Imperfect Competition in the Inter-bank Market for Liquidity as a Rationale for Central Banking

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Motivation

- Central Banking as a response to market failure in provision of liquidity arising from asymmetric information, lack of coordination etc.

- This paper examines one such source of market failure: Market power of liquidity rich banks in the interbank market.

- Surplus banks exploit their market power to extract rents
  - Inefficient liquidity transfers such as excessive liquidation of banking assets
  - Misallocation cost

- Central bank acting as a lender can improve liquidity transfers.

Cooperation among Banks

- Inter-bank Market:

- Banks borrow and lend to each other

- Mutual insurance

Cooperation among Banks

- Clearing Houses: Before the establishment of Federal Reserve
- Private arrangements by banks during crises for co-insurance
- Started in New York in 1853.
- Acted as LOLR during crises
- Suspended convertibility and issued joint claims to protect member banks.

Competition among Banks

- Banks may benefit from peers' failures:
  - Slovin, Sushka and Polonchek (1999) and Schumacher (2000)
- Flight to quality, gain failed banks' customers.
- Buy distressed banks' assets at fire-sale prices.
  - JP Morgan Chase acquires Bear Stearns
  - JP Morgan stock price up 10% next day.

Failure of Private Arrangements

- In practice, clearing houses have not been organized quickly.

- Anecdotal evidence
  - Park (1991), Goodhart-Schoenmaker (1999), Freixas-Giannini-Hoggarth-Soussa (1999)

- The role of **competition** and the strategic behaviour in the failure of private arrangements.

Failure of Private Arrangements

- Episodes from England
- BoE orchestrated an insurance fund for Baring Brothers in 1890.
- However, BoE was unwilling to support Overend Gurney in 1866.
- Goodhart-Shoenmaker attribute this to a **commercial rivalry** between the two banks.

Failure of Private Arrangements

- Episode from Australia
- Crisis in 1893: 11 banks failed, others experienced runs.
- Associated banks of Victoria coalition of private banks.
- Banks agreed and announced they will help each other.
- Pope (1989): Failure of private arrangements due to healthy banks seeking to increase their market share.

Failure of Private Arrangements

- Episode from France
- Crisis in 1867:
- Banque de France threatened by competition from other banks.
- Credit Mobilier experienced difficulties after unsuccesful real estate speculation.
- Banque de France forced its liquidation.

Failure of Private Arrangements

- Kindleberger (1989):

  "… the optimum may be a small number of actors, closely attuned to one another in an oligarchic relation, like-minded, applying strong pressure to keep down the **chiselers** and **free-riders**, prepared ultimately to accept responsibility."

Failure of Private Arrangements

- Goodhart-Schoenmaker (1995):

  "Although rescues financed on an implicit central bank-commercial banks basis may seem desirable, it is doubtful how far it will be sustainable much longer. These rescues depend on the cohesion of a well-defined group of banks, which are prepared to finance a self-supporting regime under the leadership, usually, of a central bank."

  "…Greater **competition** has made commercial banks **less willing** to participate (in such cartels and coalitions), and reduced the clout of the central bank in dragooning unwilling volunteers."

Failure of Private Arrangements

- 1907 Crisis in New York:
- Commercial-bank clearing houses assisted Mercantile National Bank.
- Trust companies did not receive assistance, some were solvent.
  - Some argue that commercial banks were threatened by the growth of trust companies.
  - JP Morgan started an attack on trust companies.
- Only after 2 weeks, JP Morgan organized a rescue plan.
- During this period, **strong banks gained deposits**.

Failure of Private Arrangements

- 1907 Crisis in New York:

- Morgan says he has done enough and wants a quit pro quo.

- Morgan's US Steel would acquire Tennessee Coal's assets (from Moore and Schley, a trust company) estimated to be worth $1 billion for $45 million.

- Creation of the Federal Reserve:

- Senator Aldrich: "We may not always have Pierpont Morgan with us to meet a banking crisis".

Strategic Behaviour

- Donaldson (1992):
- US data for the period 1873-1993
- Banks with excess liquidity exert market power and charge high interest rates to exploit other banks.
- Interest rates during panics higher than competitive rates
  - Evidence for the strategic behavior of banks with excess liquidity.
- LOLR can prevent cash rich banks from exploiting other banks.

Strategic Behaviour

- National City Bank (1893, 1907):

- National City had higher reserve and capital ratios.

- During the panic it gained deposits and loans relative to its competitors.

- Vanderlip's (Vice President) complaint in early 1907 that National City's low leverage and high reserve ratio was depressing profitability.

- Stillman (President): “What impresses me most important is to go into next Autumn (usually a time of financial stringency) **ridiculously strong and liquid**, and now is the time to begin and shape for it...If by able and judicious management we have money to help our dealers when trust companies have suspended, **we will have all the business we want for many years**.”

Related Literature

- Goodfriend and King (1988):
  - Efficient inter-bank market, solvent bank can always get liquidity.
  - No need for LOLR
  - Provide liquidity to the market, inter-bank market takes care of the rest.

- **Fed introduced 5 new facilities:**

- Extended maturities

- Extended the range of collateral

- Extended the safety net to investment banks.

Related Literature

- **Frictions:**

- Asymmetric information:
  - Flannery (1996)

- Coordination failure:
  - Rochet and Vives (2002)

- Banks may free ride on liquidity:
  - Gale and Bhattarcharya (1987), Repullo (2003), Gonzales-Eiras (2003)…

- **Strategic Behaviour**

Main Focus

- Strategic behaviour and market power can prevent efficient transfer of liquidity.
- Enough liquidity in aggregate but concentrated among a few players.
- Central bank as a LOLR
- Credible option for liquidity
- Supervisory and LOLR role of central banks.

Model

- Similar to Holmstrom and Tirole (1998)
- There are 3 dates: t = 0, 1, 2.
- **Banks:**
  - 2 banks: Bank *A* and Bank *B*.
  - Bank *B* always have some cash (cash-rich bank).
  - Bank *A* can be hit by a liquidity shock so that it may need the cash.
  - Bank *A* invests in risky assets at t = 0.

Model (cont.)

- **Risky Asset:**
- Invest 1 unit at t = 0.
- Return realized at t = 2.
- Risky assets return R_t (*Success*) or 0 (*Failure*).
- At t = 1, there may be a liquidity shock.
- Bank needs to put liquidity of ρ into the project. Otherwise the return at t = 2 is 0.

Model (cont.)

Risky Asset:

- If the original bank (*A*) chooses the good project, the probability is p_H.
- If the original bank chooses the bad project, the probability is p_L.
- The other bank (*B*) has the probability $\overline{p}$, where $p_L < \overline{p} < p_H$
- Loss of value if assets change hands.

Banks and moral hazard

Banks cannot fully pledge their future returns due to moral hazard (HT-98).

- Non-pecuniary benefit of b from choosing bad projects.

$$p_H(R-r) \geq p_L(R-r)+b$$

$$R-r \geq \frac{b}{\Delta p} \Rightarrow r \leq R-\frac{b}{\Delta p}$$

- Some of the profit has to go stay with banks $\left(R_b = \frac{b}{\Delta p}\right)$
- Maximum interest satisfies: $r \leq (R-R_b)$

Lending vs. Acquisition

- The other bank (*B*) has the probability $\overline{p}$, where $p_L < \overline{p} < p_H$

- Maximum interest satisfies: $r \leq (R - R_b)$

- Purchase can be more profitable than lending:

$$\overline{p}R > p_H r$$

Market Power

- Bank *B* has liquidity at t = 1.
- Bank *A* needs liquidity at t = 1.
- If Bank *A*'s options are limited, this gives Bank *B* some market power.
- We model this using a two-stage bargaining game.

Barganing Game

Stage 1:

- Bank *A* makes an offer to Bank *B*.
- If Bank *B* accepts, the offer is implemented.
- If Bank *B* rejects:
  - With probability β, Bank B gets the chance to make a take-it-or-leave-it offer.
  - With probability (1 - β), game is over. Banks get their outside options (X_A and X_B).

Barganing Game

Stage 2:

- Bank *B* makes an offer to Bank *A*.

- If Bank *A* accepts, the offer is implemented.

- If Bank *A* rejects, banks get their outside options (X_A and X_B).

Barganing Game

Stage 2:

- Bank *B* makes a take-it-or-leave-it offer to Bank *A*.
- Offer has:
- α of Bank *A*'s assets sold to Bank *B* at price *P*.
- Bank *B* lends Bank *A* *L* units at the rate of *r* (per unit of asset left at *A*).
- Total liquidity transfer: $T = \alpha P + (1 - \alpha)L$

Stage 2

- Bank B's problem:

$$\begin{aligned} \max_{\alpha,r,T} \quad & (1-\alpha)p_H r + \alpha\overline{p}R - \alpha\rho - T \\ s.t. \quad & r \leq (R - R_b) \\ & T \geq (1-\alpha)\,\rho \\ & (1-\alpha)p_H\,(R-r) - (1-\alpha)\,\rho + T \geq X_A \end{aligned}$$

Stage 2 outcomes

- Offer:

$$r = (R - R_b),$$

$$\alpha = \left(1 - \left(\frac{X_A}{p_H R_b}\right)\right),$$

$$T = \left(\frac{X_A}{p_H R_b}\right)\rho.$$

- Bank *B*'s payoff:

$$\pi_B = (\overline{p}R - \rho) - X_A\left[1 - \frac{(p_H - \overline{p})\,R}{p_H R_b}\right].$$

Stage 1

- Bank A's problem:

$$\begin{aligned} \max_{\alpha,r,T} \quad & (1-\alpha)p_H\left(R-r\right)-\left(1-\alpha\right)\rho+T \\ s.t. \quad & r \leq (R-R_b) \\ & T \geq (1-\alpha)\,\rho \\ & (1-\alpha)p_H r+\alpha\overline{p}R-\alpha\rho-T \geq E\left(\pi_B\right). \end{aligned}$$

Bargaining game

- Solution:

$$
\begin{aligned}
r^* &= (R - R_b) \\
\alpha^* &= \max\left\{0\,;\ \left(\frac{E(\pi_B) + \rho - p_H(R - R_b)}{\overline{p}R - p_H(R - R_b)}\right)\right\} \\
T^* &= (1 - \alpha^*)\,\rho.
\end{aligned}
$$

$$E(\pi_B) = \beta\pi_B + (1-\beta)X_B$$

- As $E(\pi_B)$ increases, α* increases.
- As X_B increases, $E(\pi_B)$ increases.
- As X_A increases, $E(\pi_B)$ increases.

Main Result

- If Bank *B* lends, it needs to leave some of the profits (R_b) to Bank *A*.
- There is a limit to how much it can earn by lending: $r \leq (R - R_b)$
- However, it may force Bank *A* to sell some of its assets at low prices.
- Bank *B* may be able to earn more this way.
- Best user of assets is the original bank. So (excessive) sales result in welfare losses.

Main Result

- Fraction of Bank *A*'s assets sold to Bank *B* and the associated inefficiency:
- Increase with Bank *B*'s market power
- Increase with Bank *B*'s outside option
- Decrease with Bank *A*'s outside option
- Decrease with Bank *B*'s effectiveness at running Bank *A*'s assets

Ex-ante Liquidity Insurance (in progress)

- Bank *A* can arrange a line of credit with Bank *B*.
- As long as insurance is not full, results go through.
- Reasons for less than full insurance:
- Bank *B* can have own projects that it needs the liquidity for.
- Bank B's cost of liquidity can increase (non-verifiable).
- If non-verifiable, not full insurance.

Central Bank and Outside Options

- Bank *A* gets liquidity from “outsiders”.
- Outsiders are not as efficient as Bank *B* in running assets and monitoring Bank *A*.
- Outsiders worse than Bank *B*: $p^s_o < \overline{p}$
- Bank *B* better monitor than outsiders when lending: $R_b < R_b^{\,o}$
- Bank *A* can get a smaller amount of liquidity from outsiders.

Central Bank

- A Central Bank can alleviate the inefficiency if it can improve upon Bank *A*'s outside options

- If it can do so, then it can play a "virtual and virtuous" role:
  - CB does not have to lend in equilibrium

- Under what conditions can a Central Bank (or cannot) improve upon the market outcome?

Central Bank

- No loss-making loans and no supervision:
  - CB no better than outsiders
  - CB cannot improve upon the market outcome

- Some loss-making loans, but no supervision:
  - Akin to lowering collateral quality for lending
  - CB can reduce Bank B's market power
  - Credible? Moral hazard?

- Supervision:
  - Again, CB can reduce Bank B's market power
  - Commitment to the LOLR role, no moral hazard

Central Bank

- Suppose that the CB can better monitor banks than outsiders:

$$b \leq b^{CB} < b^{o}$$

$$R_b \leq R_b^{CB} < R_b^{o}$$

- As the Central Bank's monitoring advantage over outsiders increases, the equilibrium outcome is more efficient: Bank A borrows more from and sells less assets to Bank B.

  - Bank A's outside option X_A increases

Central Bank

- Central Banking effective at little cost as in equilibrium Central Bank does not lend to Bank *A*.
- But, there may be commitment issues…
- The Central Bank must be prepared to lend against collateral that outsiders will not lend against.
- Either suffer loss on loans ex post OR Invest in better supervision ex ante.
- Bank supervision thus naturally coincident with the liquidity provision role of Central Bank.

Further Questions

- Can Bank *B* exert power on the Central Bank?
- Fed wanted to resolve Bear Stearns before markets open.
- Only credible offer came from JP Morgan Chase.

- Coordination role of the CB
- Use of public funds

- Use of CB liquidity? Stigma?