Integrating Balance Sheet Policy into Monetary Policy Conditions

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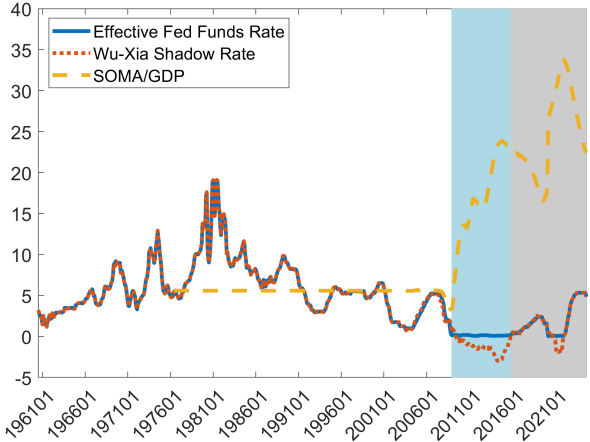
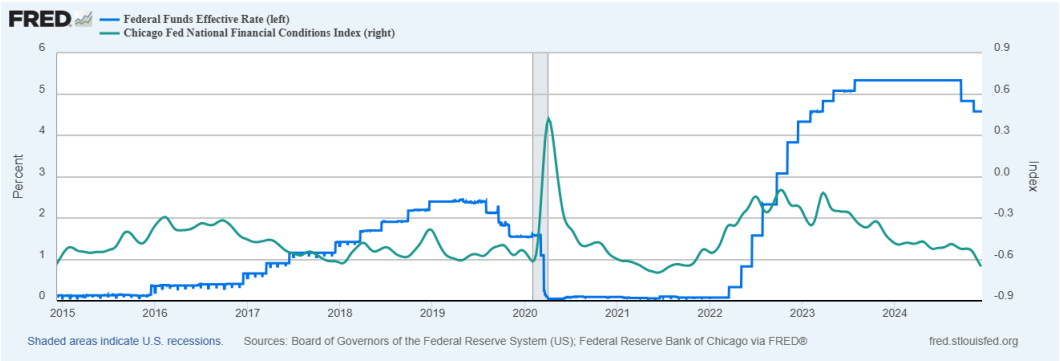
Backdrop

- Large CB balance sheets became a regular feature in post-ZLB era
- Their "stock" effects continue to influence financial conditions, even as CBs shifted to use policy rate as the main tool
- The shadow rate does not capture these effects outside of ZLB



Key questions

- How to systematically incorporate balance sheet policies into policy analysis?
- What does large CB balance sheets mean for monetary policy stance?
- Does balance sheet policy help explain some puzzling facts, e.g. loose financial conditions despite higher policy rate?



Framework in a nutshell

- Summarise monetary policy condition (MCI, m_t) by a weighted average of short-term interest rate (i_t) and CB balance sheet size to GDP (BS_t):

$$m_t = bi_t + (1 - b)(-BS_t)$$

  with $0 \leqslant b \leqslant 1$.

- Model joint dynamics of MCI, FCI, GDP and inflation via BVAR
  - Integrate literature's findings on the effects of balance sheet policies as priors
  - Allow structural identification through sign restrictions

Summary of key results

- MCI $\approx 0.8 i_t + 0.2(-BS_t)$
  - 1 ppt of Δi_t = 4 ppts of $-\Delta BS_t$
- Monetary policy setting has been substantially more accommodative after 2015 than short-term rates or the shadow rate suggest
- MCI helps account for post-pandemic resilient recovery, inflationary persistence, and easy financial conditions despite large rate hikes

Model setup

$$X_t = \sum_{\tau=1}^{p} B_\tau X_{t-\tau} + \varepsilon_t \quad \varepsilon_t \sim \mathcal{N}(0, \Sigma), \tag{1}$$

$$X_t = \left[f_t, \pi_t, y_t, m_t\right]', \tag{2}$$

$$m_t = bi_t + (1-b)(-BS_t), \quad 0 \leqslant b \leqslant 1 \tag{3}$$

Monthly US data from Jul-03 to Oct-24:

- i_t : 2-year yield (interest rate + forward guidance)
- BS_t : CB balance sheet size/potential GDP
- f_t : Financial condition index (Chicago-Fed NFCI)
- π_t : CPI inflation
- y_t : CBO output gap

Estimation procedure

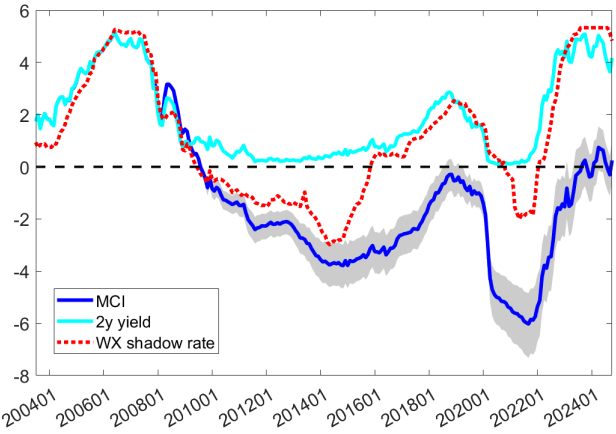
Estimate $\{b, B, \Sigma\}$, a nonlinear problem, with Bayesian approach, using informative prior about b and diffuse priors about B, Σ

Algorithm:

1. Initialise b to construct m_t, form X_t and estimate B with OLS
2. Fix b and B. Draw Σ from the IW distribution implied by VAR residuals
3. Fix b and Σ. Draw B from MVN distribution based on OLS estimates
4. Fix B and Σ. Draw b using a Metropolis-Hastings step, ensuring $b \in [0, 1]$ and using acceptance probability based on log posterior
5. Collect sampled values, and iterate steps 2-4

Priors and posterior

Results: MCI

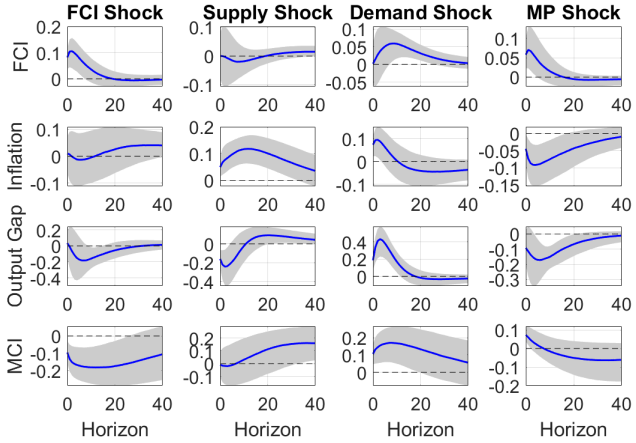


- MCI tracks the shadow rate during ZLB up to 2014, but suggests significantly more accommodative monetary policy since

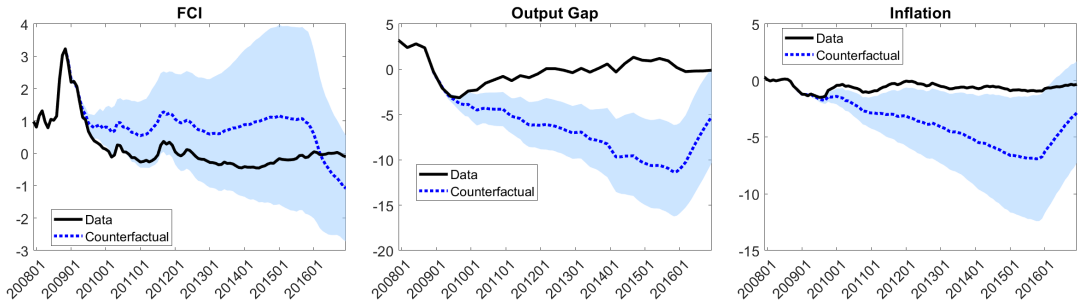
Alt. BS measures | Time-varying b

Structural shock identification and impulse responses

	Risk shock	Supply shock	Demand shock	MP shock
FCI	+			+
Inflation		+		− (6m)
Output		−	+	− (6m)
MCI	−		+	+

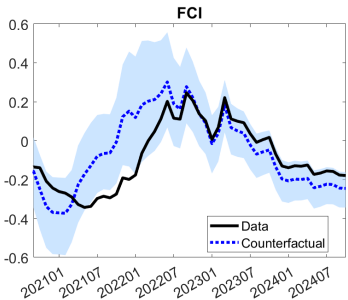


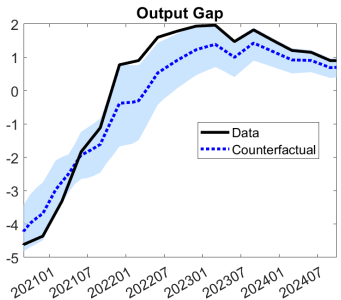
Counterfactual: No QE in the wake of GFC

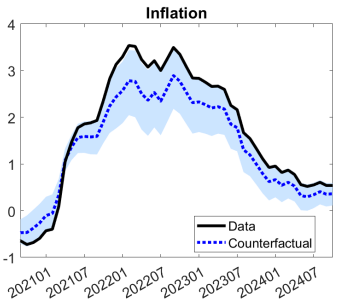


- Add MCI shocks equivalent to no QE imposed during Dec 2008–Nov 2015
- Protracted downturn with tighter financial conditions

Counterfactual: No forceful pandemic response



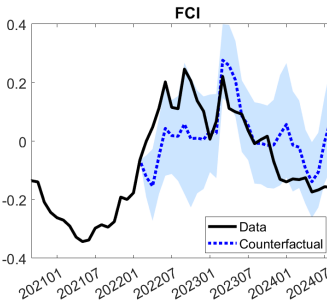




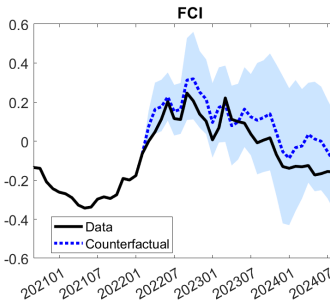
- No monetary policy shocks between 2020-2022
- Tighter FCI, slower recovery, but also lower inflation

Counterfactual: Why has FCI been so loose?

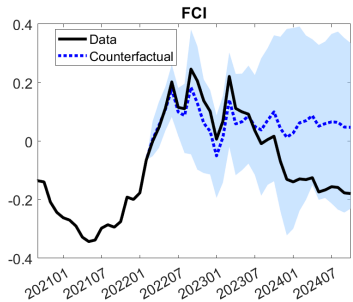
(a) No MCI shocks



(b) No risk shocks



(c) No output shocks



- MCI shocks exacerbate FCI volatility
- Strong risk appetite kept FCI looser than otherwise
- Moderating demand (soft landing) eased FCI via systematic MP

Larger "equilibrium" CB balance sheet?

"I think of ample reserves as the threshold below which banks would need to scramble to find safe, liquid funding, something that would drive up the federal funds rate and money market interest rates across the economy."

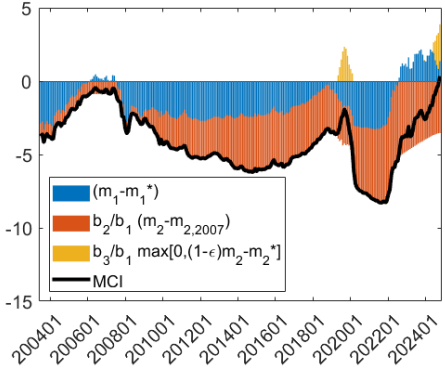
Christopher Waller (2025)

"In September 2019, [...] reserves fell below what we later assessed to be the ample level. It was necessary to add reserves to continue operating a floor system, and that's what we did."

Lorie Logan (2023)

MCI gap with r-star and BS-star

$$\widehat{MCI}_t = b_1(m_{1t} - m_{1t}^*) + b_2 \underbrace{(m_{2t} - m_{2,2007})}_{\text{Stock effects (asset side)}} + b_3 \underbrace{\max[0, ((1-\varepsilon)m_{2t} - m_{2t}^*]^2}_{\text{Liquidity effects (liability side)}} \quad (4)$$



Conclusions

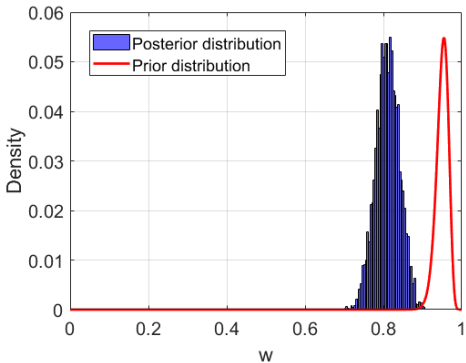
- MCI provides a more encompassing picture of monetary policy settings
- Simple "weighted average" approach to MCI does well to approximate the shadow rate during ELB, while improving on it away from ELB
- Findings highlight persistent monetary policy accommodation from large central bank balance sheets, explaining otherwise puzzling post-pandemic developments
- Framework can flexibly accommodate extensions such as an introduction of r-star/BS-star, other countries or global-level analysis, and multiple policy tools

Appendix

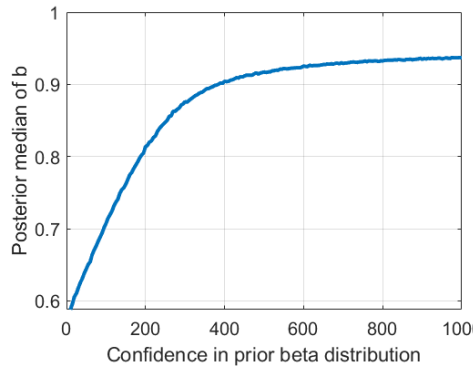
Prior and posterior estimate of b

- Wei 2022: 2.2 trillion ($\approx$8% of GDP) BS reduction is equivalent to 29 to 74 basis point increase in the policy rate, $b = 0.92 - 0.97$.
- Crawley et al. 2022: 2.5 trillion ($\approx$9% of GDP) BS reduction is equivalent to 50 basis point increase in policy rate, $b = 0.95$.

(a) Distribution of b



(b) Sentivity to prior



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Robustness: Alternative CB balance sheet measures

Figure: MCI with duration measures

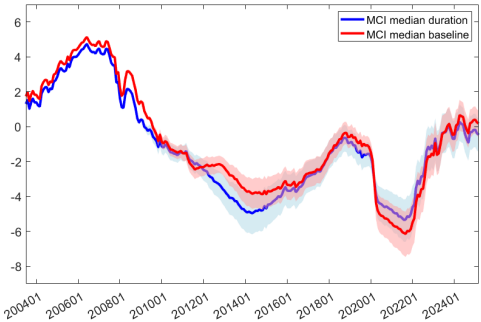
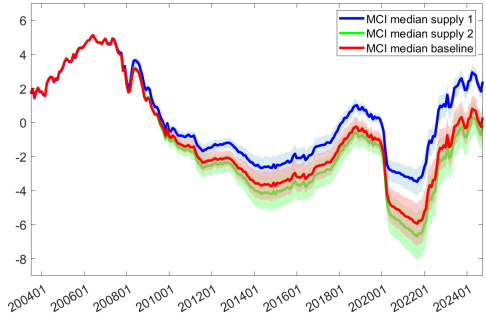


Figure: MCI with bond supply measures



Note: Red lines are baseline MCI. In left panel, blue line uses the SOMA ten-year equivalents to potential GDP. In right panel, blue line uses BS/(total bond supply), while red line is MCI with bond supply uses as exogenous control in VAR.

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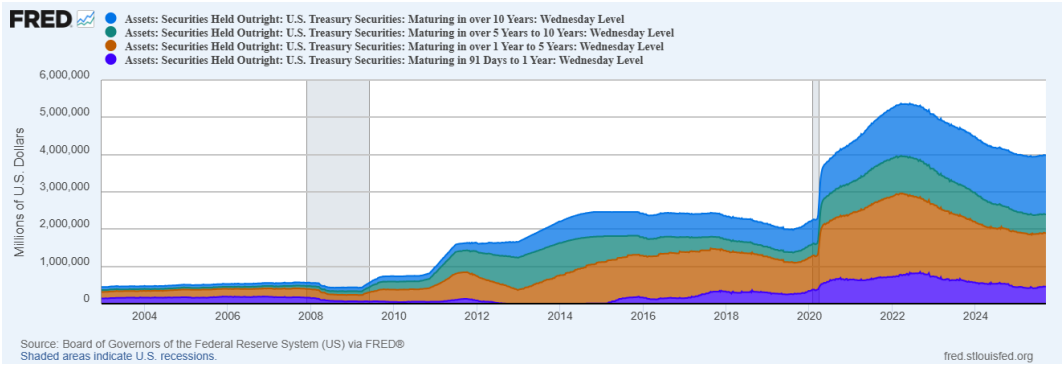
Robustness: Fed's security holdings by maturities



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Robustness: Time-varying b

Figure: b estimate with expanding sample

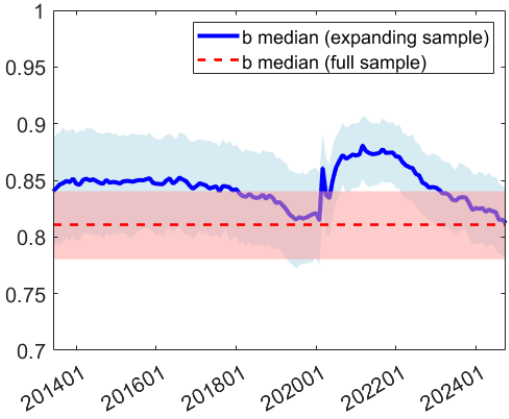
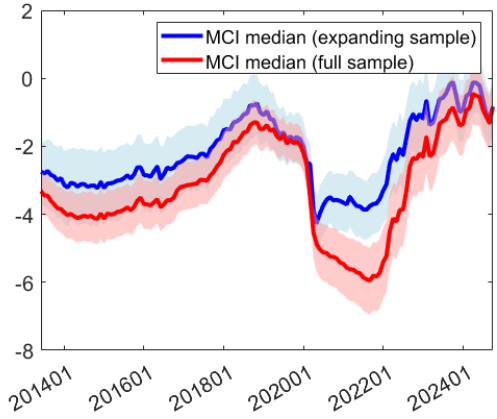


Figure: MCI with time-varying b



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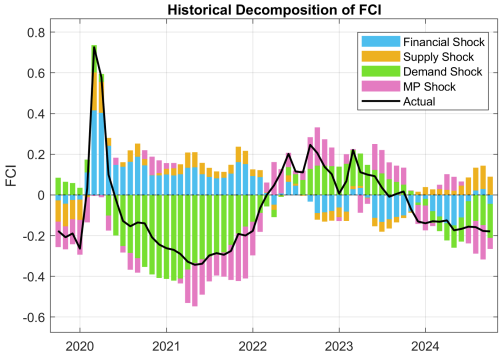
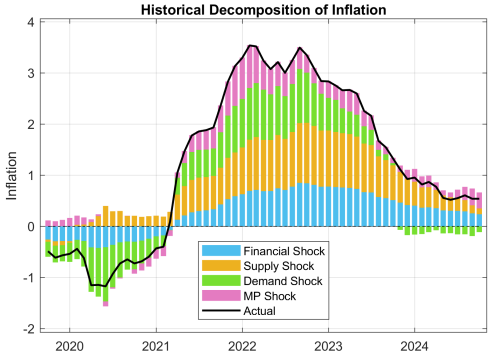
Historical decomposition of FCI & inflation





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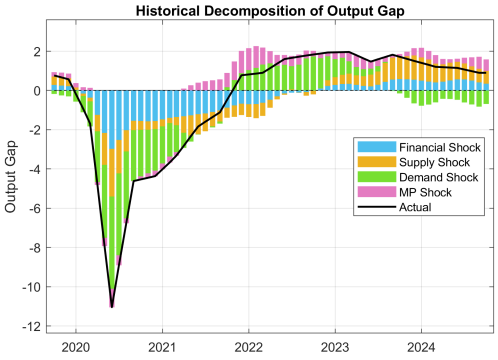
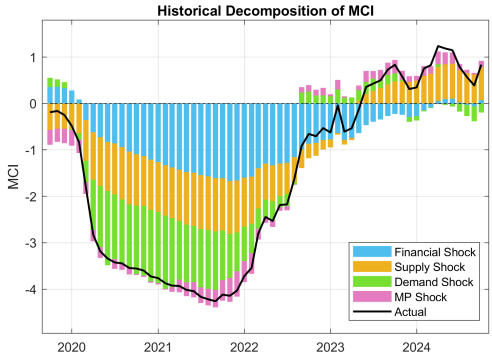
Historical decomposition of Output & MCI (Recent)





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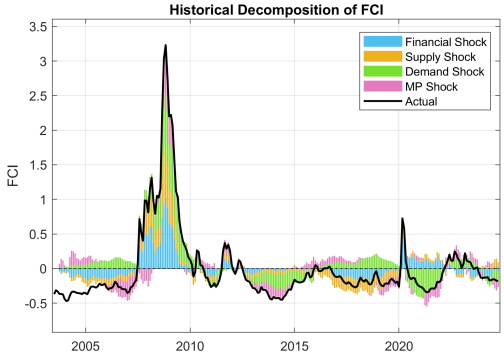
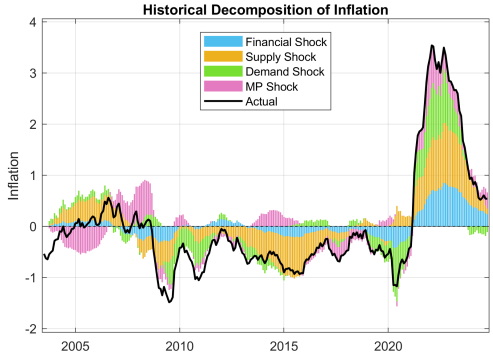
Long historical decomposition of FCI & inflation





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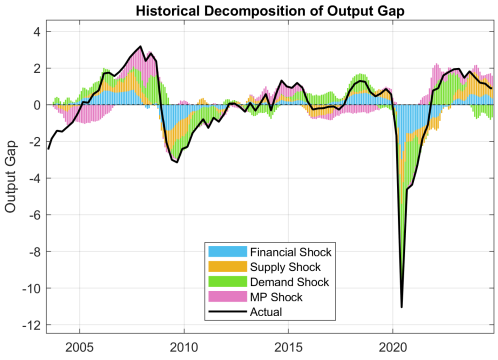
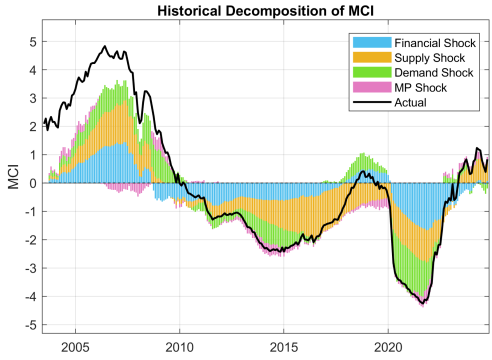
Long historical decomposition of Output & MCI





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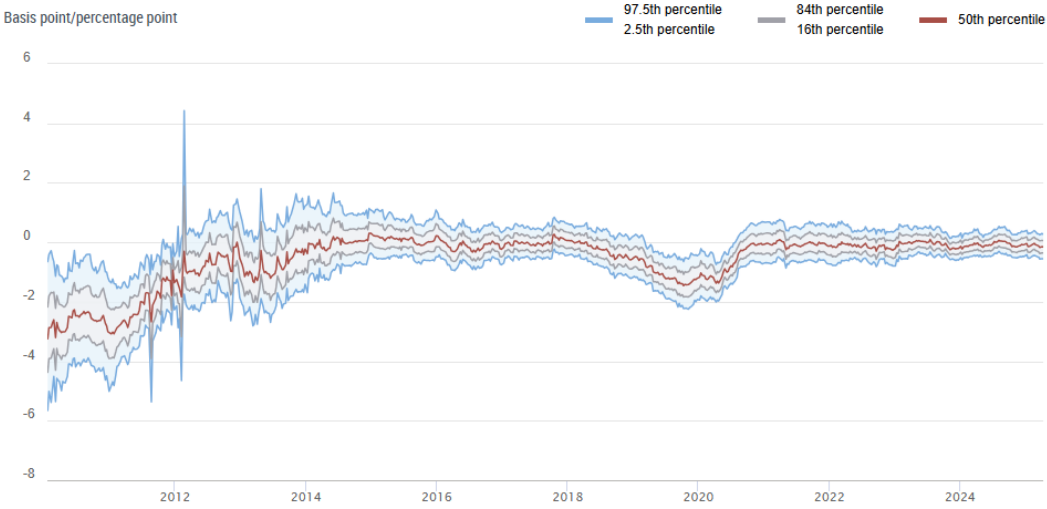
Reserve Demand Elasticity



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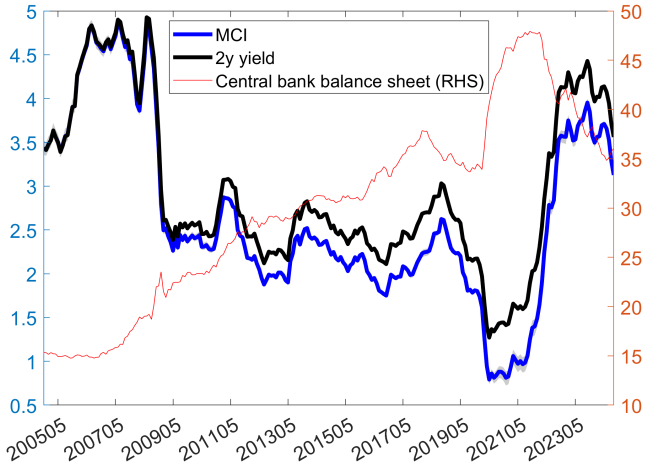
Global MCI



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