Liquidity provision and co-insurance in bank syndicates

Kevin Kiernan‡ Vladimir Yankov† Filip Zikes†

(†)Federal Reserve Board

(‡) Fannie Mae [1]

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[1] Disclaimer: Views expressed herein are those of the authors and do not reflect those of the Federal Reserve Board or Fannie Mae.

Motivation (1/2)

- Banks are important providers of liquidity to the corporate sector in stress periods.
  - Inflow of insured deposits during stress creates synergy between deposit-taking and provision of credit lines that economizes on banks' liquidity holdings and hedges corporate liquidity risks.
  - Global Financial Crisis challenged banks' ability to serve as liquidity providers without explicit government support.
- Liquidity regulation required *individual* banks to have liquidity positions that are adequate relative to banks' credit line exposures and stability of funding.
- While individual large U.S. banks now have strong liquidity positions, the capacity of the banking system as a whole to withstand large simultaneous drawdowns on credit lines has yet to be assessed.

Motivation (2/2)

- Bank exposures to the corporate sector are substantial
  - The banking system provides close to $4 trillion in undrawn credit line commitments to the corporate sector
  - Close to 70 percent of credit lines are to large corporate borrowers and are syndicated
  - Around $400 billion of syndicated credit lines are in the form of on-demand components called sublimits
- A potentially complex network of interbank obligations arises that could either co-insure these liquidity risks or amplify liquidity shocks across the banking system
- Banks' liquidity capacity is co-determined with borrowers' liquidity management choices (credit lines vs cash) and likelihood to draw in a stress period

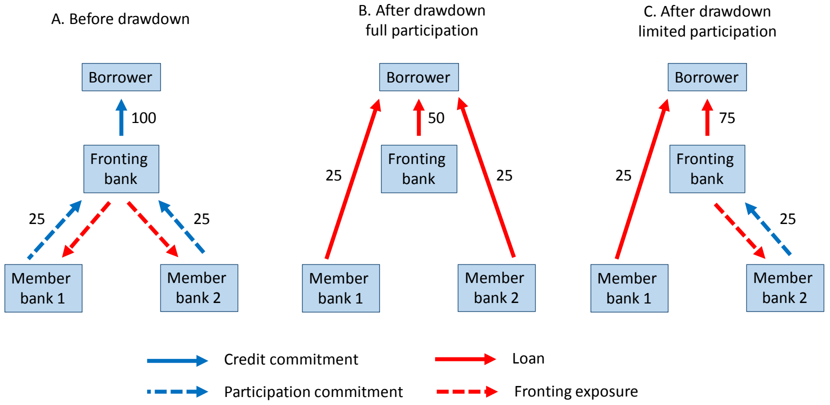
Overview of results

1. Develop a simple model of liquidity capacity defined as a solution to a system of budget constraints that incorporates
   - The interbank network resulting from the process of syndication
   - Liquidity stress scenarios based on historical data and observed credit line contracts
2. Examine how banks' liquidity capacity is affected by regulation and has changed since the GFC 2007-2009
3. Show that higher liquidity capacity increases reliance on credit lines and reduces cost of credit

Loan syndication, sublimits, and fronting exposures

- Loan syndication is a form of risk-sharing arrangement among several banks
  - Drawdowns on credit lines normally requires participation of all syndicate banks and liquidity is available with some delay
  - Sublimits are components of credit lines such as swing lines and letters of credit that are available to draw on demand
- A designated "fronting bank" (could be different from lead) assumes all sublimit drawdowns on behalf of the syndicate
- Fronting bank requests participation by member banks through a set of fronting exposures and commitments to participate

Liquidity co-insurance through fronting exposures



Data

- Information on syndicated bank credit lines:
  - Refinitiv and Loan Connector (DealScan)
  - Information on credit line utilization CapitalIQ and FR Y-14
  - Information on sublimits (DealScan) and fronting exposures (FR Y-14)
- Bank balance sheet information: FR Y-9C and LCR disclosures
- Borrower information: S&P Compustat, CRSP, Moody's Analytics and CreditEdge, and S&P Capital IQ
- Final dataset: 5451 borrowers, 754 bank holding companies, sample period 2004:Q1 until 2020:Q2
  - We include non-financial borrowers along with financials and utilities

Liquidity capacity as a system of budget constraints

Assets	Liabilities
HQLA (L_i) Illiquid loans (Z_i)	Equity E_i Deposits D_i Uninsured debt B_i
Undrawn revolvers U_i Fronting exposures $\sum_j f_{i,j}$	Participation commitments $\sum_j f_{j,i}$

- N banks endowed with heterogeneous balance sheets and exposures to the corporate sector
- Syndication of credit lines creates a network of fronting exposures and participation commitments $F := \{f_{i,j}\}$

- In a stress scenario, firms draw a fraction of unused credit lines $\alpha := \{\alpha_k\}_{k=1}^{K} \in [0,1]^K$ and banks experience outflow of uninsured debt.
- Assumptions
  - Limited liability and priority of debt obligations
  - No fire sales of illiquid assets
  - If illiquid, banks service drawdowns in proportion to contractual exposures.
  - No inflows of deposits either retail or corporate
  - No access to government liquidity backups

Liquidity capacity as a system of budget constraints

Assets	Liabilities
HQLA $(L_i - \lambda_B B_i - \bar{p}_i(\alpha))$	Equity E_i
Illiquid loans (Z_i)	Deposits D_i
Drawdowns $\bar{d}_i(\alpha)$	Uninsured debt $(1-\lambda_B)B_i$
$\sum_j \bar{f}_{i,j}(\alpha)$	$\sum_j \bar{f}_{j,i}(\alpha)$
Undrawn revolvers $U_i - d_i(\alpha)$	
$\sum_j (f_{i,j} - \bar{f}_{i,j}(\alpha))$	$\sum_j (f_{j,i} - \bar{f}_{j,i}(\alpha))$

- Bank i receives request for funds

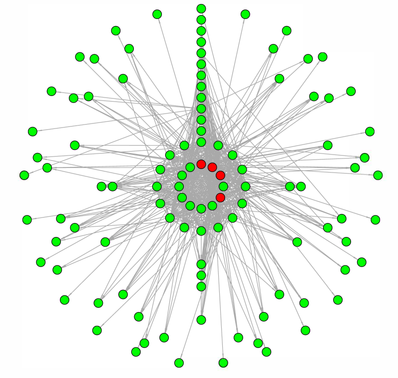
$$\bar{p}_i(\alpha) = \sum_{k=1}^{K} \bar{d}_{k,i}(\alpha) + \sum_{j=1}^{N} \bar{f}_{j,i}(\alpha), \quad \text{for } i = 1, .., N.$$

- Feasible payment

$$p_i(\alpha) \leq L_i - \lambda_B B_i + \sum_{j=1}^{N} f_{i,j}(\alpha), \quad \text{for} \quad i = 1, .., N,$$

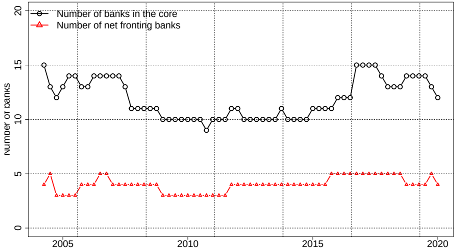
- Equilibrium payment $\{p_i^*(\alpha)\}_{i=1}^N$ solved using the fictitious sequential default algorithm of Eisenberg and Noe (2001)
- Liquidity capacity of the banking sector characterized by:
  - Set of illiquid banks and their shortfalls $p_j^*(\alpha) < \bar{p}_j(\alpha)$ for $j \in N_D$
  - System-wide liquidity shortfalls $\sum_{j=1}^{N_D} \left(\bar{p}_j(\alpha) - p_j^*(\alpha)\right)$
  - Liquidity reallocation through fronting exposures
  - Drawdown feasibility is the maximum drawdown rate before liquidity shortfall $max_u\{p_i^*(u) \leq \bar{p}_i(u)\}$, for $i = 1, .., N$.

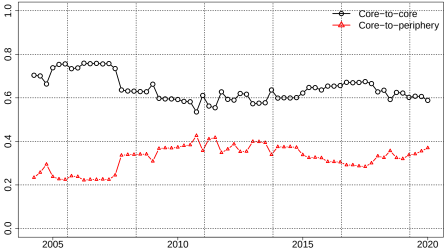
Interbank network



- A well-defined core-periphery structure
- Core consists of largest banks
- Significant net fronting exposures at a few banks in the core (in red)

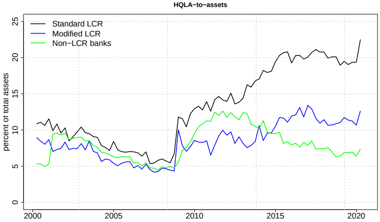
Core-periphery structure

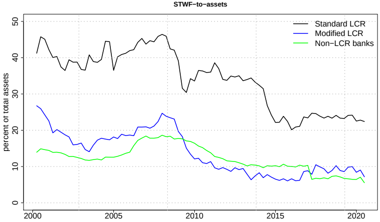




- Core-periphery structure relatively stable over time
- More than 95 percent of fronting exposures concentrated at the core
  - About 60 percent of those are among core banks ("core-to-core")
  - Remaining fronting exposures are from core banks to periphery ("core-to-periphery")

Balance sheet liquidity



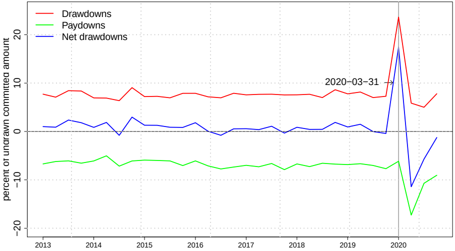


- Large banks subject to liquidity regulation (LCR) significantly increase liquidity positions (HQLA)
    - The more stringent standard LCR group increased liquidity the most.
    - Non-LCR banks have been reducing liquidity
- Standard LCR banks also significantly reduced reliance on unstable short-term wholesale funding (STWF)

Liquidity stress scenarios

Drawdowns, paydowns, and net drawdowns

Drawdown rate	GFC 2007-2009 (2)	COVID 2020Q1 (4)	EAD 2019Q4 (5)
Aggregate	8.8	15.6	53.6



- We calibrate drawdown rates (α) to match those observed during the GFC, COVID, and bank-reported expected drawdown rates at default (EAD).
- We also examine uniform drawdown rates ranging from 0 to 100.
- Funding shock $\lambda_B = \{0, 10\%\}$

Drawdowns in liquidity stress scenarios

	2006Q4			2019Q4		
Drawdowns	GFC	COVID	EAD	GFC	COVID	EAD
Amount ($bn)	214	281	971	528	645	2,321
— Sublimits ($bn)	21	26	91	31	36	134
% of HQLA	28	37	129	16	19	69
% of (HQLA-0.1 $\times$ STWF)	68	89	308	18	22	78

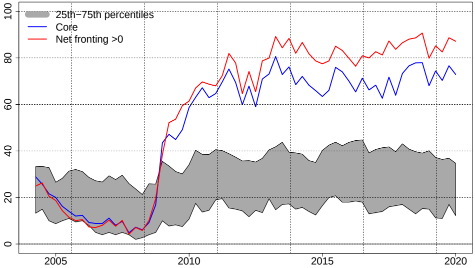
- For the GFC and COVID scenarios in 2006 and 2019, banking system had enough HQLA to cover drawdowns even with SWTF outflows.
- The distribution of liquidity in the banking system matters as well as the ability of the syndication interbank network to reallocate and co-insure the liquidity shock.

Liquidity capacity in 2006 (pre-GFC) and 2019 (post-GFC)

	2006Q4			2019Q4		
Drawdown rate (α)	GFC	COVID	EAD	GFC	COVID	EAD
	Outflows of short-term wholesale funding ($\lambda_B = 10\%$)					
Banks with shortfall (#)	35	41	63	16	20	51
—LCR banks	4	6	10	2	2	4
—Core banks	6	8	14	0	0	1
—Net fronting banks	1	3	4	0	0	0
Liquidity shortfall ($bn)	58	94	728	90	115	856
—% of drawdown	27	33	75	17	18	37
Net fronting ($bn)	6	8	65	2	3	32
—% of sublimit drawdown	27	32	71	6	7	24

- The liquidity capacity of core banks has increased significantly due to both increased balance sheet liquidity and reduced reliance on short-term funding.
- Caevet: We do not impose capital and liquidity requirements in stress scenario. In simulations, we show that capital requirements are not breached. However, many LCR banks would breach their LCR regulatory minima.

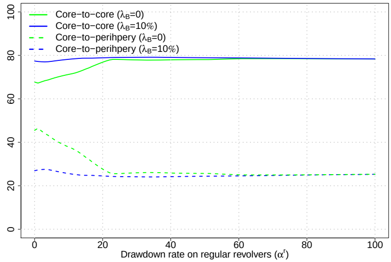
Liquidity capacity as drawdown feasibility



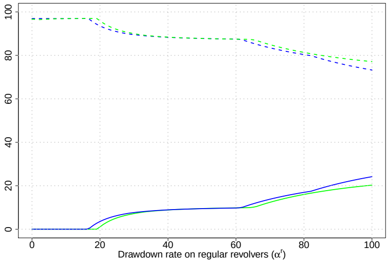
- Drawdown feasibility: the maximum drawdown rate that a bank can sustain before becoming illiquid.
- Significant increase in drawdown feasibility at banks in the core and especially at net fronting banks in the post-GCF period
- However, more than a quarter of banks cannot honor drawdowns of 20 percent or higher

Liquidity insurance through fronting exposures

2006



2019



- Liquidity reallocations through fronting have shifted from reallocations among core banks (core-to-core) in 2006 to reallocations from core banks to periphery in 2019.

Liquidity management

- Test whether and how bank liquidity influences corporate liquidity management
  - Test for the presense of assortative matching on liquidity characteristics

$$\mathit{LiqMan}_{k,t} = \beta_L' \mathit{Liquidity}_{i,t-1} + \beta_E' \mathit{Capital}_{i,t-1} + \beta_D' \mathit{Deposits}_{i,t-1} + \alpha_k + \beta_i + \tau_t + \gamma' X_{k,t-1} + \epsilon_{k,i,t}$$

  - Measure the effects of bank liquidity on the cost of credit

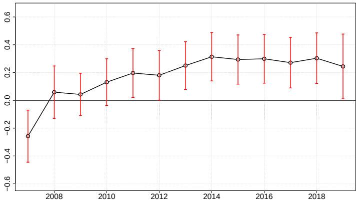
$$\mathit{Spread}_{k,i,t} = \beta_L{}' \mathit{Liquidity}_{i,t-1} + \beta_E' \mathit{Capital}_{i,t-1} + \beta_D' \mathit{Deposits}_{i,t-1} + \alpha_k + \beta_i + \tau_t + \lambda' \mathit{LiqMan}_{k,t-1} + \gamma' X_{k,t-1} + \xi_{k,i,t}$$

- $\mathit{LiqMan} = \{$Cash/Assets,Revolver/Assets,Revolvers/Liquidity$\}$ and $X_{k,t-1}$ includes measures of firm credit risk, systemicness (MES), and Tobin's Q.
- $\mathit{Spread} = \{$all-in-spread drawn (AISD), all-in-spread undrawn (AISU)$\}$
- Firm (α_k), bank (β_i), and time fixed effects (τ_t)

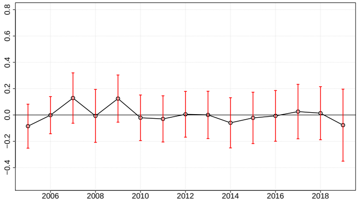
Matching on liquidity characteristics and cost of credit

Firm revolver-to-assets and bank liquidity:

Lead bank HQLA-to-assets



Member banks' HQLA-to-assets



Coefficient estimates and 5/95 confidence intervals

- Lead banks with 10 percentage point higher HQLA-to-asset ratio lend to firms with 2 pp higher revolver-to-asset ratio and 1 pp lower cash-to-assets ratio.
  - AISD and AISU spreads are 8 bps and 3 bps lower, respectively.
- Firms that borrow from a net fronting bank have 9 pp higher revolver-to-liquidity ratio and 2 pp lower cash-to-asset ratios.
  - AISD and AISU spreads are 44 bps and 5 bps lower, respectively.
- $\Rightarrow$ Evidence for assortative matching on liquidity characteristics. Significant impact of liquidity capacity on cost of credit.

Conclusion

- We have provided a simple model of the capacity of banks to serve as liquidity providers to the corporate sector and characterized its determinants
- We have shown that liquidity of banks influences liquidity management choices of large corporate firms and reduces the cost of credit
- The liquidity capacity measure could be used to tailor the size of future government interventions designed to stabilize credit and funding markets in a stress period
- Incorporating liquidity regulation policies in the model could allow to study optimal liquidity regulation