

Inflation, Fiscal Rules and Cognitive Discounting

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On the role of fiscal and monetary policy facing the ZLB, the paper makes four main contributions

- 1 **Evaluate super-active fiscal rules**, which call for tax cuts and/or spending increases when the government's debt-to-GDP level rises—that is, *seemingly-irresponsible* fiscal responses.

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- 2 **Welfare comparison of such rules**, employing a model-consistent measure of the welfare costs of fluctuations.

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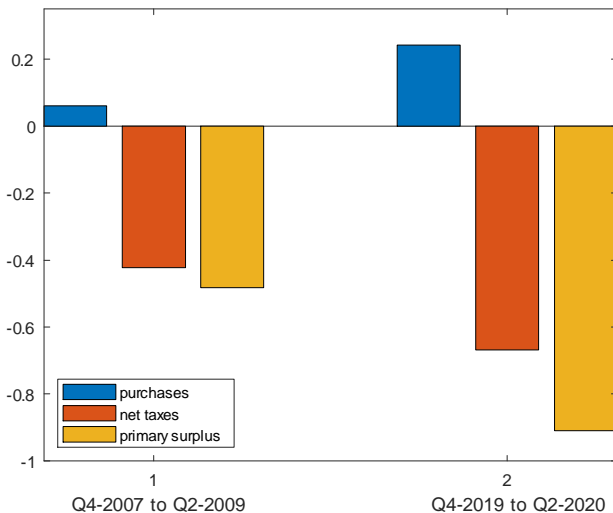
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- 2 **Welfare comparison of such rules**, employing a model-consistent measure of the welfare costs of fluctuations.
- 3 Depart from rational expectations and instead assume **bounded rationality, in the form of cognitive discounting**, that causes less weight to be placed on future events.
- 4 Study fiscal responses as seen in the U.S. during the **Great Recession** and **COVID recession**. See next slide, Fig. 1 ...

Fig. 1: U.S. fiscal responses during GR (1) and COVID (2)

Change in category divided by change in debt held by the public



Relation to the vast literature on monetary policy frameworks and ZLB

- **Optimal monetary policy (ignoring the role of fiscal policy):** Eggertsson and Woodford (2003, 2006), Adam and Billi (2006), Nakov (2008), Billi, Galí, and Nakov (2023)
- **Emergency budgets and temporary adoption of an active fiscal policy:** Sims (2016), Jacobson, Leeper and Preston (2023), Bianchi, Faccini and Melosi (2022), Bianchi and Melosi (2017, 2019), Ascari, Florio and Gobbi (2023)
- **Role of long-term government debt:** Caramp and Silva (2023), Leeper (2021), Leeper and Zhou (2021), Leeper, Leith and Liu (2021), Harrison (2021)
- **Deviations from rational expectations in the form of cognitive discounting:** Gabaix (2020), Budianto, Nakata, and Schmidt (2023)

New Keynesian model with cognitive discounting (CD)

- Let $\bar{m} \in [0, 1]$ be the micro-cognitive discounting factor. We set $\bar{m} = 0.85$ as in Gabaix (2020) and summarize some of the empirical evidence on \bar{m} . Note, under rational expectations $\bar{m} = 1$.

$$\pi_t = \beta M^f E_t \{ \pi_{t+1} \} + \kappa \tilde{y}_t \quad (1)$$

$$\tilde{y}_t = \bar{m} E_t \{ \tilde{y}_{t+1} \} - \frac{1}{\bar{\sigma}} \left(\hat{i}_t - \bar{m} E_t \{ \pi_{t+1} \} - \hat{r}_t^{CD} \right) \quad (2)$$

$$\hat{r}_t^{CD} \equiv (z_t - \bar{m} E_t \{ z_{t+1} \}) - \bar{\sigma} (1 - \Gamma) (\bar{m} E_t \{ \hat{g}_{t+1} \} - \hat{g}_t) + \bar{\sigma} b_d \hat{b}_t \quad (3)$$

- where $M^f \equiv \bar{m} \left[\theta + (1 - \theta) \left(\frac{1 - \beta \theta}{1 - \beta \theta \bar{m}} \right) \right] \leq \bar{m} \leq 1$, and $b_d \equiv (1 - \bar{m}) \beta \rho \left(\frac{C}{Y} \right) \left(\frac{\varphi}{\varphi + (1 - \alpha) \bar{\sigma}} \right) \geq 0$

A model-consistent measure of the welfare costs of fluctuations

$$\mathbb{L} = \frac{1}{2} \left[\frac{\epsilon}{\lambda} \text{var}(\pi_t) + \frac{\kappa}{\lambda} \text{var}(\tilde{y}_t) + \frac{\gamma\kappa}{\lambda} \text{var}(\hat{g}_t) \right] \quad (4)$$

- We are consistent with Gabaix (2020) and with the view of Sims (2001) regarding criteria for policy design.

Role of monetary policy, facing ZLB

$$\hat{i}_t = \max[-\rho, \phi\pi_t] \quad (5)$$

- where $i_t \geq 0$ implying $\hat{i}_t \geq -\rho$, and $\rho > 0$ is the discount rate.
- Terminology of Leeper and Leith (2016), regime M vs regime F.
- Regime M, monetary policy reacts strongly to inflation ($\phi > 1$) when away from the ZLB. Thus, **monetary-led inflation**.
- Regime F, weak response ($\phi < 1$) therefore **fiscal-led inflation** ...

Government budget, and fiscal rules for net taxes and spending reacting to debt-to-GDP ratio

Assume one-period bonds here in the baseline (and long-term debt in the extended model)

$$\hat{b}_t = \underbrace{\beta^{-1} \hat{b}_{t-1}}_{\text{Roll over}} + \underbrace{\beta^{-1} b (\hat{i}_{t-1} - \pi_t)}_{\text{Real interest cost}} - \underbrace{(\hat{\tau}_t - \hat{g}_t)}_{\text{Primary surplus}} \quad (6)$$

$$\hat{\tau}_t = \psi_\tau \hat{b}_{t-1} \quad (7)$$

$$\hat{g}_t = \psi_g \hat{b}_{t-1} \quad (8)$$

- These together give

$$\hat{b}_t = \underbrace{(\beta^{-1} - \psi_\tau + \psi_g)}_{< 0 \text{ if passive fiscal}} \hat{b}_{t-1} + \beta^{-1} b (\hat{i}_{t-1} - \pi_t) \quad (9)$$

< 0 if passive fiscal
> 0 if active fiscal

- where $b \equiv B/Y$ denotes the long-run debt target as a share of steady-state output.

Role of fiscal policy for inflation stabilization

- Regime M, passive fiscal $\psi_\tau > 0$, **raise taxes** when the debt-to-GDP level rises, i.e. **austerity** in recessions at the ZLB.
- Regime F, we evaluate **super-active fiscal** $\psi_s \equiv \psi_\tau - \psi_g < 0$:
 - $\psi_\tau < 0$, **cut taxes** when debt rises, and/or
 - $\psi_g > 0$, **hike spending** when debt rises
- The latter policies generate **expectations of inflation**, which serve to stabilize the economy during **downturns**, especially at the ZLB.

On the mechanics of fiscal-led inflation in regime F

- If **regime F** involves a nominal interest rate peg ($\hat{i}_{t-1} = 0$), the budget (9) solved forward gives

$$\frac{\hat{b}_{t-1}}{b} = E_t \sum_{i=0}^{\infty} \left(\frac{\beta \bar{m}}{1 - \beta \psi_s} \right)^i \pi_{t+i} \quad (10)$$

- Note, a **fall in current inflation**, $\pi_t < 0$, due to an adverse demand shock, in regime F must generate **higher future inflation to ensure a stationary debt process**.
- With **cognitive discounting**, $\bar{m} < 1$, **inflation must rise even higher** to stabilize debt.
- **Super-active fiscal policy**, $\psi_s < 0$, acts in a manner **similar** to a stronger cognitive discounting (a lower value of \bar{m}).

Table 1: Baseline calibration

Parameter	Description	Value
...
ϕ	{ 'Active' monetary policy response to inflation or 'passive' monetary policy response to inflation	2 0.4
ψ_τ	Fiscal policy, net taxes response to debt	0.3
ψ_g	Fiscal policy, purchases response to debt	0
b	Debt-to-GDP target	2.4
η	Bond coupon decay rate	0
ρ_z	Persistence of aggregate-demand shock	0.8
σ_z	Std. deviation of aggregate-demand shock	0.028
\bar{m}	Degree of cognitive discounting	0.85

Notes: Values are shown in quarterly rates. Shock volatility σ_z chosen to obtain under regime M a frequency of the ELB near 25%.

Fig. 2: Equilibrium determinacy with cognitive discounting

The right column provides a close-up of the left column

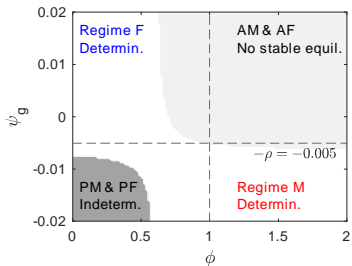
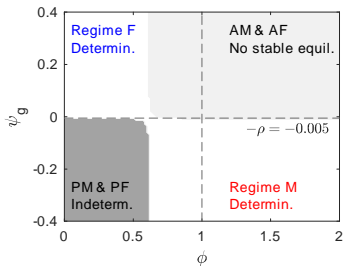
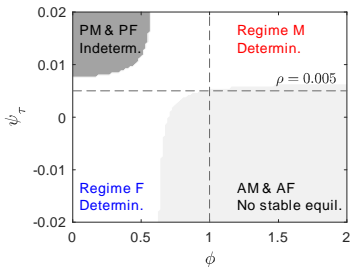
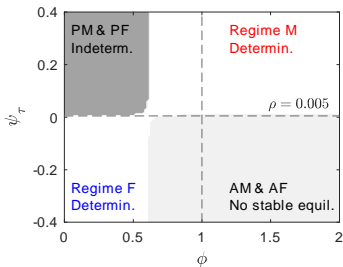


Table 2: Policy scenarios under regimes M and F

Scenario	Policy coefficients					Regime
	ϕ	ψ_τ	ψ_g	b	η	
1. M	2	0.3	0	2.4	0	M
2. No tax or G	0.4	0	0	2.4	0	F
3. Tax	0.4	-0.3	0	2.4	0	F
4. G	0.4	0	0.3	2.4	0	F
5. G balanced	0.4	0.3	0.3	2.4	0	F
6. G high b	0.4	0	0.3	8.0	0	F
7. G long debt	0.4	0	0.3	2.4	0.955	F

Notes: In regime F, $\phi < 1$ and $\psi_s \equiv \psi_\tau - \psi_g \leq 0$,
i.e. super-active fiscal. The debt duration is one quarter
if $\eta = 0$ and 5 years if $\eta = 0.955$.

Fig. 3: Effects of regime F without ZLB, under RE

Deviation from steady state in response to -3sd demand shock

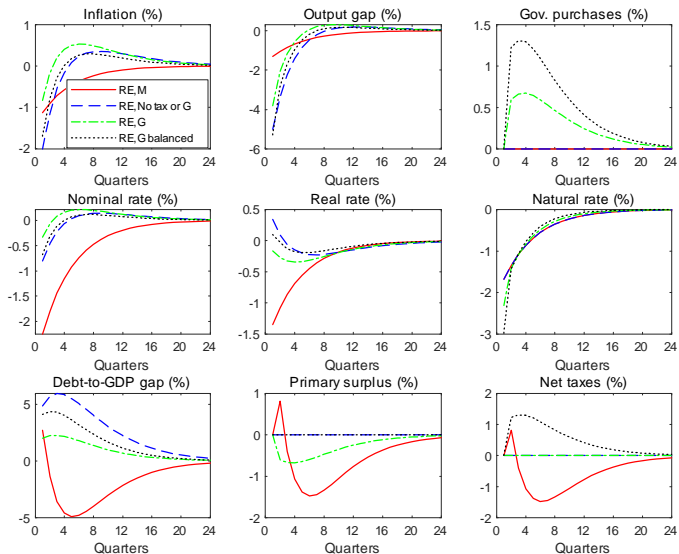


Fig. 4: Effects of regime F with ZLB, under RE

Deviation from steady state in response to -3sd demand shock

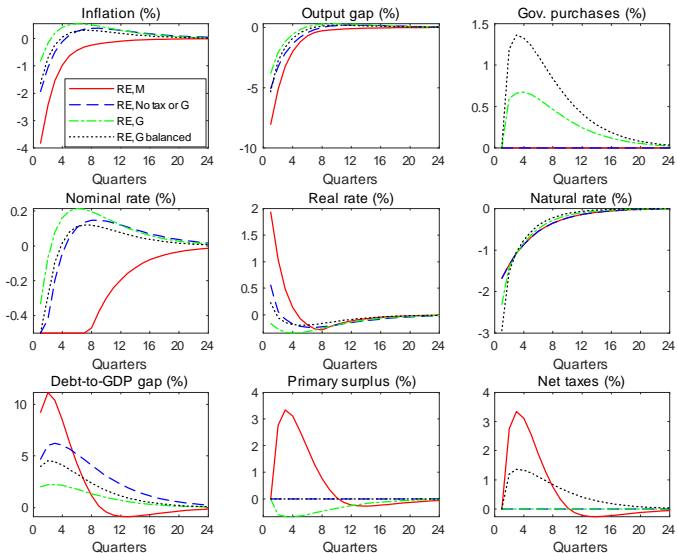


Fig. 5: Effects of regime F with ZLB, under CD

Deviation from steady state in response to -3sd demand shock

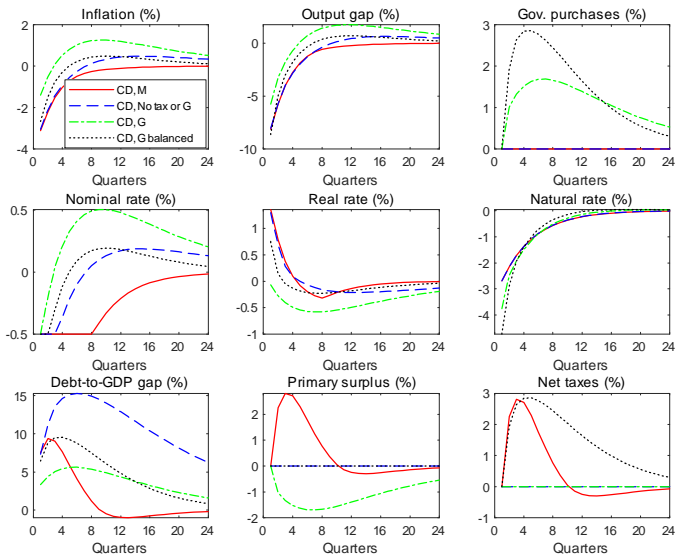


Table 3: Welfare loss under regimes M and F

Scenario	$\mathbb{L}(\%)$ no ELB				$\mathbb{L}(\%)$ with ELB				ZLB freq. (%)
	Tot.	π_t	\tilde{y}_t	\hat{g}_t	Tot.	π_t	\tilde{y}_t	\hat{g}_t	
<i>A. Rational expectations ($\bar{m} = 1$)</i>									
1. M	0.31				0.79				25.0
...									
4. G	0.28				0.28				0.0
<i>B. Cognitive discounting ($\bar{m} = 0.85$)</i>									
1. M									
...									
4. G									

Notes: \mathbb{L} is the permanent consumption loss from fluctuations.

- If **RE**, key advantages of super-active fiscal (e.g. **scenario 4**):
 - **welfare gains** in the presence of ZLB, and
 - **reduced frequency** of episodes at ZLB
- CD ?

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1. M	0.31				0.79				25.0
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4. G	0.28				0.28				0.0
<i>B. Cognitive discounting ($\bar{m} = 0.85$)</i>									
1. M	0.39				0.81				27.0
...									
4. G	2.13				1.92				7.6

Notes: \mathbb{L} is the permanent consumption loss from fluctuations.

- If **RE**, key advantages of super-active fiscal (e.g. **scenario 4**):
 - **welfare gains** in the presence of ZLB, and
 - **reduced frequency** of episodes at ZLB
- **CD makes super-active fiscal very undesirable**

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<i>B. Cognitive discounting ($\bar{m} = 0.85$)</i>									
1. M					0.81				27.0
...									
6. G high b					1.40				3.6
7. G long debt					1.71				6.6

Notes: \mathbb{L} is the permanent consumption loss from fluctuations.

- **CD makes super-active fiscal very undesirable:** this result is robust to the government's long-run debt target and the presence of long-term debt.

Summary and policy implications

- In the face of aggregate-demand shocks and the ZLB, a commitment to passive monetary policy and active fiscal policy (**PM/AF**) can yield **welfare gains** *if expectations are formed rationally*.
- This last condition is crucial. *When agents display cognitive discounting, **PM/AF performs significantly worse**.*
- This outcome highlights the importance of investigating the impact of deviations from rational expectations when assessing policy frameworks.