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Distortionary fiscal policy and monetary policy goals[☆]

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HIGHLIGHTS

- We reconsider the role of inflation conservatism.
- We study a setting with endogenous fiscal policy and distortionary taxation.
- And we compare a simultaneous policy regime to a fiscal leadership regime.
- Full inflation conservatism is optimal only in the case of fiscal leadership.

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ABSTRACT

We reconsider the role of an inflation conservative central banker in a setting with distortionary taxation. To do so, we assume monetary and fiscal policy are decided by independent authorities that do not abide to past commitments. If the two authorities make policy decisions simultaneously, inflation conservatism causes fiscal overspending. But if fiscal policy is determined before monetary policy, inflation conservatism imposes fiscal discipline. These results clarify that in our setting the value of inflation conservatism depends crucially on the timing of policy decisions.

1. Introduction

The problem of designing institutional frameworks that cope best with discretionary behavior of policymakers has received much attention following the seminal work of Kydland and Prescott (1977) and Barro and Gordon (1983). In particular, to overcome the inflationary bias caused by discretionary conduct of monetary policy, Rogoff (1985) proposed appointing a *conservative* central banker, who dislikes inflation more than society does. Recently in Adam and Billi (2008) we have shown inflation conservatism à la Rogoff also to be desirable when fiscal policy is endogenous and equally subject to a commitment problem. By introducing distortionary taxation into the setting, in this paper we show that the desirability of inflation conservatism depends crucially on the timing of policy decisions.

We consider, in particular, two policy regimes under discretion. In one, the two authorities decide policy at the same time (simultaneous policy regime). In the other, fiscal policy is determined before monetary policy (fiscal leadership regime). The main result is that inflation conservatism pays off overall, even though excessive concern about inflation may be harmful, depending on the policy regime. In particular, full conservatism, which implies zero inflation in equilibrium, is optimal only in the case of fiscal leadership, arguably the most plausible assumption. Instead, the optimal degree of conservatism in the case of simultaneous policy, though substantially high, is less than full.

The intuition is the following. In the simultaneous policy regime, the fiscal instruments are not observed when the monetary instrument is set. In contrast, under fiscal leadership, the central bank can condition the nominal interest rate on fiscal policy and she does so in a way that depends on her preferences for inflation. Under full conservatism, inflation is completely stabilized at

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zero. Therefore, a surge in public spending is followed by a strong monetary policy tightening and, as a consequence, the fiscal policy maker correctly perceives the trade-off between public consumption and private consumption, implied by the production function and the resource constraint. Then, the Ramsey plan is implemented even if the fiscal policy maker lacks the ability to commit to future policies. The whole mechanism breaks when the central bank moves at the same time as the fiscal authority, since the nominal interest rate cannot be contingent on public expenditure. Rather, the low inflation rate implied by conservatism can be harmful, because it reduces the marginal cost of a further increase of government expenditure, in terms of inflation. It follows that the optimal degree of conservatism under a simultaneous policy regime has to solve a trade-off between high inflation and high public expenditure. The solution to the trade-off is less than full conservatism.

Relative to the existing literature, the paper shows that the presence of distortionary taxation significantly worsens the trade-off between inflation and government expenditure in the simultaneous policy regime. As a consequence, full conservatism is not necessarily optimal in such case. This conclusion partially overturns the result in Adam and Billi (2008). When the government expenditure is financed with lump-sum taxation, as in that paper, full conservatism is always optimal, irrespective of the policy regime. Adam (2011) studies how the level of government debt affects optimal policies under commitment. Finally, Niemann (2011) studies how different levels of government debt affect the desirability of monetary conservatism under discretion in a flexible price economy. If the government issues nominal debt, as in his setting, the high debt tolerance implied by full conservatism can be harmful.

Section 2 describes the model. Section 3 explains the policy regimes. Section 4 presents the policy evaluation. And Section 5 concludes. The Appendix contains technical details.

2. The model

We generalize the setting of Adam and Billi (2008) to a case in which public spending is financed with a distortionary income tax.

There is a continuum of identical households with preferences given by

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, h_t, g_t), \tag{1}$$

where β denotes the discount factor. c_t denotes consumption of an aggregate good, $h_t \in (0, 1)$ is labor supply, and g_t is public goods provision by the government in the form of an aggregate good.[1] Each household produces a differentiated intermediate good with a technology linear in h_t. Demand for that good is $y_t d(\widetilde{P}_t/P_t)$, where y_t is demand for the aggregate good and $\widetilde{P}_t/P_t$ is the relative price. $d(\cdot)$ satisfies $d(1) = 1$ and $d'(1) = \eta_t$, where $\eta_t < -1$ is the price elasticity of demand for the different goods. Thus, η_t represents a mark-up shock.

The household chooses $\widetilde{P}_t$ and then hires labor $\widetilde{h}_t$ so satisfy product demand,

$$z_t \widetilde{h}_t = y_t d\left(\frac{\widetilde{P}_t}{P_t}\right), \tag{2}$$

where z_t is an aggregate technology shock. The shocks η_t and z_t evolve according to independent AR(1) stochastic processes with autocorrelation coefficients ρ_η and ρ_z and steady state values $z = 1$ and $\eta < -1$. Following Rotemberg (1982), we assume quadratic resource costs of adjusting prices, where $\theta > 0$ indexes the degree of price stickiness.

The budget constraint of the household is then

$$\begin{aligned} P_t c_t + B_t &= R_{t-1} B_{t-1} \\ &\quad + P_t \left[\frac{\widetilde{P}_t}{P_t} y_t d\left(\frac{\widetilde{P}_t}{P_t}\right) - w_t \widetilde{h}_t - \frac{\theta}{2}\left(\frac{\widetilde{P}_t}{\widetilde{P}_{t-1}} - 1\right)^2 \right] \\ &\quad + P_t w_t h_t (1 - \tau_t), \end{aligned} \tag{3}$$

where R_t denotes the gross nominal interest rate, B_t are nominal bonds paying $R_t B_t$ in period $t + 1$, w_t is the real wage paid in a competitive labor market, and τ_t is a labor income tax. We assume bonds are in zero aggregate net supply. And we rule out Ponzi schemes.

Thus, the household's problem consists of choosing $\{c_t, h_t, \widetilde{h}_t, \widetilde{P}_t, B_t\}_{t=0}^{\infty}$ to maximize (1) subject to (2) and (3) taking as given $\{y_t, P_t, w_t, R_t, g_t, \tau_t\}_{t=0}^{\infty}$. The first-order conditions of this problem are (2) and (3) and

$$u_{ht} = -u_{ct} w_t (1 - \tau_t) \tag{4}$$

$$u_{ct} = \beta E_t \frac{R_t u_{ct+1}}{\Pi_{t+1}}$$

$$\begin{aligned} 0 &= u_{ct}\Bigg[y_t d(r_t) + r_t y_t d'(r_t) - \frac{w_t}{z_t} y_t d'(r_t) \\ &\quad - \theta\left(\Pi_t \frac{r_t}{r_{t-1}} - 1\right)\frac{\Pi_t}{r_{t-1}} \Bigg] \\ &\quad + \beta\theta E_t u_{ct+1}\left(\frac{r_{t+1}}{r_t}\Pi_{t+1} - 1\right)\frac{r_{t+1}}{r_t^2}\Pi_{t+1}, \end{aligned}$$

where $r_t = \widetilde{P}_t/P_t$ denotes the relative price and $\Pi_t = P_t/P_{t-1}$ is the gross inflation rate. In addition, the usual transversality condition holds.

The government consists of two independent authorities, namely a monetary authority setting R_t and a fiscal authority choosing g_t in each period t. The government is assumed to operate under a balanced budget

$$\tau_t w_t h_t = g_t. \tag{5}$$

We consider a symmetric price-setting equilibrium in which $r_t = 1$ for all t. The first-order conditions of the household's problem can then be condensed into two equilibrium conditions, i.e., a Phillips curve

$$\begin{aligned} u_{ct}(\Pi_t - 1)\Pi_t &= \frac{u_{ct} z_t h_t}{\theta}\left(1 + \eta_t + \frac{\eta_t}{z_t}\left(\frac{u_{ht}}{u_{ct}} - \frac{g_t}{h_t}\right)\right) \\ &\quad + \beta E_t u_{ct+1}(\Pi_{t+1} - 1)\Pi_{t+1}, \end{aligned} \tag{6}$$

and a consumption Euler equation

$$\frac{u_{ct}}{R_t} = \beta E_t \frac{u_{ct+1}}{\Pi_{t+1}}. \tag{7}$$

Conveniently, these two equilibrium conditions do not make reference to τ_t and w_t.[2] Thus, an equilibrium in the private sector consists of a plan $\{c_t, h_t, \Pi_t, R_t, g_t\}_{t=0}^{\infty}$ satisfying (5)–(7) and the market-clearing condition

$$z_t h_t = c_t + \frac{\theta}{2}(\Pi_t - 1)^2 + g_t. \tag{8}$$

3. The policy regimes

As a benchmark in the policy evaluation, we use the optimal Ramsey plan, i.e., the optimal commitment policy determined at time zero. The Ramsey planner chooses $\{c_t, h_t, \Pi_t, R_t, g_t\}_{t=0}^{\infty}$ to maximize (1) subject to (6)–(8). We assume that the government

[1] We assume $u(\cdot)$ is separable and increasing in c and g but decreasing in h.

[2] Eqs. (4) and (5) imply $\tau_t = g_t\left(g_t - h_t \frac{u_{ht}}{u_{ct}}\right)^{-1}$ and $w_t = \frac{g_t}{h_t} - \frac{u_{ht}}{u_{ct}}$.

authorities cannot abide to the Ramsey plan and instead re-optimize in each period. In such a setting, we consider two policy regimes.[3]

Simultaneous policy. In the first regime, the authorities make decisions at the same time in each period. The government in period t has to choose $(c_t, h_t, \Pi_t, g_t, R_t)$ to maximize (1) subject to (6)–(8), a fiscal reaction function, a monetary reaction function, and taking as given $\{c_{t+j}, h_{t+j}, \Pi_{t+j}, R_{t+j}, g_{t+j}\}$ for $j \geq 1$.

In particular, the fiscal reaction function represents the optimal strategy from the point of view of the fiscal authority in period t, who takes R_t as given. The fiscal authority has to choose (c_t, h_t, Π_t, g_t) to maximize (1) subject to (6)–(8) taking as given $\{c_{t+j}, h_{t+j}, \Pi_{t+j}, R_{t+j-1}, g_{t+j}\}$ for $j \geq 1$.[4] Instead, the monetary reaction function represents the optimal strategy from the vantage point of the monetary authority in period t, who takes g_t as given. The objective of the monetary authority is assumed to take the form:

$$E_t \sum_{j=0}^{\infty} \beta^j \left[(1-\alpha) u(c_{t+j}, h_{t+j}, g_{t+j}) - \alpha \frac{(\Pi_{t+j} - 1)^2}{2} \right] \tag{9}$$

where $\alpha \in [0, 1]$ denotes the degree of inflation conservatism. When $\alpha = 1$ the monetary authority cares only about inflation. The monetary authority chooses (c_t, h_t, Π_t, R_t) to maximize (9) subject to (6)–(8) taking as given $\{c_{t+j}, h_{t+j}, \Pi_{t+j}, R_{t+j}, g_{t+j-1}\}$ for $j \geq 1$.[5]

Fiscal leadership. In the second regime, the fiscal authority decides before the monetary authority in each period. The government in period t has to choose $(c_t, h_t, \Pi_t, g_t, R_t)$ to maximize (1) subject to (6)–(8), the monetary reaction function, and taking as given $\{c_{t+j}, h_{t+j}, \Pi_{t+j}, R_{t+j}, g_{t+j}\}$ for $j \geq 1$. The monetary reaction function, of course, is the same as in the first regime, because the monetary authority faces the same economic environment in the two regimes.

4. Policy evaluation

After calibrating the model, we provide an assessment of the implications of inflation conservatism. We assess the implications on both the steady state and the response to shocks.

4.1. Calibration

As in Adam and Billi (2008) household preferences are assumed to take the form:

$$u(c_t, h_t, g_t) = \log(c_t) - \omega_h \frac{h_t^{1+\varphi}}{1+\varphi} + \omega_g \log(g_t), \tag{10}$$

where $\omega_h > 0$, $\omega_g \geq 0$ and $\varphi \geq 0$ denotes the inverse of the Frisch labor supply elasticity. We set β equal to 0.9913 quarterly, to imply a steady-state real interest rate of 3.5% annual. η is equal to -6, so that the mark-up over marginal costs is 20%. θ is equal to 17.5, making Phillips curve (6) consistent with Schmitt-Grohé and Uribe (2004). And φ^{-1} is equal to 1. The weights ω_h and ω_g are chosen such that households in the Ramsey plan work 20% of the time and spend 20% of output on public goods.[6] The technology shock has ρ_z equal to 0.95 and σ_z equal to 0.6% quarterly, while the mark-up shock has ρ_η equal to 0.96 and σ_η equal to 2.1% quarterly.

4.2. The implications of inflation conservatism

Based on the calibrated model, Fig. 1 shows the effects of inflation conservatism on welfare, measured as the welfare equivalent consumption loss relative to the Ramsey plan.[7] In the figure, lack of inflation conservatism ($\alpha = 0$) results in a welfare loss of more than 8 percentage points in the two policy regimes. But if we consider inflation conservatism, welfare differs greatly across the two regimes. With simultaneous policy, a value of α slightly below 1 reduces the welfare loss to less than 5 percentage points. However, if α rises to 1, the welfare loss rises back to about 8 percentage points. With fiscal leadership, by contrast, the welfare loss falls all the way to zero when α rises to 1. The reason is that, in the fiscal leadership regime, inflation conservatism imposes discipline on public spending.

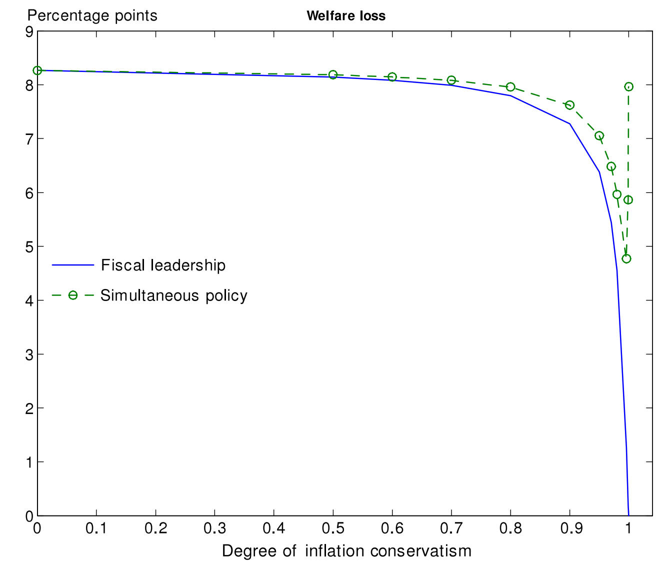


Fig. 1. Effect of inflation conservatism on welfare. Note: Welfare equivalent consumption loss relative to the Ramsey plan.

To illustrate the fiscal discipline, Fig. 2 shows the effects of inflation conservatism on the equilibrium allocation in the two policy regimes and in the Ramsey plan.[8] If the level of inflation conservatism is moderate ($\alpha = 0.7$), inflation and output (GDP) are high, compared to the Ramsey plan. The high output is achieved via excessive public spending. And public spending crowds out private consumption. With simultaneous policy, raising α results in further crowding out of private consumption. But with fiscal leadership, raising α to 1 eliminates the crowding out. Thus, in the fiscal leadership regime, full inflation conservatism recovers the Ramsey allocation.

Regarding the dynamics of the economy, Fig. 3 shows the response after a negative technology shock. The shock size is one standard deviation. On impact, private consumption, public spending and output all fall about 2 percentage points below steady state, while inflation remains at steady state. The response is the same both for the Ramsey plan and for the fiscal leadership regime with full inflation conservatism. At the same time, the response to a mark-up shock is minimal, as Fig. 4 shows. In fact, the deviation from steady state is less than 0.2% and is in the first few quarters only. Overall, in the fiscal leadership regime, full inflation conservatism practically eliminates any volatility in the economy due to technology shocks and mark-up shocks.

[3] The regimes correspond to the notion of a Markov-perfect equilibrium.

[4] See Appendix A.1 for the calculations.

[5] See Appendix A.2 for the calculations.

[6] The calculation of the weights can be found in the appendix of Adam (2011), after imposing bonds are in zero aggregate net supply.

[7] Let $u(c, h, g)$ denote the period utility in the Ramsey steady state and $u(c^A, h^A, g^A)$ the period utility in the steady state of an alternative policy regime. The figure shows the percent fall in consumption ν making the Ramsey steady state welfare equivalent to the alternative policy regime, i.e., $u(c(1-\nu), h, g) = u(c^A, h^A, g^A)$.

[8] In the Ramsey steady state $c = 0.16$, $h = 0.2$, $\Pi = 1$, $g = 0.04$ and $\tau = 0.24$.

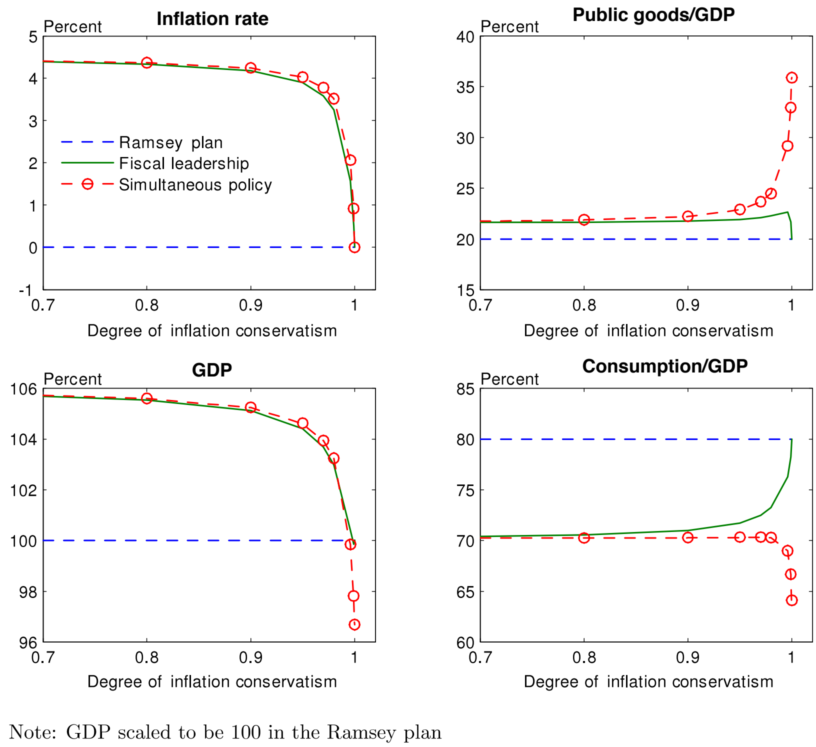


Fig. 2. Effects of inflation conservatism on the equilibrium allocation. Note: GDP scaled to be 100 in the Ramsey plan.

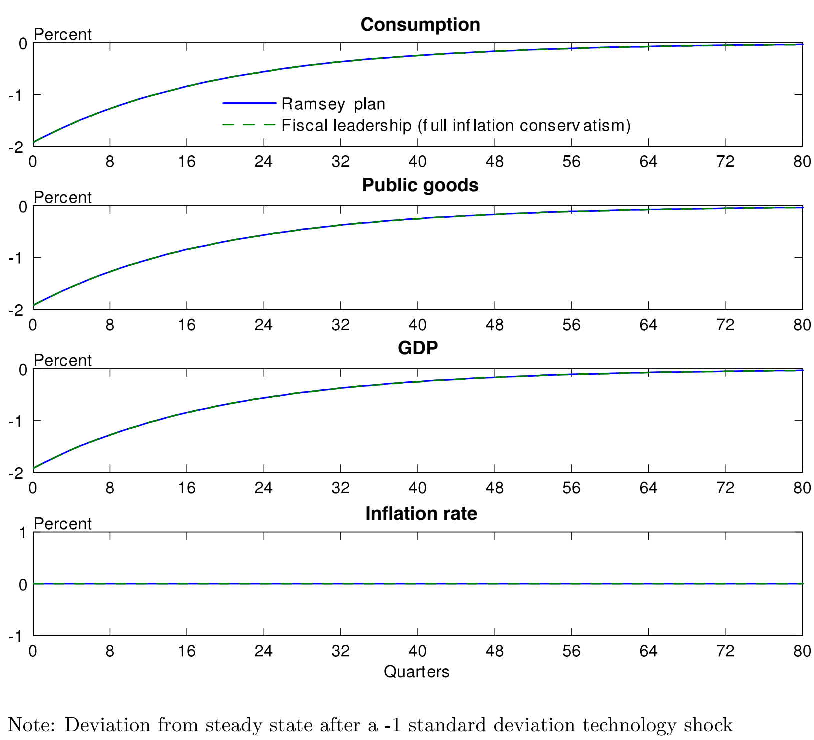
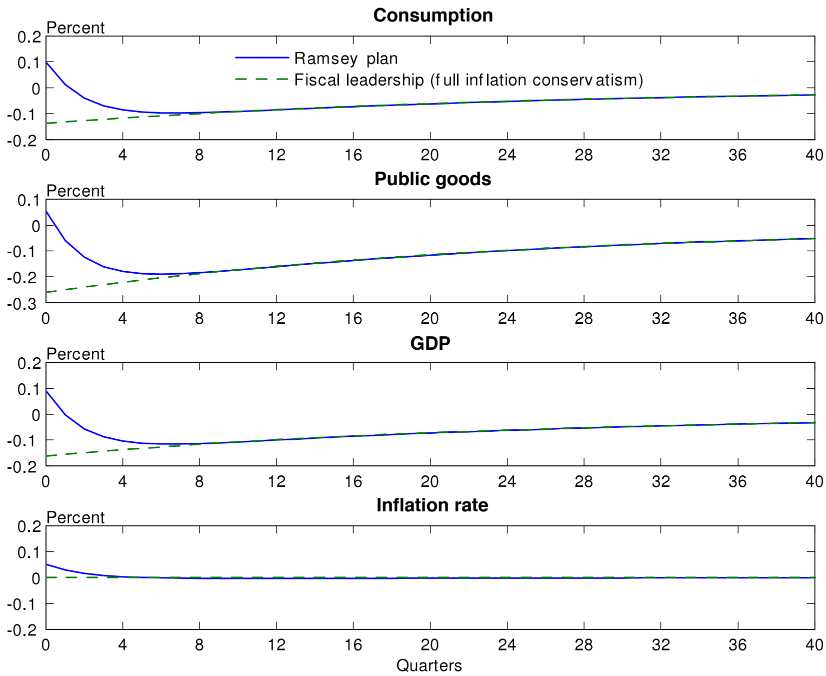


Fig. 3. Response to a technology shock. Note: Deviation from steady state after a −1 standard deviation technology shock.

5. Conclusion

In this paper, we reconsider the role of inflation conservatism in a setting with endogenous fiscal policy and distortionary taxation. The analysis clarifies that the desirability of inflation conservatism depends crucially on the timing of policy decisions. In particular, full conservatism, which implies zero inflation in equilibrium, is optimal only in the case of fiscal leadership, arguably the most plausible case. Still, we do not take into account government debt accumulation. As a consequence, fiscal policy is not allowed to



Note: Deviation from steady state after a 1 standard deviation mark-up shock

Fig. 4. Response to a mark-up shock. Note: Deviation from steady state after a 1 standard deviation mark-up shock.

smooth taxes, and the associated distortions, over time. Incorporating these features into the analysis seems an interesting task for future research.

Appendix

This appendix derives the fiscal reaction function and the monetary reaction function. In doing so, let γ_t^j for $j = 1$ to 3 denote the Lagrange multipliers on (6)–(8), respectively.

A.1. Fiscal reaction function

The first-order conditions of the fiscal authority's problem are

$$c_t : 0 = u_{ct} + \gamma_t^1 (u_{cct}(\Pi_t - 1)\Pi_t - \frac{u_{cct} z_t h_t}{\theta}\left(1 + \eta_t - \frac{\eta_t}{z_t}\frac{g_t}{h_t}\right)) + \gamma_t^2 \frac{u_{cct}}{R_t} - \gamma_t^3 \quad (11)$$

$$h_t : 0 = u_{ht} - \gamma_t^1 \frac{u_{ct} z_t}{\theta} \times \left(1 + \eta_t + \frac{\eta_t}{z_t}\left(\frac{u_{ht}}{u_{ct}} + h_t \frac{u_{hht}}{u_{ct}}\right)\right) + \gamma_t^3 z_t \quad (12)$$

$$\Pi_t : 0 = \gamma_t^1 u_{ct}(2\Pi_t - 1) - \gamma_t^3 \theta(\Pi_t - 1) \quad (13)$$

$$g_t : 0 = u_{gt} + \gamma_t^1 \frac{u_{ct}}{\theta}\eta_t - \gamma_t^3. \quad (14)$$

Eqs. (13) and (14) imply

$$\gamma_t^1 = \frac{u_{gt}\theta(\Pi_t - 1)}{u_{ct}(2\Pi_t - 1 - \eta_t(\Pi_t - 1))}.$$

Using this result and (14) to eliminate γ_t^3 in (12) gives the fiscal reaction function

$$u_{gt} = -\frac{u_{ht}}{z_t}\frac{2\Pi_t - 1 - \eta_t(\Pi_t - 1)}{2\Pi_t - 1 - (\Pi_t - 1)\left(1 + \eta_t + \frac{\eta_t}{z_t}\left(\frac{u_{ht}}{u_{ct}} + h_t\frac{u_{hht}}{u_{ct}}\right)\right)}.$$

A.2. Monetary reaction function

The first-order conditions of the monetary authority's problem are

$$c_t : 0 = (1 - \alpha) u_{ct} + \gamma_t^1 \left(u_{cct}(\Pi_t - 1)\Pi_t - \frac{u_{cct} z_t h_t}{\theta}\left(1 + \eta_t - \frac{\eta_t}{z_t}\frac{g_t}{h_t}\right)\right) + \gamma_t^2 \frac{u_{cct}}{R_t} - \gamma_t^3 \quad (15)$$

$$h_t : 0 = (1 - \alpha) u_{ht} - \gamma_t^1 \frac{u_{ct} z_t}{\theta}\left(1 + \eta_t + \frac{\eta_t}{z_t}\left(\frac{u_{ht}}{u_{ct}} + h_t\frac{u_{hht}}{u_{ct}}\right)\right) + \gamma_t^3 z_t \quad (16)$$

$$\Pi_t : 0 = \gamma_t^1 u_{ct}(2\Pi_t - 1) - \gamma_t^3 \theta(\Pi_t - 1) - \alpha(\Pi_t - 1) \quad (17)$$

$$R_t : 0 = -\gamma_t^2 \frac{u_{ct}}{R_t^2}. \quad (18)$$

Eq. (18) implies $\gamma_t^2 = 0$. While (15)–(17) give, respectively,

$$\gamma_t^3 = (1 - \alpha) u_{ct} + \gamma_t^1 \left(u_{cct}(\Pi_t - 1)\Pi_t - \frac{u_{cct} z_t h_t}{\theta}\left(1 + \eta_t - \frac{\eta_t}{z_t}\frac{g_t}{h_t}\right)\right) \quad (19)$$

$$\gamma_t^3 = -(1 - \alpha)\frac{u_{ht}}{z_t} + \gamma_t^1 \frac{u_{ct}}{\theta} \times \left(1 + \eta_t + \frac{\eta_t}{z_t}\left(\frac{u_{ht}}{u_{ct}} + h_t\frac{u_{hht}}{u_{ct}}\right)\right) \quad (20)$$

$$\gamma_t^3 = \gamma_t^1 \frac{u_{ct}(2\Pi_t - 1)}{\theta(\Pi_t - 1)} - \frac{\alpha}{\theta}. \quad (21)$$

Then (19) and (21) imply

$$\gamma_t^1 = \frac{\theta\left(1 - \alpha + \frac{1}{u_{ct}}\frac{\alpha}{\theta}\right)}{\frac{2\Pi_t - 1}{\Pi_t - 1} - \frac{u_{cct}}{u_{ct}}\left(\theta(\Pi_t - 1)\Pi_t - z_t h_t\left(1 + \eta_t - \frac{\eta_t}{z_t}\frac{g_t}{h_t}\right)\right)}. \quad (22)$$

While (20) and (21) imply

$$\gamma_t^1 = \frac{\theta\left(1-\alpha-\frac{z_t}{u_{ht}}\frac{\alpha}{\theta}\right)}{\frac{z_t u_{ct}}{u_{ht}}\left(1+\eta_t-\frac{2\Pi_t-1}{\Pi_t-1}+\frac{\eta_t}{z_t}\left(\frac{u_{ht}}{u_{ct}}+h_t\frac{u_{hht}}{u_{ct}}\right)\right)}. \tag{23}$$

Equating (22) and (23) gives the monetary reaction function

$$\begin{aligned}
&-\frac{z_t u_{ct}}{u_{ht}}\left(\eta_t\left(\Pi_t-1\right)-\Pi_t\right)-\left(\Pi_t-1\right)\eta_t\left(1+h_t\frac{u_{hht}}{u_{ht}}\right)\\
&\quad+\left[2\Pi_t-1-\frac{u_{cct}}{u_{ct}}(\Pi_t-1)\left(\theta(\Pi_t-1)\Pi_t\right.\right.\\
&\quad\left.\left.-z_t h_t\left(1+\eta_t-\frac{\eta_t}{z_t}\frac{g_t}{h_t}\right)\right)\right]\frac{(1-\alpha)\,\theta-\alpha\frac{z_t}{u_{ht}}}{(1-\alpha)\,\theta+\alpha\frac{1}{u_{ct}}}=0.
\end{aligned}$$

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