The Macroeconomics of Liquidity in Financial Intermediation[a]

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[a]This paper represents our own views, not necessarily those of the European Central Bank or Eurosystem.

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- within standard macro framework.

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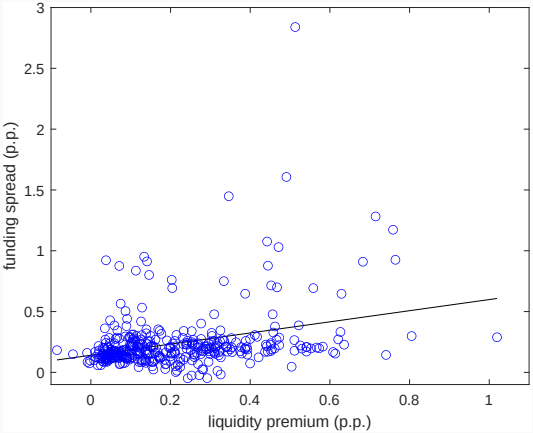
Macroeconomic effects of government-supplied liquid assets (e.g., treasuries)?

- It reduces banks' run risk $\implies$ supports lending.
- How and how much liquidity should be supplied?

Motivating evidence

1. Large fluctuations in bank-funding spreads.

2. Bank-funding spreads positively correlated with liquidity premium (US data 1991-2023)
   - Bank-funding spread = 3M LIBOR - 3M GC repo rate.
   - Liquidity premium = 3M GC repo rate - 3M T-bill rate.



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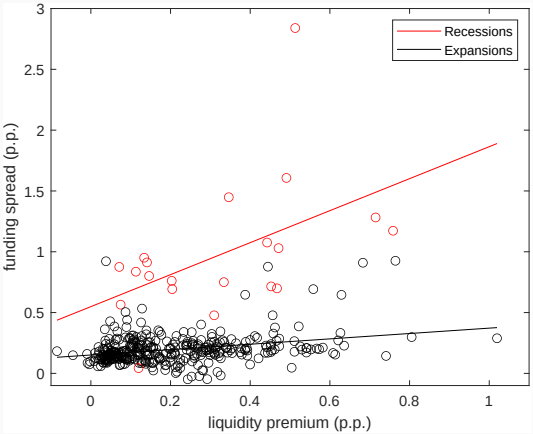

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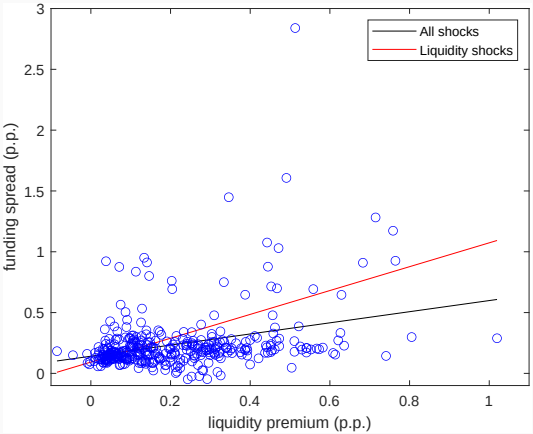

Literature

Macro-banking: Gertler and Kiyotaki (2010), Gertler and Karadi (2011), Brunnermeier and Sannikov (2014), Gertler, Kiyotaki, and Prestipino (2020), Karadi and Nakov (2021).

$\rightarrow$ different friction.

Banking theory: Diamond and Dybvig (1983), Goldstein and Pauzner (2005).

$\rightarrow$ in general equilibrium.

Demand for reserves/liquid assets: Poole (1968), Bianchi and Bigio (2022).

$\rightarrow$ different micro-foundation.

Roadmap

1. Coordination game among bank creditors.
   $\Longrightarrow$ no-run condition.

2. Macro model
   - RBC: firms, households, and government.
   - Banks.
   - Policy.

3. Calibration and quantitative exercise.

4. Empirical evidence.

No-run condition

In each period,

1. banks with net worth N choose:
   - liquidity ratio m,
   - capital ratio n.
2. Households choose whether or not to hold the deposits.

Because of illiquid-asset liquidation cost $1 - \lambda$, bank is bankrupt if too few households hold deposits.

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No-run condition:

$$\underbrace{\frac{j-\rho}{1+\rho}}_{\text{Funding spread}} \geq \underbrace{\theta}_{\text{LGD}} \underbrace{\left(\frac{1-n}{\lambda+(1-\lambda)m}-1\right)}_{\text{Bank fragility}} \tag{1}$$

Macro model

Illustrate with RBC model, but can also embed in full NK DSGE model.

1. Households save in bank debt, supply labour and consume.
2. Competitive firms rent physical capital from banks and hire labour.
3. Government supplies liquid assets (government bonds) with lump-sum taxes/transfers.

Bank behaviour

Bank maximizes PDV(dividends) s.t. BCs, no-run condition and minimum dividend payout.

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Liquidity choice:

$$\underbrace{\frac{j-\rho}{1+\rho}}_{\text{funding spread}} = \sqrt{\theta} \quad \underbrace{\sqrt{\frac{\rho-i}{1+\rho}}}_{\text{liquidity premium}} . \tag{2}$$

Illiquid-asset holdings:

$$K = \frac{N + \frac{1}{\lambda}\left[1-\lambda-\sqrt{1-\frac{\lambda}{\theta}\left(\frac{r-\rho}{1+\rho}+\theta\right)}\right] M}{\sqrt{1-\frac{\lambda}{\theta}\left(\frac{r-\rho}{1+\rho}+\theta\right)}} \tag{3}$$

where $(r-\rho)/(1+\rho)$ is the credit spread.

Policy

- Real effects of liquidity supply.

Optimal policy sets spreads equal to zero, but

- implementation requires $M \to +\infty$.
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- steady-state bank net worth is zero.

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More modest policy recommendation is to stabilize spreads.

- Respond to shocks with liquidity supply.

$\to$ Mitigate amplification of shocks.

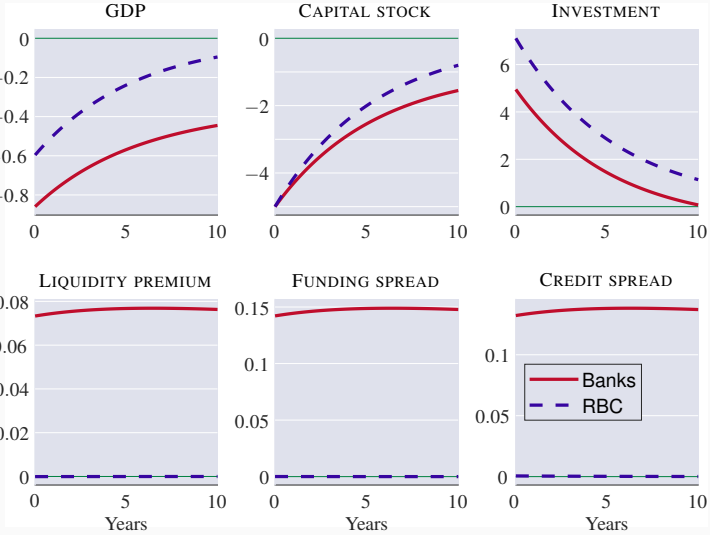
Calibration: targets and parameters

- A model period is one month. • Data 1986–2008.

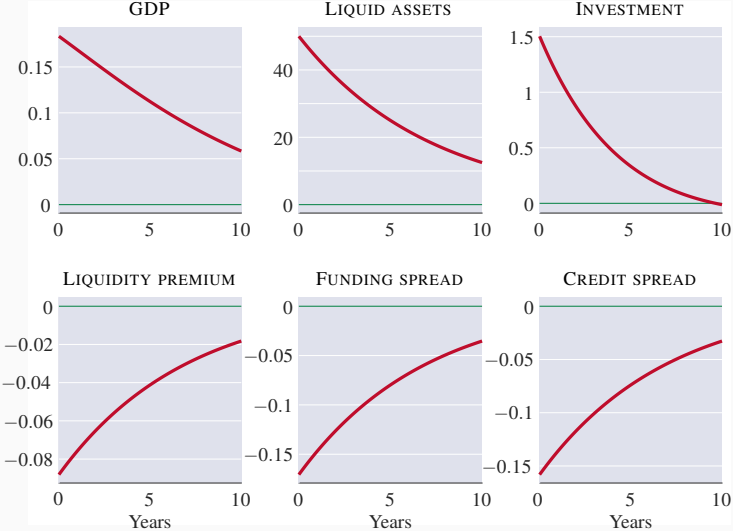
Description	Notation	Value
Real Treasury Bill rate	i	1.9%
Real return on bank equity	q	7.6%
Credit spread	$r - i$	2.1%
Liquidity premium	$\rho - i$	0.24%
Bank capital ratio	n	8.1%

Description	Notation	Value
Bank-asset liquidity relative to T-bills	λ	0.632
Loss given bank default	θ	0.003
Minimum dividend distribution	γ	0.0063
Subjective discount factor	β	0.998
Elasticity of intertemporal substitution	σ	1
Frisch elasticity of labour supply	ψ	3
Capital elasticity of output	α	1/3
Depreciation rate	δ	0.0063

One-off 5% capital destruction shock



Increase in supply of liquid assets



Empirics: does liquidity reduce spreads?

OLS with **daily** data (2005–22): spreads regressed on Treasuries

- Controls:
  1. 30 lags (treasuries, bank-funding spread, liquidity premium, 3M GC repo rate, 10-year treasury yield, corporate-bond yield, TGA balance, S&P 500, S&P financials, VIX).
  2. dummies (weekday, day, month, NBER recession, linear trend).

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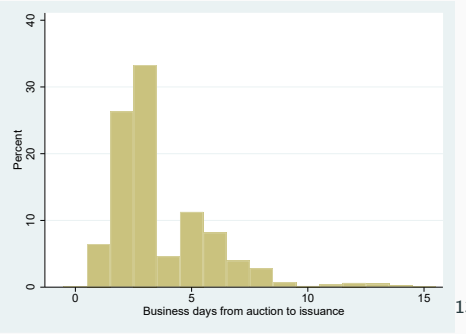
- Identification:
  1. Supply of treasuries does not respond to endogenous variables *within a day*.
  2. Daily supply of treasuries is known in advance by mkt participants.
  3. Lags capture persistent response of treasuries to past economic events.



Empirics: effects of Treasury issuance

$$\mathrm{y}_t - \bar{y}(\mathrm{lags}_t, \mathrm{dummies}_t) = \beta \left[M_t - \bar{M}(\mathrm{lags}_t, \mathrm{dummies}_t) \right] + \epsilon_t$$

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	Funding spread	Liquidity premium	Risk-free rate
log Treasuries	-1.7***	-1.7***	1.3***
	(0.4)	(0.5)	(0.4)
R-squared	99%	91%	100%

Note 1: Bootstrapped standard errors are reported in parentheses.
Note 2: Interest rates are measured in basis points.
Note 3: Funding spread is 3M LIBOR - 3M repo rate. Liquidity premium is 3M repo rate - 3M T-bill rate. The risk-free rate is the 3M repo rate.

Conclusion

Macro model + bank fragility.

Coordination game among bank creditors:

1. Fragility is costly because funding costs $\uparrow$.
2. Leverage $\downarrow$ and liquidity $\uparrow$ $\implies$ fragility $\downarrow$.

Macro model:

1. Demand for liquid assets.
2. Amplification and propagation of shocks via spreads.
3. Liquidity supports bank lending and economic activity.

Quantitative exercise: After capital-destruction shock, GDP falls 40% more and more persistently.

Empirical evidence shows supply of liquidity reduces bank-funding spread.