Testing the Portfolio Rebalancing Channel of Quantitative Easing

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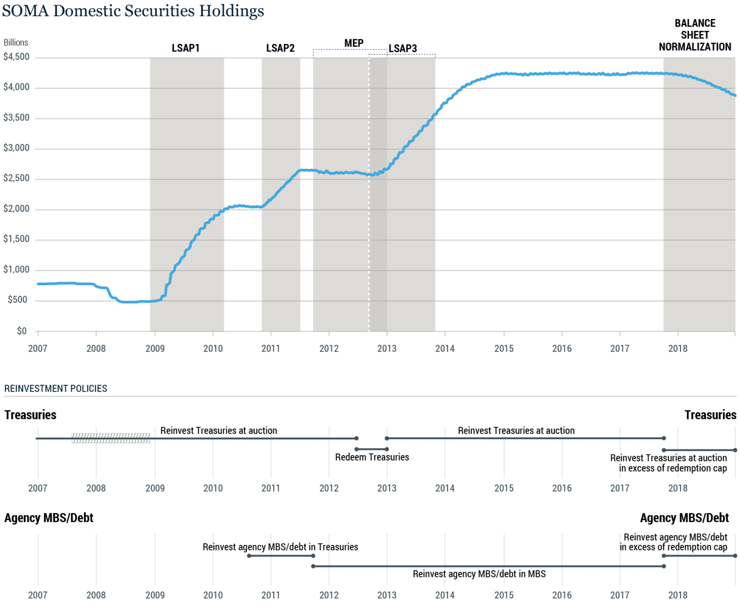
What is QE


SOMA Domestic Securities Holdings
Billions
$4,500
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
LSAP1
LSAP2
MEP
LSAP3
BALANCE SHEET NORMALIZATION
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
REINVESTMENT POLICIES
Treasuries
Reinvest Treasuries at auction
Redeem Treasuries
Reinvest Treasuries at auction
Reinvest Treasuries at auction in excess of redemption cap
Agency MBS/Debt
Reinvest agency MBS/debt in Treasuries
Reinvest agency MBS/debt in MBS
Reinvest agency MBS/debt in excess of redemption cap

Does QE Matter?

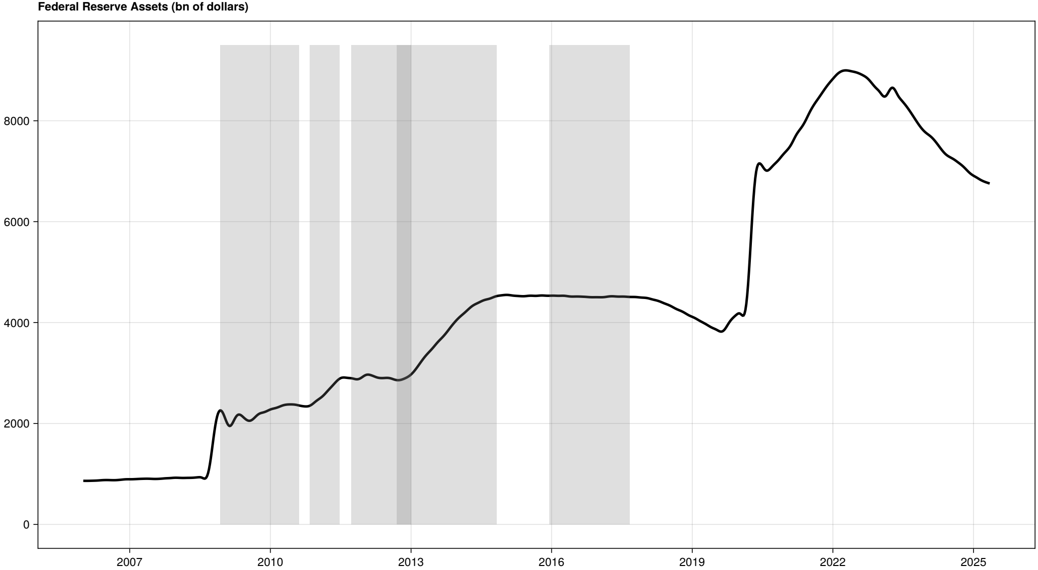
Treasury Market

- 25t outstanding
- 2t issued / year; 5t issued in 2021
- 1t traded / day

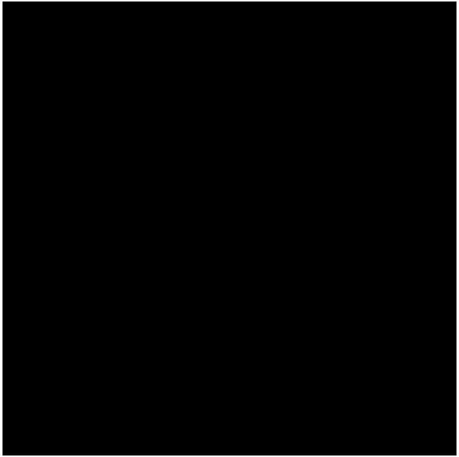
Quantitative Easing

- 4t in open market operations before covid plus signalling!
- Treasury and MBS (2/3, 1/3 as of 2024 HR41)
- Spread over more than 10 years

It keeps going...



Ask the Expert



The channels of QE Transmission

"It works in practice, but does it work in theory?"

- Portfolio rebalancing
  - Risk premium effects
  - Corporate bond transmission
- Expectations Channel
- Credit Channel

This Paper

- Find a QE shock: change in the residual supply of some treasury assets
  - At the bond level, at fund level
- Effect on prices
  - How does the price of the shocked bond move?
  - How does the price of closely related assets respond? Propagation to corporates.
- Real effects

QE Shock

- Shock is when the Fed does not buy what a optimizing trader would expect

$$\text{Shock}_i = \text{Real World Fed}_i - \text{Optimizing Fed Model}_i$$

- Units of the shock are normalized by market size:

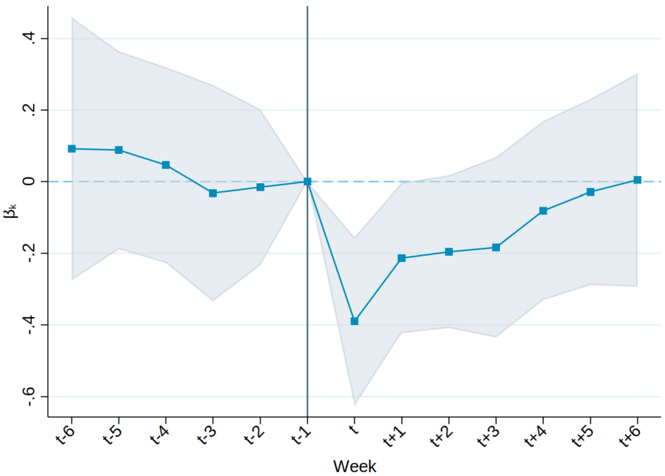
$$\text{QEShock}_i = \frac{\sum_{\text{QE operations}} \text{Real World Fed}_i - \text{Optimizing Fed Model}_i}{\text{Treasury Coupons Outstanding}}$$

QE Shock: the regressions

Shock on yield

$$\Delta y = \beta \cdot \text{QE shock}$$

Yield Changes in Treasurys Around QE Shocks

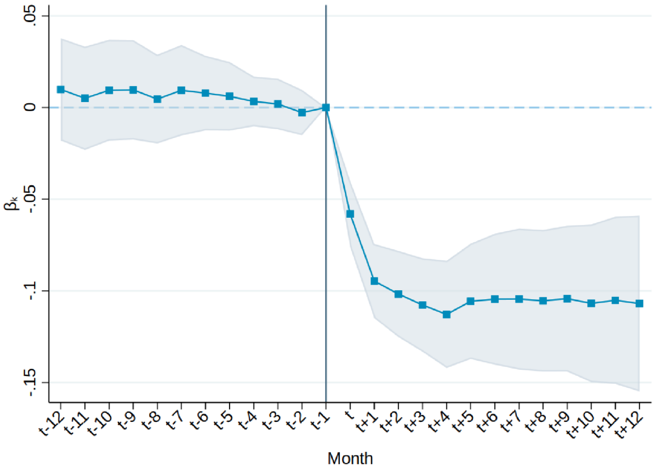


QE Shock: the regressions

Shock on mutual fund holdings

$$\Delta \text{Holdings} = \beta \cdot \text{QE shock}$$

Active Rebalancing by Funds into Fed-Purchased Treasurys around QE Shocks



QE Shock: the regressions

Shock on mutual fund holdings: different units

$$\Delta\text{Holdings} = \beta \cdot (\text{yield from first stage})$$

Active Rebalancing by Funds into Treasurys: Yield Changes

	$\Delta Holdings$
$\Delta\widehat{y}$	0.016**
	(0.008)
Maturity FEs	✓
Calendar Time FEs	✓
R^2	0.229
N	3,776

Preferred Habitat as Restrictions on Elasticities

Vayanos-Vila model

- Three agents trading two different characteristics: duration and credit
  - Long vs. Short-term Treasury
  - Corporate vs. Treasury
- Preferred habitat: nest within a specific maturity
- Arbitrageurs
- Residuals: fixed demand curve for corporate

Preferred Habitat as Restrictions on Elasticities

Preferred habitat investors

- Rebalance between treasury and corporates within a maturity
- Demand units: level on log price

$$
\begin{pmatrix}
\overbrace{\begin{bmatrix} \alpha(\tau = 1) & \beta(\tau = 1) \\ \tilde{\alpha}(\tau = 1) & \tilde{\beta}(\tau = 1) \end{bmatrix}}^{\mathcal{E}_{\tau=1}} & & \\
& \begin{bmatrix} \mathcal{E}_{\tau=T-1} \end{bmatrix} & \\
& & \begin{bmatrix} \mathcal{E}_T \end{bmatrix}
\end{pmatrix}
$$

Preferred Habitat as Restrictions on Elasticities

Treasury abitrageurs

- Arbitrage the yield curve

$$\begin{pmatrix} \left[\mathcal{E}^{\mathsf{TR}}(\tau)\right] & [\mathbf{0}] \\ [\mathbf{0}] & [\mathbf{0}] \end{pmatrix}$$

Preferred Habitat as Restrictions on Elasticities

Residual Corporate Bond Demand

- Fixed residual supply curve on the coroporate bond

$$\begin{pmatrix} \gamma & [\mathbf{0}] \\ [\mathbf{0}] & [\mathbf{0}] \end{pmatrix}_{\tau=1}, \quad \cdots \quad , \begin{pmatrix} \gamma & [\mathbf{0}] \\ [\mathbf{0}] & [\mathbf{0}] \end{pmatrix}_{\tau=N}$$

Preferred Habitat as Restrictions on Elasticities

Cross-sectional regressions only give us relative elasticities

- In the model we cannot directly estimate preferred habitat elasticity
  - only estimate $\alpha - \tilde{\beta}$ for each maturity τ
- Some model restrictions:
  - One parameter for own elasticity across maturities
  - One parameter for the cross-elasticity of substitution
  - Still N residual supply curves from corporate bond providers

Model regressions: identify the whole elasticity matrix

$$\frac{\overline{\frac{\partial \tilde{Z}_t^{(\tau^*)}}{\partial QE_t}} - \overline{\frac{\partial \tilde{Z}_t^{(\tau)}}{\partial QE_t}}}{\overline{\frac{\partial Z_t^{(\tau^*)}}{\partial QE_t}} - \overline{\frac{\partial Z_t^{(\tau)}}{\partial QE_t}}} = \frac{\overline{d(-\tilde{\alpha}(\tau^*)log\tilde{P}_t^{(\tau^*)} + \tilde{\beta}(\tau^*)logP_t^{(\tau^*)})} - \overline{d(-\tilde{\alpha}(\tau)log\tilde{P}_t^{(\tau)} + \tilde{\beta}(\tau)logP_t^{(\tau)})}}{\overline{d(-\alpha(\tau^*)logP_t^{(\tau^*)} + \beta(\tau^*)log\tilde{P}_t^{(\tau^*)})} - \overline{d(-\alpha(\tau)logP_t^{(\tau)} + \beta(\tau)log\tilde{P}_t^{(\tau)})}}$$

$$= \frac{\overline{d(-\tilde{\alpha}(\tau^*)(-\tilde{A}(\tau^*)s_t - \tilde{C}(\tau^*)) + \tilde{\beta}(\tau^*)(-A(\tau^*)s_t - C(\tau^*)))} - \overline{d(-\tilde{\alpha}(\tau)(-\tilde{A}(\tau^*)s_t - \tilde{C}(\tau^*)) + \tilde{\beta}(\tau)(-A(\tau^*)s_t - C(\tau^*)))}}{\overline{d(-\alpha(\tau^*)(-A(\tau^*)s_t - C(\tau^*)) + \beta(\tau^*)(-\tilde{A}(\tau^*)s_t - \tilde{C}(\tau^*)))} - \overline{d(-\alpha(\tau)(-A(\tau^*)s_t - C(\tau^*)) + \beta(\tau)(-\tilde{A}(\tau^*)s_t - \tilde{C}(\tau^*)))}}$$

Final Thoughts

Great Paper. Graduate students: go read it!

Take away

- Progress on understanding the effects of QE
- Progress on convincing shocks to estimate demand