Overview

- Deriving optimal robust monetary policy in a behavioral environment, where agents are not fully rational: behavioral NK model (Gabaix, 2020).
- We assume Knightian uncertainty regarding key parameters of the model: price stickiness and cognitive discounting, as we lack solid empirical evidence on its numerical values.
- Our main finding is that the Brainard principle is well and alive in presence of Knightian uncertainty on cognitive discounting.

Model

We use Gabaix (2020)’s behavioral New Keynesian model:

\[ x_t = ME_t x_{t+1} - \sigma (i_t - \bar{\psi} [\pi_t + 1] - r^*_t) \]

\[ \pi_t = \beta M^i E_t \left[ \pi_{t+1} + \kappa x_t + u_t \right] \]

\[ \kappa = \frac{(1-\theta)(1-\beta)}{\beta} (\gamma + \phi) \]

Where \( \bar{\pi} \) is a myopia parameter in the set \((0, 1)\).

Robustly Optimal policy

- Monetary policy is assumed to determine output and inflation that minimize the welfare loss.
- To achieve the equilibrium inflation and output, monetary policymaker sets the interest rate to minimize

\[ \mathbb{W} = \frac{1}{2} (\pi_t^2 + \rho x_t^2) \quad \vartheta = \frac{\kappa}{\rho} \]

- At the time of decision-making, the policy maker does not have a perfect knowledge about some parameter vector, defined with \( \vartheta \).
- The central bank, in this model, is playing a zero sum game against a fictitious evil agent who sets \( \vartheta \) in such a way to maximize the welfare loss.
- Optimal robust policy: minimize the welfare loss resulting from the worst case scenario

\[ \min_{\vartheta} \max_{\vartheta} \mathbb{E} \mathbb{W}(\vartheta) \]

Discretionary policy and myopia uncertainty

- To take into account the uncertainty facing the central bank regarding \( \bar{\pi} \), the policy maker can conjecture the worst parameter constellation \( \max_{\vartheta} \mathbb{E} \mathbb{W} \)
- In doing so, a robust policy should be based on \( \bar{\pi} = \bar{\pi}^{max} \).
- Based on Ibañaca et al. (2020), \( \bar{\pi} \in [0.49, 0.92] \). The worst case belief of the central bank about myopia is materialized when \( \bar{\pi} = \bar{\pi}^{max} = 0.92 \).

Commitment to a non-inertial policy rule

- We restrict our attention to the class of rules of the form

\[ i_t = \psi_t \pi_t + \psi'_t x_t \]

- Substituting the interest rate in the IS equation, we can write the model as a system

\[ E_t z_{t+1} = \Lambda z_t + \gamma_t \]

\[ z_t = [\pi_t, x_t]' \]

- For determinacy purposes, the eigenvalues of the matrix \( \Lambda \) should be outside the unit circle. This should be achieved under the condition

\[ \psi + \frac{1 - \beta M}{\kappa} \psi + \frac{1 - \beta M}{\kappa} (1 - \beta M) > 1 \]

- In face of uncertainty on \( \bar{\pi} \), the determinacy region shrinks and it is more likely to have multiple equilibria.

Robustness under optimal commitment

- The central bank minimizes the loss function

\[ \sum_{i=0}^{\infty} \beta^i (\pi_t^2 + \rho x_t^2) \]

- The FOCs of this problem

\[ \pi_t = -\frac{\vartheta}{\kappa} x_t + \frac{\vartheta M_f}{\kappa} x_{t-1} \]

- The interest rate rule implementing this first best solution is the following

\[ i_t = r^*_t + \psi_t + \frac{1}{\sigma} (M^t \psi - 1) x_t + \frac{\psi}{\kappa} (1 - M^t \psi - \rho_u) \left( 1 - \rho_u + \frac{M \rho_u}{\vartheta} \right) u_t \]

- To determine the worst-case scenario, we calculate the welfare loss for different \( \bar{\pi} \) values.

<table>
<thead>
<tr>
<th>Myopia values</th>
<th>Higher myopia</th>
<th>Behavioral-Baseline</th>
<th>Lower myopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare loss</td>
<td>0.154729</td>
<td>0.14944</td>
<td>0.15949</td>
</tr>
</tbody>
</table>

What about joint uncertainty for myopia and price stickiness?

- If the policy maker is uncertain about \( \bar{\pi} \) and \( \theta \), jointly, a robust policy should be based on \( \bar{\pi} = \bar{\pi}^{max} \) and \( \theta = \theta^{max} \). This is true for both setups: discretion and commitment.
- Our findings are similar to the literature on price stickiness uncertainty, where violation of Brainard’s principle is found. The rationale being that the effect of \( \theta \) dominates \( \bar{\pi} \).

Discussion and conclusion

- The first ever contribution to the question of uncertainty and optimal policy, Brainard (1967), has established what is called Brainard’s attenuation principle; i.e. the presence of uncertainty implies an attenuated policy response compared to settings where uncertainty is not taken into account.
- A recent literature contested this result showing, in particular setups, that uncertainty leads to aggressive policy actions (Giannoni, 2002).
- Barley (2011) rationalizes ‘aggressive responses’ to uncertainty, given that this later is introduced mainly in two ways: uncertainty about persistence, and uncertainty about the trade-off of competing objectives of the central bank.
- Cognitive discounting falls under the category of parameters producing uncertainty as opposed to the previous literature.

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