Managing Monetary Policy Normalization

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Main Results

- A new **two-instrument** framework for monetary policy analysis: the interest rate and the quantity of reserves, or liquidity.

- Under certain conditions, the **optimal** size of government liquidity is small relative to the full-satiation benchmark.

- Liquidity policy is an effective **stabilization tool** during zero-lower-bound episodes. Quantitative tightening may optimally begin before interest-rate liftoff, with both instruments normalizing a few periods after the shock ends.

New Framework for Monetary Analysis

A New Monetary Policy Framework

- For an illiquid security, household optimality implies

$$1 = E_t \left[R_{t+1}(1 + i_t) \right],$$

- For a liquid security, namely central bank reserves, household optimality implies

$$1 = \underbrace{\frac{V_q\left(\frac{Q_t}{P_t}\right)}{U_c(C_t)}}_{\text{non-pecuniary return}} + E_t \left[R_{t+1}(1 + i_t^Q) \right].$$

Liquidity Demand and Aggregate Demand

- The central bank can choose **both** the quantity of reserves, Q_t, and the administered interest rate on reserves, i_t^Q. In equilibrium, goods-market clearing implies $C_t = Y_t$.

- The equilibrium in the market for liquid securities is:

$$\frac{Q_t}{P_t} = L\left(Y_t, i_t - i_t^Q\right).$$

- The Euler equation for the illiquid security is:

$$U_c(Y_t) = \beta E_t\left[U_c(Y_{t+1})\frac{1+i_t}{\Pi_{t+1}}\right], \qquad \Pi_{t+1} \equiv \frac{P_{t+1}}{P_t}.$$

- The key point is that i_t is the market rate, not the administered policy rate i_t^Q.

Aggregate Demand with a Liquidity Channel

- Inverting the liquidity-demand schedule gives

$$i_t - i_t^Q = S\left(Y_t, \frac{Q_t}{P_t}\right), \qquad S_Y > 0, \qquad S_q < 0.$$

- Substituting this spread into the Euler equation yields a modified aggregate demand equation:

$$U_c(Y_t) = \beta E_t \left[U_c(Y_{t+1}) \frac{1 + i_t^Q + S\left(Y_t, \frac{Q_t}{P_t}\right)}{\Pi_{t+1}} \right].$$

- Aggregate demand is therefore affected by two monetary-policy instruments:

$$i_t^Q \qquad \text{and} \qquad \frac{Q_t}{P_t}.$$

Log-Linear Aggregate Demand

$$\hat{Y}_t = \frac{1}{1 + \sigma d_y / d_i} \left\{ E_t \hat{Y}_{t+1} - \sigma \left[\hat{\imath}_t^Q - E_t(\pi_{t+1} - \pi) \right] + \frac{\sigma}{d_i} \hat{q}_t \right\}.$$

Two new features:

- Monetary policy has two instruments: the price of liquidity and the quantity of liquidity.
- Forward guidance is muted because

$$\frac{1}{1 + \sigma d_y / d_i} < 1.$$

- The reason is that higher current demand raises liquidity demand, increases the liquidity spread, and partly offsets the expansionary effect.

Banking Foundation of the Liquidity Channel

- Households do not hold reserves directly. They hold liquid deposits, Q_t, issued by intermediaries.
- The intermediary balance sheet is

$$A_t + B_t^g = Q_t + (1-\delta)N_t,$$

  where A_t are private assets yielding i_t, B_t^g are safe assets/reserves yielding i_t^R, Q_t are deposits paying i_t^Q, and N_t is intermediary equity.
- Intermediaries face the collateral constraint

$$B_t^g + \gamma_t A_t \geq \rho Q_t,$$

  where ρ is the collateral requirement for deposits and γ_t is the degree of pledgeability of private assets.

Banking Equilibrium

- When government liquidity is scarce, the collateral constraint binds:

$$B_t^g + \gamma_t A_t = \rho Q_t, \qquad 0 \le \gamma_t < \rho.$$

- The deposit rate is a weighted average of the reserve/policy rate and the market rate:

$$1 + i_t^Q = \rho_{\gamma,t}(1 + i_t^R) + (1 - \rho_{\gamma,t})(1 + i_t).$$

where

$$\rho_{\gamma,t} \equiv 1 - \frac{1-\rho}{1-\gamma_t} = \frac{\rho - \gamma_t}{1 - \gamma_t}.$$

- The public-to-private liquidity multiplier is

$$Q_t = \frac{B_t^g}{\rho_{\gamma,t}}.$$

Pledgeability, Private Liquidity, and Financial Crises

- The key variable is the pledgeability of private assets, γ_t. Higher pledgeability reduces $\rho_{\gamma,t}$ and increases the liquidity multiplier:

$$\gamma_t \uparrow \quad \Rightarrow \quad \rho_{\gamma,t} \downarrow, \qquad \frac{1}{\rho_{\gamma,t}} \uparrow .$$

- Thus, for a given stock of government liquidity,

$$B_t^g, \qquad Q_t = \frac{B_t^g}{\rho_{\gamma,t}},$$

  private liquidity expands when private collateral becomes more pledgeable.

- Conversely, a financial crisis can be viewed as a pledgeability shock:

$$\gamma_t \downarrow \quad \Rightarrow \quad \rho_{\gamma,t} \uparrow \quad \Rightarrow \quad Q_t \downarrow \quad \Rightarrow \quad i_t - i_t^Q \uparrow .$$

- Balance-sheet expansion offsets this contraction by increasing B_t^g and supporting the supply of liquid deposits.

The Optimal Scarcity of Liquidity

What Is the Optimal Supply of Liquidity?

The framework hinges on the non-pecuniary return on liquidity:

$$\frac{V_q(Q_t/P_t)}{U_c(Y_t)}.$$

A natural question follows: why would a benevolent government not always eliminate this return by fully satiating liquidity demand?

The answer depends on the fiscal cost of supplying liquidity.

- With non-distortionary taxes, the first-best policy eliminates the liquidity premium:

$$\frac{V_q(Q_t/P_t)}{U_c(Y_t)} = 0, \qquad i_t = i_t^Q = i_t^R.$$

- If public liquidity can be backed by sufficiently safe private assets, the government can expand liquidity without relying on costly tax finance.

Fiscal Costs and Private Collateral

When tax finance is distortionary, public liquidity is fiscally costly: issuing more government liabilities requires raising distortionary revenues.

- In a second-best environment, liquidity premia act as an implicit tax on liquidity services.
- Hence, the optimal allocation may feature scarce liquidity and a positive liquidity premium.
- Another determinant is the availability of private assets that can act as collateral.
- When private assets are sufficiently pledgeable,

$$\gamma_t \geq \rho,$$

  the collateral constraint ceases to bind and liquidity premia are zero.

When Is Liquidity Optimally Scarce?

Thus, liquidity is more likely to be scarce when:

- the government is not benevolent and maintains rents;
- tax finance is distortionary;
- private assets are scarce or weakly pledgeable, that is, γ_t is low.

$$\Longrightarrow$$

the optimal size of government debt or of the central bank balance sheet is reduced relative to the full-satiation benchmark.

Liquidity Policy for Stabilization

Liquidity Policy for Stabilization

- How should liquidity be set optimally for stabilization purposes?
- The context is one in which there are two policy instruments:

$$i_t^R \qquad \text{and} \qquad B_t^g.$$

- Both instruments are costly because they involve movements in taxes, which are distortionary.
- The experiment is a collapse in the pledgeability of private securities:

$$\gamma_t \downarrow .$$

- Interestingly, this shock is isomorphic to an intertemporal-preference shock and therefore captures the type of shock commonly used to model a fall in the natural rate of interest and the occurrence of the zero lower bound.

Preview: Balance-Sheet Policy as Rate Substitute

A useful way to summarize the dynamics is through the aggregate-demand equation:

$$y_t = aE_t y_{t+1} - \sigma a \left[\hat{i}_t^R - E_t(\pi_{t+1} - \pi) - r_t^n - \omega \hat{b}_t^g \right],$$

where

$$a \equiv 1 - \rho_\gamma^{-1}\nu, \qquad \omega \equiv \frac{q_y^{-1}\rho_\gamma^{-1}\nu}{\sigma(1 - \rho_\gamma^{-1}\nu)}.$$

- ω is a sufficient statistic for the effectiveness of balance-sheet policy.

- A higher ω makes public liquidity a stronger substitute for an interest-rate cut.
- ω is higher when money-market spreads are larger, ν is higher, or when the public-to-private liquidity multiplier, ρ_γ^{-1}, is larger.

Timing of Balance-Sheet Normalization

Define

$$s_t \equiv E_t(\pi_{t+1} - \pi) + r_t^n,$$

which measures how much accommodation is naturally repaired by the recovery in expected inflation and in the natural real rate.

Rearranging aggregate demand gives

$$\hat{b}_t^g = \frac{1}{\chi}\left[y_t - aE_t y_{t+1} + \sigma a\left(\hat{i}_t^R - s_t\right)\right], \qquad \chi \equiv q_y^{-1}\rho_\gamma^{-1}\nu.$$

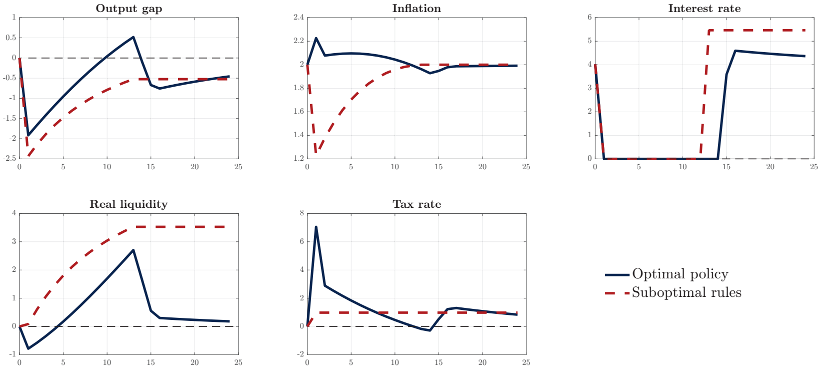
- In a liquidity trap, $\hat{i}_t^R = 0$.
- Holding y_t close to target, the required liquidity support falls as s_t recovers.
- This explains why quantitative tightening may begin before rate liftoff: balance-sheet support can become less desirable even while the policy rate remains constrained by the lower bound.

Preview of the Results and General Principles

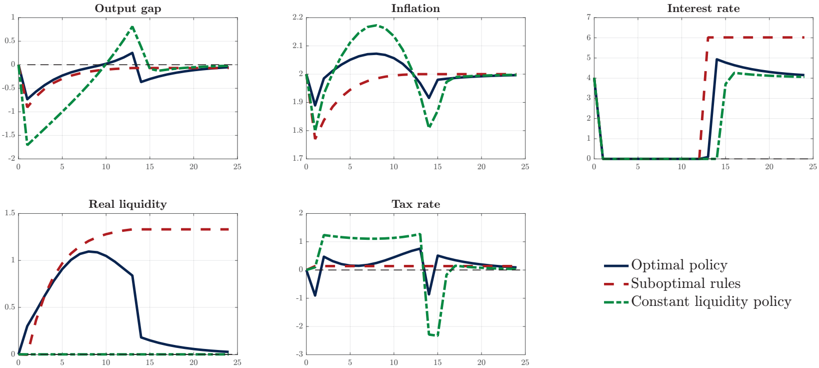
The ω-s_t decomposition organizes the comparative statics.

- In the benchmark calibration, ω is relatively small and the loss function places a high weight on inflation stabilization. Optimal policy therefore relies mainly on the interest-rate instrument, including forward guidance.
- When money-market spreads are higher, ν rises and so does ω. Liquidity becomes a more powerful stabilization tool: policy injects liquidity earlier, withdraws it sooner, and the zero-lower-bound episode is shorter.
- When the policymaker places more weight on output-gap stabilization, liquidity policy is used more aggressively and more front-loaded. Balance-sheet normalization then tends to coincide more closely with, or precede, interest-rate normalization.

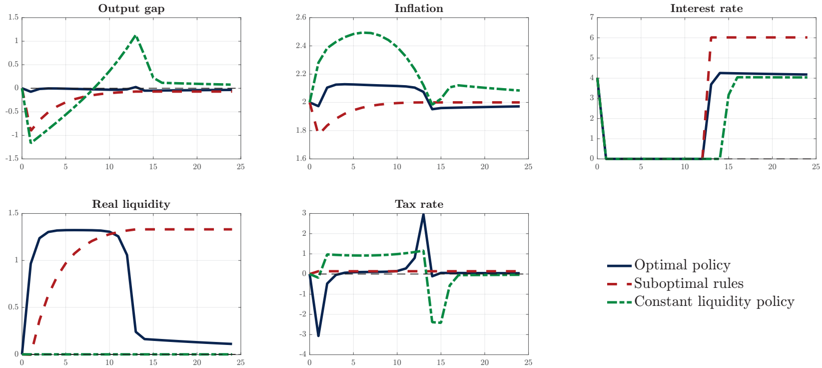
Benchmark Case



Higher Money-Market Spread



Output Stabilization



Conclusion

- New framework for monetary policy analysis
- Important role of liquidity, private and public.