

QE, Bank Liquidity Management, and Non-Bank Funding: Evidence from Administrative Data

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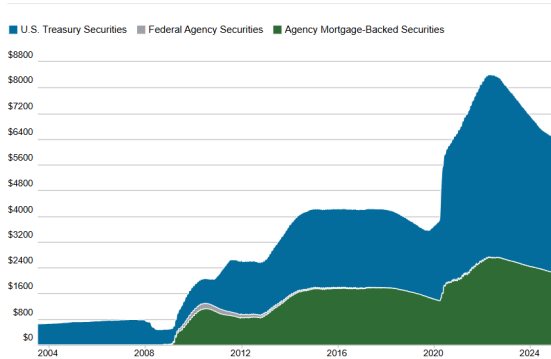
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The Micro and Macro of Financial Intermediation
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Motivation 1: Quantitative Easing (QE) prominent post GFC

- Unprecedented expansion of central bank balance sheets since the GFC



Federal Reserve System Domestic Securities Holdings

QE with Banks: Asset Swap

- Typically, QE involves a swapping of OMO eligible securities for reserves at banks balance sheets

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	Liabilities
Securities	Reserves held by banks Cash

BANKING SECTOR	
Assets	Liabilities
Securities Reserves at the Fed	Deposits Capital

The Fed Purchases Assets from Banks

FEDERAL RESERVE	
Assets	Liabilities
Securities +\$1	Reserves held by banks +\$1 Cash

BANKING SECTOR	
Assets	Liabilities
Securities -\$1 Reserves at the Fed +\$1	Deposits Capital

QE with Non-banks: Banks BS Expansion

- QE purchases from non-banks involves more than an expansion of Fed's balance sheet and an asset substitution for banks

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	Liabilities
Securities	Reserves held by banks Cash

BANKS	
Assets	Liabilities
Securities Reserves at the Fed	Deposits Capital

NON-BANKS	
Assets	Liabilities
Deposits Securities	Net worth

The Fed Purchases Assets from Non-Banks

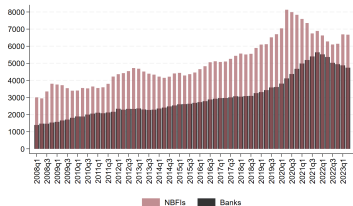
FEDERAL RESERVE	
Assets	Liabilities
Securities +\$1	Reserves held by banks +\$1 Cash

BANKS	
Assets	Liabilities
Securities Reserves at the Fed +\$1	Deposits +\$1 Capital

NON-BANKS	
Assets	Liabilities
Deposits +\$1 Securities -\$1	Net worth

Motivation 2: Non-banks Rise and links between Banks/Non-banks via QE

- There has been a massive rise of nonbank intermediaries over the last decade (Irani et al., 20)
- NBFIs heavily participated in the pandemic-QE by selling assets via banks as NBFIs cannot hold reserves → surge in uninsured, fragile NBFIs deposits for banks (Acharya & Rajan, 25) **Bank Fragility**



Banks and NBFIs holdings of OMO eligible securities



NBFIs deposits

This paper

- **Question:** How does QE work via a *bank-nonbank* channel? What are the financial stability implications and associated real effects? Examine:
 - ▶ *Banks' liquidity risk management* across deposits liabilities and credit exposures to deal with an increase in funding fragility
 - ▶ *Implications* of banks' risk liquidity management imply *for QE effectiveness*
- **Administrative data** on banks' deposits and loans matched to bank & firm balance sheets, including links between banks and nonbanks, and deposit rates from Ratewatch
- **Rich heterogeneity** across: (i) banks, (ii) deposit counterparties (including nonbanks); (iii) firms
- **Identifying differentially “exposed” banks** to QE-injection based on the shares

$$Shares_b = (NBFI \text{ Uninsured Deposits} / \text{Deposits})_{Feb-20}$$

This *shares* variable is balanced across size, risk, capital across banks.

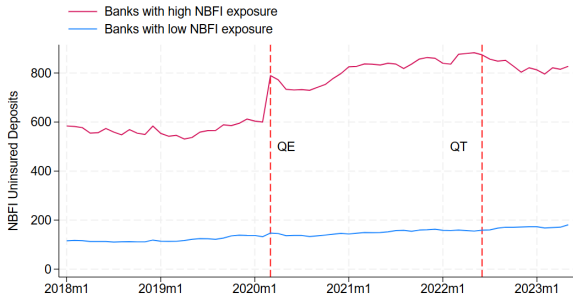
Preview of key results

- Exposed banks see a **rapid and persistent rise in uninsured NBFIs deposits** post-QE
- They engage in **liquidity risk management on both liabilities and assets**
- On the liabilities side, **they gradually shift from uninsured to insured deposits**
 - ▶ **Immediate price changes suggest bank-driven adjustment:** higher rates on insured, lower on uninsured deposits
- On the asset side, **they reduce contingent liquidity risk via credit lines**
 - ▶ Lower credit-line commitments, driven by cuts to undrawn (off-balance sheet) lines
- **Firms linked to exposed banks face negative real effects**
- **Unintended consequences of QE for MP effectiveness via bank risk management**

Uninsured NBFIs deposits and QE

Uninsured NBFIs Deposits

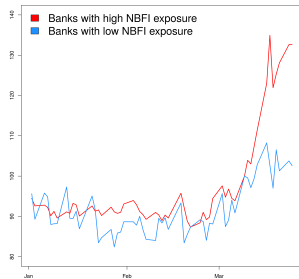
Monthly deposits (bn USD)–All banks



Source: FR2052a

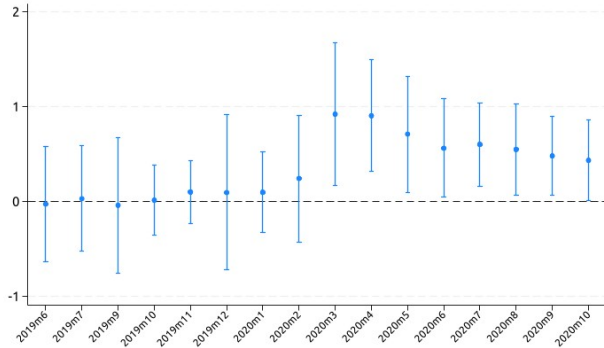
Note: Units are in Billions USD. Includes all daily and monthly FR2052a filers; monthly observations.

Daily deposit growth–GSIBs



Parallel trends

$$\text{Log}(\text{Un. NBF}I_{i,t}) = \sum_{t=1}^T \lambda_{1,t}(\text{Month}_t \cdot \text{Shares}_i) + \beta \log(\text{TA}_{i,t}) + a_i + a_t + \varepsilon_{i,t}$$



Notes: Vertical bars represent 95% confidence intervals.

NBFI uninsured deposits and QE

	1	2	3	4	5	6	7	8	9
Dependent variable:	Log(Uninsured NBFI deposits)								
QE*Shares	0.286*** (5.258)	0.288*** (5.436)	0.272*** (4.655)	0.268*** (4.813)		0.263*** (4.469)	0.277*** (5.358)	0.290*** (4.813)	0.273*** (3.393)
Bank size		0.353*** (3.503)	0.347*** (3.365)	0.342*** (3.446)	0.354*** (3.507)	0.738*** (7.509)	0.355*** (3.511)	0.353*** (3.488)	0.756*** (7.375)
QT*Shares			-0.099 (-1.196)						0.029 (0.351)
QE*GSIBS				0.047** (2.340)					-0.016 (-0.615)
QE (SLR rel.)* Shares					0.209*** (3.137)				
QE (SLR act.)* Shares					0.362*** (7.279)				
NBFI credit						0.046*** (3.008)			0.046*** (2.774)
BD*VIX							0.002** (2.232)		0.004** (2.126)
Shares*VIX								-0.000 (-0.055)	-0.002 (-0.380)
Month FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,079	2,077	2,077	2,077	2,077	2,066	2,077	2,077	2,066
R-squared	0.968	0.968	0.968	0.968	0.968	0.970	0.968	0.968	0.970

Notes: *QE* and *QT* are dummies set to one from March 2020 to March 2022 and from June 2022 onwards, respectively.

Liquidity risk management:

Liabilities side

Uninsured and insured deposits

	1	2	3	4
Dependent variable:	Log(Total deposits)	Log(Total uninsured deposits)	Log(Total uninsured deposits exc. NBFI)	Log(Total insured deposits)
QE * Shares	-0.049 (-1.374)	-0.253*** (-6.469)	-0.398*** (-8.444)	0.811*** (8.329)
Bank control	Y	Y	Y	Y
QT control	Y	Y	Y	Y
Month FE	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Observations	2,145	2,145	2,145	2,000
R-squared	0.988	0.981	0.980	0.970

Bank control indicates whether we control for time-varying bank size (logarithm of total assets), and the *QT control* indicates whether the interaction term $QT_t \cdot Shares_i$ is included.

Deposit Rates: Evidence of Bank Adjustment

	1	2	3	4	5	6
Dependent variable:	Rates on Insured Deposits			Rates on Uninsured Deposits		
QE * Shares	0.499*** (6.954)	0.614*** (10.872)	0.609*** (10.925)	-0.557*** (-5.769)	-0.631*** (-5.505)	-0.632*** (-5.530)
Bank control			Y			Y
QT control		Y	Y		Y	Y
Month FE	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y
Observations	1,677	1,677	1,677	838	838	838
R-squared	0.714	0.716	0.718	0.521	0.522	0.522

Bank control indicates whether we control for time-varying bank size (logarithm of total assets), and the *QT control* indicates whether the interaction term $QT_t \cdot Shares_i$ is included.

Liquidity risk management:

Assets side

Credit lines, Term loans, and Total Loan Commitments

	1	2	3	4	5	6
Dependent variable:	Log(Credit lines)		Log(Term loans)		Log(Total commitments)	
QE*Shares	-0.095** (-2.063)	-0.076* (-1.783)	0.065 (0.752)	0.110 (1.394)	-0.142*** (-3.212)	-0.153*** (-3.603)
Bank controls	Y	Y	Y	Y	Y	Y
QT control	Y	Y	Y	Y	Y	Y
Bank*Firm FE	Y	Y	Y	Y	Y	Y
ILST FE	Y		Y		Y	
Firm*Time FE		Y		Y		Y
Observations	632,635	317,776	236,988	95,199	919,369	391,659
R-squared	0.966	0.944	0.953	0.918	0.962	0.935

QE is a dummy set to one from March 2020 to March 2022, and *Shares* indicates the share of uninsured NBFI deposits in total deposits as of February 2020. The *Bank control* indicates whether we control for time-varying bank size, reserves, treasuries & agency securities, insured and uninsured deposits. The *QT control* indicates whether the interaction term $QT_t \cdot Shares_i$ is included.

Without controls

Utilized & Undrawn Credit Lines

	1	2	3	4
Dependent variable:	Log(Utilized credit lines)		Log(Undrawn credit lines)	
QE*Shares	-0.005 (-0.041)	-0.058 (-0.566)	-0.291*** (-4.855)	-0.182*** (-4.021)
Bank controls	Y	Y	Y	Y
QT control	Y	Y	Y	Y
Bank*Firm FE	Y	Y	Y	Y
ILST FE	Y		Y	
Firm*Time FE		Y		Y
Observations	408,805	184,557	550,076	300,783
R-squared	0.860	0.874	0.897	0.942

QE is a dummy set to one from March 2020 to March 2022, and *Shares* indicates the share of uninsured NBFI deposits in total deposits as of February 2020. The *Bank control* indicates whether we control for time-varying bank size, reserves, treasuries & agency securities, insured and uninsured deposits. The *QT control* indicates whether the interaction term $QT_t \cdot Shares_i$ is included.

Without controls

Interest rate on credit lines and new credit lines

Liquidity constrained firms

Dynamic adjustment

Model:

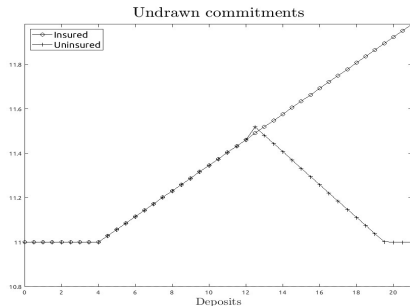
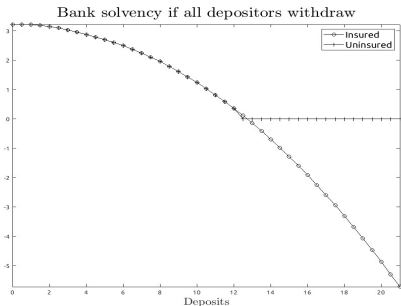
Undrawn commitments & uninsured deposits

Conventional wisdom and a new stylized model

- Kashyap, Rajan, and Stein KRS (2002) show strong synergies between deposits and credit lines:
Banks increase the extension of credit lines when they receive more deposits
 - ▶ (Costly) liquid asset holdings to satisfy deposit withdrawals or credit-lines utilization
 - ▶ If deposit-withdrawals and credit-line-utilization are imperfectly correlated, synergies exist
- We find the opposite result when looking at (large) runnable uninsured NBFIs deposits

Intuition and mechanism

- Liquidity management with runnable deposits requires considering off-equilibrium, self-fulfilling withdrawals, not just withdrawals expected in equilibrium— “*KRS meets Diamond-Kashyap*”
 - ▶ Run-proof condition: Bank is solvent even if all depositors withdraw and bank resorts to more expensive wholesale funding
- After a point this gets costly and banks reduce their lines of credit despite higher deposit funding
- This mechanism is absent if one considers insured, not runnable, deposits



Firm-level evidence

Firm level effects

	1	2	3	4	5	6
Dependent variable:	Log(Utilized credit lines)	Log(Undrawn credit lines)	Log(Term loans)	Log(Total commitments)	Log(Other borrowing)	Log(Investment)
QE *Bank-firm relationship shares	-0.014 (-0.515)	-0.071*** (-2.926)	0.001 (0.072)	-0.014* (-1.800)	-0.006 (-0.226)	-0.354*** (-4.130)
QT *Bank-firm relationship shares	-0.105** (-2.729)	-0.095*** (-3.507)	0.036 (1.428)	-0.029** (-2.301)	-0.080** (-2.710)	-0.454*** (-3.573)
Observations	223,976	256,001	122,718	497,200	264,437	43,199
R-squared	0.820	0.798	0.929	0.951	0.914	0.817
ILST FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y

Firm's exposure to QE captures the loan relationships with exposed banks, measured by a dummy equal to one for firms with more than 50% of their lending relationships with more exposed banks at 2019Q4.

Summary

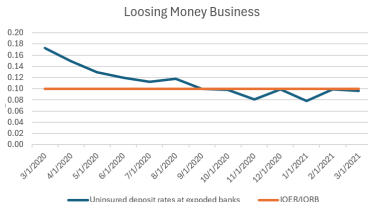
Summary of results

- QE induces an increase in uninsured deposits at banks when buying assets from NBFIs
- Banks respond to the higher funding fragility by adjusting both their deposits and loans, thus doing liquidity risk management
- More exposed banks shift from uninsured to insured deposits (in volumes, with rates going in the opposite way, suggesting bank-driven results)
- More exposed banks reduce contingent liquidity risk by cutting (undrawn) credit lines, with negative real effects for firms
- Results suggest some **unintended consequences of QE in terms of effectiveness of monetary policy via risk management of banks**

Appendix

QE influx of Uninsured Deposits and Bank Fragility

- QE results in a 1-to-1 increase in Uninsured NBFI Deposits and Reserves
- Bank fragility deteriorates for two reasons:
 1. Reserves are fungible and the bank may not use them to "back" uninsured deposits 1-to-1
 - Funding reserves with uninsured deposits is unprofitable at the ZLB (even excluding non-interest costs)



2. Banks' target liquidity buffers deteriorate causing re-adjustment
 - Banks hold excess liquidity over expected outflows either as buffers over LCR or due to stricter internal liquidity requirements: $\frac{120}{100} > \frac{120+1}{100+1}$
 - A 1-to-1 increase in reserves and NBFI uninsured deposits results in an average 2pp drop in buffers

Descriptive statistics: Aggregate volumes

Panel A: Deposit Funding by Counterparty								
	Feb-20	Mar-20	Pre QE		QE		QT	
	Mean	Mean	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Uninsured NBFI	746.6	953.6	699.7	42.2	978.7	72.6	1051.1	93.2
Insured NBFI	19.3	19.4	23.3	2.3	17.6	4.5	49.3	21.2
Uninsured Retail	1,383.9	1,449.6	1,240.7	56.9	1,750.5	217.5	2,007.1	100.5
Insured Retail	3,573.0	3,738.5	3,281.2	119.5	4,162.5	214.8	4,575.1	159.3
Total Deposits	9,287.5	9,987.6	8,466.6	53.3	11,362.6	771.7	12,480.8	495.5

Panel B: Bank Exposure to Insured and Uninsured Deposits							
	Uninsured NBFI Ratio		Insured Retail Ratio		Total Uninsured Ratio		
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	
Banks with low NBFI Share	2.12%	1.79%	53.84%	16.39%	40.63%	15.65%	
Banks with high NBFI Share	22.84%	20.14%	17.66%	15.40%	78.69%	17.59%	

Panel C: Statistics on Loan-Level Data						
Period	Total Commitments	Utilized & Drawn Credit	Undrawn Credit Lines	Utilized Credit Lines	Term Loans	
2019q4	1.73	0.70	1.03	0.44	0.27	
2020q1	1.76	0.86	0.90	0.58	0.29	
Pre-QE	1.37	0.55	0.82	0.35	0.21	
QE	1.76	0.66	1.10	0.40	0.25	
QT	1.96	0.75	1.21	0.45	0.30	

Note: Panel A contains the distribution of deposits by counterparty type in billions of USD. Panel B provides comparative statistics on deposit ratios for banks with different shares of NBFI deposits as of February 2020. Panel C displays aggregated summary statistics of loan-level data in trillions of USD.

List of banks in FR 2052a and FR Y-14 samples

Bank Name	Total assets (\$ bn)	Total deposits (\$ bn)	C&I/TA	CR	LCR
JPMORGAN CHASE & CO\$ ⁺	2688	1563	0.05	0.14	1.16
BANK OF AMER CORP\$ ⁺	2434	1435	0.10	0.13	1.16
CITIGROUP\$ ⁺	1951	1071	0.04	0.13	1.15
WELLS FARGO & CO\$ ⁺	1928	1323	0.09	0.13	1.20
GOLDMAN SACHS GROUP THE\$ ⁺	993	190	0.02	0.15	1.27
MORGAN STANLEY\$ ⁺	895	190	0.02	0.19	1.34
U S BC	495	362	0.16	0.11	1.07
PNC FNCL SVC GROUP	410	289	0.22	0.11	1.07
TD GRP US HOLDS LLC	409	285	0.08	0.16	1.06
CAPITAL ONE FC	390	263	0.10	0.14	1.41
BANK OF NY MELLON CORP\$ ⁺	382	260	0.00	0.14	1.20
HSBC N AMER HOLDS	249	116	0.11	0.14	1.14
STATE STREET CORP\$ ⁺	246	182	0.01	0.15	1.10
ALLY FNCL	181	121	0.22	0.11	1.24
BMO FNCL CORP	173	104	0.23	0.12	1.49
MUFG AMERS HOLDS CORP	171	96	0.10	0.14	1.52*
FIFTH THIRD BC	169	127	0.27	0.11	1.15
CITIZENS FNCL GRP	166	126	0.23	0.11	1.15*
SANTANDER HOLDS USA	149	67	0.12	0.16	1.44*
KEYCORP	146	112	0.27	0.11	1.45
RBC US GRP HOLDS LLC	140	53	0.06	0.17	1.28
UBS	139	56	0.04	0.28	1.34*
NORTHERN TR CORP	137	109	0.03	0.14	1.10
REGIONS FC	127	98	0.19	0.11	1.10
BNP PARIBAS	125	67	0.11	0.16	1.25*
M&T BK CORP	120	95	0.16	0.11	1.21
DEUTSCHE BANK	109	19	0.02	0.38	1.75
HUNTINGTON BSHRS	109	82	0.21	0.11	1.49
BBVA USA BSHRS	94	75	0.18	0.13	1.28*

Note: \$⁺ indicates daily FR2052a filers. Total assets and total deposits are in \$ billion in 2019Q4. C&I/TA is the share of C&I loans in total assets in 2019Q4. CR and LCR are the Tier-1 capital ratio and the Liquidity Coverage Ratio.

Demandable NBFI uninsured deposits

	1	2	3	4	5	6
Dependent variable:	Log(Demandable uninsured NBFI deposits)					
QE * Shares	0.423*** (4.153)	0.410*** (4.063)	0.350*** (2.994)	0.435*** (3.824)		0.344*** (2.971)
Bank size		-0.207 (-1.283)	-0.227 (-1.411)	-0.195 (-1.227)	-0.207 (-1.285)	-0.142 (-0.516)
QT * Shares			-0.351** (-2.578)			
QE * GSIBS				-0.055 (-1.158)		
QE (SLR rel.)* Shares					0.444*** (4.302)	
QE (SLR act.)* Shares					0.377*** (3.618)	
NBFI credit						0.117*** (3.031)
Month FE	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y
Observations	2,028	2,026	2,026	2,026	2,026	2,015
R-squared	0.907	0.906	0.906	0.906	0.906	0.907

NBFI uninsured deposits: Supervised and non-supervised NBFIs

	1	2	3	4
Dependent variable:	Log(uninsured NBFI deposits)			
Group	Supervised NBFI		Non-supervised NBFI	
QE * Shares	2.615*** (3.556)	2.735*** (4.106)	0.064 (1.045)	0.061 (0.977)
Bank control		Y		Y
Month FE	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Observations	1,736	1,734	1,625	1,623
R-squared	0.877	0.877	0.952	0.952

Notes: "Supervised" NBFI includes regulated institutions such as investment advisors, brokers/dealers, and insurance companies, while "Non-supervised" includes institutions registered with the SEC under the Investment Company Act of 1940, as well as hedge funds and private equity funds.

Fiscal transfers during Covid-19

	1	2	3	4
Dependent variable:	Log(Uninsured NBF1 deposits)			
March 2020 * Shares	0.617*** (14.392)	0.514*** (8.307)	0.587*** (11.836)	0.500*** (8.006)
$\widetilde{QE}_t * Shares$	0.272*** (5.098)	0.278*** (5.311)	0.242*** (4.106)	0.262*** (4.515)
Bank control		Y		Y
QT control			Y	Y
Month FE	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Observations	2,079	2,077	2,079	2,077
R-squared	0.968	0.968	0.968	0.968

Other deposit categories & Liquidity Coverage Ratios

	1	2	3	4
Dependent variable:	Log(Total deposits)	Log(Total uninsured deposits)	Log(Total uninsured deposits exc. NBF)	Log(Total insured deposits)
QE*Shares	-0.022 (-0.588)	-0.202*** (-4.926)	-0.352*** (-7.383)	0.798*** (8.329)
QE*LCR	0.002*** (4.248)	0.003*** (7.981)	0.003*** (7.032)	-0.001** (-2.547)
Bank control	Y	Y	Y	Y
QT control	Y	Y	Y	Y
QT·LCR control	Y	Y	Y	Y
Month FE	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Observations	2,145	2,145	2,145	2,000
R-squared	0.988	0.982	0.980	0.970

Notes: LCR_i is the liquidity coverage ratio of bank i in 2019Q4.

Credit lines, Term loans, and Total Loan Commitments

	1	2	3	4	5	6
Dependent variable:	Log(Credit lines)		Log(Term loans)		Log(Total loan commitments)	
QE*Shares	-0.120*** (-2.888)	-0.133*** (-3.354)	-0.007 (-0.073)	0.038 (0.416)	-0.134*** (-3.192)	-0.164*** (-3.895)
Bank*Firm FE	Y	Y	Y	Y	Y	Y
ILST FE	Y		Y		Y	
Firm*Time FE		Y		Y		Y
Observations	655,814	328,905	243,258	95,469	952,707	404,116
R-squared	0.966	0.942	0.953	0.919	0.962	0.935

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Utilized & Undrawn Credit Lines

	1	2	3	4
Dependent variable:	Log(Utilized credit lines)		Log(Undrawn credit lines)	
QE * Shares	-0.006 (-0.057)	-0.115 (-1.178)	-0.191*** (-3.472)	-0.142*** (-3.337)
Bank*Firm FE	Y	Y	Y	Y
ILST FE	Y		Y	
Firm*Time FE		Y		Y
Observations	425,895	192,968	569,704	310,230
R-squared	0.859	0.870	0.897	0.941

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Credit lines: Interest rates & new issuance

	1	2	3	4	5	6	7	8
Dependent variable:	Log(Interest rate on credit lines)				Log(Newly issued credit lines)			
QE*Shares	0.003 (0.787)	0.001 (0.354)	0.003 (0.645)	0.002 (0.474)	-0.197 (-1.362)	-0.294** (-2.417)	-0.143 (-0.796)	-0.234 (-1.561)
Bank ccontrols			Y	Y			Y	Y
QT control			Y	Y			Y	Y
Bank*Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
ILST FE	Y		Y		Y		Y	
Firm*Time FE		Y		Y		Y		Y
Observations	617,829	308,407	595,106	297,643	9,991	9,058	9,825	8,899
R-squared	0.775	0.798	0.777	0.799	0.839	0.780	0.843	0.783

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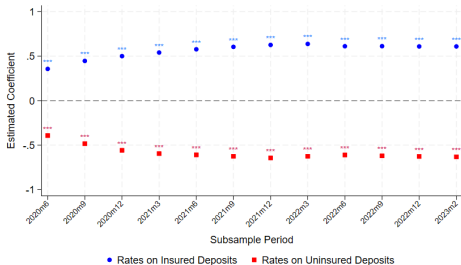
Undrawn credit lines for liquidity constrained firms

	1	2
Dependent variable:	Log(Undrawn credit lines)	
QE*Shares	-0.150*** (-3.148)	-0.181*** (-3.619)
QE*Shares*Liquidity	0.060 (0.688)	0.026 (0.283)
QE*Shares*Covid	-0.507 (-1.057)	-0.419 (-0.814)
QE*Shares*Covid*Liquidity	-1.616*** (-2.766)	-1.663*** (-2.731)
QT*Shares	-0.320*** (-4.651)	-0.349*** (-5.065)
QT*Shares*Liquidity	0.092 (0.766)	0.059 (0.485)
QT*Shares*Covid	-0.029 (-0.064)	0.040 (0.084)
QT*Shares*Covid*Liquidity	1.202 (0.633)	1.413 (0.658)
Bank Size		0.070** (2.083)
Bank reserves		-0.005 (-0.976)
Bank treasuries & agencies		-0.021** (-2.278)
Bank insured deposits		-0.029 (-1.542)
Bank uninsured deposits		0.023 (0.933)
Bank*Firm FE	Y	Y
Firm*Time FE	Y	Y
Observations	293,416	284,562
Adjusted R-squared	0.941	0.941

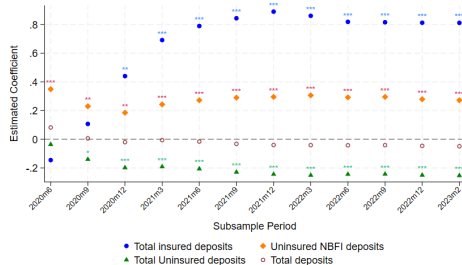
Notes: $Covid_f$ is a dummy indicating that firm f operates in an industry heavily impacted by the COVID-19 pandemic. We following NAICS industries are defined to be heavily impacted by the pandemic: 721110–Hotels (except Casino Hotels) and Motels; 722511–Full-service restaurants; 722513–Limited-Service Restaurants; 722514–Cafeterias, Grill Buffets, and Buffets; and 722515–Snack and Nonalcoholic Beverage Bars. $Liquidity_f$ is a dummy that takes the value of one if the ratio of sales to accounts receivable for firm f at 2019Q4 is higher than the median for all firms at 2019Q4.

Dynamic Adjustment: Deposit Rates vs. Volumes

- Why do exposed banks adjust both their deposits liabilities and undrawn credit lines?
- Although they raise rates on insured deposits and cut rates on uninsured ones immediately, deposit volumes adjust more slowly



Deposit rate adjustments

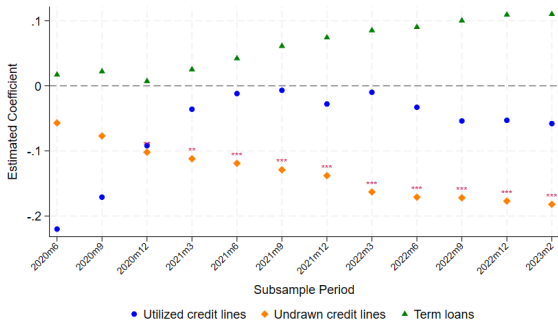


Deposit volume adjustments

Notes: *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dynamic Adjustment: Lending Exposures

- To compensate for the liquidity risk, exposed banks gradually adjust their contingent credit lines



Credit line and term loan adjustments

Notes: *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

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Asset substitution channel of QE: Control for OMO securities

	1	2	3	4	5	6	7	8
Dependent variables:	Log(Utilized credit lines)		Log(Undrawn credit lines)		Log(Utilized credit lines)		Log(Undrawn credit lines)	
Group:	OMO securities				Unencumbered OMO securities			
QE * Shares	0.001 (0.010)	-0.059 (-0.570)	-0.312*** (-5.150)	-0.190*** (-4.167)	-0.077 (-0.566)	-0.110 (-0.896)	-0.195*** (-2.755)	-0.131** (-2.506)
QT * Shares	-0.159 (-0.826)	-0.071 (-0.446)	-0.425*** (-5.114)	-0.327*** (-5.349)	-0.219 (-0.941)	0.036 (0.198)	-0.268*** (-2.742)	-0.234*** (-3.146)
QE * OMO securities	-0.128 (-0.669)	0.051 (0.276)	0.372*** (2.973)	0.124 (1.429)	-0.321 (-1.185)	-0.229 (-0.797)	0.417** (2.278)	0.214* (1.833)
QT * OMO securities	-0.279 (-0.903)	0.381 (1.344)	0.348** (2.034)	0.153 (1.076)	-0.223 (-0.535)	0.383 (0.974)	0.598*** (2.820)	0.352* (1.962)
Bank*Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
ILST FE	Y	N	Y	N	Y	N	Y	N
Firm*Time FE	N	Y	N	Y	N	Y	N	Y
Observations	408,805	184,557	550,076	300,783	408,805	184,557	550,076	300,783
R-squared	0.860	0.874	0.897	0.942	0.860	0.874	0.897	0.942