

The Effect of Monetary Policy on Bank Wholesale Funding

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Motivation

- ▶ Risks of bank short-term wholesale funding dependency during the crisis
 - ▶ Repo funding risk: Gorton and Metrick (2012); Copeland et al. (2014); Krishnamurthy et al. (2014)
 - ▶ Wholesale funding reliance and bank lending during the 2007-09 crisis: Cornett et al. (2011); Ivashina and Scharfstein (2010); De Haas and Van Lelyveld (2014); Dagher and Kazimov (2015)
 - ▶ Bank liquidity risks from wholesale funding reliance and secondary market liquidation: Irani and Meisenzahl (2015)
- ▶ New Basel III regulations on liquidity risks
 - ▶ Liquidity Coverage Ratio (LCR), Net Stable Funding Ratio (NSFR)

Open questions:

- ▶ What contributed to the rapid buildup of wholesale funding reliance towards the crisis?
- ▶ How the new liquidity regulations would interact with other policy measures?

In this paper

- ▶ Study the impact of monetary policy on bank funding composition.
 - ▶ Wholesale (non-core) funding vs retail (core) deposits
- ▶ Two-dimensional analysis (time-series and cross-sectional); monetary tightening...
 - ▶ leads to greater wholesale funding reliance of the banking sector...
 - ▶ ... which is more pronounced for larger or heavy wholesale-user banks
- ▶ Identification using regional demographic variation

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Implications

- ▶ Systemic stability (focusing on risks)
- ▶ Monetary policy transmission (focusing on policy effectiveness)

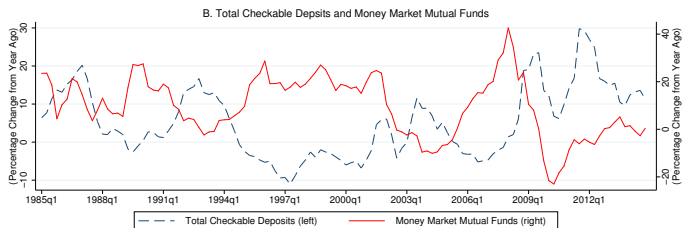
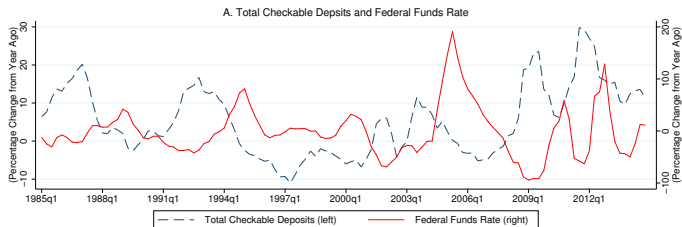
Monetary policy and retail deposit supply

Monetary tightening decreases retail deposits in the banking sector

- ▶ Decrease in the bank reserves
Bernanke and Blinder (1992), Kashyap and Stein (1995),
Bianchi and Bigio (2014)
- ▶ Decrease in money demand
Baumol (1952), Tobin (1956), Bernanke and Blinder (1988)
- ▶ Substitution between money-like assets (e.g. MMFs)
Nagel (2016)

→ Lending squeeze, or funding substitution?

As FFR increases, banks lose retail deposits

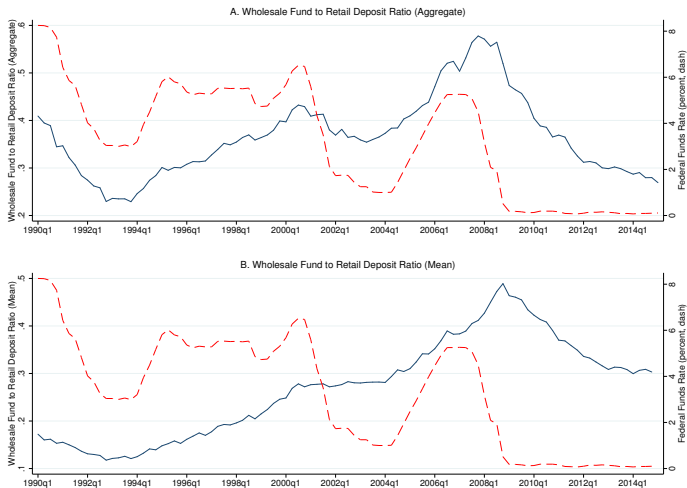


- ▶ Top: y-to-y change in total checkable deposit (dash) and FFR (solid)
- ▶ Bottom: y-to-y change in total checkable deposit (dash) and MMF (solid)

Funding responses with heterogeneous frictions

- ▶ Tightening reduces retail deposit supply (exogenous)
- ▶ Banks increase wholesale funding until $MR=MC$
 - ▶ MC increases faster for banks facing more frictions
 - ▶ They end up adding less wholesale funding.
- These are the banks with less wholesale funding (and small) to start with!

As FFR increases, banks rely more on wholesale funding



- ▶ Top: aggregate WF/RD, Bottom: average bank-level WF/RD, with FFR (dash)
- ▶ Higher levels, more fluctuations in the top panel (i.e., larger banks)

What We Find

As the Federal Funds Rate increases,

1. Banks experience the outflow of retail deposit (shock)
2. To avoid lending squeeze, banks substitute the outflow with wholesale funding
3. The substitution is stronger in large banks (less financial frictions, cheaper cost for wholesale funding)
4. Bank can mitigate the policy impact and smooth lending: more for larger banks
5. Wholesale funding becomes more concentrated in the banking sector, increasing systemic imbalances

Bank Data

Main Database

- ▶ Consolidated Financial Statements for Holding Companies (Y9C)
- ▶ Federal Reserve's Report of Condition and Income (Call Report)
- ▶ From 1992 to 2006, Quarterly Panel

Definition of Bank

- ▶ For banks with Y9C reporting, use bank holding company level variables directly from Y9C
- ▶ Banks without Y9C but with top holder ID (RSSD9348), aggregate bank-level Call Report variables by the top holder
- ▶ Banks without Y9C and RSSD9348, use bank-level Call Report as stand-alone bank
- ▶ Our sample consist of 3728 banks on average.

Bank Fund Composition and the FFR (T2)

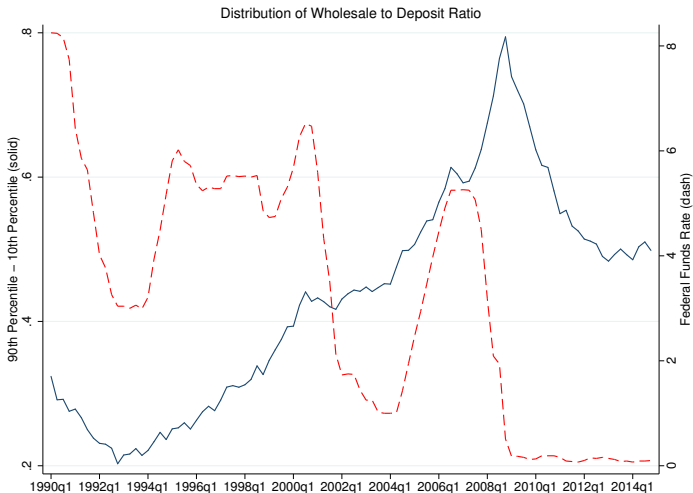
Variables	(1) % Change in RD	(2) % Change in WSF	(3) Change in WSF to RD	(4) Change in RD to TL	(5) Change in WSF to TL
Change in FFR (t-1 to t)	-0.750*** (-25.77)	1.281*** (8.40)	0.386*** (13.93)	-0.239*** (-14.57)	0.234*** (14.37)
Change in FFR (t-2 to t-1)	0.177*** (5.03)	1.921*** (11.07)	0.059* (1.85)	-0.094*** (-4.89)	0.067*** (3.56)
Change in FFR (t-3 to t-2)	0.241*** (7.33)	-0.541*** (-3.14)	0.030 (1.00)	0.042** (2.31)	-0.016 (-0.89)
Change in FFR (t-4 to t-3)	-0.400*** (-13.74)	0.571*** (3.82)	-0.053** (-1.98)	-0.048*** (-3.05)	-0.018 (-1.17)
<i>Sum of Effects</i>	-0.731*** (-27.09)	3.232*** (23.63)	0.423*** (17.63)	-0.339*** (-24.36)	0.267*** (19.19)
Observations	223,679	223,679	223,679	223,679	223,679
R-squared	0.126	0.045	0.061	0.058	0.053
Bank Controls	Yes	Yes	Yes	Yes	Yes
Macro Variable Controls	Yes	Yes	Yes	Yes	Yes
Bank FE and Quarter FE	Yes	Yes	Yes	Yes	Yes

As FFR increases, larger banks increases wholesale funding more

- ▶ We proxy the level of financial friction by the size of bank.
- ▶ Following Kashyap and Stein (AER, 2000), a bank is
 - ▶ Small if the asset size is below 95% of the quarter
 - ▶ Medium if the asset size is between 95% to 99% of the quarter
 - ▶ Large if the asset size is above 99% of the quarter

	Small	Medium	Large
	Change in WSF to RD		
	0.399*** (16.84)	0.773*** (2.84)	1.430*** (3.51)
	Change in RD to TL		
<i>Sum of Effects</i>	-0.333*** (-23.59)	-0.350*** (-3.29)	-0.615*** (-3.92)
	Change in WSF to TL		
	0.262*** (18.55)	0.294*** (2.82)	0.415*** (2.54)

As FFR increases, WSF is more concentrated



Quarterly distribution of wholesale to retail deposit ratio (90th percentile - 10th percentile)

Potential Endogeneity from the Change in Local Demand

Confounded with the change in local loan demand:

With increasing borrowing demand,

- ▶ central bank tightens monetary policy responding to the credit boom
 - ▶ banks use more wholesale funding to meet demand (CX: large banks have wider network to maneuver around local markets)
- positive correlation between WSFtoRD and FFR
- ▶ Control for bank-level total loan growth and aggregate-level total loan growth
 - ▶ Control for MSA economic condition using local bank subsample

Differentiating Monetary Policy Shock

- ▶ Demographic variation as a measure of *deposit supply sensitivity* to monetary policy (similar to Becker (JFE, 2007))
- ▶ If non-seniors are more sensitive to the increase in policy rate,
 - Banks whose deposit-base is younger,
 - : will lose more retail deposits during monetary tightening
 - : actively increase their reliance on wholesale funding
- ▶ Fraction of age above 65 in US counties + Bank branch level deposit data → we classify banks with younger deposit-base and older deposit-base.
- ▶ Define Young Deposit-Base dummy =1 if the bank is below median in the sort

Age Demographics and Bank Fund Sensitivity (T5)

Variables	(1) % Change in RD	(2) % Change in WSF	(3) Change in WSF to RD	(4) Change in WSF to TL
Change in FFR (t-1 to t)	-0.686*** (-10.20)	0.555* (1.74)	0.301*** (4.37)	0.185*** (4.76)
Change in FFR (t-2 to t-1)	0.476*** (5.64)	1.228*** (3.50)	-0.020 (-0.26)	-0.004 (-0.09)
Change in FFR (t-3 to t-2)	-0.012 (-0.15)	-0.499 (-1.33)	0.010 (0.14)	-0.011 (-0.25)
Change in FFR (t-4 to t-3)	-0.242*** (-3.75)	0.284 (0.92)	-0.075 (-1.22)	-0.033 (-0.90)
<i>Sum of Effects</i>	-0.463*** (-7.45)	1.569*** (6.13)	0.217*** (3.61)	0.138*** (4.20)
Young Deposit-Base	0.014 (0.21)	0.225 (0.83)	0.054 (0.79)	0.020 (0.58)
Young Deposit-Base x Change in FFR (t-1 to t)	-0.056 (-0.63)	-0.323 (-0.79)	-0.005 (-0.05)	-0.018 (-0.35)
Young Deposit-Base x Change in FFR (t-2 to t-1)	-0.012 (-0.10)	0.031 (0.07)	0.111 (1.07)	0.051 (0.86)
Young Deposit-Base x Change in FFR (t-3 to t-2)	0.041 (0.37)	0.678 (1.37)	0.082 (0.80)	0.053 (0.89)
Young Deposit-Base x Change in FFR (t-4 to t-3)	-0.179** (-2.09)	0.106 (0.28)	0.054 (0.68)	0.027 (0.58)
<i>Sum of Effects</i>	-0.207*** (-2.87)	0.493* (1.72)	0.242*** (3.47)	0.113*** (3.05)
Observations	85,330	85,330	85,330	85,330
R-squared	0.117	0.057	0.063	0.055
Other Controls	Yes	Yes	Yes	Yes

One Step Further...

- ▶ If the greater deposit decrease is *demand* driven (weaker local demand),
 - » financial frictions matter *less*
 - » *less* difference in funding substitution activity b.w. large vs small (*passive* adjustment)

- ▶ If the greater deposit decrease is *supply* driven (depositor withdrawals),
 - » financial frictions matter *more*
 - » *more* difference in funding substitution activity b.w. large vs small (*active* adjustment)

Age Demographics and Bank Fund Sensitivity: by Size (T6)

- ▶ Financial frictions matter more for banks with younger deposit-base
- ▶ Difference in large bank vs small bank is stronger within younger deposit-base banks
- ▶ Large Bank =1: top 1% of all local banks in asset size

Variables	Old (1) % Change in RD	Young (2) % Change in RD	Old (3) % Change in WSF	Young (4) % Change in WSF	Old (5) Change in WSF to RD	Young (6) Change in WSF to RD
<i>Change in FFR</i>						
<i>Sum of Effects</i>	-0.0072*** (-12.00)	-0.0079*** (-13.17)	0.0254*** (13.37)	0.0267*** (14.05)	0.0058*** (11.60)	0.0063*** (10.50)
Large Bank	-0.0003 (-0.06)	-0.0017 (-0.41)	0.0081 (0.70)	0.0241** (2.36)	0.0036 (0.59)	0.0006 (0.11)
<i>Large Bank * Change in FFR</i>						
<i>Sum of Effects</i>	0.0106 (1.25)	-0.0048 (-1.04)	-0.0225 (-1.55)	-0.0128 (-1.39)	-0.0023 (-0.36)	0.0176** (2.20)

Implication 1: Financial Stability

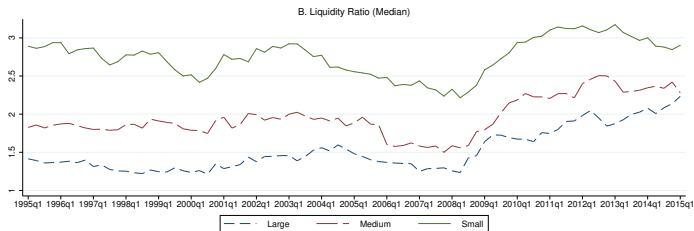
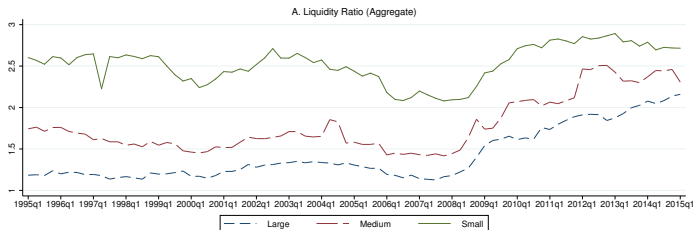
- ▶ We know about the vulnerability caused by loosening.
 - : Asset price bubble, credit booms, risk taking channel...
- ▶ Debate between “leaning versus cleaning” still assumes that tightening would contain systemic imbalances.
- ▶ What if banks try to mitigate the tightening effect through the funding substitution?
 - ▶ Banks increase their reliance on runnable funds
 - ▶ Particularly so for systemic banks
- Credit boom can't be contained, but systemic risk goes up?
- ▶ Liquidity regulation would help mitigating this side effect.
 - ▶ imposing “taxes” on wholesale fund reliance
 - ▶ treat sticky funding (i.e. retail deposit) and unstable funding (i.e. wholesale funding) differently
 - ▶ Basel III imposes the run-off rate of 3-10% for retail deposits but up to 100% for other wholesale funding source

Implication 2: Transmission Mechanism

- ▶ Bank Lending channel has little aggregate effect (Romer and Romer 1990)
- large banks could have mitigated this channel through alternative funding source (Kashyap and Stein 2000, Kishan and Opiela 2000)
- ▶ Is this true even with liquidity regulation, such as LCR?

Policy Implication of New Liquidity Regulations

- ▶ Liquidity Ratio (LR): the ratio between liquidity-adjusted assets and liquidity-adjusted liabilities
- ▶ Lower LR for the larger banks/ during monetary tightening



Liquidity Ratio, Asset Size, and Monetary Policy

Prediction 4: Negative association with the asset size, and the FFR change.

Variables	(1) Liquidity Ratio	(2)	(3)	(4)	(5)
			Change in LR		
Change in FFR (t-2 to t-1)		-0.0343*** (-2.86)	-0.0392*** (-7.61)	-0.0316*** (-9.38)	-0.0318*** (-11.00)
log Assets (t-1)	-0.134** (-1.97)		0.00659 (0.74)		0.00908 (1.39)
Loan Ratio (t-1)			-0.00266 (-0.68)		-0.00322 (-1.43)
Capital Ratio (t-1)			0.0187 (1.11)		0.0148 (1.15)
Liquid Asset Ratio (t-1)			-0.00595 (-1.24)		-0.00966*** (-2.8)
Observations	31652	29285	27842	29285	27842
R-squared	0.0173	0.000441	0.0157	0.0922	0.0942
FE	Year x Quarter	-	-	Bank	Bank

Bank Lending Channel and Liquidity Requirements

- ▶ (Statutory) liquidity ratios are lower for larger banks
- ▶ (Statutory) liquidity ratios are lower during monetary tightening
- Liquidity requirements bind more during monetary tightening, particularly for large banks.
- Larger banks could be forced to reduce lending, aggregate effect through the lending channel?

Conclusion

- ▶ Monetary tightening could increase wholesale funding reliance of the banking sector
- ▶ More pronounced for banks with larger externalities, increasing distortion
- ▶ Monetary tightening to contain credit boom could increase systemic risks, which could be mitigated through macroprudential regulations.
- ▶ When introducing liquidity regulations, monetary policy transmission could become stronger through the bolstered lending channel.