lemon premium"

$$l^1 \equiv \frac{\lambda}{\lambda + (1 - \pi^H)(1 - \lambda)} \cdot \pi^H < \pi^H$$

- For this presentation, focus on case 1. The analysis can be extended to case 2.

Investment under the market economy. $(\rho l^1 < 1)$

- Market for claims is inactive.
- If (group 1) agents invest in a project, they choose to monitor and get
$$\pi^H y - c \qquad (> \pi^L y)$$
- If invest in storage, they get $\lambda\rho + 1 - \lambda \equiv \bar{\rho}$

Proposition Investment in projects takes place iff $\pi^H y - c \geq \bar{\rho}$

- Equilibrium features *either* liquidity or monitoring. Claims on projects are illiquid because of information generated by monitoring.
- (In case 2, the market can create some liquidity out of projects)

An intermediated economy

- Intermediation as a solution to the monitoring-liquidity tradeoff
- One group 1 agent ("intermediary") collects endowments of N others agents ("depositors") and monitors the $N+1$ projects
- Assumption Perfect correlation between project monitored by the intermediary
  - (monitoring $N+1$ project has a cost $(N+1)c$)

  $\Longrightarrow$ informational problem faced by the intermediary is the same as in the market economy.
- Depositors have a claim on R^D date 2 good in case of success.
  - *Do not monitor*.
- Intermediary has a claim on R^I (per project)
- Show that this arrangement supports a better allocation.

Analysis of intermediation. $(\rho l^1 < 1)$

- The agent monitoring holds an illiquid claim on the (N+1) projects.
  - Utility of the intermediary

$$V^I = (N+1)\left(\pi^H R^I - c\right)$$

  - Incentives to monitor the projects

$$\Delta\pi.R^I \geq c$$

- Depositors do not monitor and hold liquid claims

$$V^U = \bar{\rho}\pi^H R^D$$

- Feasibility constraint

$$(N+1)\,R^I + NR^U = (N+1)\,y$$

Analysis of intermediation. $(\rho l^1 < 1)$

- Agents must be better off than under the market outside option

$$V^I, V^D \geq V^{ME} \equiv \{\max \pi^H y - c, \bar{\rho}\}$$

- Agents should not be able to form a better intermediary (see below)
- Characterize the maximum per capita surplus of (group 1) agents

$$\max_{N,R^I,R^D} V^{FI} \equiv \frac{V^I + NV^U}{N+1}$$

Group 1 agents will form intermediaries only if $V^{FI} \geq V^{ME}$

Analysis of intermediation. $(\rho l^1 < 1)$

$$\begin{aligned}\frac{V^I + NV^U}{N+1} &= \frac{1}{N+1}\left((N+1)\left(\pi^H R^I - c\right) + N\bar{\rho}\pi^H R^D\right) \\ &= \bar{\rho}\pi^H y - c - (\bar{\rho}-1)\left(\pi^H - ql\right)R^I\end{aligned}$$

- Maximum per capita surplus solves

$$\max \bar{\rho}\pi^H y - c - (\bar{\rho}-1)\pi^H R^I \qquad s.t. \quad R^I \geq \frac{c}{\Delta\pi} \qquad (2)$$

- Maximum attained for $R^I = \frac{c}{\Delta\pi}$ and given by

$$V^{FI} = \bar{\rho}\pi^H y - c - (\bar{\rho}-1)\pi^H \frac{c}{\Delta\pi}$$

Equilibrium size of intermediaries

- Size of the intermediary (N)?
  - Utility of a depositor is given by

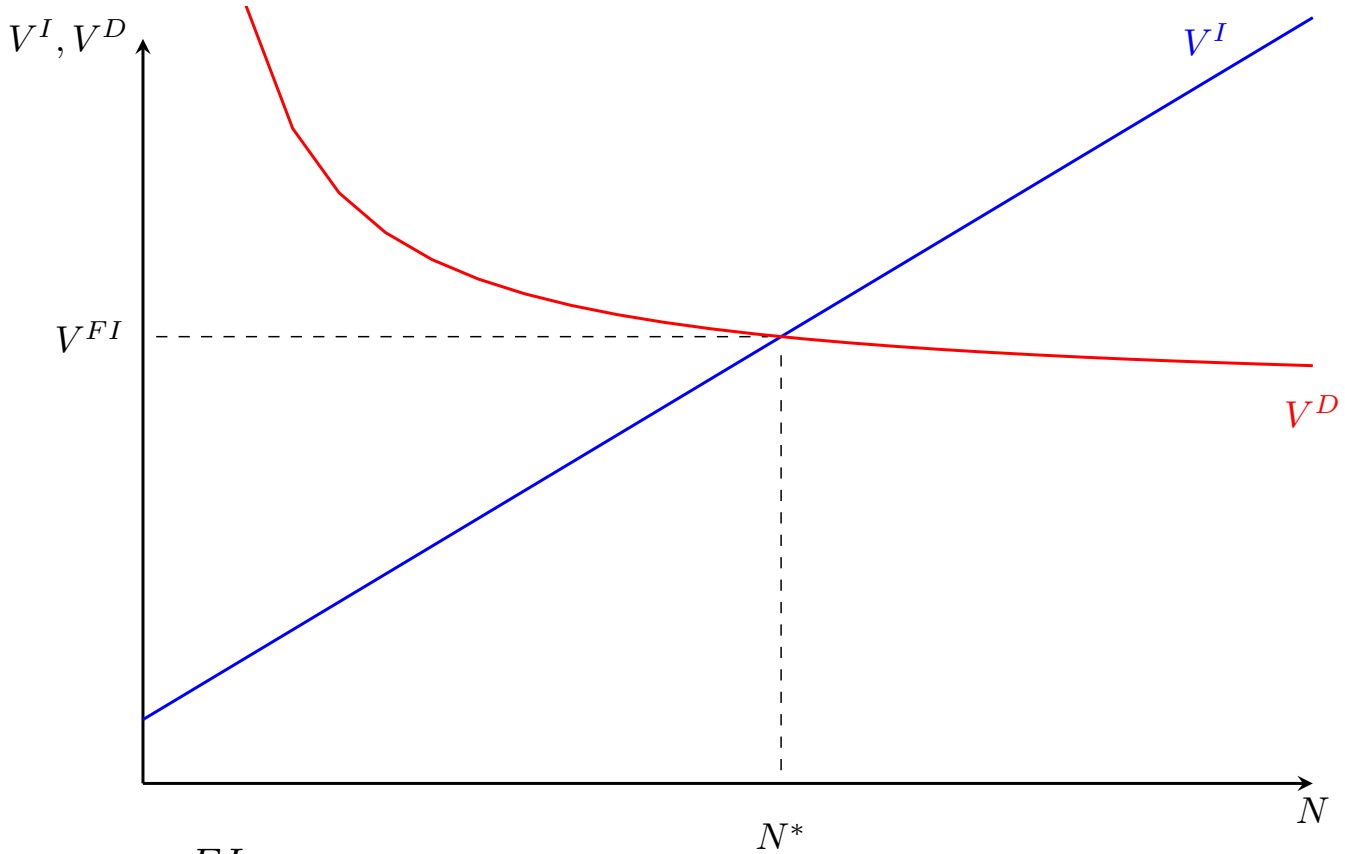
$$V^D = \bar{\rho}\pi^H \frac{N+1}{N}\left(y - \frac{c}{\Delta\pi}\right)$$

  - Utility of the intermediary

$$V^I = (N+1)\left(\pi^H \frac{c}{\Delta\pi} - c\right) = (N+1)\frac{\pi^L}{\Delta\pi}c$$

- unique N^* such that if $N < N^*$, $V^I < V_{FI} < V^D$, and $V^I > V_{FI} > V^D$ for $N > N^*$.

Equilibrium size of intermediaries



- If $V < V^{FI}$ for at least $N + 1$ agents $\Longrightarrow$ improve their utility by forming an intermediary

Liquidity creation by the intermediary. $(\rho l^1 < 1)$

- Equilibrium surplus of a group 1 agent

$$V^{FI} = \pi^H y - c + (\bar{\rho} - 1)\left(y - \pi^H \frac{c}{\Delta\pi}\right) \quad > \quad \pi^H y - c$$

- Amount of liquidity creation limited by incentives issues

Proposition Investment in projects takes place iff $V^{FI} \geq \bar{\rho}$

- More liquidity created out of projects than with the market arrangement.
- (In case 2, true only under additional conditions)

Conclusion

- Theory of banks as a solution to monitoring-liquidity tradeoff
  - explains combination between liquidity creation and credit monitoring
  - unified explanation for the illiquidity of assets and liquidity of liabilities (distribution of information)
- Two (broad) implications
  - banks useful *because* monitoring generates private information (market can create liquidity out of transparent assets)

  $\Longrightarrow$ opacity of banks' assets (loans) as a feature of efficient banking arrangement

  - depositors enjoy liquidity *because* do not have private information

  $\Longrightarrow$ should depositors discipline banks?

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