Macroprudential Policy with Liquidity Panics

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Research questions

- How does the corporate sector react to liquidity shortages in financial crises?
 - accumulation of liquid assets
- Does this reaction affect the banking sector and amplify crises?
 - potential feedback

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- How does the corporate sector react to liquidity shortages in financial crises?
 - accumulation of liquid assets
- Does this reaction affect the banking sector and amplify crises?
 - potential feedback
- Which are the implications for the analysis of macroprudential policy?
 - liquidity or reserve requirements
 - subsidies to bank financing
 - negative interest rates on reserves

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 - Demand for bank loans $\downarrow \Rightarrow$ loan rate $\downarrow \Rightarrow$ Probability of a banking crisis \uparrow
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 - Theoretical Result 2: Macroprudential policy
 - ► A policy that restricts lending (e.g. liquidity requirement) can increase aggregate investment... even when there is no crisis!
 - \star enhanced financial stability limits liquidity panics

Literature Review

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- Financial intermediaries and liquidity margin:
 - Bencivenga and Smith (1989), Holstrom and Tirole (1998)
- Self-fulfilling Panics:
 - Diamond and Dybvig (1983), Cooper and Ross (1998), Bebchuk and Goldstein (2010), Boissay (2011), Malherbe (2014)

Model: basic set-up

- Three-period model (t_0, t_1, t_2)
- Two kinds of agents: firms and banks
- $\bullet\,$ Risk neutral and maximize expected profits at t=2









Model: Markets



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Model: Interbank market (t_1)

Boissay, Collard & Smets (2014)

- Continuum of banks, each with N^B resources
- Heterogeneous lending skill drawn at t_1
- Competitive interbank loans market



- Informational frictions: 1) skill is private information; 2) Option to divert funds
 - Borrowing constraint: $\phi < ar{\phi}(
 ho)$

- Multiple equilibria in the interbank market:
 - Trade eq.: high-skill banks borrow from low-skill banks (ρ high)
 - Market freeze: no trade as banks have incentives to divert
- Trade eq. only exists if R^B is high enough to prevent low-skill banks from diverting



interbank market equilibria

Model: Liquidity loans market (Supply)



Liquidity loans market

- Demand depends on the marginal return of the investment opportunity at t_1
 - Decreasing returns \Rightarrow downward sloping demand



Liquidity loans market

- Demand depends on the marginal return of the investment opportunity at t_1
 - \blacktriangleright Decreasing returns \Rightarrow downward sloping demand
 - Subject to an aggregate shock A



Liquidity loans (L)

Liquidity loans market

• If $A = A_L \Rightarrow$ Banking Crisis

Liq. loans interest rate



Liquidity loans (L)

Liquidity loans market (Effect of an increase in C)

• Demand of loans depends on aggregate cash C



Liquidity loans (L)

Liquidity loans market (Effect of an increase in C)

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Liquidity loans (L)

Model: Firms at t₀

• At t_0 : Firms decide optimally on cash and capital: $MgP_C(c) \le R^K$

• Marginal Productivity of cash depends on Expected loan rate R^B

Liquidity Panics:

$$\begin{array}{c} \mathsf{Prob}(\mathsf{Banking Crisis}) \uparrow \Longrightarrow \mathsf{E}[\mathsf{R}^{\mathtt{B}}] \uparrow \Longrightarrow \mathsf{C} \uparrow \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & & \\ \end{array}$$

Model: Liquidity Panics

- Feedback loop between: liquidity accumulation by firms and banking crises
- Source of equilibrium multiplicity
- Amplification of small aggregate shocks even if best equilibrium selected
- Can generate banking crises in states of the world that would be unaffected otherwise
 - non-linear effect

Macroprudential Policy

Liquidity or reserve requirements:

- Banks are required to store a proportion F of their debt with other banks (reserves)
- Subsidies to bank financing
- O Negative interest rates on reserves

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• Non-linear effects: probability of crisis $\downarrow \Rightarrow C \downarrow \Rightarrow$ positive feedback loop

▶ confidence to move their investments from liquid assets to capital $(C \downarrow, K \uparrow)$

Conclusions

- Liquidity panics can arise when:
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Conclusions

- Liquidity panics can arise when:
 - there are endogenous banking crises and
 - firms can hoard liquidity for precautionary motives
- Macroprudential policy debate must take into account:
 - direct effect on interbank market and
 - reaction by firms and banks
 - \Rightarrow tighter policy (e.g. liquidity requirements) can increase aggregate investment

Appendix 1: Preliminary Empirical Motivation Interbank market freeze:



policy with endogenous growth/data/Amadeus/interbank1y.jpg



Appendix 1: Preliminary Empirical Motivation

Reduction in the supply of liquidity loans:



policy with endogenous growth/data/Amadeus/loans.jpg

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Appendix 1: Preliminary Empirical Motivation Liquidity hoarding by firms:



policy with endogenous growth/data/Amadeus/cash.jpg



- Banks' actions:
 - $I Store goods \Rightarrow R^s$
 - 2 Lend to other banks $\Rightarrow
 ho$
 - **③** Borrow from other banks and lend to firms $\Rightarrow \omega R^B(1+\phi) \rho \phi$
 - Source from other banks and default $\Rightarrow R^{s}(1+\theta\phi)$

where ϕ is the amount of borrowing per unit of n^B

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• Incentive compatibility constraint (no default) :

$$ho \geq R^{s}\left(1+ heta\phi
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 \Rightarrow borrowing constraint:

$$\phi \leq ar{\phi} = rac{
ho - R^s}{ heta R^s}$$

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• Banks are borrowers when:

$$\omega \geq \bar{\omega} = rac{
ho}{R^B}$$

$$\begin{array}{c|c} 0 & & \overline{\omega} & \text{borrowers} & 1 \\ \hline & & & & \\ \hline & & & & \\ \end{array}$$

Appendix 2: Interbank market





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Market rate, ρ_t



Appendix 3: Interbank market



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• At *t*₁:

► If $z_i = 1$, given c, k and the realization of A, firm i solves: max $F(A, m, k) - R^B \ell$ s, t. : $m = \ell + c$

Appendix 3: Interbank market



back to slide

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Model: Equilibrium

Given initial aggregate savings N and a distribution $F_A(A)$:

An equilibrium are prices and allocations at t_1 : $\{\rho(A), R^B(A)\}$ and $\{\phi(A), L(A)\}$, and prices and allocations at t_0 : R and $\{K, C, N^B\}$, such that:

- At *t*₁:
 - Firms optimally demand $\ell_i = L$, taking R^B as given
 - Banks maximize profits, taking R^B and ρ as given
 - Equilibrium $\{
 ho, \phi\}$ with interbank trade is selected when it exists
- At *t*₀:
 - Firms optimally choose $k_i = K$ and $c_i = C$, taking as given R
 - Banks optimally choose N^B, taking as given R
- Markets clear:
 - at t_1 : interbank lending and liquidity loan market at every state A
 - at t_0 : $N = K + C + N^B$

Macroprudential Policy: Subsidy to banks financing

• No period t_1 effects



Macroprudential Policy: Subsidy to banks financing

- Period t_0 effect: opposite to liquidity requirement
 - Marginal relief in a crisis...



Macroprudential Policy: Subsidy to banks financing

- Period t₀ effect: opposite to liquidity requirement
 - Marginal relief in a crisis... but could generate crises in more states



Macroprudential Policy: Negative rates on reserves

• Period *t*₁ effects:



Macroprudential Policy: Negative rates on reserves

• Period t_1 effects:



- Ambiguous period *t*₀ effects

 - More banks lend on a crisis: <u>w</u> ↓ ⇒ R^B ↓ ⇒ C ↓
 Banks have lower profits: Π^B ↓ ⇒ N^B ↓ ⇒ R^B ? ⇒ C ?

Macroprudential Policy: Negative rates on reserves

• Period t_1 effects:



- Ambiguous period t_0 effects
- Can be welfare improving if neutralized with banks financing subsidy