Interbank Market Liquidity and Central Bank Intervention

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Introduction

- Despite their importance, interbank markets are little studied
  - No clear theory of how they operate and what imperfections they are subject to
- We develop a simple model to study the functioning of interbank markets and the effects of central bank intervention
  - There is no asymmetric information and no bankruptcy

Our paper

- Banks are subject to *idiosyncratic* and *aggregate* liquidity risk
- But they have difficulties in hedging these risk
  - Interbank markets are incomplete in this sense
- Market allocations can be inefficient as they lead to excess price volatility
- The central bank can correct this inefficiency through open market operations

The model

- Three dates t = 0, 1, 2, a single good
- Banks are competitive, raise deposits paying $c_1 = d$ at t = 1 and c_2 at t = 2, invest in risk free assets and trade on an interbank market
- Depositors:
  - Measure is 1, each with an initial endowment of 1
  - Utility function $u(c_t)$ for t = 1,2

- Depositors have consumption shocks

$\lambda_{\theta i}$ consume early at t = 1

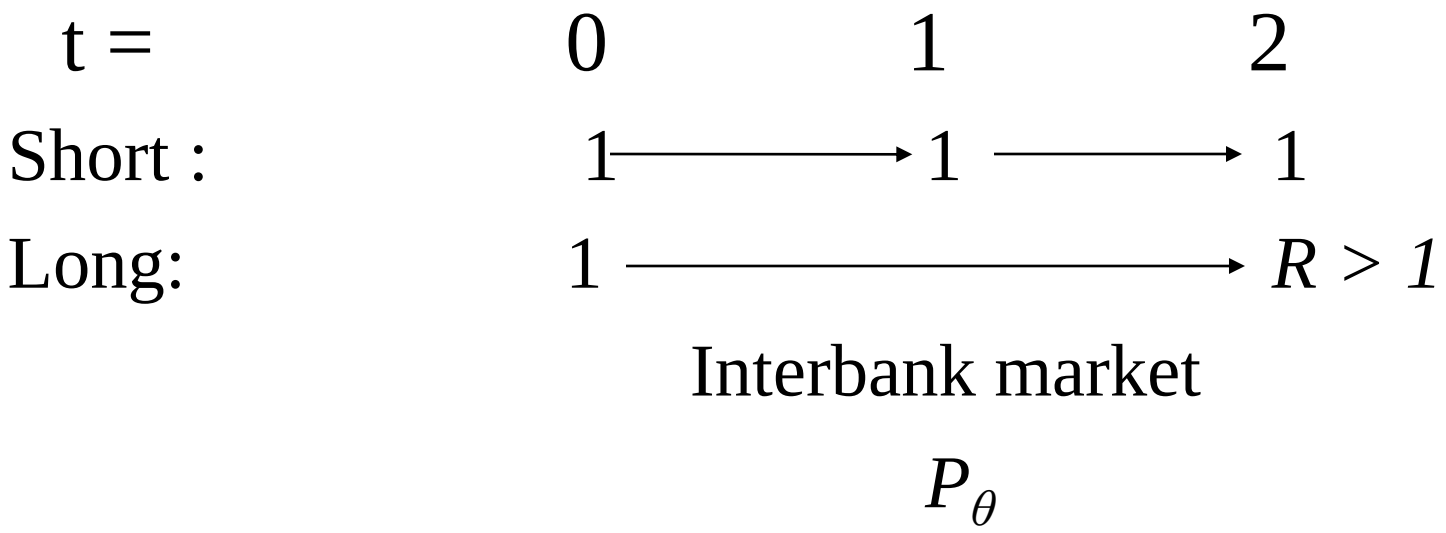
$1-\lambda_{\theta i}$ consume late at t =2

with $\lambda_{\theta i} = \alpha_i + \varepsilon\theta$

– α_i idiosyncratic risk, $\alpha_i = \begin{cases} \alpha_H = \overline{\alpha} + \eta & pr.\ 1/2 \\ \alpha_L = \overline{\alpha} - \eta & pr.\ 1/2 \end{cases}$

– $\varepsilon\theta$ aggregate risk, $\theta = \begin{cases} 0 & pr.\ \pi \\ 1 & pr.\ 1\text{-}\pi \end{cases}$

- Banks invest ***y*** in a short asset and ***1 – y*** in a long asset



- All uncertainty is resolved at t =1
- Focus on parameter space where there is **no** bankruptcy

Constrained efficient allocation

- A planner chooses *d* and *y* to maximize consumers' expected utility, subject to feasibility constraints
- Idiosyncratic risk does not matter
- Denoting $\lambda_0 = \overline{\alpha}$ and $\lambda_1 = \overline{\alpha} + \varepsilon$:
  - Always enough liquidity: $y^* = \lambda_1 \mathrm{d}^* > \lambda_0 \mathrm{d}^*$
  - Optimal consumptions c_{20}^* and c_{21}^* vary across states but **not** across banks

Interbank market allocation

- Banks solve a similar problem to the planner but interbank market prices P_θ now play an important role
- Banks choose $y = \lambda_1 d > \lambda_0 d$ so that there is excess liquidity in state $\theta = 0$
- $P_0 = R$ so banks hold both assets from t = 1 to 2

  $P_1 < 1$ so " " " " " t = 0 to 1
- This leads to *inefficient consumption volatility* across banks because of the interaction of price volatility and idiosyncratic risk

Central bank intervention

- The central bank implements the constrained efficient allocation by
  - fixing $P_0 = 1$
  - using open market operations
- There is a lump sum tax X_0 (or issuance of bonds X_1) at t = 0 to fund the central bank's portfolio
- Central bank uses its portfolio to intervene at t = 1 to inject or drain liquidity

Idiosyncratic risk only ($\eta > 0$, $\varepsilon = 0$)

- *Date 0*:
  - CB buys $X_0 = 1 - d^*$ of short asset
  - Banks choose $y^* - X_0$ of short and $1 - y^*$ of long asset

- *Date 1*:
  - CB sets $P = 1$ by buying X_0 of long asset
  - Bank i covers liquidity need $y^* - X_0 - \lambda_i d^*$ by selling long asset

- *Date 2*:
  - Banks pay $\frac{(1-y^*+y^*-X_0-\lambda_i d^*)R}{1-\lambda_i} = d^*R$
  - Lump sum grant $\frac{X_0 R}{1-\lambda}$
  - Total consumption $d^*R + \frac{X_0 R}{1-\lambda} = \frac{(1-y^*)R}{1-\lambda} = c_2^*$

- Consumption at t = 2 is the same for depositors at all banks so idiosyncratic risk is eliminated

- Opposite interpretation if $d^* > 1$
  - Security replicating short asset granted at t = 0 (“money”)
  - Security replicating long asset issued at t = 1
  - Lump sum tax at t = 2

Aggregate risk only ($\eta = 0, \varepsilon > 0$)

- *Date 0*: Banks choose y^* short and $1 - y^*$ long

- *State* $\theta = 0$

  Date 1: CB sets $P_0 = 1$ by selling to

  banks $X_1 = \varepsilon d^*$ of security replicating long asset

  Date 2: Lump sum tax and consumption c_{20}^*

- *State* $\theta = 1$: no CB intervention

Both risks ($\eta > 0$, $\varepsilon > 0$)

- Interventions above can be combined to achieve the constrained efficient allocation

- Markets "freeze" (banks stop trading with each other) in state $\theta = 0$ if $\varepsilon > \eta$ but this is constrained efficient if the central bank is intervening optimally as above

Concluding remarks

- Central bank intervention allows the market failure arising from incomplete opportunities to hedge liquidity risk to be corrected

- It does so by fixing interest rates (asset prices) and conducting open market operations

- We have shown this in the case of no bankruptcy