Motivation and Research Questions

- Balance sheet policy is now standard
- Examples: QE1/2/3 and the Covid-19 monetary policy response
- Federal Reserve balance sheet expanded by $400 billion in 2019 with policy rate above zero before any Covid news

Research questions:
- What does optimal dual instrument monetary policy look like?
  - The “divine coincidence” holds with dual instrument policy
- Can balance sheet policy sustain a policy rate peg?
  - Yes! However, the welfare costs are high.
- How should the policy rate respond to balance sheet expansion?
- Matters for: Monetary policy design and transmission; emphasis on the policy rate lower bound and “lift-off”

The Paper in a Nutshell

- Uses theoretical model to address the above questions
- New Keynesian model with three structural equations
- Nominal short-term rate and balance sheet size are policy instruments
- Model is simple by design for theoretical analysis
- Simplifies to an AS/AD summary of the transmission of balance sheet policy

New Keynesian Model with Finance

Term premium augmented IS and Phillips Curves:
\[ x_t = E_t x_{t+1} = \left( r_t - E_t \pi_{t+1} - \gamma_{\pi t} - 1 - \frac{\beta}{1 - \beta_k} E_t \Delta \pi_{t+1} - r_t^* \right) \]
\[ \pi_t = \gamma x_t + \beta E_t \pi_{t+1} + \gamma \left( \frac{b}{1 + \eta + \beta \pi_t} \right) \]

Term premium definition, linear function of:
\[ t \pi_t = f \left( x_t, r_t, \pi_t, \{ r_{j+1} \}_{j=0}^{\infty}, \theta_t, \theta_{t-1}, \sigma_e, \sigma_{\pi_t-1}, t_{\pi_{t-1}} \right) \]

- Expectations hypothesis bond price, or forward looking path of the policy rate
- \( \theta_t \), financial capacity shock (\( \theta_t \uparrow \Rightarrow t_{\pi_t} \downarrow \))
- \( \sigma_e \), central bank balance sheet size (\( \sigma_e \uparrow \Rightarrow t_{\pi_t} \downarrow \))

Dual Instrument Policy

Proposition 1: Absent endogenous balance sheet policy, the divine coincidence fails due to term premium variability.

Proposition 2: There exists endogenous balance sheet policy that stabilizes the output gap, inflation, and the term premium, the equivalent of divine coincidence in this economy.

Corollary: The policy rate equals the natural rate when balance sheet policy supports term premium stabilization.

Endogenous Balance Sheet Policy

Consider the model with short-term debt, \( \kappa = 0 \), and balance sheet policy given by:
\[ r_{\pi t} = \frac{1}{b_t} \left( \sigma_e \pi_t + \sigma_{\pi_t} t_{\pi_{t-1}} \right) \]

Proposition 3: The necessary and sufficient condition for a rational expectations equilibrium to be unique under a policy rate peg when debt is short-term and balance sheet policy responds to output gap and term premium fluctuations is that:
\[ \frac{1 + \sigma_{\pi_t}}{\sigma_e} < \frac{1 + \sigma_{\pi_t}}{(1 + \eta) b_t - \eta} \]

Welfare Comparisons across Monetary Policies

<table>
<thead>
<tr>
<th>Measure</th>
<th>Monetary Policy Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda_t ) - Fixed Balance Sheet</td>
<td>0.00% 0.17% 0.76% 0.26%</td>
</tr>
<tr>
<td>( \lambda_t ) - Interest Rate Peg</td>
<td>● ● ● ●</td>
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</tbody>
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where \( \lambda_t \) is the argument satisfying:
\[ W_t = W(\lambda_t) = \frac{1}{1 - b_t} \ln \left( \left( 1 - \lambda_t \right) C_t + \psi \beta \ln C_{\pi t} - \psi \lambda_t^{1+\eta} \right) \]

“Fixed wedges” refers to dual instrument policy following:
\[ t_{\pi t} = 0 \]

The final column considers inflation targeting interest rate policy with balance sheet policy following Sims et al. (2021):
\[ \sigma_{\pi_t} = -\frac{1 - b_t^{\beta}}{b_t^{\beta} - \beta \theta_t} \]

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