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

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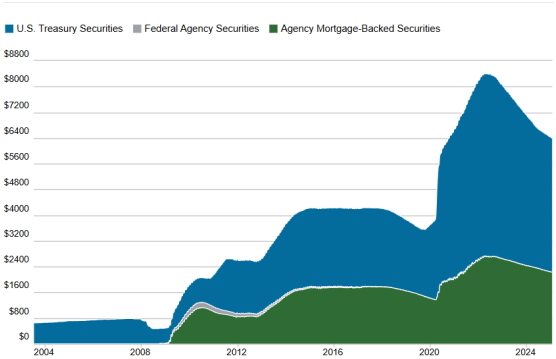
# Motivation 1: Quantitative Easing (QE) prominent post GFC

- 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 | Deposits |
| Reserves at the Fed | 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 | Deposits |
| Reserves at the Fed +$1 | Capital |

Source: Leonard, Martin, and Potter (2017)

# 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<br>Cash |

| BANKS | |
|---|---|
| **Assets** | **Liabilities** |
| Securities<br>Reserves at the Fed | Deposits<br>Capital |

| NON-BANKS | |
|---|---|
| **Assets** | **Liabilities** |
| Deposits<br>Securities | Net worth |

*The Fed Purchases Assets from Non-Banks*

| FEDERAL RESERVE | |
|---|---|
| **Assets** | **Liabilities** |
| Securities +$1 | Reserves held by banks +$1<br>Cash |

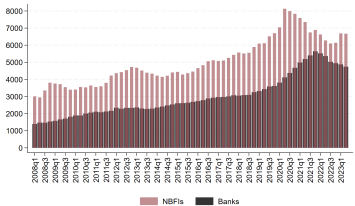
| BANKS | |
|---|---|
| **Assets** | **Liabilities** |
| Securities<br>Reserves at the Fed +$1 | Deposits +$1<br>Capital |

| NON-BANKS | |
|---|---|
| **Assets** | **Liabilities** |
| Deposits +$1<br>Securities -$1 | Net worth |

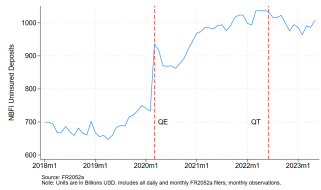
Source: Leonard, Martin, and Potter (2017)

# 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)
- NBFI heavily participated in the pandemic-QE by selling assets via banks as NBFI cannot hold reserves $\rightarrow$ surge in uninsured, fragile NBFI deposits for banks (Acharya & Rajan, 25) Bank Fragility




Banks and NBFI holdings of OMO eligible securities




NBFI 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

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

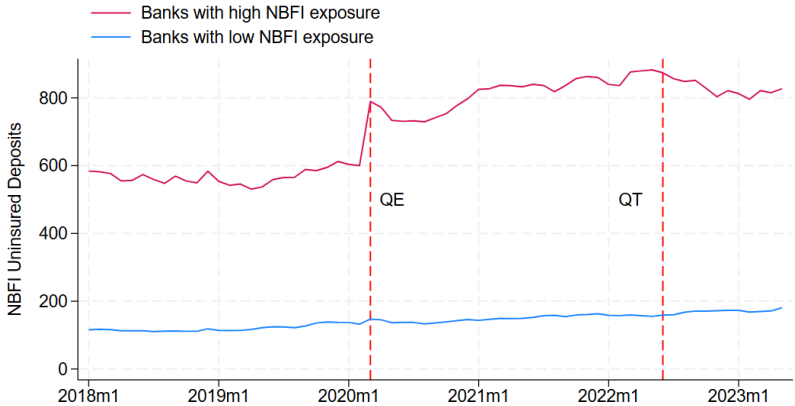
This *shares* variable is balanced across size, risk, capital across banks.

# Preview of key results

- Exposed banks see a **rapid and persistent rise in uninsured NBFI 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 NBFI deposits and QE

# Uninsured NBFI Deposits




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

Parallel Trends

# NBFI uninsured deposits and QE

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

Demandable uninsured NBFI deposits | Supervized vs Non-Supervized NBFIS | Fiscal transfers

# 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<br>(-1.374) | -0.253***<br>(-6.469) | -0.398***<br>(-8.444) | 0.811***<br>(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.

Liquidity coverage ratio

# 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*** | 0.614*** | 0.609*** | -0.557*** | -0.631*** | -0.632*** |
| | (6.954) | (10.872) | (10.925) | (-5.769) | (-5.505) | (-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** | -0.076* | 0.065 | 0.110 | -0.142*** | -0.153*** |
| | (-2.063) | (-1.783) | (0.752) | (1.394) | (-3.212) | (-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 | -0.058 | -0.291*** | -0.182*** |
| | (-0.041) | (-0.566) | (-4.855) | (-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

# 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 NBFI deposits
- 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

# Firm-level evidence

# Firm level effects

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Dependent variable: | Log(Utilized | Log(Undrawn | Log(Term loans) | Log(Total | Log(Other | Log(Investment) |
| Dependent variable: | credit lines) | credit lines) | | commitments) | borrowing) | |
| QE *Bank-firm relationship shares | -0.014 | -0.071*** | 0.001 | -0.014* | -0.006 | -0.354*** |
| | (-0.515) | (-2.926) | (0.072) | (-1.800) | (-0.226) | (-4.130) |
| QT *Bank-firm relationship shares | -0.105** | -0.095*** | 0.036 | -0.029** | -0.080** | -0.454*** |
| | (-2.729) | (-3.507) | (1.428) | (-2.301) | (-2.710) | (-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

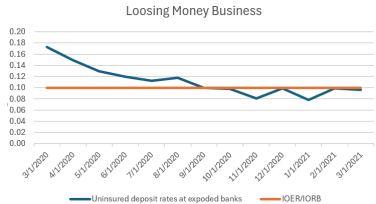
# Summary of results

- QE induces an increase in uninsured deposits at banks when buying assets from NBFI
- 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

Return to slide

# 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.

Return to slide

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

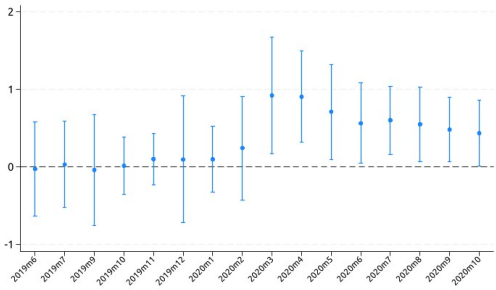
| Bank Name | Total assets ($ bn) | Total deposits ($ bn) | C&I/TA | CR | LCR |
|---|---|---|---|---|---|
| JPMORGAN CHASE & CO$^+$ | 2688 | 1563 | 0.05 | 0.14 | 1.16 |
| BANK OF AMER CORP$^+$ | 2434 | 1435 | 0.10 | 0.13 | 1.16 |
| CITIGROUP$^+$ | 1951 | 1071 | 0.04 | 0.13 | 1.15 |
| WELLS FARGO & CO$^+$ | 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.

Return to slide

# Parallel trends

$$Log(Un.\ NBFI_{i,t}) = \sum_{t=1}^{T} \lambda_{1,t}(Month_t \cdot Shares_i) + \beta \log(TA_{i,t}) + a_i + a_t + \varepsilon_{i,t}$$




Notes: Vertical bars represent 95% confidence intervals.

Return to slide

# Demandable NBFI uninsured deposits

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Dependent variable: | Log(Demandable uninsured NBFI deposits) | | | | | |
| QE * Shares | 0.423*** | 0.410*** | 0.350*** | 0.435**** | | 0.344*** |
| | (4.153) | (4.063) | (2.994) | (3.824) | | (2.971) |
| Bank size | | -0.207 | -0.227 | -0.195 | -0.207 | -0.142 |
| | | (-1.283) | (-1.411) | (-1.227) | (-1.285) | (-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 |

Return to slide

# 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*** | 2.735*** | 0.064 | 0.061 |
| | (3.556) | (4.106) | (1.045) | (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.

Return to slide

# Fiscal transfers during Covid-19

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Dependent variable: | Log(Uninsured NBFI deposits) | | | |
| March 2020 * Shares | 0.617*** | 0.514*** | 0.587*** | 0.500*** |
| | (14.392) | (8.307) | (11.836) | (8.006) |
| $\widetilde{QE}_t * Shares$ | 0.272*** | 0.278*** | 0.242*** | 0.262*** |
| | (5.098) | (5.311) | (4.106) | (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 |

Return to slide

# Other deposit categories & Liquidity Coverage Ratios

| | 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 | -0.022 | -0.202*** | -0.352*** | 0.798*** |
| | (-0.588) | (-4.926) | (-7.383) | (8.329) |
| QE*LCR | 0.002*** | 0.003*** | 0.003*** | -0.001** |
| | (4.248) | (7.981) | (7.032) | (-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.

Return to slide

# 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*** | -0.133*** | -0.007 | 0.038 | -0.134*** | -0.164*** |
| | (-2.888) | (-3.354) | (-0.073) | (0.416) | (-3.192) | (-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 |

Return to slide

# Utilized & Undrawn Credit Lines

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Dependent variable: | Log(Utilized credit lines) | | Log(Undrawn credit lines) | |
| QE * Shares | -0.006 | -0.115 | -0.191*** | -0.142*** |
| | (-0.057) | (-1.178) | (-3.472) | (-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 |

Return to slide

# 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 | 0.001 | 0.003 | 0.002 | -0.197 | -0.294** | -0.143 | -0.234 |
| | (0.787) | (0.354) | (0.645) | (0.474) | (-1.362) | (-2.417) | (-0.796) | (-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 |

Return to slide

# Undrawn credit lines for liquidity constrained firms

| | 1 | 2 |
|---|---|---|
| Dependent variable: | Log(Undrawn credit lines) | |
| QE*Shares | -0.150*** | -0.181*** |
| | (-3.148) | (-3.619) |
| QE*Shares*Liquidity | 0.060 | 0.026 |
| | (0.688) | (0.283) |
| QE*Shares*Covid | -0.507 | -0.419 |
| | (-1.057) | (-0.814) |
| QE*Shares*Covid*Liquidity | -1.616*** | -1.663*** |
| | (-2.766) | (-2.731) |
| QT*Shares | -0.320*** | -0.349*** |
| | (-4.651) | (-5.065) |
| QT*Shares*Liquidity | 0.092 | 0.059 |
| | (0.766) | (0.485) |
| QT*Shares*Covid | -0.029 | 0.040 |
| | (-0.064) | (0.084) |
| QT*Shares*Covid*Liquidity | 1.202 | 1.413 |
| | (0.633) | (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.

Return to slide

# 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 | -0.059 | -0.312*** | -0.190*** | -0.077 | -0.110 | -0.195*** | -0.131** |
| | (0.010) | (-0.570) | (-5.150) | (-4.167) | (-0.566) | (-0.896) | (-2.755) | (-2.506) |
| QT * Shares | -0.159 | -0.071 | -0.425*** | -0.327*** | -0.219 | 0.036 | -0.268*** | -0.234*** |
| | (-0.826) | (-0.446) | (-5.114) | (-5.349) | (-0.941) | (0.198) | (-2.742) | (-3.146) |
| QE * OMO securities | -0.128 | 0.051 | 0.372*** | 0.124 | -0.321 | -0.229 | 0.417** | 0.214* |
| | (-0.669) | (0.276) | (2.973) | (1.429) | (-1.185) | (-0.797) | (2.278) | (1.833) |
| QT * OMO securities | -0.279 | 0.381 | 0.348** | 0.153 | -0.223 | 0.383 | 0.598*** | 0.352* |
| | (-0.903) | (1.344) | (2.034) | (1.076) | (-0.535) | (0.974) | (2.820) | (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 |