Robustly Optimal Monetary Policy in a Behavioral Environment

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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:

$$x_t = M\mathbb{E}_t x_{t+1} - \sigma \left(i_t - \mathbb{E}_t \left[\pi_{t+1} \right] - r_t^e \right)$$

$$\pi_t = \beta M^f \mathbb{E}_t \left[\pi_{t+1} \right] + \kappa x_t + u_t$$

with $M = \bar{m}$, $M^f = \bar{m} \left(\theta + \frac{1-\beta\theta}{1-\beta\theta\bar{m}} (1-\theta) \right)$,

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

Where $\bar{m}$ 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

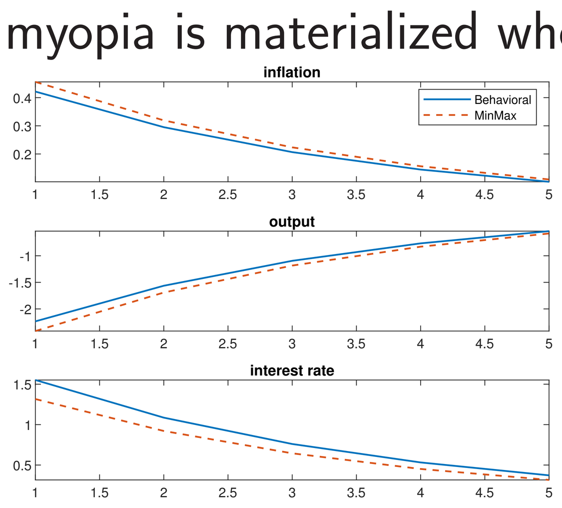
$$\mathbb{W} = \frac{1}{2} \left(\pi_t^2 + \vartheta x_t^2 \right) \qquad \vartheta = \frac{\kappa}{\epsilon}$$

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

$$\min_p \max_{v \in \Theta} \mathbb{E} W(p(v))$$

Discretionary policy and myopia uncertainty

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



Commitment to a non-inertial policy rule

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

$$i_t = \psi_\pi \pi_t + \psi_x x_t$$

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

$$E_t z_{t+1} = \Lambda z_t + \tau \gamma_t \quad z_t = [\pi_t, x_t]' \quad \gamma_t = [u_t, r_t^e]'$$

- For determinacy purposes, the eigenvalues of the matrix Λ should be outside the unit circle. This should be achieved under the condition

$$\psi_\pi + \frac{1-\beta M^f}{\kappa} \psi_x + \frac{\left(1-\beta M^f\right)(1-\beta M)}{\kappa\sigma} > 1$$

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

Robustness under optimal commitment

- The central bank minimizes the loss function

$$\sum_{t=0}^{\infty} \beta^t \left(\pi_t^2 + \vartheta x_t^2 \right)$$

- The FOCs of this problem

$$\pi_t = -\frac{\vartheta}{\kappa} x_t + \frac{\vartheta M^f}{\kappa} x_{t-1}$$

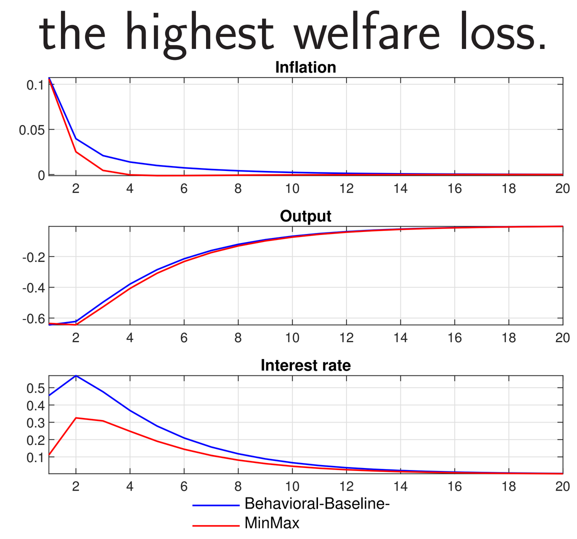
- The interest rate rule implementing this first best solution is the following

$$i_t = r_t^e + \psi \pi_t + \frac{1}{\sigma} (M\psi - 1) x_t + \frac{\psi}{1-\beta\psi\rho_u} \left(1 - \rho_u + \frac{M\kappa\rho_u}{\vartheta} \right) u_t$$

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

	Higher myopia	Behavioral-Baseline-	Lower myopia
Myopia values	**0.49**	**0.7**	**0.92**
Welfare loss	0.154729	0.14594	0.15949

- This table shows clearly that the case of $\bar{m} = \bar{m}^{max} = 0.92$ is delivering the highest welfare loss.



What about joint uncertainty for myopia and price stickiness?

- If the policy maker is uncertain about $\bar{m}$ and θ, jointly, a robust policy should be based on $\bar{m} = \bar{m}^{max}$ 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 θ dominates $\bar{m}$.

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).
- Barlevy (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 persistence, we provided a case for attenuated policy response in face of uncertainty as opposed to the previous literature.

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- The views expressed in this paper do not represent the views of the IMF, its executive Board, or its Management.

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