



EUROPEAN CENTRAL BANK

EUROSYSTEM

# Reserve Demand, Interest Rate Control, and Quantitative Tightening



9 November 2023

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- *The views expressed here are the authors' and do not necessarily reflect those of the ECB or the Eurosystem*
- Thank you to colleagues in ECB Research, Market Operations and Monetary Policy directorates for discussions on the topic and on Lopez-Salido&Vissing-Jorgensen (LSVJ)'s paper

- ① **Discussion of LSVJ's paper**
- ② Application of LSVJ to euro area (with Maria Viola (ECB/DGR))

## Reserve demand - LSVJ framework (I)

- **Novelty:** Derive the reserve demand from a bank optimisation problem where deposits are a **key variable**
- **Intuition:** Reserves earn an interest **but also** provide a convenience yield due to transactions cost saving: when faced with deposits outflows the bank does not need to sell securities and/or loans
- **Advantage:** LSVJ provide parameters for a wide range of US reserves so you can recover the whole demand function
- **Policy:** LSVJ assess how much quantitative tightening (QT) is feasible (reduce reserves but keep control over short-term rates)

# Reserve demand - LSVJ framework (II)

- Convenience yield defined as benefit  $v(R, D)$  (or  $-cost(R, D)$ )
  - More reserves (R) reduce price of reserves  $\rightarrow v'_R > 0$
  - More deposits (D) increase price of reserves  $\rightarrow v'_D < 0$
- The (inverse) demand for reserves is

$$\underbrace{FFR}_{\text{Marginal cost of borrowing in Federal funds market}} = \underbrace{IOR + v'_R(R, D) - \phi}_{\text{Marginal benefit of holding reserves}} \quad (1)$$

- FFR is the federal fund rate
- IOR is the interest on reserves paid by Fed
- $v'_R(R, D)$  is marginal liquidity benefit from additional reserves
- $\phi$  is the marginal cost of regulation (penalises balance-sheet expansion)
- No upper bound rate: the discount window rate (as in Poole's models)
- Potentially bank can raise reserves via repo funding and discount window but these channels are muted

# Reserve demand - LSVJ framework (III)

- **Key ingredient:** functional form of  $v'_R(R, D)$

- ① LSVJ's choice is

$$v'_R(R, D) = d + b \log(R) + c \log(D) \quad (2)$$

- ② More "traditional" choice would be

$$v'_R(R/D) = d + b \log(R/D) \quad (3)$$

liquidity benefits double if both reserves and deposits double

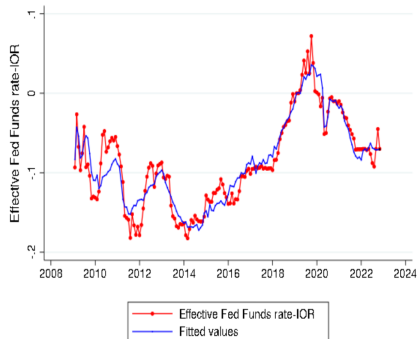
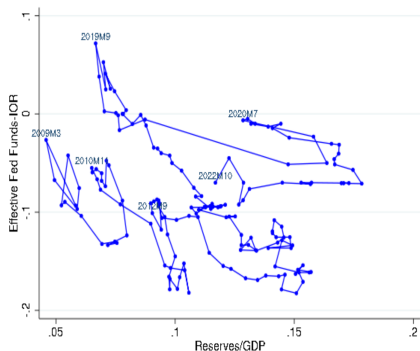
- Money demand (Lucas (2000,E), Ireland (2009,AER))
- US Treasury convenience yield (Krishnamurthy&Vissing-Jorgensen (2012,JPE))

- LSVJ estimate (plug eq.(2) into eq.(1))

$$FFR - IOR = a + b \log(R + ONRRP) + c \log(D) + u \quad (4)$$

- "regulation"  $\phi$  is absorbed by the intercept  $a (= d - \phi)$
- reserves are instrumented with the sum of reserves and take-up at the overnight reverse repo (ONRRP) facility
- What is the advantage of (1)? Model fitting

# From theory to data (2009M1-2022M10)



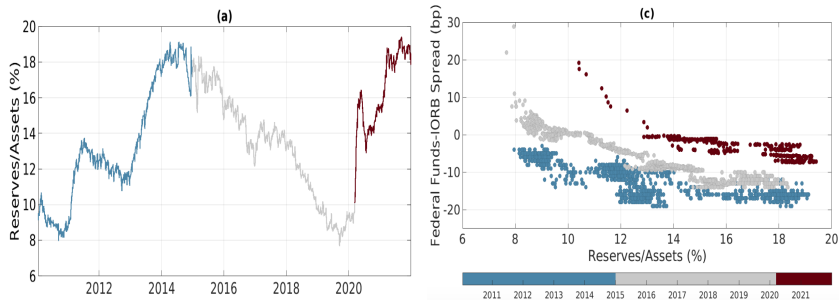
- Reserve demand is unstable (lhs panel)
- Model fit is "very tight" when you control for deposits (rhs panel)

# Estimates (I)

- **Comment 1:** the implied elasticity of (log) deposits is 1.79  $\rightarrow$  the price of reserves is more sensitive to (log) deposits than to (log) reserves
  - Why should we expect such large sensitivity to deposits (deposits are larger than reserves)? Implications for QT exercise?
  - More work and discussion on the functional form of  $v'_R$
- **Comment 2:** Is the relation unstable or has the relation more than one regime?
  - Afonso, Giannone, La Spada&Williams (2023) discuss three regimes over the same sample
  - Different approach: provide *local* estimates using daily time-series variation in the quantity of reserves (see also *liquidity effect* literature as Hamilton (1997,AER), Carpenter&Demiralp (2006,JMCB))



# Estimates (II) - Afonso et al. (2023)

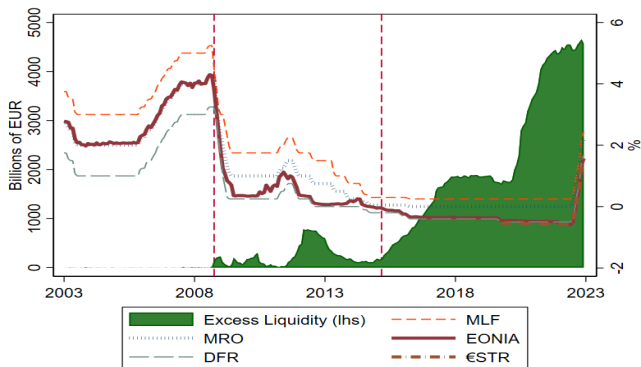


- Reserves over bank assets (lhs panel):
  - 1 From 2010 to 2014: expansion
  - 2 From 2015 to mid-March 2020: contraction
  - 3 From mid-March 2020 to December 2021: expansion
- The location of the reserve demand has shifted over time (rhs panel) ... but are deposits the only demand curve shifter? other factors?
- Lagos&Navarro (2023) propose a quantitative theory-based approach to assess how variation in key parameters shifts reserve demand

- **Comment 3:** Regulation
  - Liquidity regulation is modelled in reduced form and as a linear **cost** that penalises balance-sheet expansion
  - But banks may have **precautionary reserve motives** to comply with liquidity regulation
  - But banks appear to have a **preference** for meeting Liquidity Coverage Ratio (LCR) requirement partly with reserves rather than with other High-quality liquid assets (HQLA)

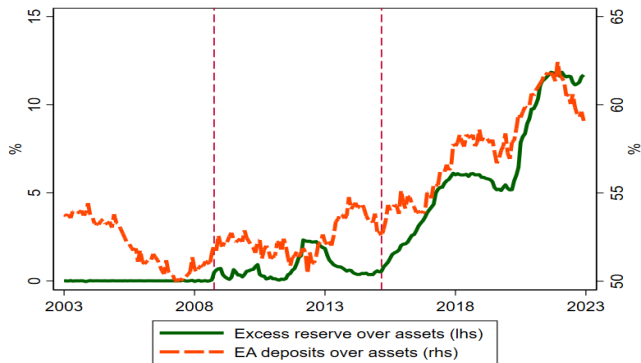
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# Euro area reserve demand: three regimes



- 1 Jan 1999 - Oct 2008: neutral allotment with low and stable excess reserves
- 2 Oct 2008 - Feb 2015: fixed rate full allotment with moderate excess reserves → liquidity **endogenously** determined by banks' needs via LTROs (Garcia-de-Andoain, Heider, Hoerova & Manganelli (2016, JFI))
- 3 March 2015 - QE and TLTROs injected large amounts of excess reserves → liquidity (partially) **exogenously** driven by outright purchases

# Reserves and deposits in euro area



- Reserves and deposits strongly co-move since March 2015

# Estimates for euro area

LHS variable: Eonia (€STER) - DFR; monthly observations

	2008-2015		2015 onward	
	(1)	(2)	(3)	(4)
log(Reserves)	-0.12***	-0.26***	-0.04***	-0.03***
log(Deposits)		3.38***		-0.15***
Dummy €STER			-0.08***	-0.07***
Obs.	77	77	94	94
R <sup>2</sup>	0.59	0.84	0.97	0.98

- Positive and statistically significant sign for deposits only in 2008 – 2015
- The reserve elasticity is affected by accounting for deposits in 2008 – 2015

Euro area institutional framework is different and we should take into account

- The two-tier system for remunerating excess reserve holdings (Sep 2019 - Sep 2022)
- The reserves elasticities may vary when the analysis is run at country level
- Banks receive reserves when they borrow from the Eurosystem through its refinancing operations (such as TLTROs)
  - But it is difficult to find a good instrument for Eurosystem borrowing

# Let me conclude

- Must-read paper!
- Thank you!