Fiscal-monetary policy interactions in a low interest rate world

Boris Hofmann, Marco J. Lombardi, Benoît Mojon and Athanasios Orphanides

The views expressed are not necessarily those of the BIS
Background: Low $r^*$ and $r^* < g^*$

Outline

**Goal:** Assess the interaction of monetary and fiscal policy in low $r^*$ environment

1. Implications of lower $r^*$ for conventional monetary policy (ZLB frequency)

2. Effectiveness of central bank balance sheet policy and fiscal policy at low $r^*$
   - For macroeconomic stability and for public debt stability

3. The role of fiscal rules and negative policy rates
Methodology

- **Toolbox**: small-scale semi-structural model featuring:
  - Short- and long-term interest rates
  - Central bank bond purchases (QE)
  - Fiscal policy and public debt accumulation
  - Expectations formations can be rationale or under learning to allow for de-anchoring

- **Simulations** of fiscal-monetary interactions
  - Stochastic simulations of the model over a period of 50 years
  - Severe recession scenarios
The model
IS curve and Phillips curve

- **IS curve**: linking the unemployment gap to long-term real rates and the primary fiscal balance

  \[ u_t = \phi_u u_{t-1} + (1 - \phi_u)E(u_{t+1}) + \alpha_u (r^l_t - r^l*) + \alpha_f (pb_t - pb^*) + \epsilon_{u,t} \]

  Calibration: \( \phi_u = 0.5, \alpha_u = 0.15, \alpha_f = 0.5 \) (fiscal output multiplier = 1), shock SD = 0.45
  
  (calibration of \( r^l* \) and \( pb^* \) later)

- **Phillips curve**: linking inflation to the unemployment gap

  \[ \pi_t = \phi_\pi \pi_{t-1} + (1 - \phi_\pi)E(\pi_{t+1}) + \alpha_\pi (u_t - u^*) + \epsilon_{\pi,t} \]

  Calibration: \( \phi_\pi = 0.5, \alpha_\pi = 0.1 \) (flat Phillips curve), shock SD = 0.75

  \( \pi^* = 2\% \), \( u^* = 4\% \)
Long-term interest rates

- **Long-term interest rates**: driven by expected short-term rates and the term premium (5y maturity)

\[ r_t^l = \frac{1}{L} \sum_{j=0}^{L} r_j^s + tp_t, \quad i_t^l = \frac{1}{L} \sum_{j=0}^{L} i_j + tp_t. \]

- **Term premium**: increasing in net supply of debt to public (increasing in \( d-d^* \), decreasing in \( b-b^* \))

\[ tp_t = tp^* + \alpha_{tp} (b_{t-1} - b^*) - \alpha_{tp} (d_{t-1} - d^*) \]

Calibration: \( \alpha_{tp} = -0.05 \) (-5 bp for each pp increase in \( b-b^* \)) based on Li and Wei (2013)

- **Steady state long-term real interest rate**:

\[ r_t^l = r^* + tp^* = 1.5\% \quad (r^* = 0.5\% \text{ and } tp^* = 1\%) \]
Monetary policy

- **Conventional monetary policy**: Follows inertial Taylor rule and faces ZLB constraint

\[
i_t = \max[i_t^T + \epsilon_{i,t}, 0]
\]

\[
i_t^T = \theta_i i_{t-1} + (1 - \theta_i) [\pi_t - \pi_t^* + \theta_u (u_t - u_t^*)]
\]

Calibration: \(\theta_i = 0.85, \theta_\pi = 0.5, \theta_u = 2.0\) (inertial Taylor (1999) rule)

- **Unconventional monetary policy**: Follows inertial bond holding rule when \(i\) is at the ZLB

\[
b_t = \zeta_b b_{t-1} + (1 - \zeta_b) b^* + \zeta_\pi (\pi_{t-1} - \pi^*) + \zeta_u (u_{t-1} - u^*) + \epsilon_{b,t}
\]

when \(i\) is at the ZLB

\[
b_t = \zeta_b b_{t-1} + (1 - \zeta_b) b^*
\]

otherwise

Calibration:

- \(\zeta_b = 0.95\) corresponds to a half-life of the balance sheet of over 3 years
- \(\zeta_\pi = 6.75, \zeta_u = 9\) (non-inertial Taylor (1999) rule cast on bond holdings based on the response of long-term rates to conventional and unconventional MP shocks)
Fiscal policy

- **Fiscal rule:** expressed in terms of primary balance (as a share of GDP)

\[ pb_t = \rho_{pb} pb_{t-1} + (1 - \rho_{pb}) pb^* + \psi (u_{t-1} - u^*) + \delta (d_{t-1} - d^*) + \epsilon_{pb,t} \]

- Fiscal stance depends on unemployment gap and on the deviation of debt from target level

Calibration: \( \rho_{pb} = 0.7, \psi = -0.25 \) (Taylor (2000) fiscal rule), \( \delta = 0.01 \) (in baseline)

- **Government debt dynamics:**

\[ d_t = (1 + i_d^{d, t} - g_q, t - \pi_q, t) d_{t-1} - pb_t \]

- \( i_d^{d, t}, g_q, t, \pi_q, t \) are respectively the quarterly fractions of the government debt service cost (5-year moving average the bond yield), of the annualised inflation rate and of the annualised real GDP growth

\[ g_t = g^* - 2 (u_t - u_{t-1}) \]
applying Okun’s law and setting \( g^* = 1.5\% \)

- **Quarterly steady state primary balance:** stabilises \( d \) at \( d^* \) in steady state

\[ pb^* = (r_q^* + tp_q^* - g_q^*) d^* \]
Expectations formation

- Agents observe the history of $\pi$, $u$ and $i$
  - Estimate a VAR and use that for forecasting
    - One-period ahead inflation and unemployment
    - $L$-period ahead inflation (to construct real long-term rates)

- Constant-gain learning as in Orphanides and Williams (2007), $\kappa = 0.02$
  - Recursive updating of the VAR coefficients (VAR comprises $\pi$, $u$ and $i$)

$$c_t = c_{t-1} + \kappa R_t^{-1} X_t(Y_t - X'_t c_{t-1}),$$

$$R_t = R_{t-1} + \kappa (X_t X'_t - R_{t-1}),$$

- Starting point: RE solution
Simulation results
Lower r* makes the ZLB noticeably more binding

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<thead>
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<th>ZLB_s</th>
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<td>3.9</td>
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<td>0%</td>
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<td><strong>Stdev</strong></td>
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<td><em><em>FP, r</em> = 0.5, no ZLB</em>*</td>
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<td>0.0</td>
<td>0.3</td>
<td>4.7</td>
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- Benchmark fiscal rule
- Benchmark interest rate rule
- No balance sheet policy
CB balance sheet policy alleviates ZLB constraint

**From now on, r\* = 0.5%**

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<thead>
<tr>
<th></th>
<th>FP (no BS)</th>
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<th>d</th>
<th>ZLB_s</th>
<th>ZLB_l</th>
<th>NegTP</th>
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<th>FP + BS</th>
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<td>8.8</td>
<td>0.3</td>
<td>6.8</td>
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- Benchmark fiscal rule
- Benchmark interest rate rule
- Benchmark balance sheet policy
No balance sheet policy vs baseline
Initial shock: 6pp increase in unemployment, persistence 0.9

- Without balance sheet policy slower recovery and much higher debt
Debt and inflation under benchmark rules

Only FP

FP + BS
Debt-averse fiscal policy is counterproductive

**Debt-averse FP+BS, δ=0.04, r*=0.5**

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**Benchmark FP+BS, r*=0.5**

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- Benchmark interest rate rule
- Benchmark balance sheet policy
Debt-averse FP vs baseline: Debt and inflation outcomes

Debt-averse FP ($\delta = 0.04$) + BS

Baseline FP + BS
Debt-averse FP vs baseline: Distribution of inflation outcomes

Debt averse FP ($\delta=0.04$)  
Baseline FP ($\delta=0.01$)
Extra accommodative fiscal policy at the ZLB

\[ pb_t = \rho p b p b_{t-1} + (1 - \rho_p b) p b^* + \psi(u_{t-1} - u^*) + \delta(d_{t-1} - d^*) + \Psi_{ZLB}(i_t - i^T_t) + \epsilon_{p b, t} \]

EA FP (\( \Psi_{ZLB} = 0.5 \)) + BS

Baseline FP + BS

EA FP (\( \Psi_{ZLB} = 0.5 \)) + no BS
Negative rates (ELB=-0.5%)

ELB=-0.5% + BS

Baseline ZLB + BS

ELB=-0.5% + no BS
Recession scenario
No balance sheet policy vs baseline
Initial shock: 6pp increase in unemployment, persistence 0.9

- Without balance sheet policy slower recovery and much higher debt
Debt averse fiscal policy ($\delta=0.04$) vs baseline ($\delta=0.01$)

Initial shock: 8pp increase in unemployment, persistence 0.9

- With debt averse fiscal policy slower recovery
Extra accommodative fiscal policy at the ZLB ($\Psi_{ZLB} = 0.5$) vs baseline
Initial shock: 6pp increase in unemployment, persistence 0.9

- With extra accommodative fiscal policy faster recovery without larger increase in debt
Negative rates (ELB= -0.5) vs baseline
Initial shock: 6pp increase in unemployment, persistence 0.9

• With negative rates slightly faster recovery but noticeable smaller rise in debt
Wrapping up
Key takeaways

- Low r* significantly constrains conventional monetary policy through the ZLB
  - Unemployment and inflation diverge from steady state levels
  - Greater risk of debt deflation

- CB balance sheet policy alleviates ZLB constraints
  - Unemployment and inflation stabilised around steady state levels
  - Stabilises public debt without explicitly aiming to do so

- Fiscal rules matter
  - Excessively debt averse fiscal rules are counterproductive in a low r* world
  - Extra accommodative fiscal policy in case of a binding ZLB constraint enhances both economic and debt stability when combined with CB balance sheet policy

- Combining negative rates with CB balance sheet policy further helps somewhat dampening downturns and containing the associated rise in debt