

Liquidity Dependence and the Waxing and Waning of Central Bank Balance Sheets

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(Earlier version “Liquidity Dependence: Why Shrinking Central Bank Balance Sheets is an Uphill Task”, presented at Jackson Hole Economic Symposium 2022)

Conundrum: Where did all the liquidity go?

- Unprecedented expansion of central bank balance sheets since the GFC
- Surprisingly fragile financial conditions
 - Repo rate spike in September 2019
 - Dash for cash in March 2020
 - Turmoil in UK gilts in Sep-Oct 2022
 - Silicon Valley, Signature and First Republic Bank failures in March 2023
- Are central bank balance sheet expansion, contraction, and financial fragility related?

This talk

- Focus on banking sector liability-side (see Acharya-Rajan 2021)
 - In contrast to the more common asset-side and asset-pricing approach to QE
- Focus on sustained mismatches rather than intra-day

Key insights

- Reserves financed with demand deposits
 - QE is not just an expansion of central bank balance sheet
 - QE is typically also an expansion of commercial bank balance sheets
- Possible asymmetry between QE and QT:
 - Risk 1. Time-series: Uninsured demand deposits don't come off when reserves do, raising the aggregate price of liquidity during QT
 - Risk 2. Cross-section: Reserves do not remain where the uninsured demand deposits are, increasing liquidity risk during QT
 - Less-capitalized banks take liquidity risk but become fragile
- Central bank response to shortages?
 - May need to be medium term
 - Ratcheting up of demand, conflict with other policies

QE : (i) Purchase from banks – Asset Swap

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	Liabilities
Treasury securities	Reserves held by banks Cash

BANKING SECTOR	
Assets	Liabilities
Treasury securities	Deposits
Reserves at the Fed	Capital

The Fed Purchases Assets from Banks
Balance Sheet Effects

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

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

Asset swap with banks

Source: “How the Fed Changes the Size of its Balance Sheet” (Leonard, Martin and Potter, *Liberty Street Economics*, 2017)

QE: (ii) Purchase from non-banks– Bank BS expansion

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	Liabilities
Treasury securities	Reserves held by banks
	Cash held by the Treasury

BANKING SECTOR	
Assets	Liabilities
Treasury securities	Deposits
Reserves at the Fed	Capital

PUBLIC	
Assets	Liabilities
Deposits	Net worth
Treasury securities	

The Fed Purchases Assets from the Public
Balance Sheet Effects

FEDERAL RESERVE	
Assets	Liabilities
Treasury securities +\$1	Reserves held by banks +\$1
	Cash held by the Treasury

BANKING SECTOR	
Assets	Liabilities
Treasury securities	Deposits +\$1
Reserves at the Fed +\$1	Capital

Bank balance sheets expand, financed with deposits (typically wholesale or uninsured)

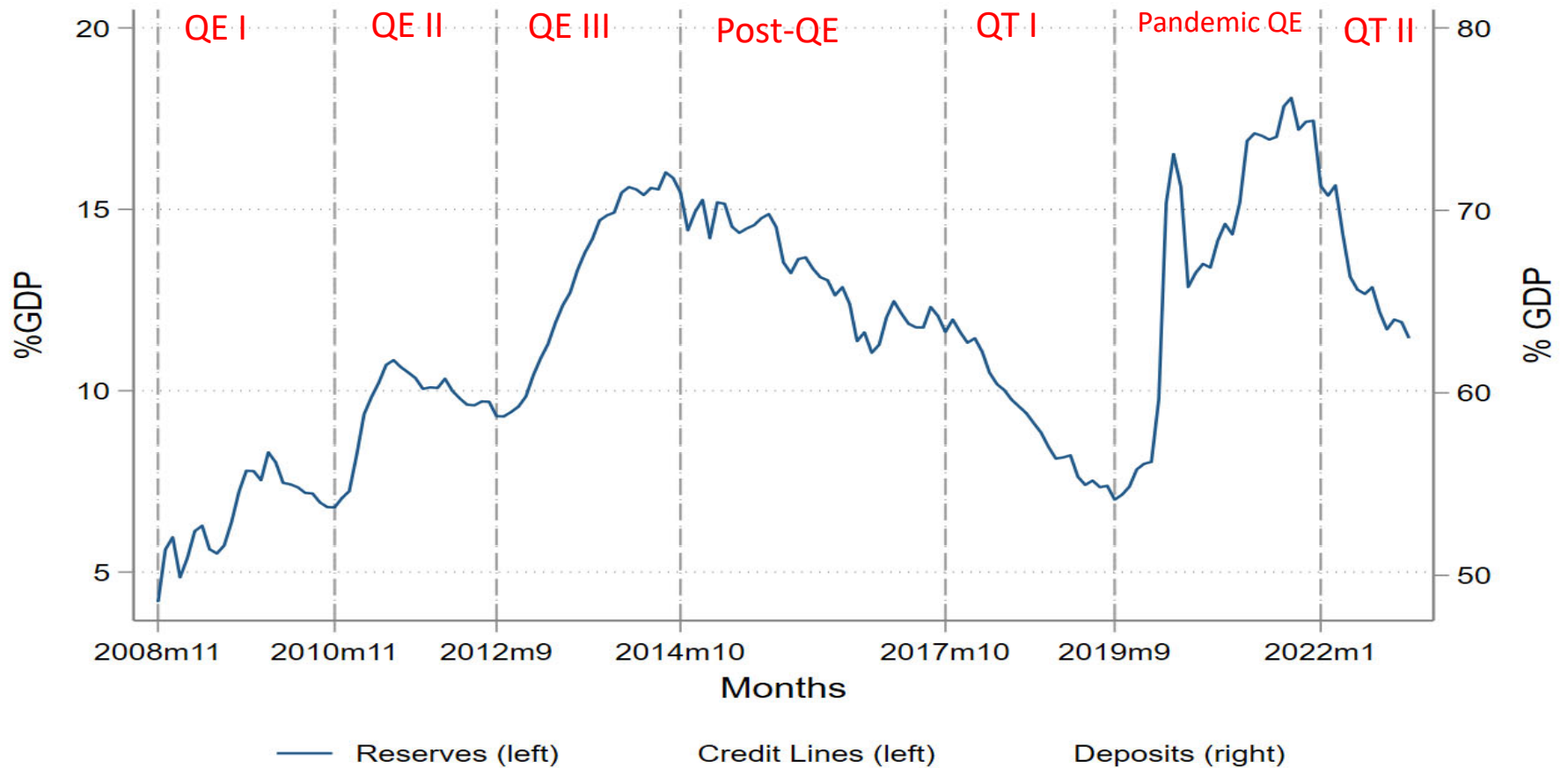
PUBLIC	
Assets	Liabilities
Deposits +\$1	Net worth
Treasury securities -\$1	

Source: “How the Fed Changes the Size of its Balance Sheet” (Leonard, Martin and Potter, *Liberty Street Economics*, 2017)

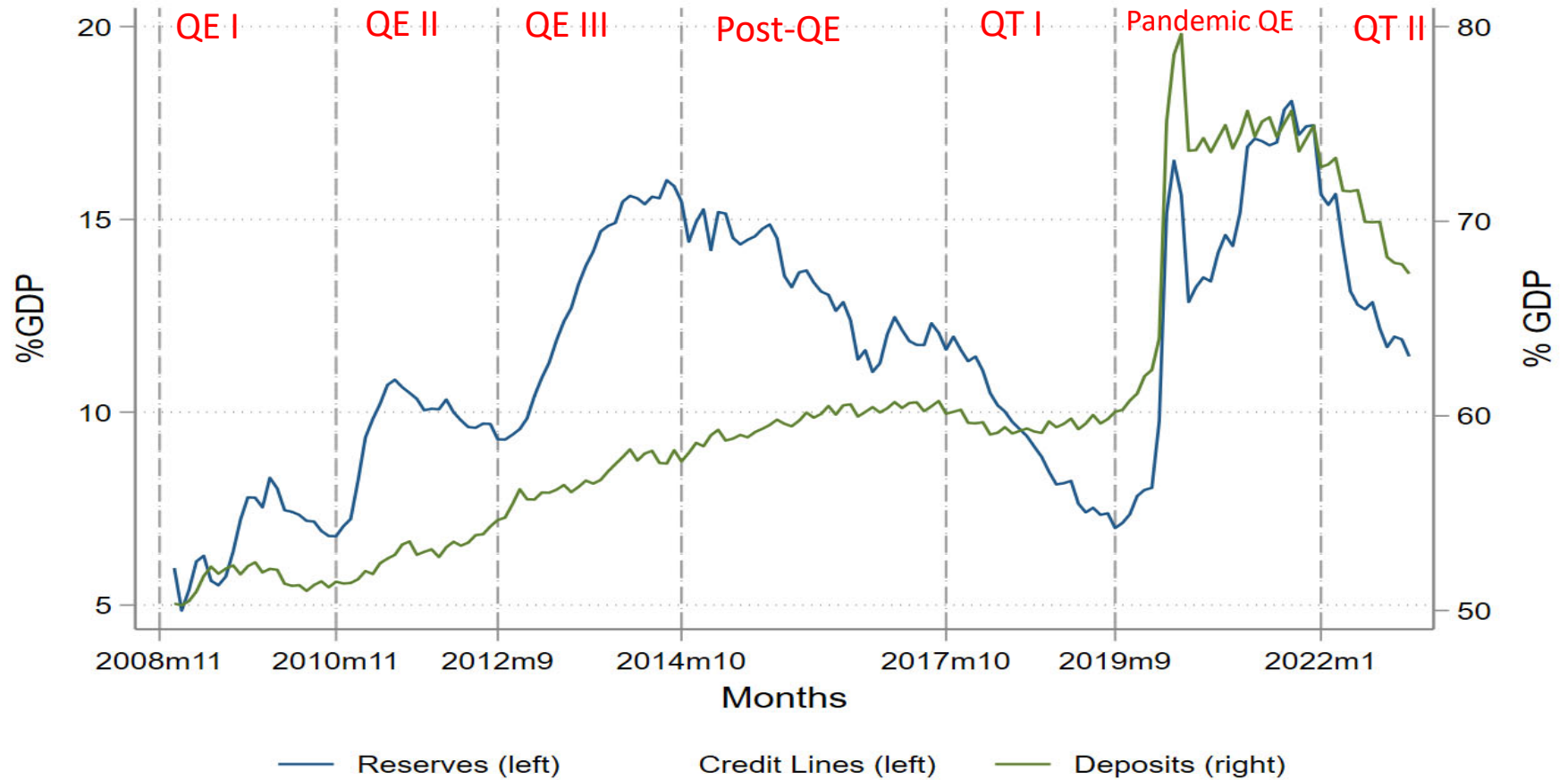
QT is not simply a reversal of QE!

- QE => growth of on- and off-balance-sheet demandable bank liabilities
 - Reserves expand
 - (Uninsured) demand deposits expand
 - Plus shrinkage of deposit maturity; additional writing of credit lines
- QT (2017-19)=> Hysteresis: No shrinkage of these liquidity claims
 - Reserves shrink, but liquidity claims keep growing post-QE + remain stable during QT
 - Asset swap for banks?
 - Liquidity mismatch (in less-capitalized banks) -> Financial fragility
- “Liquidity dependence” in the banking system in case of (even small) shocks
 - Ratcheting up of central bank b/s size with each stress and intervention
 - QE may be less effective than envisaged, while QE may be less easy than believed

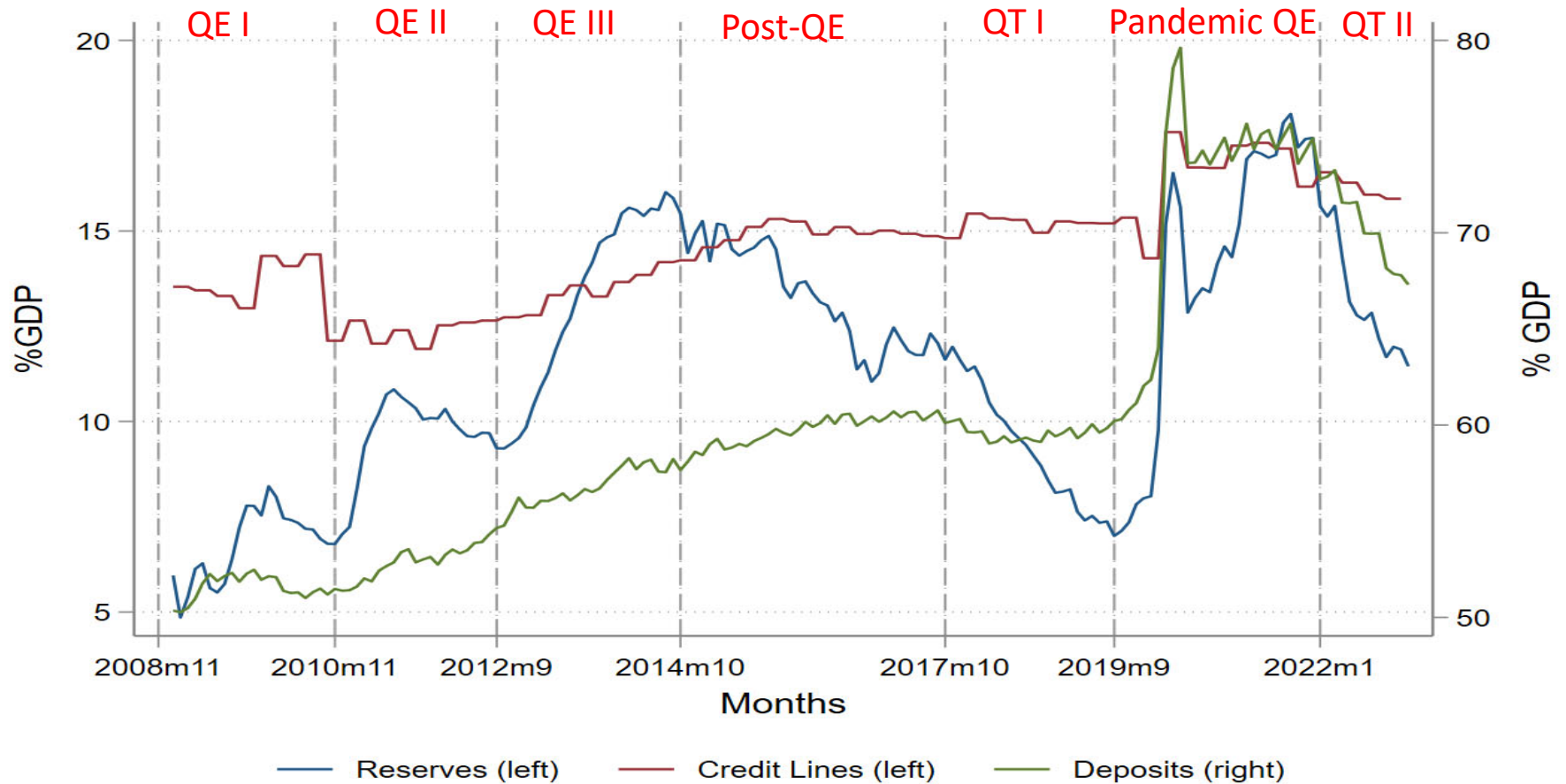
Reserves and Claims (% of GDP)



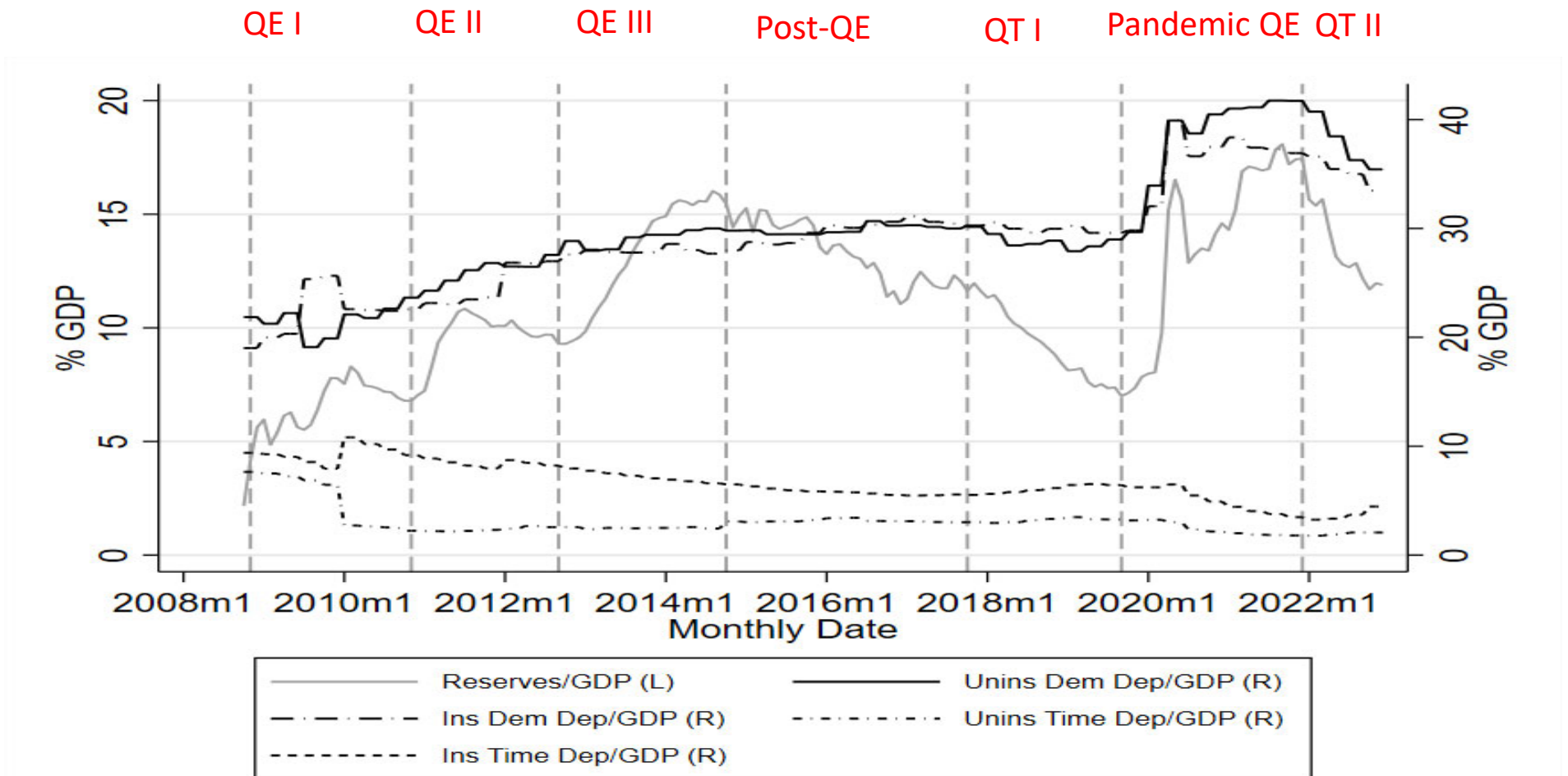
Reserves and Claims (% of GDP)



Reserves and Claims (% of GDP)



Uninsured/Insured Demandable/Time Deposits (Prop. of GDP)



Empirical Tests

- Aggregate, time-series evidence
 - Reserves -> Quantities of demandable claims
 - Reserves -> Price of demandable claims
- Panel tests across banks
 - Reserves -> Quantities: Instrument for bank-level reserves
 - Reserves -> Price of liquidity: Term Spread in deposit rates (also IV for deposits)
- Financial fragility: March 2020, March 2023
 - Measure of liquidity risk: $(UDD + CL) / (\text{Reserves} + \text{Eligible Assets})$
 - Distribution of liquidity risk and aggregate price of liquidity: Δ from QE to QT?
 - Relate bank stock returns and demandable claim drawdowns to liquidity risk

Aggregate, Time-series Evidence

Time-series analysis: Reserves -> Claims

$$\Delta Y_t = \alpha \Delta X_t + \beta X_{t-12} + \varepsilon_t$$

$\Delta Y_t = Y_t - Y_{t-12}$ is either the $\Delta \ln(\text{Deposits})$ or $\Delta \ln(\text{Credit Lines})$ or $\Delta \text{ Deposits}$ or $\Delta \text{ Credit Lines}$

$\Delta X_t = X_t - X_{t-12}$ is respectively either the $\Delta \ln(\text{Reserves})$ or $\Delta \text{ Reserves}$.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta \text{Ln}(\text{Deposits})$	$\Delta \text{Ln}(\text{Demand Deposits})$	$\Delta \text{Ln}(\text{Time Deposits})$	$\Delta \text{Ln}(\text{Credit Lines})$	$\Delta \text{Deposits}$	$\Delta \text{Demand Deposits}$	$\Delta \text{Time Deposits}$	$\Delta \text{Credit Lines}$
$\Delta \text{Ln}(\text{Reserves})$	0.137*** (0.0368)	0.180*** (0.0541)	-0.242** (0.114)	0.0802*** (0.0282)				
$\text{Ln}(\text{Reserves})_{t-12}$	0.0503*** (0.0140)	0.0136 (0.0227)	-0.0251 (0.0702)	0.0882*** (0.0323)				
$\Delta \text{Reserves}$					0.999*** (0.242)	1.358*** (0.314)	-0.224** (0.0932)	0.147*** (0.0392)
Reserves_{t-12}					0.329*** (0.0691)	0.343*** (0.0838)	0.0726 (0.0684)	0.146*** (0.0399)
Constant	-0.327*** (0.106)	-0.0265 (0.172)	0.163 (0.533)	-0.616** (0.249)	-88.97 (169.3)	-15.98 (164.0)	-220.0 (150.2)	-162.4* (91.28)
Obs	147	147	147	147	147	147	147	147
R-sq	0.592	0.589	0.296	0.232	0.663	0.673	0.334	0.416
S.E.(# Lags)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)



	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ Ln(Uninsured Deposits)	Δ Ln(Insured Deposits)	Δ Ln(Uninsured Demandable Deposits)	Δ Ln(Insured Demandable Deposits)	Δ Ln(Uninsured Deposits)	Δ Ln(Insured Deposits)	Δ Ln(Uninsured Demandable Deposits)	Δ Ln(Insured Demandable Deposits)
Δ Ln(Reserves)	0.217** (0.101)	0.0818 (0.0734)	0.181** (0.0701)	0.140** (0.0631)				
Ln(Reserves) _{t-4}	0.0945 (0.0900)	0.0211 (0.0293)	0.0147 (0.0572)	-0.00274 (0.0445)				
Δ Reserves					0.687*** (0.0891)	0.324 (0.219)	0.797*** (0.174)	0.479*** (0.160)
Reserves _{t-4}					0.212 (0.151)	0.116 (0.111)	0.125 (0.101)	0.0809 (0.0859)
Constant	-0.609 (0.693)	-0.129 (0.224)	-0.0418 (0.437)	0.0870 (0.346)	-78.02 (372.7)	-12.75 (293.6)	83.39 (226.6)	174.9 (207.4)
N	49	49	49	49	49	49	49	49
r2	0.0526	0.0536	0.303	0.274	0.366	0.101	0.586	0.423
S.E.(# Lags)	Newey-West (4)	Newey-West (4)	Newey-West (4)	Newey-West (4)	Newey-West (4)	Newey-West (4)	Newey-West (4)	Newey-West (4)

Reserves →
(Especially)
Uninsured
demand deposits

Time-series analysis: Reserves -> Price of liquidity

LS-VJ (2022):

$$\begin{aligned} & EFFR - IOR_t \\ & = \alpha \ln(\text{Reserves})_t + \beta \ln(\text{Deposits})_t + \gamma \ln(\text{Credit Line})_t + \varepsilon_t \end{aligned}$$

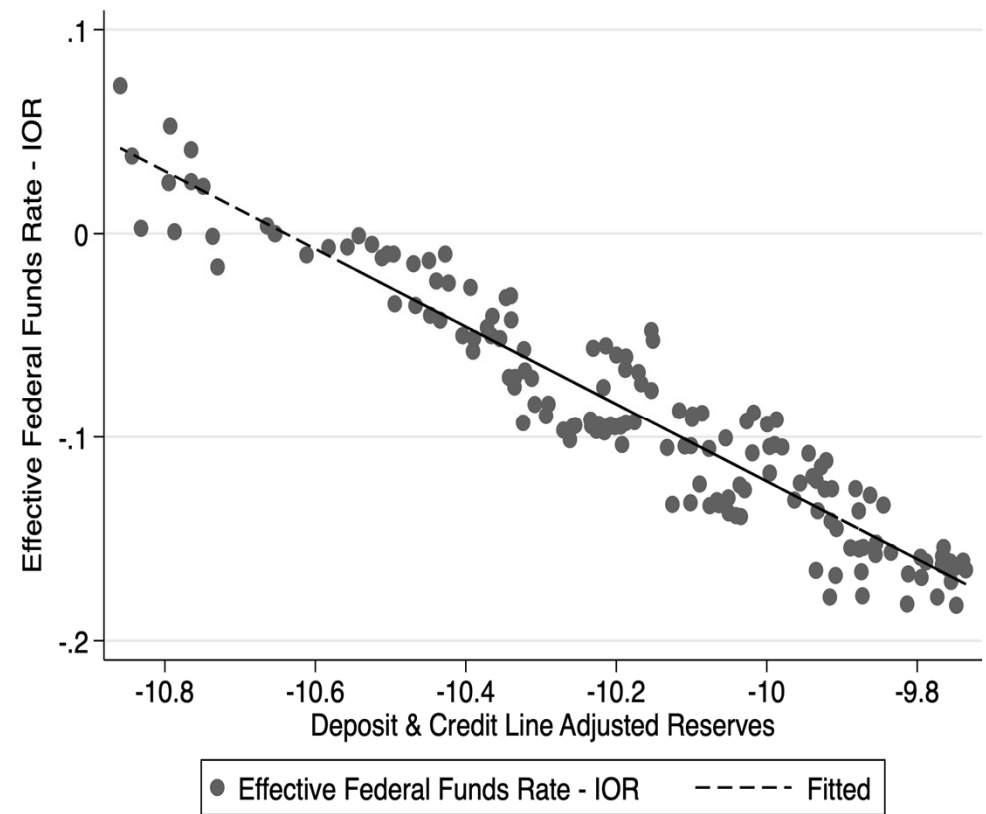
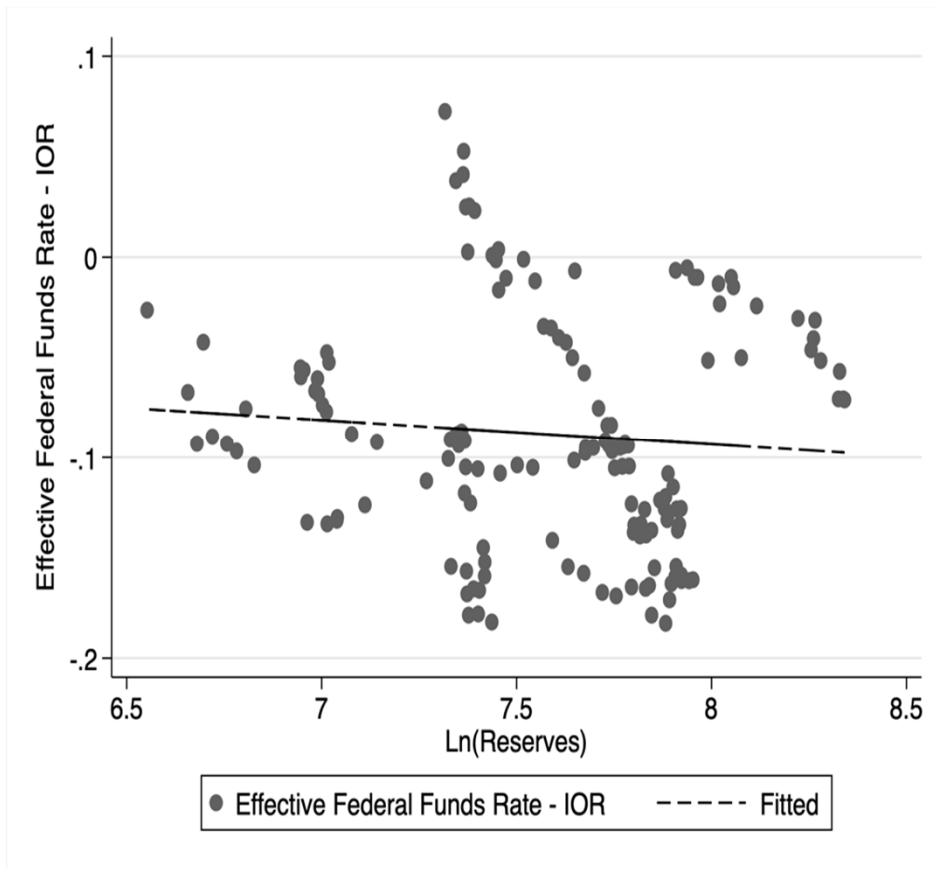
OR (to address issues of non-stationarity and co-integration)

$$\begin{aligned} & \Delta(EFFR - IOR)_t \\ & = \alpha \Delta \ln(\text{Reserves})_t + \beta \Delta \ln(\text{Deposits})_t + \gamma \Delta \ln(\text{Credit Line})_t + \varepsilon_t \end{aligned}$$

$\Delta X_t = X_t - X_{t-4}$ for regressions with quarterly variables and

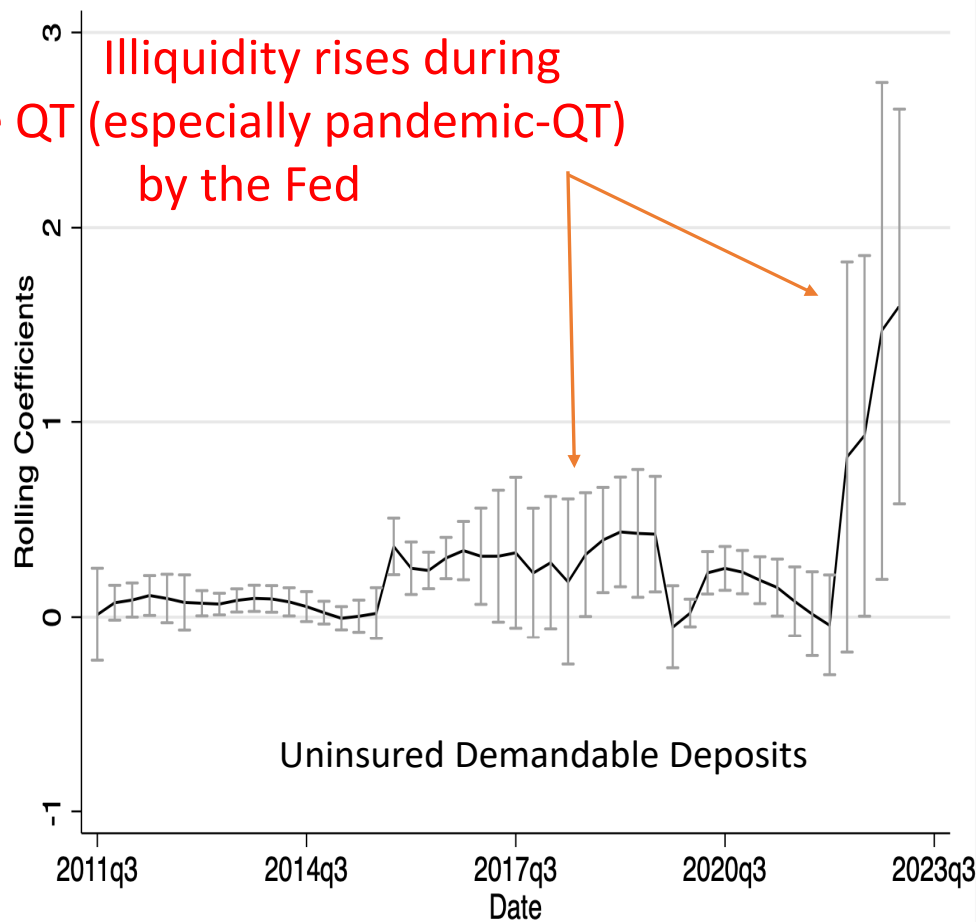
$\Delta X_t = X_t - X_{t-12}$ for regressions with monthly variables

Reserves, Claims, and the Price of Liquidity



Note: inspired by Lopez-Salido and Vissing-Jorgensen (2022)

Qtrly Rolling Coefficient of EFFR-IOR on Reserves + UDD



Dependence view: Liquidity demand affected by reserves



- Supply of reserves creates its own additional demand, new claims written by banks.
- Liquidity conditions and the effect of quantitative tightening depend on how these claims evolve.

Panel Tests (across banks)

From time-series to panel tests

- Time-series evidence suggests
 - Reserves affect claims on liquidity held by the banking system
 - Demandable deposits and credit lines rise
 - Time deposits shrink
 - Claims on liquidity have to be accounted for to price liquidity
- But time-series tests lack power to isolate well the QE/QT periods
 - Can't rule out confounding effects due to interest rates, economic activity
- Hence, panel tests...

Challenges in panel tests

- Reserves are exogenous for the banking system as a whole, but endogenous for each individual bank

e.g. A risk averse or LCR constrained bank may seek higher reserves, *higher* time-deposits and *lower* demand deposits or credit-lines

- We instrument bank-level reserves to get at a “reserves beta”
 - *Non-transient bank-level variation*: Bank’s share of aggregate (commercial bank) reserves over the past year
 - *Exogenous variation* in aggregate reserves:
 - Growth in Fed’s balance-sheet or reserve size

Instrument for Reserves

$$z_{it}^{R1} = \ln \left(\frac{\text{Aggregate Reserves}_t}{\text{Aggregate Reserves}_{t-1}} \right) \times \frac{1}{4} \sum_{k=1}^4 \text{Bank } i\text{'s share of aggregate reserves}_{t-k}$$

Bank i's share of aggregate reserves in quarter t is calculated by dividing the bank-level reserves by aggregate central bank reserves.

Rationale:

- Average of lagged share reflects “location” of the bank with regard to picking up exogenous reserves
 - being a money-center bank,
 - having relationships with non-banks tendering assets to the Fed
- Assumption: Endogenous responses caused by shocks uncorrelated to “location”

Uninsured Demand Deposits– IV 2nd Stage

	(1)	(2)	(3)	(4)
	$\Delta\text{Ln}(\text{Uninsured Demandable Deposits})$			
$\Delta\text{Ln}(\text{Reserves})$	0.104*** (0.0281)	0.110*** (0.0295)	0.109*** (0.0300)	-0.253 (0.202)
Obs	96284	42439	34825	29807
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

NOTE: Results driven by banks with below-median equity capitalization (Appx); Search for yield (we will revisit later...)

Active maturity-shortening: Reserves -> Lower deposit term spreads

	(1)	(2)	(3)	(4)
	3 month CD	12 month CD	18 month CD	24 month CD
	Rate - Savings	Rate - Savings	Rate - Savings	Rate - Savings
	Rate	Rate	Rate	Rate
Ln(Reserves)	-0.154*** (0.0320)	-0.0690 (0.0654)	-0.220*** (0.0582)	-0.104*** (0.0146)
Ln(Total Deposits)	0.775 (0.479)	0.654 (0.545)	1.448** (0.564)	0.737 (0.456)
Obs	78827	84196	70531	82941
Bank & Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Controls	Y	Y	Y	Y
Period	Overall: 2001Q1 - 2021Q4	Overall: 2001Q1 - 2021Q4	Overall: 2001Q1 - 2021Q4	Overall: 2001Q1 - 2021Q4

Bank
preference
to shorten
the maturity
of deposits
in QE ;
No reversal
of this
preference
post-QE / QT

NOTE: Robust to instrumenting Total Deposits for exogenous variation; Results driven by high-deposit HHI banks₂(Appx)

Active selling of demandable claims (CLs)

- Do reserves-intensive banks also sell more credit lines?
 - Consistent with time-series tests, results hold for sub-IG credit line originations

	(1)	(2)	(3)	(4)
Non-Investment Grade				
	$\Delta \text{Ln}(\text{Credit Lines})$			
$\Delta \text{Ln}(\text{Reserves})$	0.354*	0.337*	0.295**	0.0921
	(0.184)	(0.190)	(0.131)	(0.236)
Obs	1768	719	550	484
Time-FE	Y	Y	Y	Y
Time Clustered SEs	Y	Y	Y	Y
Reg-Type	IV	IV	IV	IV
Period	Overall	QE I-III + Pandemic QE	QE I-III	Post-QE III + QT

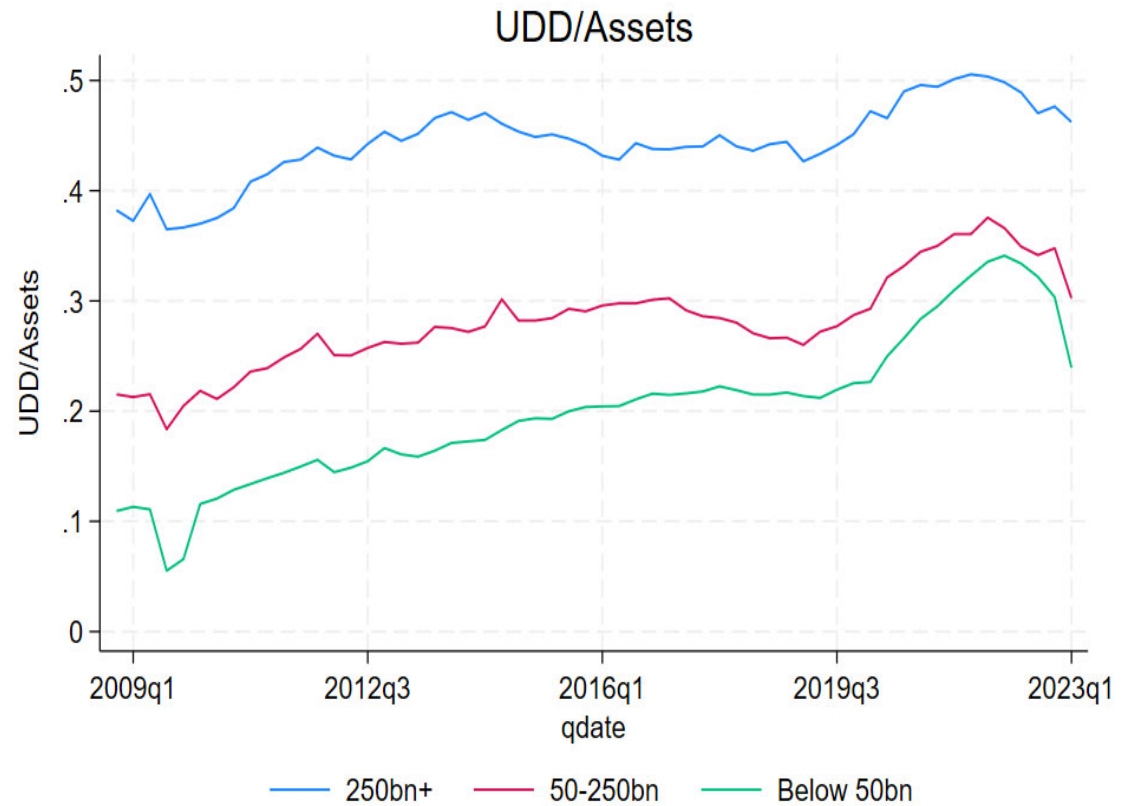
QE → QT and Financial Fragility

Financial Fragility Consequences I: From QE to QT

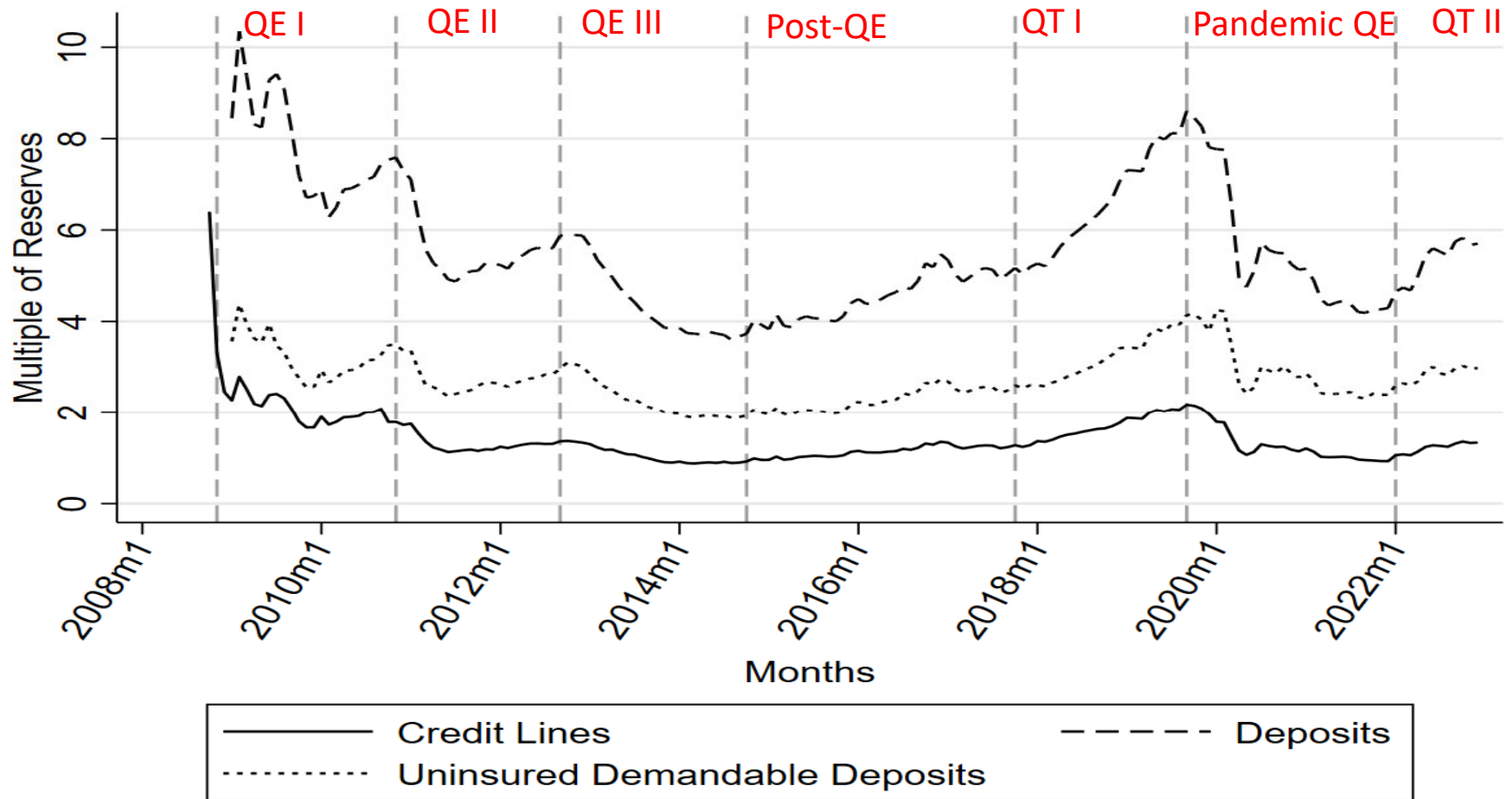
- Overall ratcheting-up of claims to liquidity
- Why do banks not shrink liquidity claims when reserves fall?
 - They instead substitute into eligible assets (Treasuries, MBS, Agency debt)
 - Claims to Potential Liquidity
 - = [Credit Lines + (Uninsured) Demandable Deposits] / [Reserves + Eligible Assets]
- Who does not shrink liquidity claims when reserves fall?
 - Evidence of illiquidity-seeking by (smaller) banks not subject to LCR
 - Illiquidity-seeking results in higher ROE...
Especially for below-median-capitalization banks
- What are the consequences?
 - Skews liquidity risk distribution and increases duration mismatch
 - Financial fragility: COVID shock, Mid-size/regional banking failures/stress

Ratcheting-up of Uninsured Demand Deposits

Date	>\$250 billion	\$50-250 billion	< \$50 billion
2008Q3	35.8	20.9	10.4
2014Q3	46.1	30.1	18.3
2019Q3	44.1	27.7	21.9
2019Q4	45.1	28.7	22.5
2021Q4	50.4	37.6	33.5
2022Q4	49.8	34.8	30.3
2023Q1	46.2	30.2	23.9



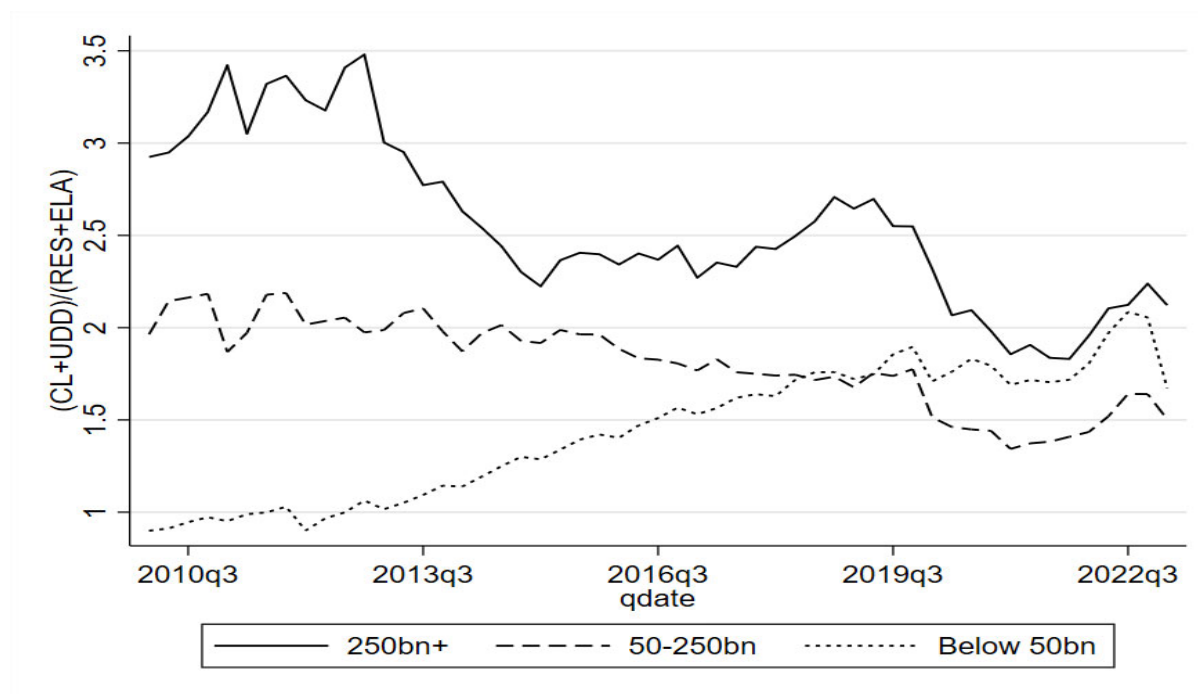
Ratcheting-up of Claims (multiple of reserves)



Ratcheting-up of Liquidity Risk

Claims to Liquidity:

$(\text{Uninsured Demandable Deposits} + \text{Credit Lines}) / (\text{Reserves} + \text{Eligible Assets})$



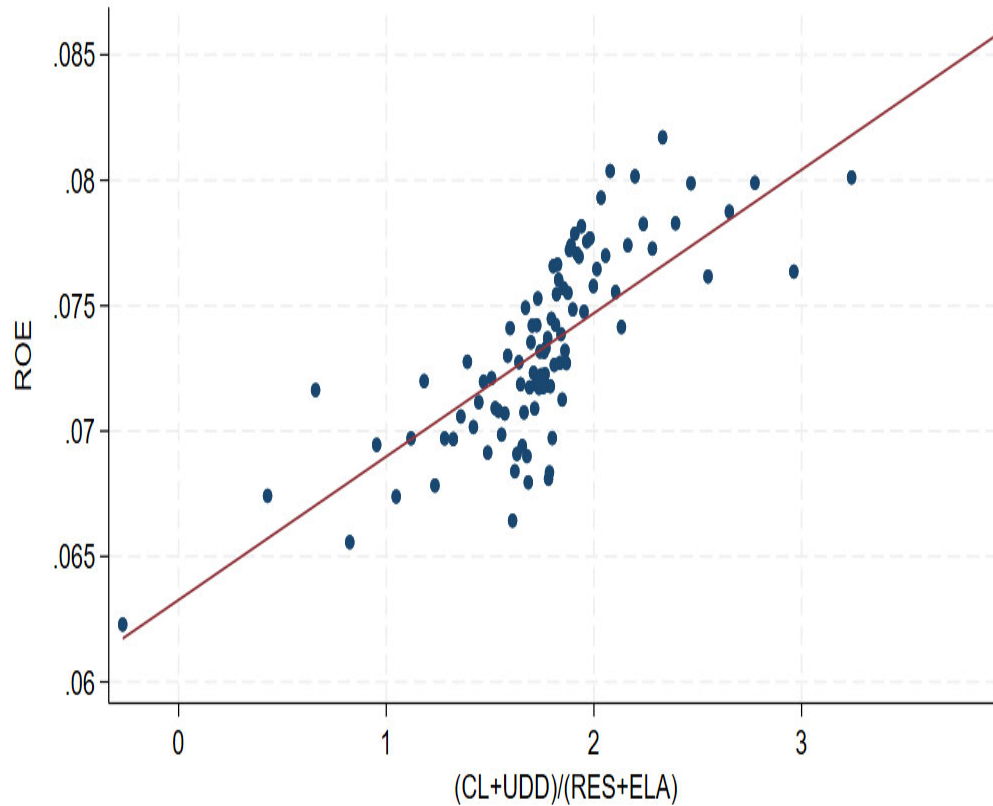
Largest banks becoming safer, smallest banks increasingly at risk of illiquidity

Uninsured Demandable Deposits part of the ratio shows similar heterogeneity

Financial Fragility Consequences I: From QE to QT

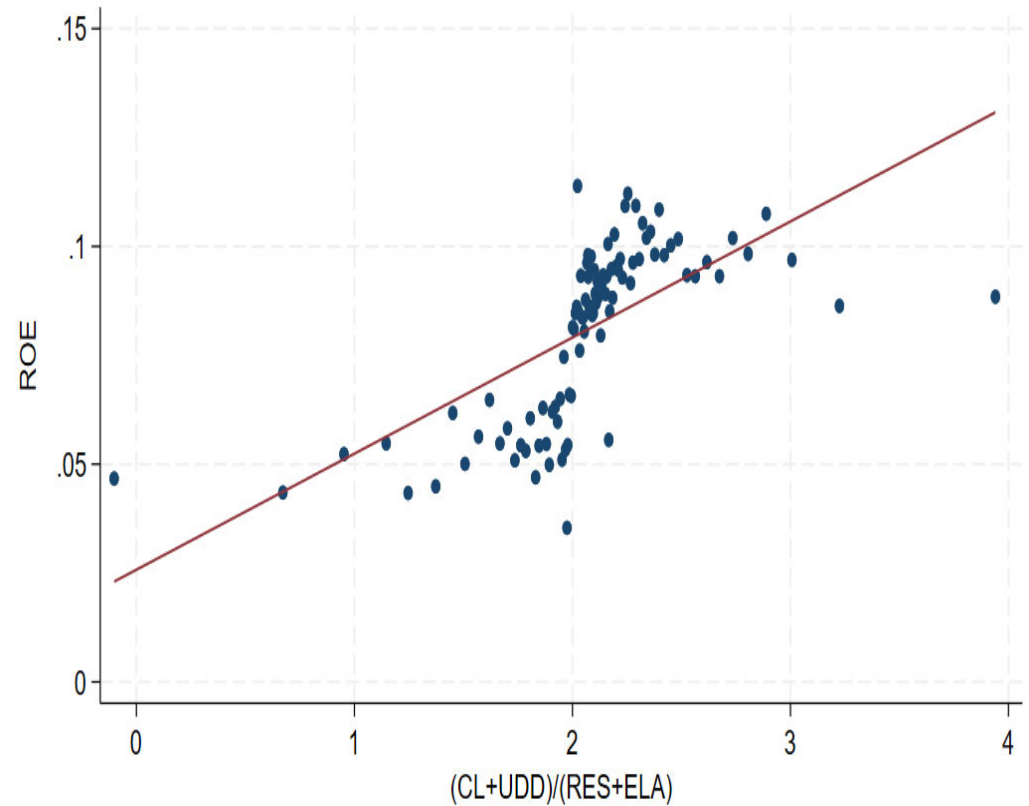
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Binscatter for 2014Q4-2019Q3



Controls include Bank and Time Fixed Effects, Both Variables winsorized at 5th and 95th percentile

Binscatter for 2022Q1-2023Q1



Controls include Bank and Time Fixed Effects, Both Variables winsorized at 5th and 95th percentile

1. Results hold during QE also, but ROE less steeply related to liquidity risk than during QT
2. Results hold with lagged or beginning-of-period liquidity risk

Liquidity risk boosts ROE more for below-median capital banks

	(1)	(2)	(3)	(4)	(5)
	ROE				
$(CL+UDD)/(RES+ELA)_{t-1}$	0.000482* (0.000269)	-0.000584 (0.000340)	0.000614** (0.000240)	-0.000322 (0.000643)	-0.000758 (0.000727)
Below Median Equity/Assets _{t-1}	0.000997 (0.00165)	-0.00276* (0.00151)	0.00519*** (0.00143)	-0.00310 (0.00282)	-0.00719 (0.00529)
Below Median Equity/Assets _{t-1} ×(CL+UDD)/(RES+ELA) _{t-1}	0.00134*** (0.000301)	0.00156*** (0.000429)	0.000507* (0.000254)	0.000886 (0.000496)	0.00172 (0.000795)
N	89495	40123	37216	8459	3565
R ²	0.639	0.654	0.775	0.806	0.837
Period	2010Q1-2023Q1	2010Q1-2014Q3	2014Q4-2019Q3	2019Q4-2021Q4	2022Q1-2023Q1

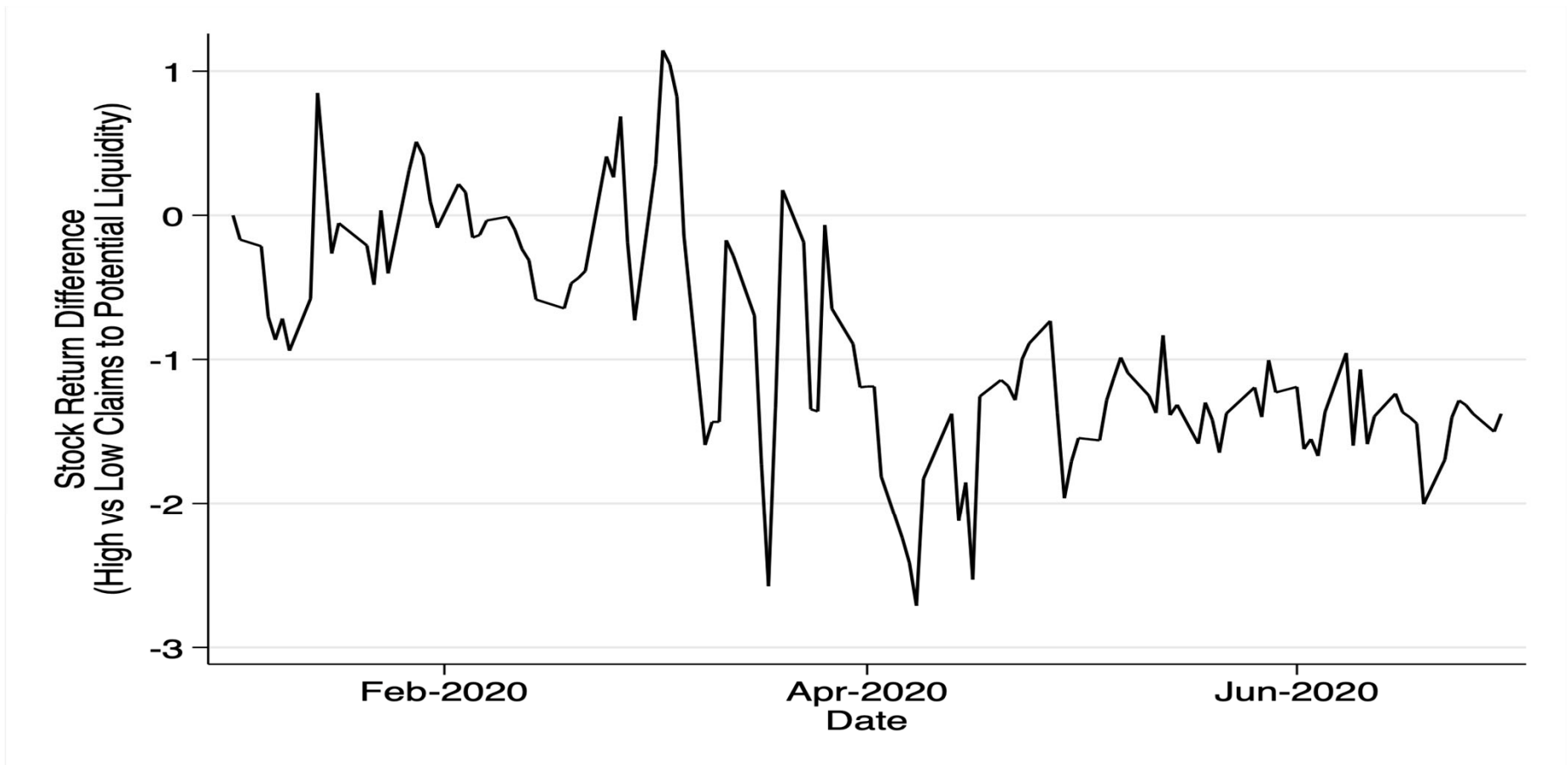
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Financial Fragility II: COVID case study

- How did liquidity risk fare post-QT I, i.e., at the pandemic outbreak?
 - 2020: COVID shock - Dash for cash on bank credit lines by corporate clients

CL + Uninsured Demandable Deposits and Fragility: Covid Shock



Panel A. Implications for bank stock returns (1 March – 23 March 2020)

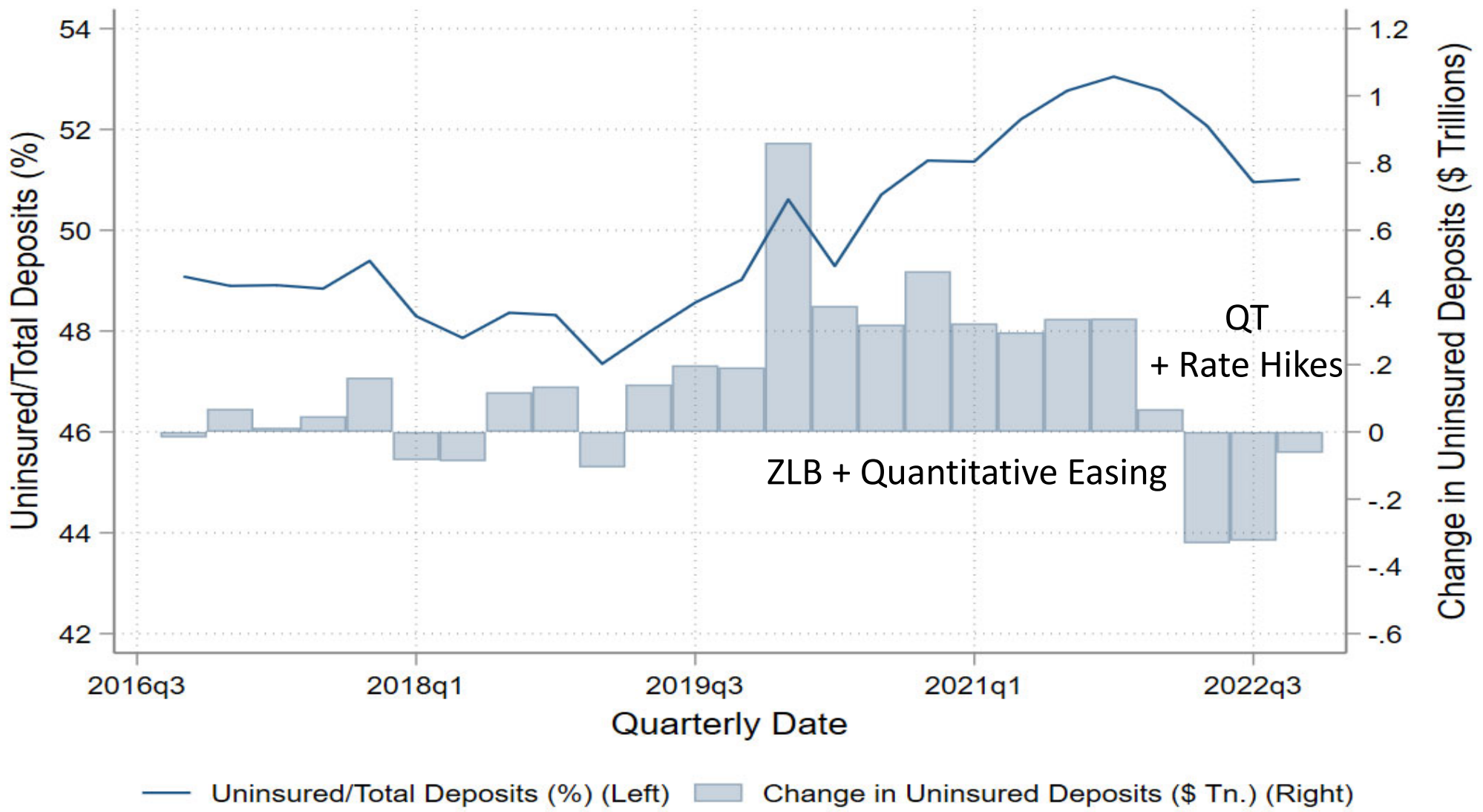
Claims to Liquidity and Fragility: COVID shock

Bank Stock Returns and Gross Credit Line Drawdowns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	Excess Returns			Gross Drawdowns				
	2 nd Jan – 28 th Feb 2020	1 st – 23 rd March 2020		2020Q1				
Ln(Claims to Potential Liquidity)	0.0117** (0.010)	-0.0165** (0.027)		0.00194** (0.027)				
Ln(Credit Lines to Potential Liquidity)			-0.0194*** (0.000)	0.00196*** (0.001)				
Ln(Uninsur ed Demandabl e Deposits to Potential Liquidity)				-0.0146* (0.054)	0.00156* (0.062)			
N	0.270	0.0555	0.0957	0.0514	0.314	0.356	0.307	
R-Sq	309	310	304	309	131	128	131	

Financial Fragility III: COVID QE, recent QT and banking stress

- Solvency was not an issue at the time of COVID outbreak because of massive stimulus and low rates
- However, post pandemic QT is accompanied by sharp rate increases
 - Slow deposit outflows during 2022
 - (Solvency-based?) Runs in Q1 of 2022 on SVB, Signature, First Republic Bank
- An important feature of failed banks: large share of uninsured deposits
- Why did uninsured deposits grow at unprecedented pace until 2021?
 - The role of QE (fiscal stimulus -> insured deposits)
- Did pandemic QE, by raising uninsured deposits, set the stage for banking stress?



Claims to Liquidity and Fragility: SVB stress

Bank Stock Returns (1-13 Mar 2023) and UDD Drawdowns (Q1 23)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Excess Returns				$\Delta \text{Ln}(\text{Uninsured Demandable Deposits})$		
	03 rd Jan – 28 th Feb 2023	1st-13th Mar 2023		2022Q4 -2023Q1			
Ln(Claims to Potential Liquidity)	0.00691 (0.00455)	-0.0157** (0.00638)		-0.0223*** (0.00719)			
Ln(Credit Lines to Potential Liquidity)		-0.00334 (0.00333)		-0.0123*** (0.00366)			
Ln(Uninsured Demandable Deposits to Potential Liquidity)				-0.0169** (0.00679)			-0.0242*** (0.00836)
N	308	305	299	304	3890	3613	3890
R-Sq	0.114	0.400	0.383	0.403	0.00770	0.00534	0.00870

NOTE: Results driven by banks with below \$250bln size in assets as of Q4 2022 (see Appx)

Policy Implications

Is there a cost to repeated Fed liquidity provision?

- Tightening post-QE associated with financial fragility despite excess reserves (reverse repo) and presence of Federal Home Loan Banks.
- Liquidity shortages may need more sustained Fed reserve support.
 - Intra-day support not enough
- But then market underprices liquidity mismatches, enhancing need to intervene.
 - Easy for Fed to get in, hard to get out
 - Distortion in financial activity, risk taking.
 - Distortion in real activity?
- Permanent fiscal financing/ interferes with monetary function
- Accidents/places Fed cannot reach

Financial stability concerns?

- Accidents waiting to happen? Not just banks, but also in shadow banks?
 - BOE in 2022
- Agency problems in banks and bailout
 - Fed and Treasury in March 2023
- Engage in QT while “feeling the stones” for financial fragility
- Revisit desirable scale, scope, duration of QE: “pushing on a string”?

Appendix

Aggregate price of liquidity $\Delta(EFFR - IOR)_t$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta\text{Ln}(\text{Reserves})$	-0.149*** (0.0335)	-0.198*** (0.0291)	-0.206*** (0.0204)	-0.174*** (0.0312)	-0.207*** (0.0190)	-0.219*** (0.0213)	-0.183*** (0.0293)
$\Delta\text{Ln}(\text{Deposits})$		0.464** (0.222)			0.343* (0.194)		
$\Delta\text{Ln}(\text{Demandable Dep})$			0.430*** (0.106)			0.360*** (0.0951)	
$\Delta\text{Ln}(\text{Time Dep})$			0.0586 (0.0542)			0.0423 (0.0603)	
$\Delta\text{Ln}(\text{Unins Dem Dep})$							0.0776** (0.0338)
$\Delta\text{Ln}(\text{Credit Lines})$				0.182*** (0.0496)	0.160*** (0.0511)	0.170*** (0.0487)	0.188*** (0.0508)
$\Delta\text{Ln}(\text{Gross Draws})$				-0.0154*** (0.00512)	-0.0138* (0.00693)	-0.0120* (0.00657)	-0.0142*** (0.00437)
Constant	0.00474** (0.00195)	-0.00182 (0.00427)	-0.00333 (0.00296)	0.00321 (0.00199)	-0.00146 (0.00379)	-0.00359* (0.00210)	0.00164 (0.00240)
Obs	51	51	51	51	51	51	51
R-sq	0.468	0.518	0.530	0.562	0.588	0.605	0.575
Reg-Type	OLS	OLS	OLS	OLS	OLS	OLS	OLS

Price of liquidity
 → - Reserves,
 + Demandable,
 + Uninsured DD

Reserves Instrument: 1st Stage

	(1)	(2)	(3)	(4)
	$\Delta\text{Ln}(\text{Reserves})$	$\Delta\text{Ln}(\text{Reserves})$	$\Delta\text{Ln}(\text{Reserves})$	$\Delta\text{Ln}(\text{Reserves})$
z^{R1}	28.79*** (8.127)	30.15*** (7.162)	27.33** (11.78)	-22.18 (13.86)
z^{R2}	-44.35 (27.02)	-50.30* (25.17)	-42.21 (39.17)	243.8*** (58.14)
N	112098	50835	43041	30696
R-sq	0.128	0.162	0.162	0.0290
F-stat	284213.1	82579.8	319247.0	27.86
Controls	Ln(Assets), Equity/Assets, Net Income/Assets, Primary Dealer, HHI			
Period	Overall: 2001Q1- 2021Q4	QE I-III+Pandemic QE: 20008Q4- 2014Q3 + 2019Q4- 2021Q4	QE I-III: 20008Q4- 2014Q3	Post-QE III+QT: 2014Q4-2019Q3

Mechanisms at work...

Additional Test I: Active maturity-shortening

- Is the shortening of maturities bank-driven?
 - Ability to affect deposit quantity by adjusting rates requires market power
 - Effects driven by banks with above-median HHI banks, limited effect for others
 - Banks with above median value of deposits-weighted county-level-deposit-HHI (full-sample)

Term spread and bank deposit HHI

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A.1	3 month CD Rate - Money Market AC Rate							
	Above Median HHI				Below Median HHI			
Ln(Reserves)	-0.170*** (0.0525)	-0.203*** (0.0612)	-0.216*** (0.0541)	0.209* (0.117)	0.0259 (0.0356)	0.0579 (0.0533)	0.00854 (0.0544)	0.260 (0.375)
Ln(Total Deposits)	0.753 (0.637)	0.825 (0.681)	1.016 (0.615)	-0.528 (1.068)	-0.363 (0.747)	-1.154 (0.735)	-0.234 (0.340)	0.127 (1.651)
N	40573	19429	17026	10856	41143	19918	17552	10570
Bank and Time-FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank and Time Clustered SE	Y	Y	Y	Y	Y	Y	Y	Y
Period	Overall	QE I- III+Pande mic QE	QE I-III	Post-QE III+QT	Overall	QE I- III+Pande mic QE	QE I-III	Post-QE III+QT

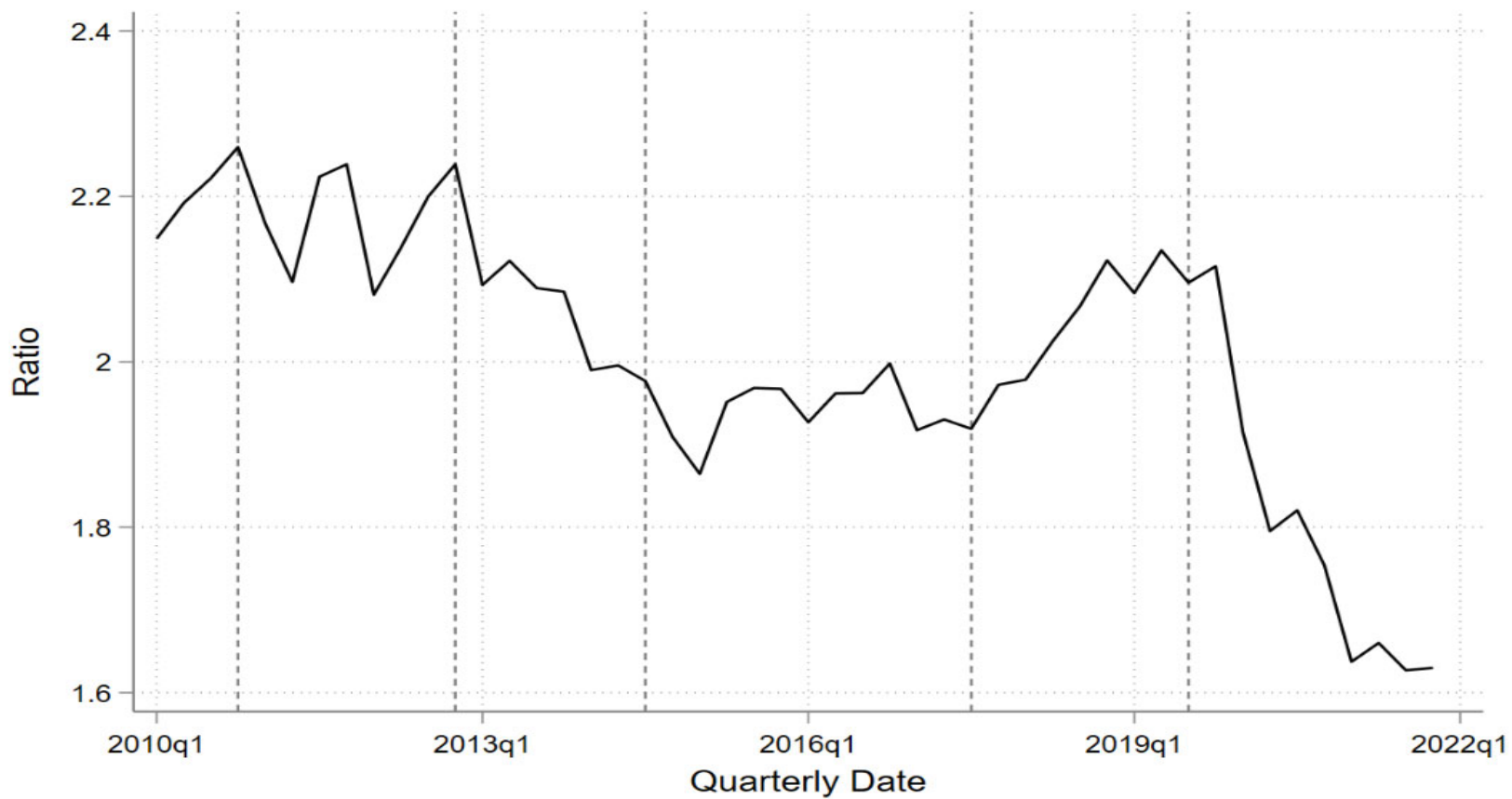
II: Maturity-shortening by less-capitalized banks

- Which banks raise uninsured deposits and shrink maturity?
 - Results driven by below median (one-quarter-lagged) equity-to-assets banks
 - QE x Bank under-capitalization → Uninsured deposits, maturity shortening

Bank capital and demand deposits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta \ln(\text{Uninsured Demand} + \text{Savings Deposits})$							
	Above Median Equity/Assets				Below Median Equity/Assets			
$\Delta \ln(\text{Reserves})$	0.110	0.167	0.186	-0.108	0.113***	0.116***	0.127***	-0.317
	(0.110)	(0.115)	(0.125)	(0.244)	(0.0224)	(0.0201)	(0.0239)	(0.420)
N	41001	19111	15794	13468	55283	23328	19031	16339
Time-FE	Y	Y	Y	Y	Y	Y	Y	Y
Bank & Time Clustered FE	Y	Y	Y	Bank	Y	Y	Y	Y
Period	Overall	QE I-III + Pandemic QE	QE I-III	Post-QE III + QT	Overall	QE I-III + Pandemic QE	QE I-III	Post-QE III + QT

(Credit Lines + Uninsured Demandable Deposits) / (Reserves + Eligible Assets)



Uninsured Demandable Claims (Deposits) and Fragility

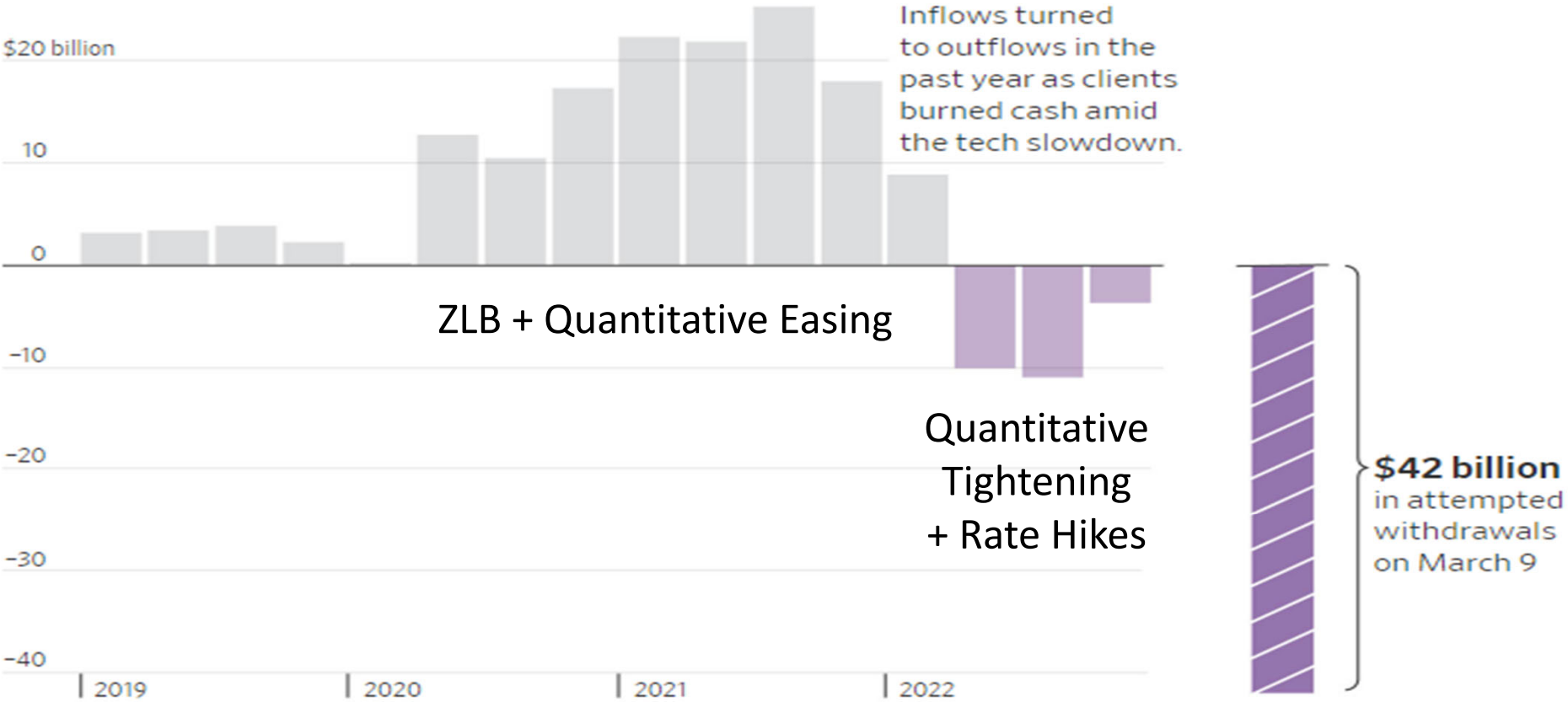
Bank Stock
Returns
(1-13 Mar 2023)

and

UDD Drawdowns
(Q1 23)

Panel B: Interactions with Size Indicator						
	(1)	(2)	(3)	(4)	(5)	(6)
		Excess Return		$\Delta \ln(\text{Uninsured Demandable Deposits})$		
Claims to Potential Liquidity	0.0495**			0.168***		
	(0.0193)			(0.0531)		
Bank Assets \leq \$250 bn=1	0.00469	-0.0605	-0.0103	0.0641	-0.154	0.00804
	(0.0476)	(0.0576)	(0.0478)	(0.101)	(0.136)	(0.103)
Bank Assets \leq \$250 bn=1 # Claims to Potential Liquidity	-0.0769***			-0.201***		
	(0.0203)			(0.0535)		
Credit Lines to Potential Liquidity		0.00615			0.0440*	
		(0.0102)			(0.0238)	
Bank Assets \leq \$250 bn=1 # Credit Lines to Potential Liquidity		-0.0171			-0.0601**	
		(0.0131)			(0.0237)	
Uninsured Dem Deposits to Potential Liquidity			0.0575***			0.153**
			(0.0201)			(0.0735)
Bank Assets \leq \$250 bn=1 # Uninsured Dem Deposits to Potential Liquidity			-0.0863***			-0.189**
			(0.0216)			(0.0738)
N	305	299	304	4094	3800	4094
r2	0.0973	0.0814	0.0993	0.0116	0.0105	0.0134

SIVB deposits, quarterly net change



Sources: company filings (quarterly); California regulators (March 9)