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))
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?
Complementarity between liquidity creation and credit

- Management of deposit accounts generates information relevant to the lending activity.

- 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?
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
  
  ⇒ monitoring has both a *positive* and a *negative* side

- with direct investment, investors suffer from the dark side of monitoring
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
  \[\Rightarrow\]  their assets are illiquid because of informational asymmetries
- depositors do not monitor and have no private information
  \[\Rightarrow\]  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
Outline of the talk

1. Introduction
2. Environment
3. Market economy
4. Intermediated economy
5. Conclusion
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 \(t = 1\):
    \[
    \tilde{\phi} = \begin{cases} 
    1 & \text{w.p. } 1 - \lambda, \text{ "patient"}, \\
    \rho > 1 & \text{w.p. } \lambda, \text{ "impatient"}.
    \end{cases}
    \]
    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 \(\mathbb{E}_{t=1} [c_2]\)
Technologies

- **storage**
  - short-term 1 $\rightarrow 1$ from $t$ to $t + 1$.
  - available to everyone.

- **long-term projects**
  - available to Group 1 agents
  - fixed investment 1 at $t = 0$ $\rightarrow$ output $y$ at $t = 2$ if successful.
  - positive NPV if and only if monitored
  - monitoring has two effects:
    - raises probability of success from $\pi^L$ 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
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
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:

$$l(q) = E_{t=1} [p|q] y.$$  \hfill (1)
Analysis of the market for claims (2)

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

$$\max \{\phi q l + (1 - q) p y, p y\}$$

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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 \( l^1 \cdot y \), 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
  \[
  \pi^H y - c \quad (> \pi^L y)
  \]
- 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 $(N + 1)c$)
  - informational problem faced by the intermediary is the same as in the market economy.
- Depositors have a claim on $R_D^D$ date 2 good in case of success.
  - *Do not monitor.*
- Intermediary has a claim on $R_I^I$ (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
  \[
  (N + 1) R^I + N R^U = (N + 1) y
  \]
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. \((\rho l^1 < 1)\)

\[
\frac{V^I + NV^U}{N + 1} = \frac{1}{N + 1} \left( (N + 1) (\pi^H R^I - c) + N \bar{\rho} \pi^H R^D \right)

= \bar{\rho} \pi^H y - c - (\bar{\rho} - 1) (\pi^H - q^l) R^I
\]

- Maximum per capita surplus solves

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

- 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 $\Rightarrow$ improve their utility by forming an intermediary.
Liquidity creation by the intermediary. \((\rho l^1 < 1)\)

- Equilibrium surplus of a group 1 agent

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

- 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)
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
(bank can create liquidity out of transparent assets)

⇒ opacity of banks’ assets (loans) as a feature of efficient banking arrangement

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

⇒ should depositors discipline banks?