Managing Monetary Policy Normalization

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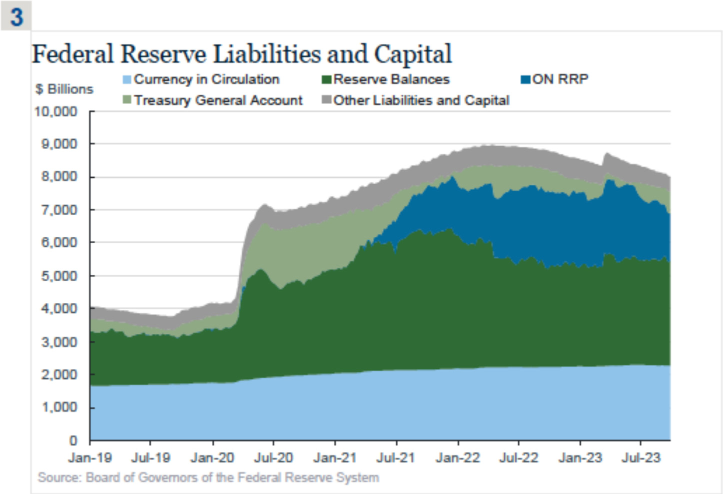
Background and Motivation

- Global Financial Crises and Covid-19 Pandemic have pushed advanced economies' Central Banks in using unconventional monetary policy
  - Balance Sheet Policies (Quantitative Easing) at the ELB.
- Rapid recovery along with inflationary developments have prompted Central Banks' reaction
  - Design of Exit strategies: Quantitative Tightening and nominal interest rate normalization.

Background and Motivation



Background and Questions

- Exit Strategy and Monetary Policy Normalization Process
  - What is the role of Balance Sheet Policies?
  - What is the Optimal supply of Liquidity?
  - How government liquidity should be managed in and out of a liquidity trap?

Background and Motivation

- Workhorse monetary policy analysis (Woodford, 2003): no role for liquidity (reserves) and/or balance sheet policies.
- Our framework:
  - Liquidity Channel provides role for reserve policies.
- Key elements of our framework
  - Bank as holder of reserves
  - Fiscal/Monetary authority as supplier of liquid assets
  - Asset provide liquidity services to the private sector.

Key Findings

- Balance Sheet policies (government liquidity) are in general effective outside the zero lower bound;
  - Influence aggregate demand through its effect on liquidity premia.
- Interest on reserves and Balance Sheet policies are independent policy tools.
- Optimal supply of Liquidity below satiation point;
- Experiment of an economy exiting a liquidity trap:
  - QT to start before lift-off of policy rate and slow in adjustment.

Model: Key features

Key features.

- At the level of households, deposits provide liquidity (non-pecuniary) services modeled as direct utility from holding real deposits

$$V\left(\frac{D}{P}\right)$$

with $V_d\left(.\right) = 0$ when $d > \bar{d}$. This implies spread between deposit rate and money market rate.

- In the banking sector, government liquidity is an explicit or implicit collateral for issuing deposits

$$B_t^g \geq \rho D_t$$

with $0 < \rho < 1$. This implies a spread between deposit rate and interest rate on reserves.

Model: Households

Household Behavior.

- Households get utility from consumption and liquidity service, D_t with interest rate i_t^D. They borrow/lend in illiquid private securities with interest rate i_t^B.
- Key optimality conditions:
  - Euler equation in terms of money market interest rate, i_t^B :

$$Y_{t+1} = \beta \frac{(1 + i_t^B)}{\Pi_{t+1}} Y_t$$

  - Demand for liquid asset

$$1 + i_t^D = (1 - \mu_t)(1 + i_t^B) \qquad \mu_t = V_d\left(d_t\right)$$

  with μ_t representing the liquidity premium.
- Household would be New Keynesian when there is full satiation or when there are no assets that provide liquidity services.

The Model: Banking Sector

Banking Sector

- Banks maximize profits subject to limited liability constraint.
- Their balance sheet is given by

$$B_t^g + A_t = D_t + N_t$$

where reserves, R_t are remunerated at i_t^R.

- They face regulatory constraint

$$B_t^g \geq \rho D_t \qquad \text{with } 0 \leq \rho \leq 1$$

- Key optimality condition:
  - Money market rates

$$(1 + i_t^D) = \rho(1 + i_t^R) + (1 - \rho)(1 + i_t^B).$$

- Banking would be "irrelevant" when reserve do not provide non-pecuniary benefits ($\rho = 0$). or when reserved are abundant $B_t^g > \rho D_t$.

Effectiveness of Liquid Assets

Household + Banking Sector

- Effectiveness depends on how liquidity affects money market interest rate (aggregate demand).
- Demand and supply of deposits:

$$1 + i_t^D = (1 - \mu_t)(1 + i_t^B) \qquad \mu_t = V_d\,(d_t)$$

$$(1 + i_t^D) = \rho(1 + i_t^R) + (1 - \rho)(1 + i_t^B)$$

- Combining

$$(1 + i_t^B) = \frac{\rho}{\rho - V_d\left(\frac{b_t^g}{\rho}\right)}(1 + i_t^R)$$

- Reserves become ineffective when
  - there is satiation
  - reserve do not provide liquidity services and there are no securities that provide liquidity services.

Determination of Liquid Assets

Consolidated Treasury and Central Bank sector

- Budget Constraint:

$$B_t^g = (1 + i_{t-1}^R) B_{t-1}^g + T_t - \tau_t P_t Y_t,$$

with the short-term debt (B^g), treasury's bills and central bank's reserves, carries the nominal interest rate i^R; T_t with $T_t \geq 0$ are exogenous transfers, and distortionary tax τ_t.

- Public sector is the net supply of liquid assets within the limit set by intertemporal resource constraint of the economy.

$$\frac{(1 + i_{t-1}^R) B_{t-1}^g}{P_t} = E_t \left\{ \sum_{T=t}^{\infty} \beta^{T-t} \frac{\xi_T U_c(Y_T)}{\xi_t U_c(Y_t)} \left[\underbrace{\tau_T Y_T - \frac{T_T}{P_T}}_{\text{primary surplus}} + \underbrace{\frac{i_t^B - i_t^R}{1 + i_t^B} \frac{B_t^g}{P_t}}_{\text{seigniorage}} \right] \right\}, \tag{1}$$

Banking sector

- Demand coming from Banking sector:

$$D_t \leq \frac{B_t^g}{\rho}$$

- [illegible]

Optimal Supply of Liquidity

Optimal Supply of Liquidity

- Max utility

$$U_{t_0} = \left\{ \sum_{t=t_0}^{\infty} \beta^{t-t_0} \left[\frac{Y_t^{1-\sigma^{-1}}}{1-\sigma^{-1}} - \frac{Y_t^{1+\eta}}{1+\eta} + V(d_t) \right] \right\},$$

subject to

$$Z_{t_0} = \sum_{T=t_0}^{\infty} \beta^{T-t_0} \left[Y_T^{-\sigma^{-1}} \left(\tau_T Y_T - \frac{T_T}{P_T} \right) + \frac{V_d(d_t)\, b_t^g}{\rho} \right],$$

with

$$Y_t = Y(\tau) \equiv \left[\frac{(1-\tau)}{\mu_\theta} \right]^{\frac{1}{\eta+\sigma^{-1}}}.$$

- Two forces:
  - satiating liquidity
  - minimizing distortionary taxation.

Optimal Supply of Liquidity

Liquidity Supply

- When there are lump sum taxes liquidity becomes irrelevant then it is optimal to satiate liquidity: the NK benchmark model is achieved with no spreads in money markets.
- When there are only distortionary taxes then it is optimal to supply liquidity below satiation point. Money market spreads are present and liquidity policy acts as an independent tool in influencing AD.

Optimal Management of Liquidity

- Consider shock that brings the natural real rate of interest, r^n from the steady-state level of 2% to -4% at annual rates for twelve quarters.
- Given that the steady-state policy rate is set at 4% accounting for a 2% inflation target, the shock to the natural rate of interest could be fully accommodated only if the policy rate could fall at -2%.
- The zero-lower bound prevents this fall and creates an interesting trade-off among stabilizing the relevant macroeconomic variables.

Optimal Management of Liquidity

Optimization problem

- Welfare function

$$L_{t_0} = E_{t_0} \sum_{t=t_0}^{\infty} \beta^{t-t_0} \left\{ \frac{1}{2}\lambda_y y_t^2 + \frac{1}{2}\lambda_\pi (\pi_t - \pi)^2 + \frac{1}{2}\lambda_q \hat{q}_t^2 \right\}$$

- Aggregate Demand

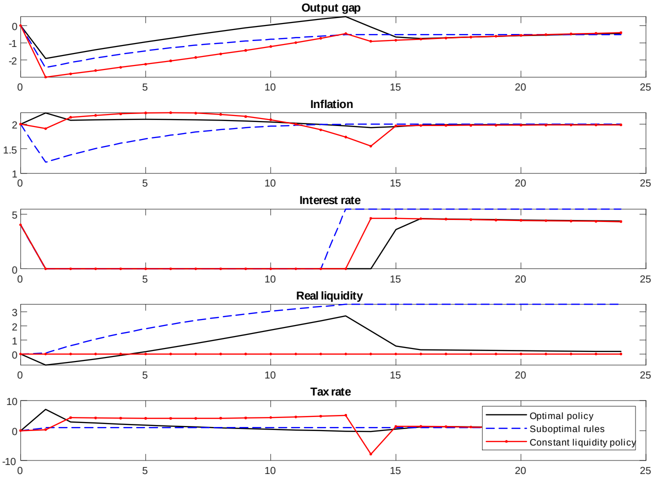
$$y_t = (1-\rho^{-1}\nu)E_t y_{t+1} - \sigma(1-\rho^{-1}\nu)(\hat{\imath}_t^R - E_t(\pi_{t+1} - \pi) - r_t^n) + q_y^{-1}\rho^{-1}\nu\hat{q}_t,$$

- Aggregate Supply
- Intertemporal resource constraint of the economy.
- Only distortion that prevents full-stabilization at the targets is given by presence of zero lower bound.

Optimal Management of Liquidity

Low money market spreads

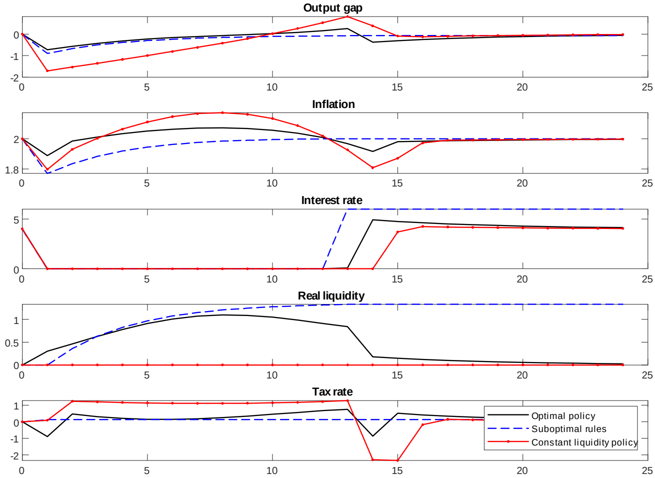
Comparison between optimal policy, optimal policy with constant liquidity and sub-optimal rules



Optimal Management of Liquidity

High Money Market Spreads

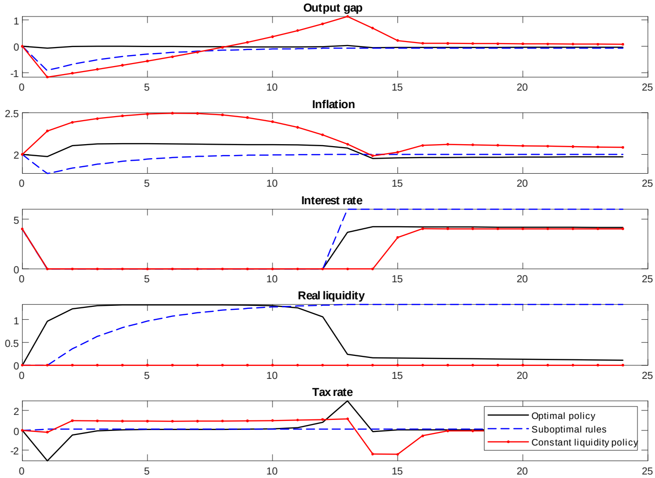
Comparison between optimal policy, optimal policy with constant liquidity and sub-optimal rules, when money-market spread is high.



Optimal Management of Liquidity

High weight on Output Stabilization

Comparison between optimal policy, optimal policy with constant liquidity and sub-optimal rules, when λ_y/λ_π is fifty times higher than the benchmark calibration and money-market spread is high.



Conclusion

- Liquidity channel provides a framework in which government liquidity is an additional tool to monetary policy even outside the zero lower bound.
- Fiscal and monetary policy interaction crucial for understanding role of government liquidity (reserves).
- Optimal liquidity is below satiation and in a new normal liquidity should go back to the optimal level.
- Liquidity should be used in a liquidity trap to reduce the stay at the zero lower bound but withdrawal should occur at the liftoff of the policy rate.