Unconventional Monetary Policy and the Search for Yield

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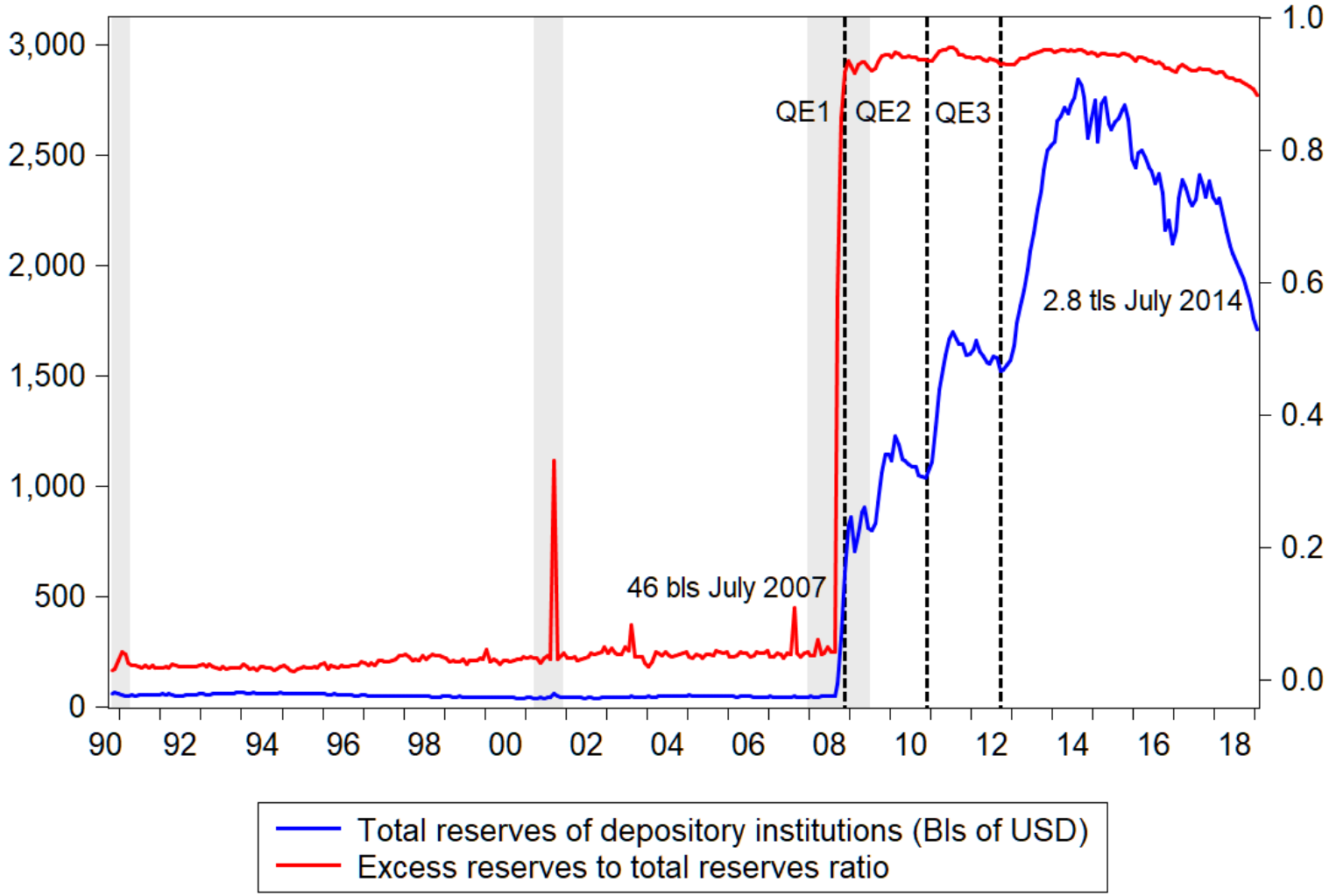
In a snapshot

- "Fed pays for securities by creating reserves in the banking system...As the economy strengthened, banks would begin to loan out their reserves...that was exactly what we wanted to see" (Bernanke, 2015)
- Role of reserves tends to be overlooked in recent analyses of QE
- *Identification strategy*: IV using confidential daily reserves
- *Mechanism*: Exogenous change in FDIC insurance fee assessment base affecting net return on holding reserves
- Positive link between reserves accumulation during QE and search for yield; weaker, if higher return on reserves

Background

- Fed's response to financial crisis led to the rise of reserves Figure
- Bulk of additional reserves are in excess of regulatory requirements and receive interest since October 2008
- Studies exploit heterogeneity in banks' holdings of QE-eligible assets to identify **bank-lending** effects of QE (Rodnyansky and Darmouni, 2017; also examine **bank risk-taking** effects (Morais et al., 2019)
- With a few exceptions (Ryan and Whelan, 2019; Kandrac and Schlusche, 2020), reserves are less explored in academic work

Reserves and excess reserves ratio - all U.S. banks



QE and bank lending/risk-taking

- Recent studies exploit heterogeneity in US banks' holdings of QE-eligible assets to identify **bank-lending** effects
- QE affects R&E and C&I lending - *bank net worth channel* (Rodnyansky and Darmouni, 2017)
- MBS purchases increases mortgage origination - *mortgage origination channel* (Chakraborty et al., 2019)
- Few studies on **bank risk-taking** effects of QE compared to those on link with interest rates (Maddaloni and Peydro, 2011; Jimenez et al., 2014; Dell'Ariccia et al., 2017; Heider et al., 2019; Bubeck et al., 2020, Morais et al., 2019)

Mechanism: Reserves-induced search for yield

- Massive injection of (low-yielding) reserves during QE suppressed interest rates and improved economic outlook
- However, fall in net interest income of banks (Altavilla et al., 2018)
- Adverse effects on profitability push banks to higher-yielding assets; aligns with *search for yield* - nominal profitability targets matter (Rajan, 2006; Borio and Zhu, 2012)
- Mechanism (1) different from mechanical reserves-lending link implied by money multiplier (2) does not depend on which assets Fed purchases; identity of sellers; imperfect substitutability of assets
- Anecdotal evidence from official surveys of financial institutions offers support for this channel

Hypotheses

- **H1**: Growth in bank-level reserves during QE led to search for yield
- **H2**: Relationship depends on net return that a bank earns on its reserve balances; lower return implies stronger link

Contributions

- Reserves rise defining characteristic of QE; limited number of related studies (Ryan and Whelan, 2019; Kandrac and Schlusche, 2020)
- New insights for transmission mechanism of non-conventional monetary policy and search for yield using bank-level QE exposure
- Address key empirical challenges:
  - Endogeneity of reserves and bank lending - IV with novel instrument
  - Isolate credit supply effects at the loan level - Fixed effects
  - Mechanism - Exogenous variation in banks' cost of holding reserves due to regulatory shift

Syndicated loan market and sample

- **Dealscan**:
  - Information on loan characteristics (loan amount, collateral, etc)
  - Lenders' names and role in the syndicate (lead arranger, etc)
  - Borrowers' name
  - Exclude loans granted to utilities or financial companies
  - Exclude loans where lenders include institutional investors that are neither commercial nor investment banks (e.g. PE funds)
- **Compustat**: Balance-Income sheet information on the borrower
- **Call reports**:
  - Balance-Income sheet information on the lenders
  - *Daily bank reserves*
- Matching process yields 8,443 loans originated by 234 banks to 2,518 firms over the period 2007q1-2016q2

Econometric model

$$Y_{l,f,b,t} = \lambda_0 \cdot \left[\frac{\Delta(Reserves)}{Assets}\right]_{b,t} + \sum_{j=1}^{3} \lambda_j \cdot QE_j \cdot \left[\frac{\Delta(Reserves)}{Assets}\right]_{b,t} \quad (1)$$
$$+ \beta_1' \boldsymbol{L}_{l,t} + \beta_2' \boldsymbol{F}_{f,t-1} + \beta_3' \boldsymbol{B}_{b,t-1} + \boldsymbol{\Phi}_{f,b,t} + \epsilon_{l,f,b,t}$$

- $Y_{l,f,b,t}$, is the log amount (\$Mil; l) that firm f borrowed from bank b
- $QE_j \cdot \left[\frac{\Delta(Reserves)}{Assets}\right]_{b,t}$ denotes the quarterly change in reserves relative to total assets of bank b during QE_j (j=1,2,3)
- L, F, B are vectors of **loan**, **firm** and **bank**
- $\Phi_{f,b,t}$ denotes fixed effects

Reserves accumulation - syndicated loan market banks

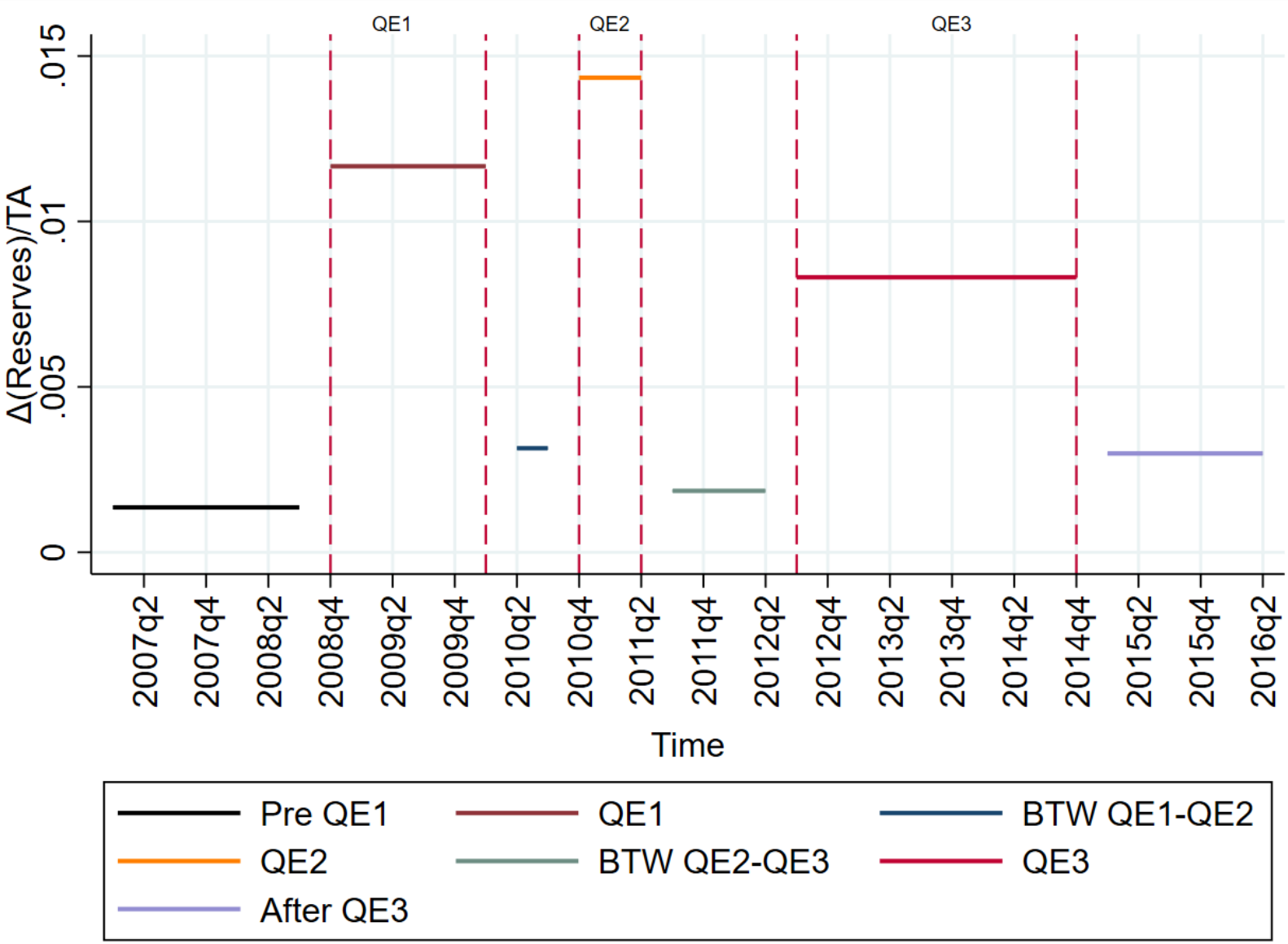


Table: Reserves and lending - Loan amount FE estimates

	I	II	III	IV	V	VI
$\Delta(RES)/TA$	-0.654***	-0.498***	-0.517***	-0.525***	-0.394***	-0.487***
QE1 * $\Delta(RES)$/TA	1.021***	0.883***	0.799***	0.772***	0.894***	0.717***
QE2 * $\Delta(RES)$/TA	2.008***	1.532***	1.289***	1.308***	0.969**	1.203***
QE3 * $\Delta(RES)$/TA	1.258**	0.869**	1.345***	1.226**	1.067***	1.569***
QE dummies	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y
Observations	20,884	20,884	20,655	20,655	20,203	20,173
Adjusted R-squared	0.381	0.412	0.623	0.625	0.761	0.630
Year FE	Y	Y	Y			Y
Lead bank FE		Y	Y		Y	
Firm FE			Y	Y		
Lead bank*Year FE				Y		
Firm*Year FE					Y	
Lead bank*Firm FE						Y
Clustered standard errors	Bank	Bank	Bank	Bank	Bank	Bank

Constructing the IV

- Confidential data on bank-level daily reserves
- Construct a measure of their sensitivity to changes in aggregate reserves (determined by the Fed's actions)
- High-frequency sensitivity can be used to generate instrument: predicted quarterly changes in bank-level reserves
- Instrument stems from variation mostly attributable to client activity

Table: Reserves and lending - Loan amount IV estimates

	Panel A: First stage					
	I	II	III	IV	V	VI
Dependent variable	$\Delta(RES)/TA$					
$\Delta(predRES)/TA$	0.268***	0.268***	0.264***	0.264***	0.260***	0.259***
F-stat	235	215	180	176	217	637
	Panel B: Second stage					
	I	II	III	IV	V	VI
QE1 * $\Delta(\widehat{RES})/TA$	1.401**	0.917*	1.120***	0.955***	1.669***	0.945**
QE2 * $\Delta(\widehat{RES})/TA$	2.245***	1.662***	1.785***	1.758***	1.371***	1.744***
QE3 *$\Delta(\widehat{RES})/TA$	9.345***	7.132***	6.596***	5.424**	6.799***	6.297***
QE, Loan, Firm & Bank controls	Y	Y	Y	Y	Y	Y
Observations	19,110	19,110	18,889	18,889	18,479	18,405
Adjusted R-squared	0.383	0.416	0.632	0.634	0.766	0.639
Wald (P-value)	0.000	0.000	0.000	0.000	0.000	0.000
Year FE	Y	Y	Y			Y
Lead bank FE		Y	Y		Y	
Firm FE			Y	Y		
Lead bank*Year FE				Y		
Firm*Year FE					Y	
Lead bank*Firm FE						Y
Clustered standard errors	Bank	Bank	Bank	Bank	Bank	Bank

FDIC fee assessment base change and exemptions

- FDIC proposal (November 2010): Deposit insurance fee to transition from deposit-based assessment to assets minus tangible equity
- **Importantly**, only some banks were granted exemption for reserves (FDIC, 2011) Table
  - Branches and agencies of foreign banks (established after December 1991): exempt from any FDIC assessment
  - Bankers' banks & banks with custodial business: partially exempt
- Calculate each bank's exemption share (excluded assets over total assessment base), as of 2010q2 to avoid anticipatory behaviour

Table: Reserves and lending - Mechanism

	I	II	III	IV	V
QE2 * $\Delta(RES)/TA$	2.795***	1.811***	1.283***	1.280***	1.446***
QE2 * $\Delta(RES)/TA$* Exemption	-1.149***	-0.864*	-0.602	-0.592*	-0.556*
QE3 * $\Delta(RES)/TA$	-0.118	0.207	0.113	0.120	-0.021
QE3 * $\Delta(RES)/TA$* Exemption	-0.931**	-0.943***	-0.849**	-0.852**	-0.827***
Marginal effect $\Delta(RES)/TA$	0.149	0.212	0.377	0.360	0.451
Marginal effect Exemption	-0.103	-0.097	-0.092	-0.093	-0.091
QE dummies	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y
Observations	15,006	15,006	14,907	14,907	14,502
Adjusted R-squared	0.375	0.428	0.648	0.648	0.657
Year FE	Y	Y	Y		Y
Lead bank FE		Y	Y		
Firm FE			Y	Y	
Lead bank*Year FE				Y	
Lead bank*Firm FE					Y
Clustered standard errors	Bootstrap	Bootstrap	Bootstrap	Bootstrap	Bootstrap

Additional tests

- **Other key findings**
  - Risk taking: more lending to ex-ante/post riskier firms Table
  - Placebo test: no role of FDIC exemptions in QE1 Table
  - More "skin in the game" during QE: syndicated loan shares (%) increase; smaller number of lenders
- **Sensitivity analysis**
  - Repeated syndicated members
  - Exclude LBO and M&A loans
  - Exclude Top3 U.S. banks based on number of deals
  - Exclude GFC recession (December 2007 - June 2009)
  - Control for role of MBS (Rodnyansky and Darmouni, 2017)

Conclusions

- We examine the role of reserves in the transmission mechanism of unconventional monetary policy
- Reserves accumulation during QE led to higher bank lending and risk-taking, in line with search for yield
- Effect attenuated by banks with larger exemption shares from FDIC regulation change
- Monetary policymakers and financial regulators should pay attention to potential interaction between the two policies (BIS, 2015)

Thank you!

Appendix

Reserves over total assets - all banks

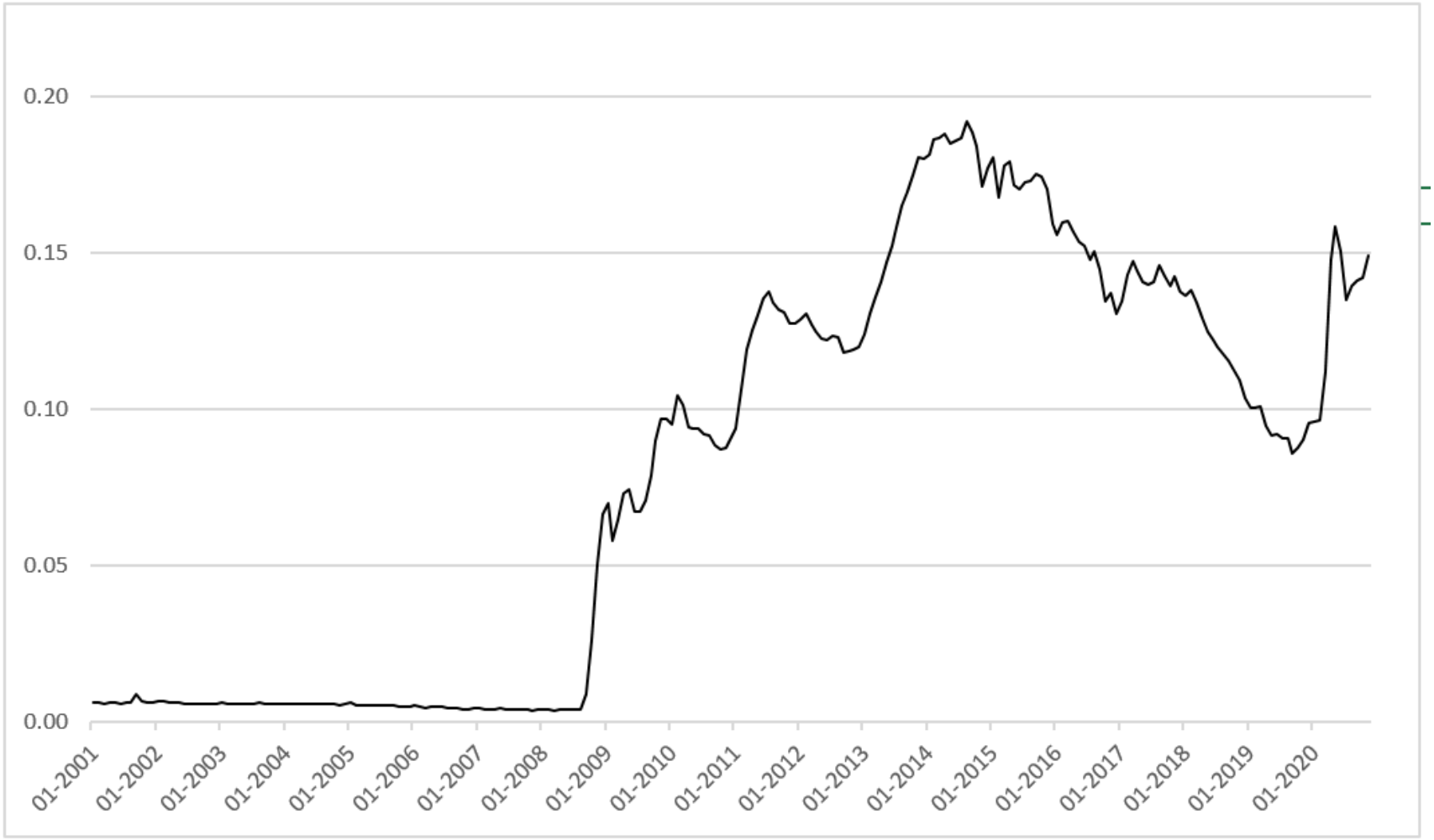


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Table: Reserves and risk-taking - Moody's firm rating & loan downgrade

	I	II	III	IV
	Rating	Rating	Downgrade	Downgrade
QE1 * $\Delta(RES)/TA$	0.377	0.541	0.101	0.121
QE2 * $\Delta(RES)/TA$	1.937**	2.032**	0.191***	0.162***
QE3 * $\Delta(RES)/TA$	2.354*	2.711*	0.160*	0.234**
QE dummies	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y
Observations	20,781	20,299	19,691	19,188
Adjusted R-squared	0.617	0.611	0.626	0.620
Year FE		Y		Y
Firm FE	Y		Y	
Lead bank*Year FE	Y		Y	
Lead bank*Firm FE		Y		Y
Clustered standard errors	Bank	Bank	Bank	Bank

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Table: Banks with partial exemption from FDIC assessment base change

Bank name	RSSD9001
Bank of America Merrill Lynch	480228
Bank of New York Mellon	541101
BMO Harris Bank NA	75633
Citibank NA	476810
Comerica Bank NA	60143
Deutsche Bank Trust Co Americas	214807
Fifth Third Bank	723112
HSBC Bank USA NA	413208
Huntington National Bank	12311
JP Morgan Chase Bank NA	852218
Key Bank NA	280110
Manufacturers & Traders Trust Co	501105
Northern Trust Co	210434
PNC Bank NA	817824
State Street Bank & Trust Co	35301
SunTrust Bank	675332
UMB Bank NA	936855
Union Bank NA	212465
US Bank National Association	504713
Wells Fargo Bank NA	451965

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Table: The Impact of reserves on lending: Placebo test for QE1

	I	II
		Placebo for QE1
$\Delta(RES)/TA$	-0.515	-0.347
Exempted	-0.096***	-0.097***
Exempted * $\Delta(RES)/TA$	0.861***	0.773**
QE1 * Exempted		-0.007
QE1 * $\Delta(RES)/TA$		0.725***
QE1 * $\Delta(RES)/TA$* Exempted		-0.188
QE2 * Exempted	0.033	0.004
QE2 * $\Delta(RES)/TA$	1.280***	1.529***
QE2 * $\Delta(RES)/TA$* Exempted	-0.592*	-0.654***
QE3 * Exempted	0.002	0.007
QE3 * $\Delta(RES)/TA$	0.120	-0.111
QE3 * $\Delta(RES)/TA$* Exempted	-0.852**	-0.662**
QE Dummies	Y	Y
Loan, Firm, Bank controls	Y	Y
Observations	14,907	20,884
Adjusted R-squared	0.648	0.620
Firm FE	Y	Y
Lead bank*Year FE	Y	Y
Clustered SE	Bootstrap	Bootstrap

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