Money-financed Fiscal Stimulus with Fiscal Adjustment *

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Abstract

Money-financed fiscal policy is typically constrained by legal and institutional arrangements that prevent money issuance from being detached from future fiscal adjustment. Using a canonical New Keynesian model, this paper studies whether money-financed fiscal stimulus remains effective when money creation is accompanied by the same future tax adjustment that would arise under debt financing. We find that imposing such a tax adjustment has limited effects on the short-run impact of money-financed fiscal stimulus, for both tax cuts and government purchases, and in both normal times and a liquidity trap. Although future tax increases reduce the long-run cumulative effect, money financing with fiscal adjustment remains more expansionary than debt financing in our baseline setting. The mechanism is that future tax increases generate deflationary pressure, which weakens the expansionary effect over time, but also raise real money balances and thereby sustain monetary accommodation. A key policy implication is that the effectiveness of money financing with fiscal adjustment depends on how gradually taxes are adjusted, since the timing of lump-sum taxes affects money growth and therefore real allocations under sticky prices.

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1 Introduction

Since Friedman (1948, 1969), money-financed fiscal policy has often been discussed as a possible policy option during economic crises. A common rationale for its effectiveness is that, unlike debt-financed policy, money-financed policy may be perceived as not requiring future tax increases, thereby raising private-sector wealth and aggregate demand (Bernanke, 2003; Buiter, 2014; Galí, 2020). In practice, however, money-financed policy is typically subject to legal and institutional constraints that prevent money issuance from being detached from future tax burdens. As emphasized by Cochrane (2023), institutional arrangements such as the gold standard, exchange-rate pegs, and central bank independence can be interpreted as fiscal commitments that keep money issuance tied to future fiscal surpluses. These facts raise the question of whether money-financed fiscal stimulus remains effective even when it is accompanied by the same future fiscal adjustment that would be required under debt financing.

This paper studies the effects of money-financed fiscal stimulus when it is accompanied by the same future tax adjustment that would arise under debt financing. We conduct the analysis in a canonical New Keynesian model with government bonds and money holdings. We consider three financing regimes: a debt-financing (*DF*) regime, a money-financing (*MF*) regime without fiscal adjustment, and an *MF* regime with fiscal adjustment. The first two regimes are based on the *DF* and *MF* specifications in Galí (2020). Under the *DF* regime, fiscal stimulus is initially financed by government bonds and is followed by future tax adjustment that stabilizes the government-bond-to-output ratio. Under the *MF* regime without fiscal adjustment, fiscal stimulus is financed by money creation and is not followed by additional future tax adjustment. In addition to these two benchmark regimes, we introduce an *MF* regime with fiscal adjustment. Under this regime, money-financed fiscal stimulus is accompanied by the same tax path that would arise under *DF* in response to the same fiscal intervention. To construct this regime, we first compute the tax path implied by the debt-stabilizing fiscal rule under *DF*, and then impose this counterfactual tax path on the *MF* regime. This exercise allows us to clarify the effects of money-financed fiscal stimulus when it entails the same tax burden as debt-financed stimulus.

Under parameter values commonly used in the New Keynesian literature, we find that fiscal adjustment has little impact on the short-run effects of money-financed fiscal stimulus, for both tax-cut and government-purchase interventions. Fiscal adjustment reduces the long-run cumulative effect, but in our baseline setting, money-financed fiscal stimulus with fiscal adjustment remains more expansionary than debt-financed stimulus even in terms of the cumulative multiplier. This qualitative result holds both in normal times, when the effective lower bound (ELB) on the nominal interest rate is not binding, and in a liquidity-trap environment, where the ELB binds.

The mechanism behind our finding is as follows. Future tax increases generate two opposing effects. On the one hand, higher taxes cause deflationary pressure, which weakens the expansionary effect over time. On the other hand, this deflationary pressure raises real money balances and strengthens the accommodative effect of the *MF* regime. Consequently, the short-run responses of real interest rates, output, and consumption remain close across the two *MF* regimes. In other words, fiscal adjustment is associated not only with future tax increases, but also with a stronger commitment to keeping nominal interest rates lower for longer.

A key policy implication of our analysis is that the effectiveness of money-financed policy with fiscal adjustment is governed by the speed of fiscal adjustment. The timing of lump-sum taxes matters under the *MF* regime because the tax path affects money growth and therefore real allocations under sticky prices. When fiscal adjustment is gradual, money financing can remain highly expansionary even with fiscal adjustment. When fiscal adjustment is rapid, however, fiscal adjustment substantially weakens its effects. The role of fiscal adjustment speed is specific to MF with fiscal adjustment. It does not arise under the *DF* regime, where Ricardian equivalence holds, or under the *MF* regime without fiscal adjustment, where there is no additional tax burden.

This paper contributes to the literature on money-financed fiscal policy by separating the effects of money financing from the effects of the absence of future fiscal adjustment. Existing studies often emphasize that money-financed fiscal stimulus is expansionary because it is not followed by future tax increases. In contrast, we ask whether money-financed fiscal stimulus remains expansionary when it is accompanied by the same future tax adjustment as debt-financed stimulus. This distinction is important because, in practice, money creation is often constrained by legal and institutional arrangements that require policymakers to maintain a commitment to future fiscal adjustment.

This perspective is also motivated by policy practice. Policymakers often seek to avoid the perception that central bank purchases of government debt amount to permanent monetization without future fiscal adjustment. For example, Kuroda (2013) states that the Bank of Japan's purchases of Japanese government bonds under quantitative and qualitative monetary easing were conducted for monetary policy purposes rather than for financing fiscal deficits. He also stresses the importance of the government's commitment to fiscal consolidation. Similarly, Adrian et al. (2021) argue that a strong and sustainable fiscal position is a key prerequisite for large-scale asset purchases to be effective, because weak public finances may raise concerns about fiscal dominance and make asset purchases counterproductive.

These concerns suggest that money-financed fiscal stimulus is not necessarily perceived as being detached from future fiscal adjustment. This paper therefore revisits the effects of money-financed fiscal stimulus under a fiscal arrangement in which money creation is accompanied by an explicit commitment to the same future fiscal adjustment that would arise under debt financing.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the model and specifies the fiscal and monetary policy rules that characterize the policy regimes. Section 4 studies the effects of fiscal stimulus in normal times. Section 5 turns to the liquidity-trap case. Section 6 discusses the key policy implications of our results. Section 7 concludes.

2 Related Literature

Our paper is mainly related to studies that analyze money-financed fiscal policy in New Keynesian models. Galí (2020) analyzes money-financed fiscal stimulus without fiscal adjustment in a standard New Keynesian model. A central insight of his paper is that money financing is effective under sticky prices because it induces a more accommodative path of money growth and nominal interest rates. At the same time, Galí (2020) also emphasizes that, because money is recognized as a net asset by households, monetary expansion raises consumption through a wealth effect. One implication of his analysis is therefore that the effectiveness of money-financed fiscal policy may reflect two distinct channels, monetary accommodation under sticky prices and a wealth-transfer effect arising from the absence of fiscal adjustment. Our contribution relative to Galí (2020) can be interpreted as isolating these two channels.

Subsequent studies have extended Galí's framework in several directions. Okano and Eguchi (2024) extend the closed-economy model of Galí (2020) to a small open economy and find that money-financed fiscal stimulus is even more effective in a small open economy than in a closed economy. Tsuruga and Wake (2019) examine the role of implementation lags and show that such lags can substantially weaken the effectiveness of money-financed fiscal stimulus and may generate a recession. Punzo and Rossi (2023) analyze the redistributive effects of money-financed fiscal stimulus in a two-agent New Keynesian model and show that money financing can be detrimental to welfare. Ida and Okano (2024) also study money-financed fiscal policy in a two-agent New Keynesian model and show that, when nominal wages are sticky, a larger share of liquidity-constrained consumers reduces the money-financed fiscal multiplier. Mao, Shen, and Yang (2023) introduce endogenous policy-regime switching into a fully nonlinear New Keynesian model. van der Kwaak (2026) shows that money-financed fiscal stimulus can lose effectiveness once interest-paying reserves are incorporated into the model.

Among these studies, Mao, Shen, and Yang (2023) are particularly close to our paper. Using a fully nonlinear New Keynesian model with endogenous policy-regime switching, they show that the possibility of switching from an *MF* regime to a *DF* regime can reduce money-financed fiscal multipliers. In their framework, a switch to the *DF* regime entails both future tax adjustment and a change in the monetary policy rule. Our analysis differs from theirs by keeping the monetary policy rule that characterizes the *MF* regime fixed, while imposing the same deterministic future tax path as under *DF*. This allows us to isolate the effects of future fiscal adjustment from those of a change in the monetary policy rule.

Our paper is also closely related to Bianchi, Faccini, and Melosi (2023), who develop a quantitative New Keynesian model with partially unfunded debt. They distinguish between funded and unfunded fiscal shocks. Funded fiscal shocks are backed by future fiscal adjustments, whereas unfunded fiscal shocks are not. The latter generate fiscal inflation that is accommodated by the central bank. They estimate the model and show that unfunded fiscal shocks play a quantitatively important role in accounting for U.S. inflation dynamics.[1] While they study the possibility that government debt can be partially unfunded, we examine the converse scenario in which money-financed fiscal stimulus is followed by future fiscal adjustment.

Our analysis is also connected to the literature on monetary–fiscal policy interaction (Sargent

[1]See also Smets and Wouters (2024), who estimate a model with partial fiscal adjustment and find a more limited role for fiscal-led inflation.

and Wallace, 1981; Leeper, 1991; Sims, 1994; Woodford, 1994, 1995; Cochrane, 1998, 2001, 2023; Bassetto, 2002; Bianchi and Melosi, 2017; Leeper, Traum, and Walker, 2017). This literature emphasizes that the effects of fiscal policy depend on how monetary and fiscal authorities jointly stabilize government liabilities. Much of this literature characterizes monetary–fiscal interactions through active and passive policy mixes, typically specified in terms of interest-rate and fiscal rules. Our paper instead focuses on a money-supply rule in which fiscal variables influence money creation through the government's consolidated budget constraint.

Another strand of related literature studies monetary policy in a New Keynesian framework in the presence of the ELB (Eggertsson and Woodford, 2003; Auerbach and Obstfeld, 2005; Svensson, 2004; Jung, Teranishi, and Watanabe, 2005; Nakajima, 2008; Werning, 2011; Fujiwara et al., 2013). A common insight of this literature is that, when the nominal interest rate is constrained by the ELB, current outcomes depend crucially on expectations about future policy. In particular, policy commitments that imply a more accommodative future path of nominal interest rates, inflation, or money growth can stimulate current demand by lowering expected real interest rates. This mechanism is important for our analysis because money-financed and debt-financed fiscal stimulus can have different effects even when money and bonds are perfect substitutes at the ELB. The difference stems from the expected policy path after the economy exits the ELB.

3 The Model

Our macroeconomic environment is close to that in Galí (2020). The key difference lies in how future fiscal adjustment is specified for money-financed fiscal policy. In Galí (2020), money-financed fiscal stimulus is not accompanied by future fiscal adjustment. This paper instead studies money-financed fiscal stimulus with fiscal adjustment, in which the fiscal intervention is accompanied by the same future tax path that would arise under debt financing.

To construct our main specification, we first compute the tax path generated by a fiscal stimulus shock under debt-financed policy with a debt-stabilizing fiscal rule. We then impose this counterfactual tax path on money-financed policy as an exogenous fiscal adjustment rule. This comparison allows us to clarify the role of future fiscal adjustment in the effects of money-financed fiscal stimulus.

3.1 Non-policy blocks

Following Galí (2020), we consider a canonical New Keynesian model with money and government bonds. The economy is populated by identical infinitely lived households, monopolistically competitive firms with Calvo price setting, and a consolidated government. Households consume the final good, supply labor, and hold non-interest-bearing money and one-period nominal government bonds as assets. The consolidated government finances fiscal expenditures through lump-sum taxes, bond issuance, and money creation. Households derive utility from consumption and real money balances and disutility from labor. Production is subject to decreasing returns to labor, and wages are flexible. We present the key linearized equations below and provide the details of the nonlinear model in Appendix A.

We analyze the log-linearized equilibrium dynamics around a steady state with zero inflation and zero government purchases. At this steady state, price markups are at their desired level. Except for the monetary and fiscal policy rules, the equilibrium conditions are the same as in Galí (2020) and are given by:

$$\hat{y}_t = \hat{c}_t + \hat{g}_t, \qquad \text{(market clearing)} \tag{1}$$

$$\hat{\xi}_t = \hat{\xi}_{t+1} + \hat{i}_t - \pi_{t+1} - \zeta_t, \qquad \text{(Euler equation)} \tag{2}$$

$$\hat{\xi}_t = -\sigma \hat{c}_t + \upsilon \hat{l}_t, \qquad \text{(marginal utility)} \tag{3}$$

$$\pi_t = \beta \pi_{t+1} - \kappa \hat{\mu}_t, \qquad \text{(NK Phillips curve)} \tag{4}$$

$$\hat{\mu}_t = \hat{\xi}_t - \frac{\alpha + \varphi}{1 - \alpha} \hat{y}_t, \qquad \text{(markup gap)} \tag{5}$$

$$\hat{l}_t = \hat{c}_t - \eta \hat{i}_t, \qquad \text{(money demand)} \tag{6}$$

$$\hat{l}_{t-1} = \hat{l}_t + \pi_t - \Delta m_t, \qquad \text{(real money balances)} \tag{7}$$

$$\hat{b}_t = (1+\rho)\hat{b}_{t-1} + (1+\rho)b(\hat{i}_{t-1} - \pi_t) + \hat{g}_t - \hat{t}_t - \chi \Delta m_t, \qquad \text{(government budget constraint)} \tag{8}$$

Here, $\hat{y}_t$, $\hat{c}_t$, $\hat{\xi}_t$, $\hat{\mu}_t$, and $\hat{l}_t$ denote log deviations of output, consumption, the marginal utility of consumption, the average price markup, and real money balances from their steady-state values, respectively. $\hat{i}_t$ denotes the log deviation of the gross nominal interest rate from its steady-state value, and π_t denotes inflation. The fiscal variables $\hat{g}_t$, $\hat{b}_t$, and $\hat{t}_t$ denote deviations of government purchases, real government bonds held by the private sector, and lump-sum taxes from their steady-state ratios to output, respectively. $\Delta m_t = m_t - m_{t-1}$ denotes nominal money growth, where m_t is the logarithm of nominal money. We introduce a deterministic preference shock, ζ_t, into the Euler equation to generate a liquidity trap in which the nominal interest rate hits the effective lower bound (ELB). Table 1 provides precise definitions of the variables used in the model.

[Table 1 about here.]

The parameter σ denotes the degree of relative risk aversion, φ is the inverse Frisch elasticity of labor supply, and α governs decreasing returns to labor. The parameter ϵ denotes the elasticity of substitution across differentiated goods, θ is the Calvo probability that firms cannot reset their prices in a given period, and $\kappa \equiv [(1-\theta)(1-\beta\theta)(1-\alpha)]/[\theta(1-\alpha+\alpha\epsilon)]$ is the slope of the New Keynesian Phillips curve. The parameter η is the semi-elasticity of money demand with respect to the nominal interest rate, υ governs the nonseparability between consumption and real money balances, χ denotes the steady-state inverse income velocity of money, or equivalently the steady-state ratio of real money balances to output, and b denotes the steady-state government-bond-to-output ratio. The discount factor is $\beta = (1+\rho)^{-1}$, where ρ is the steady-state net real interest rate, which equals the steady-state net nominal interest rate under zero steady-state inflation.

Equation (8) results from log-linearizing the consolidated government budget constraint:

$$G_t + \mathcal{B}_{t-1}\mathcal{R}_{t-1} = T_t + \mathcal{B}_t + \frac{\Delta M_t}{P_t}, \tag{9}$$

where G_t, $\mathcal{B}_t \equiv B_t/P_t$, B_t, T_t, $\Delta M_t \equiv M_t - M_{t-1}$, and $\mathcal{R}_t$ denote real government purchases, real government bond holdings, nominal one-period government bonds, lump-sum taxes, nominal money creation, and the ex-post gross real interest rate, respectively. The ex-post gross real interest rate is given by $\mathcal{R}_t \equiv (1+i_t)/\Pi_{t+1}$, where i_t is the net nominal interest rate and $\Pi_{t+1} \equiv P_{t+1}/P_t$ is gross inflation between periods t and $t+1$.

As described in the next subsection, the financing regimes differ in how this government budget constraint is satisfied. Under the *DF* regime, money issuance is governed by a monetary policy rule aimed at stabilizing inflation, so fiscal stimulus is financed by issuing government bonds. Under the *MF* regimes, by contrast, bond issuance is restricted, and fiscal stimulus is financed by money creation. The monetary policy rule is then given by a money-supply rule that depends on fiscal variables. The choice between bond financing and money financing is therefore reflected in the monetary policy rule. The fiscal rule, in turn, specifies how future taxes respond to the government obligations issued to finance fiscal interventions, including both bonds and money. In the *DF* and *MF* specifications of Galí (2020), future taxes under the *DF* regime adjust to stabilize government bonds, whereas money issuance under the *MF* regime is not followed by additional tax adjustment.

3.2 Fiscal and Monetary Policy

Equations (1)–(8), together with fiscal and monetary policy rules, determine the equilibrium dynamics of the economy. This subsection describes the exogenous fiscal interventions used in the policy experiments and the financing regimes under which they are implemented.

3.2.1 Fiscal Interventions

We consider two fiscal interventions, each announced in period 0 and implemented from period 0 onward. The first is a tax cut:

$$\hat{\tau}_t = -\delta^t < 0, \qquad t = 0, 1, 2, \ldots, \tag{10}$$

where $\hat{\tau}_t$ denotes the component of taxes associated with the exogenous tax-cut intervention. The second is an increase in government purchases:

$$\hat{g}_t = \delta^t > 0, \qquad t = 0, 1, 2, \ldots. \tag{11}$$

The parameter $\delta \in [0, 1)$ measures the persistence of the fiscal intervention. The initial size of each intervention is normalized to one percent of steady-state output.

We let $\hat{\tau}_t^j$ denote the exogenous tax component associated with fiscal intervention $j \in \{g, \tau\}$, where $j = g$ denotes the government-purchase intervention and $j = \tau$ denotes the tax-cut intervention. For the government-purchase intervention, there is no exogenous tax cut, so $\hat{\tau}_t^g = 0$. For the tax-cut intervention, the exogenous tax-cut component is $\hat{\tau}_t^\tau = \hat{\tau}_t$, and government purchases remain at their steady-state level, $\hat{g}_t = 0$.

3.2.2 *DF* Regime

Monetary policy rule under *DF* In the *DF* regime, the monetary authority sets the nominal interest rate according to a simple Taylor rule:

$$\hat{i}_t = \phi_\pi \pi_t \tag{12}$$

where $\phi_\pi > 1$ governs the response of the nominal interest rate to inflation.[2] The ELB constraint will be introduced later when we consider liquidity-trap experiments.

Because the monetary policy rule in (12) satisfies the Taylor principle, the monetary authority raises the nominal interest rate in response to inflationary pressure generated by the fiscal intervention. Under the *DF* regime, money creation in response to the intervention is constrained, and the intervention is instead financed by issuing government bonds.

Fiscal rule under *DF* The fiscal authority follows a simple tax rule, commonly used in the New Keynesian literature:

$$\hat{t}_t = \psi_b \hat{b}_{t-1} + \hat{\tau}_t, \tag{13}$$

where $\psi_b > \rho$ governs the tax response to deviations of the government-bond ratio from its steady-state target. The first term on the right-hand side captures this endogenous tax response. The second term, $\hat{\tau}_t$, is the exogenous tax-cut component defined above. Under the DF regime, fiscal stimulus raises the stock of government bonds outstanding, and the associated deviation of the government-bond ratio is gradually stabilized through future tax adjustment.

Note that $\psi_b > \rho$ ensures that the government-bond ratio converges back to its steady-state target after temporary fiscal interventions, $\lim_{T\to\infty} E_t \hat{b}_T = 0$. As long as the discount factor $\Lambda_{t,T} \equiv \prod_{j=t}^{T-1} \mathcal{R}_j^{-1}$ converges to zero as $T \to \infty$, the transversality condition for government bonds, $\lim_{T\to\infty} E_t \Lambda_{t,T} \mathcal{B}_T = 0$, is satisfied for any price level path.

[2] This specification differs from Galí (2020), which assumes strict price stability under the DF regime, $\pi_t = 0$. We instead allow inflation to fluctuate according to the Taylor rule, corresponding to a standard inflation-targeting regime in which the monetary authority responds systematically to inflation but does not fully stabilize it period by period. This modification does not affect the main results of this paper.

3.2.3 *MF* Regimes

Monetary policy rule under *MF* Following Galí (2020), the *MF* regime is characterized by keeping real government bonds at their steady-state level:

$$\hat{b}_t = 0. \tag{14}$$

Substituting (14) into the government budget constraint (8) yields the money-supply rule

$$\Delta m_t = \frac{1}{\chi}\left[\hat{g}_t - \hat{t}_t + (1+\rho)b\left(\hat{i}_{t-1} - \pi_t\right)\right]. \tag{15}$$

Thus, under the *MF* regime, the interest-rate rule (12) is replaced by the money-supply rule (15). Money growth adjusts endogenously so that the consolidated government budget constraint is satisfied while the government-bond ratio remains at its steady-state target.[3]

Fiscal rule under *MF* Next, we specify the tax paths under the two *MF* regimes. We denote by $\hat{t}_t^{MF,j}$ the tax path imposed under the *MF* regime for intervention $j \in \{g, \tau\}$.

Without fiscal adjustment

Under the *MF* regime without fiscal adjustment, the tax path is given only by the exogenous tax component associated with the fiscal intervention:

$$\hat{t}_t^{MF,j} = \hat{\tau}_t^j, \qquad j \in \{g, \tau\}. \tag{16}$$

Recall that $\hat{\tau}_t^g = 0$ for the government-purchase intervention and $\hat{\tau}_t^\tau = \hat{\tau}_t$ for the tax-cut intervention. Thus, fiscal stimulus under this regime is not accompanied by any additional future tax adjustment. Government-purchase interventions are not followed by tax increases, and tax-cut interventions are not offset by subsequent tax increases. This specification corresponds to the *MF* regime in Galí (2020).

[3] Alternative specifications of the MF regime are possible. For example, Tsuruga and Wake (2019) specify $\Delta m_t = (1/\chi)\hat{g}_t$ and allow the government-bond ratio to vary, while applying a tax rule of the form (13) to stabilize it. Because our experiments impose the counterfactual tax path exogenously, combining the exogenous tax path with such a money-supply rule may raise determinacy or stability issues, as suggested by Schabert (2006). We therefore follow the Galí-type specification, which keeps the government-bond ratio at its steady-state target.

With fiscal adjustment

Our main objective is to examine the effects of money-financed fiscal stimulus when it entails the same tax burden as debt-financed stimulus. To this end, we assign to the *MF* regime the counterfactual tax path that would arise under the *DF* regime in response to the same fiscal intervention.

Let $\{\hat{t}_t^{DF,j}\}_{t=0}^{\infty}$ denote the equilibrium tax path generated under the *DF* regime in response to the same fiscal intervention $j \in \{g, \tau\}$. This path is obtained by solving the *DF* economy with the tax rule (13) and the monetary policy rule (12). The path $\hat{t}_t^{DF,j}$ includes both the exogenous tax component $\hat{\tau}_t^j$ and the endogenous response to the government-bond ratio under the *DF* regime. We then impose this counterfactual *DF* tax path on the *MF* regime:

$$\hat{t}_t^{MF,j} = \hat{t}_t^{DF,j}, \qquad j \in \{g, \tau\}. \tag{17}$$

This specification allows us to compare money-financed and debt-financed fiscal stimulus under the same path of future tax adjustment.

One might instead consider applying the fiscal feedback rule (13) to the consolidated liabilities of the government, including both bonds and money. For example, let real consolidated liabilities be given by $D_t \equiv \mathcal{B}_t + L_t$, where $L_t = M_t/P_t$ denotes real money balances. Rewriting the consolidated government budget constraint (9) in terms of D_t and log-linearizing it around the zero-inflation steady state gives

$$\hat{d}_t = (1+\rho)\hat{d}_{t-1} + (1+\rho)b\left(\hat{i}_{t-1} - \pi_t\right) + \hat{g}_t - \hat{t}_t - \chi\left(\rho\hat{l}_{t-1} + \pi_t\right), \tag{18}$$

where $\hat{d}_t \equiv (D_t - D)/Y$, with D and Y denoting steady-state real consolidated liabilities and steady-state output, respectively.

A natural alternative specification of a fiscal rule intended to impose fiscal adjustment on both bonds and money is one in which taxes respond to $\hat{d}_t$ rather than to $\hat{b}_t$:

$$\hat{t}_t = \psi_d \hat{d}_{t-1} + \hat{\tau}_t. \tag{19}$$

At first glance, this alternative specification (19) may appear to impose fiscal adjustment not only on government bonds but also on money issuance. Indeed, if $\psi_d > \rho$ and the other variables in (18) return to their steady-state values, then $\hat{d}_t$ converges back to zero. Hence, as long as the discount factor $\Lambda_{t,T} \equiv \prod_{j=t}^{T-1} \mathcal{R}_j^{-1}$ converges to zero, the transversality condition for real consolidated liabilities, $\lim_{T\to\infty} E_t \Lambda_{t,T} D_T = 0$, is satisfied for any price level path.

However, under the *MF* regime, money-financed fiscal stimulus raises inflation through money-market equilibrium, thereby substantially eroding the real value of consolidated liabilities. As a result, the fiscal feedback rule (19), when combined with the money-supply rule (15), would lead to only limited tax adjustment and could even imply tax cuts. Such a specification would therefore not capture the experiment we are interested in, namely, money-financed fiscal stimulus that entails the same tax burden as debt-financed stimulus. We therefore exogenously impose on the *MF* regime the counterfactual tax path $\{\hat{t}_t^{DF,j}\}_{t=0}^{\infty}$ that arises under the *DF* regime in response to the same fiscal intervention. Section 6.2 confirms this point quantitatively.

Table 2 summarizes how the fiscal and monetary policy rules differ across the *DF* regime and the two *MF* regimes. Appendix B presents the full set of equilibrium conditions under each regime.

[Table 2 about here.]

4 Effects of Fiscal Interventions in Normal Times

In this section, we examine the effects of fiscal interventions in normal times, where the ELB on the nominal interest rate is not binding. We set the deterministic preference shock to zero, $\zeta_t = 0$ for all t, so that the economy is initially at the steady state before the fiscal intervention. In this environment, monetary policy under the *DF* regime follows the Taylor rule (12) without the lower-bound constraint. The money-demand equation (6) also holds with equality. Under the *MF* regimes, money growth adjusts according to the money-supply rule (15). We compare the model responses under the *DF* regime, *MF* without fiscal adjustment, and *MF* with fiscal adjustment.

4.1 Measurement of Fiscal Multipliers

To assess the quantitative effects of the fiscal interventions, we compute both cumulative and impact multipliers. Let $\mathscr{E}_t^j$ denote the level of the exogenous fiscal intervention for $j \in \{g, \tau\}$. For the government-purchase intervention, $\mathscr{E}_t^g = G_t - G$, where G_t and G are government purchases in period t and steady-state government purchases, respectively. For the tax-cut intervention, $\mathscr{E}_t^\tau = -(\tau_t - \tau)$, where τ_t and τ are the exogenous tax component in period t and its steady-state value, respectively.[4]

Following Mountford and Uhlig (2009) and Eguchi, Niwa, and Tsuruga (2024), we define the cumulative multiplier for intervention j as

$$\mathcal{M}_j^{cum} = \frac{\sum_{t=0}^{\infty} \beta^t (Y_t - Y_t^R)}{\sum_{t=0}^{\infty} \beta^t \mathscr{E}_t^j},$$

where Y_t denotes output in period t and Y_t^R is its reference level, defined below. The numerator is the present discounted value of output changes relative to the reference path Y_t^R. The denominator is the present discounted value of the exogenous fiscal intervention. Thus, $\mathcal{M}_j^{cum}$ measures the present-value output gain per unit of the present-value fiscal intervention.

While the cumulative multiplier captures the long-run effect of the fiscal intervention, the impact multiplier focuses on its short-run effect in the initial period. Because fiscal interventions begin in period 0 in our experiments, the impact multiplier is defined as

$$\mathcal{M}_j^0 = \frac{Y_0 - Y_0^R}{\mathscr{E}_0^j}.$$

It measures the output change in the initial period relative to the reference level per unit of the fiscal intervention in that period.

The reference path Y_t^R depends on the experiment. In the liquidity-trap experiment, we introduce an adverse preference shock to generate a temporary ELB episode. In this case, Y_t^R is the equilibrium path of output in the economy hit by the adverse preference shock but without any fiscal intervention. Thus, the multipliers in the liquidity-trap experiment measure the additional output effects of fiscal intervention relative to the no-fiscal-intervention benchmark. In normal times, by contrast, there are no exogenous shocks driving output other than the fiscal intervention, and the economy is initially at the steady state. We therefore set $Y_t^R = Y$ for all t.

Because the fiscal interventions are expressed as ratios to steady-state output in the simulations,

[4] We assume $G = 0$ and $\tau = 0$ in the steady state, implying $\mathscr{E}_t^g = G_t$ and $\mathscr{E}_t^\tau = -\tau_t$.

these definitions are computed as

$$\mathcal{M}_g^{cum} = \frac{\sum_{t=0}^{\infty} \beta^t (\hat{y}_t - \hat{y}_t^R)}{\sum_{t=0}^{\infty} \beta^t \hat{g}_t}, \qquad \mathcal{M}_\tau^{cum} = \frac{\sum_{t=0}^{\infty} \beta^t (\hat{y}_t - \hat{y}_t^R)}{\sum_{t=0}^{\infty} \beta^t (-\hat{\tau}_t)},$$

and

$$\mathcal{M}_g^0 = \frac{\hat{y}_0 - \hat{y}_0^R}{\hat{g}_0}, \qquad \mathcal{M}_\tau^0 = \frac{\hat{y}_0 - \hat{y}_0^R}{-\hat{\tau}_0}.$$

In normal times, $\hat{y}_t^R = 0$ for all t. In the liquidity-trap experiment, $\hat{y}_t^R$ is the output path under the adverse preference shock with no fiscal intervention. In the baseline numerical simulations, the infinite sums are approximated using a horizon of 400 quarters.

4.2 Baseline Calibration

The model is calibrated at a quarterly frequency. Unless otherwise noted, the parameterization follows Galí (2020). We set the discount factor to $\beta = 0.995$, which implies a steady-state net real and nominal interest rate of 0.5 percent per quarter, or about 2 percent at an annual rate, under zero steady-state inflation. The coefficient of relative risk aversion is set to $\sigma = 1$. The inverse Frisch elasticity of labor supply is set to $\varphi = 5$, and the index of decreasing returns to labor is set to $\alpha = 0.25$. The elasticity of substitution across differentiated goods is set to $\epsilon = 9$. The Calvo parameter is set to $\theta = 0.75$, implying an average price duration of four quarters. For money demand, the steady-state inverse income velocity of money is set to $\chi = 1/3$, and the interest semi-elasticity of money demand is set to $\eta = 7$. We assume separability between consumption and real money balances, $\upsilon = 0$. The tax response coefficient is set to $\psi_b = 0.02$, the steady-state government-bond-to-output ratio is set to $b = 2.4$, and the persistence of the fiscal intervention is set to $\delta = 0.5$. Table 3 lists the baseline parameter values used in the simulations.

[Table 3 about here.]

4.3 Tax-Cut Intervention in Normal Times

Figure 1 reports the model responses to a tax-cut intervention in normal times. The black solid line with dots represents the *DF* regime, the blue dotted line with diamonds represents *MF* without fiscal adjustment, and the red dashed line with circles represents *MF* with fiscal adjustment. All responses are reported in percentage terms. The figure illustrates how the effects of the tax cut differ across the three financing regimes.

[Figure 1 about here.]

First, in the *DF* regime, the tax-cut intervention has no effects on real allocations, inflation, or interest rates, except for the paths of taxes and the government-bond ratio. This result reflects a standard Ricardian-equivalence property of the New Keynesian model with active monetary policy ($\phi_\pi > 1$) and passive fiscal policy ($\psi_b > \rho$). Because the tax-cut intervention is accompanied by future tax increases that stabilize the government-bond ratio, the household's intertemporal budget constraint is unchanged, and lump-sum tax changes do not affect aggregate allocations. The government-bond ratio rises temporarily, but the tax rule gradually brings it back toward its steady-state target. Although Figure 1 reports only the first 15 quarters, with the baseline calibration $\psi_b = 0.02$, the government-bond ratio converges to its steady-state target after roughly 400 quarters.

Second, in *MF* without fiscal adjustment, the tax-cut intervention generates sizable expansionary effects. Nominal money growth rises to finance the tax-cut intervention through the money-supply rule (15). With sticky prices, this increase in money growth works as monetary accommodation, lowering nominal and real interest rates. As a result, consumption and output rise on impact, and inflation increases. The government-bond ratio remains at its steady-state target under the *MF* regimes. These responses correspond to the *MF* experiment in Galí (2020), in which the tax-cut intervention is not offset by future fiscal adjustment.

Finally, in *MF* with fiscal adjustment, the tax-cut intervention is accompanied by future tax increases. As shown in the taxes panel, the tax path under *MF* with fiscal adjustment coincides with that under the *DF* regime. This is because *MF* with fiscal adjustment imposes the counterfactual *DF* tax path associated with the government-bond dynamics shown by the *DF* response in the government-bond-ratio panel. Although Figure 1 reports only the first 15 quarters, this future tax adjustment continues over the much longer horizon implied by the slow convergence of the government-bond ratio under the *DF* regime. The inflation response is therefore smaller than under *MF* without fiscal adjustment and turns negative in subsequent periods. At the same time, this deflationary pressure, induced by future tax increases, raises real money balances and strengthens the accommodative effect of the *MF* regime, leading to a sharper decline in the nominal interest rate relative to *MF* without fiscal adjustment. As a result, the real-interest-rate response is close to that under *MF* without fiscal adjustment, and the impact responses of output and consumption are also similar.

The impact multipliers confirm that fiscal adjustment has little effect on the short-run consequences of the tax-cut intervention. The values of the impact multipliers are $\mathcal{M}_\tau^0 = 0.5576$ under *MF* without fiscal adjustment and $\mathcal{M}_\tau^0 = 0.5721$ under *MF* with fiscal adjustment. Thus, on impact, the tax-cut intervention under *MF* with fiscal adjustment is almost as expansionary as under *MF* without fiscal adjustment. In cumulative terms, however, fiscal adjustment lowers the multiplier. Because future tax increases generate persistent deflationary pressure, the cumulative multiplier falls from $\mathcal{M}_\tau^{cum} = 0.6240$ under *MF* without fiscal adjustment to $\mathcal{M}_\tau^{cum} = 0.3229$ under *MF* with fiscal adjustment. Both multipliers are zero under *DF*, $\mathcal{M}_\tau^0 = \mathcal{M}_\tau^{cum} = 0$.

Overall, fiscal adjustment has little effect on the short-run response to a money-financed tax cut, but it reduces the long-run cumulative effect. In our baseline setting, however, a money-financed tax cut with fiscal adjustment remains more expansionary than a tax cut under the *DF* regime, even in terms of the cumulative output multiplier. This finding suggests that a money-financed tax cut can remain effective even when it is accompanied by future fiscal adjustment.

The reason is that, even with fiscal adjustment, Ricardian equivalence does not apply to the *MF* regimes in the same way as under *DF*. Even when the tax-cut intervention is followed by future fiscal adjustment and hence does not increase household wealth, the tax path affects money growth through the money-supply rule (15). Under sticky prices, this monetary response affects real interest rates and real allocations. In this sense, a money-financed tax cut is non-neutral rather than a purely Ricardian shift in lump-sum taxes. The timing of lump-sum taxes therefore matters for equilibrium outcomes under the *MF* regime because it affects money growth. We analyze how the timing of tax adjustment affects the results in Section 6.

4.4 Government-Purchase Intervention in Normal Times

Figure 2 reports the model responses to a government-purchase intervention in normal times. As in Figure 1, the black solid line denotes the *DF* regime, the blue dotted line denotes *MF* without fiscal adjustment, and the red dashed line denotes *MF* with fiscal adjustment.

[Figure 2 about here.]

First, in the *DF* regime, the increase in government purchases raises output on impact, while consumption declines. This response reflects a standard result in the New Keynesian model with government-purchase shocks. The direct increase in government demand raises output and puts upward pressure on inflation. As long as the Taylor principle is satisfied, $\phi_\pi > 1$, the nominal interest rate responds more than one-for-one to inflation. The real interest rate therefore increases, which crowds out private consumption. As a result, the output response is smaller than the increase in government purchases, and the government-spending multiplier is below one. The government-bond ratio rises because the fiscal expansion is initially financed by government bonds, and the fiscal rule gradually stabilizes it through future tax increases. Ricardian equivalence holds under the *DF* regime, so the timing of lump-sum taxes does not affect the responses to the government-purchase intervention.

Second, in *MF* without fiscal adjustment, the government-purchase intervention generates stronger expansionary effects than under the *DF* regime. Output rises more sharply on impact, and consumption increases rather than declines. This crowding-in of consumption occurs because the increase in government purchases raises money growth through the money-supply rule (15), generating monetary accommodation. Although the nominal interest rate rises, it remains below the path under the *DF* regime. Together with higher inflation, this more accommodative interest-rate response lowers the real interest rate.

Finally, in *MF* with fiscal adjustment, the government-purchase intervention is accompanied by future tax increases. As shown in the taxes panel, taxes rise following the increase in government purchases, in contrast to *MF* without fiscal adjustment. As in the tax-cut intervention, the inflation response is smaller than under *MF* without fiscal adjustment and turns negative in subsequent periods. Again, this deflationary pressure raises real money balances and strengthens the accommodative effect, leading to a sharper decline in the nominal interest rate. As a result, the real-interest-rate response is close to that under *MF* without fiscal adjustment, and the impact responses of output and consumption are almost identical across the two *MF* regimes.

The impact and cumulative multipliers for the government-purchase intervention are as follows. The impact multiplier is $\mathcal{M}_g^0 = 1.303$ under MF without fiscal adjustment and $\mathcal{M}_g^0 = 1.320$

under MF with fiscal adjustment, compared with $\mathcal{M}_g^0 = 0.648$ under DF. Thus, on impact, the government-purchase intervention under MF with fiscal adjustment is almost as expansionary as under MF without fiscal adjustment and is more expansionary than under DF. In cumulative terms, fiscal adjustment lowers the multiplier from $\mathcal{M}_g^{cum} = 1.344$ under MF without fiscal adjustment to $\mathcal{M}_g^{cum} = 0.995$ under MF with fiscal adjustment. Even so, $\mathcal{M}_g^{cum}$ under MF with fiscal adjustment remains above the DF $\mathcal{M}_g^{cum} = 0.648$.

Overall, the government-purchase intervention delivers the same message as the tax-cut intervention. Fiscal adjustment reduces the long-run effect of *MF*, but it has little effect on the short-run response. Even when followed by future fiscal adjustment, a money-financed government-purchase intervention remains more expansionary than government purchases under the *DF* regime.

5 Effects of Fiscal Interventions in a Liquidity Trap

We next consider a liquidity-trap environment in which the ELB binds temporarily. To generate the liquidity trap, we introduce a temporary adverse preference shock. Specifically, ζ_t unexpectedly falls in period 0 and remains negative until period T:

$$\zeta_t = \bar{\zeta} < 0, \qquad t = 0, 1, \ldots, T, \tag{20}$$

and then returns to zero from period $T + 1$ onward:

$$\zeta_t = 0, \qquad t \geq T + 1. \tag{21}$$

In response to the decline in aggregate demand, the government announces and implements the fiscal intervention in period 0, when the adverse preference shock hits the economy. Both the adverse preference shock and the associated fiscal intervention are unanticipated before period 0, but once they are realized, agents know their subsequent paths with certainty. Following Galí (2020), we set $\bar{\zeta} = -0.01$ and $T = 5$, so that the adverse preference shock lasts for six quarters.

In the liquidity-trap experiment, the money demand equation (6), which holds with equality in normal times, is replaced by the complementary slackness condition

$$\left(\hat{i}_t - \ln\beta\right)\left[\hat{l}_t - \left(\hat{c}_t - \eta\hat{i}_t\right)\right] = 0,$$

with $\hat{i}_t \geq \ln\beta$ and $\hat{l}_t \geq \hat{c}_t - \eta\hat{i}_t$. When the ELB is not binding, $\hat{i}_t > \ln\beta$, the money demand equation holds with equality. When the ELB binds, real money balances may exceed the level implied by the equality condition.

For the *DF* regime, the Taylor rule incorporates the ELB constraint and is given by

$$\hat{i}_t = \max\{\phi_\pi\pi_t, \ln\beta\}. \tag{22}$$

5.1 Tax-Cut Intervention in a Liquidity Trap

Figure 3 reports the model responses to a tax-cut intervention in a liquidity-trap environment under the *DF* regime, *MF* without fiscal adjustment, and *MF* with fiscal adjustment. The line styles are the same as in Figures 1 and 2. In all regimes, the economy is initially depressed because the ELB binds.

[Figure 3 about here.]

In the *DF* regime, Ricardian equivalence still holds in a liquidity-trap environment. The tax-cut intervention has no effects on real allocations, inflation, or interest rates, and therefore coincides with the benchmark with no fiscal response. However, the paths of taxes and the government-bond ratio differ substantially from those in normal times. Because the adverse demand shock generates deflation, the real value of outstanding government bonds rises sharply. The tax rule requires a larger future tax adjustment to stabilize the government-bond ratio. Thus, although the tax-cut intervention remains neutral for aggregate allocations under the *DF* regime, the associated fiscal variables respond much more strongly in the liquidity-trap environment.

In *MF* without fiscal adjustment, the tax-cut intervention substantially mitigates the decline in output and inflation. This result corresponds to the liquidity-trap experiment in Galí (2020). Since the nominal interest rate is constrained by the ELB in the short run, the expansionary effect works mainly through expectations of lower future nominal and real interest rates. Money financing leads to a persistent increase in real money balances, which acts as a commitment to keep interest rates lower for longer. As a result, output and consumption recover faster than under the *DF* regime.

In *MF* with fiscal adjustment, the tax-cut intervention is followed by future tax increases. Unlike in normal times, the monetary accommodation generated by *MF* is constrained while the ELB binds, so fiscal adjustment weakens the expansionary effect relative to *MF* without fiscal adjustment. As discussed above, the adverse preference shock generates deflation and raises the real value of outstanding government bonds under the *DF* regime. Because *MF* with fiscal adjustment imposes the counterfactual *DF* tax path, the tax-cut intervention is accompanied by a larger and more persistent path of future tax increases than in normal times. This future tax adjustment creates persistent deflationary pressure, which lowers the inflation response relative to *MF* without fiscal adjustment. At the same time, the persistent deflationary pressure raises real money balances and keeps the economy at the ELB for a longer period. Although Figure 3 reports only the first 15 quarters, the ELB continues to bind for about 50 quarters under the baseline calibration. In this sense, *MF* with fiscal adjustment acts like a commitment to maintain accommodative monetary conditions for longer, even while future tax increases are implemented. Thus, the tax-cut intervention under *MF* with fiscal adjustment is less expansionary than under *MF* without fiscal adjustment, but remains more expansionary than under the *DF* regime.

The impact multiplier of the tax-cut intervention in the liquidity trap is $\mathcal{M}_\tau^0 = 4.676$ under *MF* without fiscal adjustment and $\mathcal{M}_\tau^0 = 2.902$ under *MF* with fiscal adjustment. In cumulative terms, $\mathcal{M}_\tau^{cum} = 6.892$ under *MF* without fiscal adjustment and $\mathcal{M}_\tau^{cum} = 4.161$ under *MF* with fiscal adjustment. Both multipliers are zero under *DF*, $\mathcal{M}_\tau^0 = \mathcal{M}_\tau^{cum} = 0$. Thus, the ordering of the multipliers is the same as in normal times. The large values reflect the fact that the multipliers are measured relative to the *DF* no-response path. Under the *MF* regimes, the money financing rule itself affects output through a commitment to a lower future path of interest rates and therefore changes the economy's response to the adverse preference shock.

It is important to note that the counterfactual *DF* tax path in the liquidity-trap environment contains more than the fiscal adjustment required to finance the fiscal intervention itself. Because the adverse preference shock generates deflation under the *DF* regime, the real value of outstanding government bonds rises, requiring additional future tax increases to stabilize the government-bond ratio. By imposing the counterfactual *DF* tax path on the *MF* regime, *MF* with fiscal adjustment therefore also inherits this additional debt-stabilizing tax adjustment. This feature may understate the expansionary effect of *MF* with fiscal adjustment relative to a specification in which fiscal adjustment applies only to the fiscal intervention itself.

5.2 Government-Purchase Intervention in a Liquidity Trap

Figure 4 shows the model responses to a government-purchase intervention in a liquidity-trap environment. The expansionary effects are larger because government purchases directly raise aggregate demand, but the qualitative pattern is almost the same as in the tax-cut intervention. *MF* without fiscal adjustment mitigates the declines in output and consumption relative to the *DF* regime, reflecting the forward-guidance effect of money financing through lower future real interest rates. *MF* with fiscal adjustment is accompanied by future tax increases, which dampen inflation and reduce the expansionary effect relative to *MF* without fiscal adjustment. However, the associated deflationary pressure raises real money balances and keeps the economy at the ELB for longer. As a result, *MF* with fiscal adjustment remains less expansionary than *MF* without fiscal adjustment but more expansionary than *DF*.

[Figure 4 about here.]

For the government-purchase intervention, the impact multiplier in the liquidity trap is $\mathcal{M}_g^0 = 5.521$ under *MF* without fiscal adjustment and $\mathcal{M}_g^0 = 4.070$ under *MF* with fiscal adjustment, and $\mathcal{M}_g^0 = 1.291$ under *DF*. In cumulative terms, $\mathcal{M}_g^{cum} = 7.450$ under *MF* without fiscal adjustment and $\mathcal{M}_g^{cum} = 5.194$ under *MF* with fiscal adjustment, and $\mathcal{M}_g^{cum} = 1.218$ under *DF*. As in the tax-cut intervention, the multiplier is highest under *MF* without fiscal adjustment, lower under *MF* with fiscal adjustment, and lowest under *DF*.

6 Discussion

6.1 The Speed of Fiscal Adjustment

In this subsection, we explore the policy implications of the baseline results. Specifically, we examine how the effects of fiscal interventions under *MF* with fiscal adjustment vary with the fiscal response coefficient ψ_b in the fiscal rule (13). As discussed in Section 4.3, lump-sum taxes are not neutral under the *MF* regime because the tax path affects money growth through the money-supply rule (15). The timing of fiscal adjustment therefore matters for equilibrium outcomes in an economy with sticky prices. Although the baseline results show that fiscal adjustment does not eliminate the expansionary effects of money-financed fiscal stimulus, the magnitude of these effects depends on how future fiscal adjustment is implemented.

The role of the speed of fiscal adjustment is a distinct implication of our framework. It does not arise under the *DF* regime, where Ricardian equivalence holds, or under *MF* without fiscal adjustment, where future tax adjustment is absent. In contrast, once *MF* is followed by future tax adjustment, the speed of fiscal adjustment becomes a key determinant of the effectiveness of fiscal stimulus.

The empirical literature suggests a wide range of values for the coefficient of the fiscal reaction function, ψ_b (Galí, López-Salido, and Vallés, 2007; Davig and Leeper, 2011; Fernández-Villaverde et al., 2015; Bianchi and Melosi, 2017; Auclert and Rognlie, 2018). According to Auclert, Rognlie, and Straub (2020), these annualized estimates can be summarized as ranging from 0.015 to 0.30.[5] In our quarterly model, the annualized range corresponds to $\psi_b \in [0.00375, 0.075]$. Because debt stabilization under the *DF* regime requires $\psi_b > \rho$ and $\rho = 0.005$, we consider $\psi_b = 0.006$ as a slow-adjustment case and $\psi_b = 0.075$ as a fast-adjustment case. We compare these cases with the benchmark value $\psi_b = 0.02$.

Figures 5 and 6 show how the speed of fiscal adjustment affects the responses to tax-cut and government-purchase interventions under *MF* with fiscal adjustment in normal times. In both figures, the blue dotted line with diamonds represents the slow-adjustment case, $\psi_b = 0.006$, and the red dashed line with circles represents the fast-adjustment case, $\psi_b = 0.075$. For reference, the black solid line with dots represents the benchmark case, $\psi_b = 0.02$.

[Figure 5 about here.]

[Figure 6 about here.]

The two interventions display the same qualitative pattern. In the slow-adjustment case, future tax increases are more gradual, so the subsequent deflationary pressure is weaker. The nominal

[5] Angeletos, Lian, and Wolf (2024) consider a slightly broader quarterly range of 0.004 to 0.085, but either choice yields nearly identical results.

interest rate falls by less than in the fast-adjustment case, but the weaker deflationary pressure keeps the real interest rate lower over time. As a result, the responses of output and consumption are more persistent.

By contrast, in the fast-adjustment case, more rapid future tax increases generate stronger deflationary pressure. This raises real money balances and induces a larger decline in the nominal interest rate on impact, so the real interest rate falls more sharply initially. However, the stronger deflationary pressure subsequently raises the real interest rate and weakens the expansion of output and consumption over time.

These results show that the speed of fiscal adjustment plays a crucial role in the persistence of the expansion. The cumulative output multipliers confirm this point. For the tax-cut intervention, $\mathcal{M}_{\tau}^{cum}$ is 0.526 in the slow-adjustment case, 0.323 in the benchmark case, and -0.178 in the fast-adjustment case. For the government-purchase intervention, $\mathcal{M}_{g}^{cum}$ is 1.230 in the slow-adjustment case, 0.995 in the benchmark case, and 0.417 in the fast-adjustment case. Thus, slow fiscal adjustment preserves much of the expansionary effect of MF with fiscal adjustment, whereas fast fiscal adjustment substantially reduces its long-run effect.

Figure 7 shows the cumulative multiplier for each value of ψ_b in normal times. Panel (a) reports the tax-cut intervention, and Panel (b) reports the government-purchase intervention. The red line reports the cumulative multiplier under *MF* with fiscal adjustment, while the blue line reports the cumulative multiplier under the *DF* regime. The filled markers indicate the benchmark value, $\psi_b = 0.02$.

[Figure 7 about here.]

The cumulative multiplier under *MF* with fiscal adjustment declines monotonically as ψ_b increases. For sufficiently gradual fiscal adjustment, *MF* with fiscal adjustment remains more expansionary than *DF*. However, once fiscal adjustment becomes sufficiently rapid, the cumulative multiplier under *MF* with fiscal adjustment falls below that under *DF*. For the tax-cut intervention, the threshold is around $\psi_b = 0.05$. When ψ_b is below this value, *MF* with fiscal adjustment yields a larger cumulative multiplier than *DF*. When ψ_b exceeds this value, the cumulative multiplier under *MF* with fiscal adjustment becomes smaller than that under *DF*. For the government-purchase intervention, the corresponding threshold is slightly lower, around $\psi_b = 0.047$.

We have also verified that the same qualitative pattern holds in the liquidity-trap environment. Because the additional figures do not change the interpretation, we focus on the normal-times results here.

6.2 Alternative Fiscal Rule

This subsection quantitatively examines what happens when the alternative fiscal feedback rule (19) is applied to the *MF* regime. We set $\psi_d = 0.02$ and compute the model responses to the tax-cut and government-purchase interventions. Figure 8 reports the results. Panel (a) shows the responses to the tax-cut intervention, and Panel (b) shows the responses to the government-purchase intervention. The blue dotted line with diamonds represents the *MF* regime in which fiscal adjustment is imposed through the alternative fiscal feedback rule (19). For comparison, the red dashed line with circles reproduces the baseline *MF* regime with fiscal adjustment, in which we exogenously impose the counterfactual *DF* tax path.

[Figure 8 about here.]

As shown in Figure 8, the alternative fiscal feedback rule generates much smaller tax adjustment than the baseline specification in both interventions. The reason is that, under the money-supply rule in the *MF* regime, fiscal intervention financed by money creation immediately raises inflation and thereby erodes the real value of consolidated liabilities. As a result, the tax response implied by the fiscal feedback rule (19) is very limited, and the effects of fiscal intervention are almost identical to those under the *MF* regime without fiscal adjustment. This confirms that the alternative specification does not capture the experiment of interest in this paper, namely, money-financed fiscal stimulus that entails the same future tax burden as debt-financed stimulus.

7 Conclusion

This paper studies whether money-financed fiscal stimulus remains effective when it is accompanied by future fiscal adjustment. Using a canonical New Keynesian model, we compare debt financing, money financing without fiscal adjustment, and money financing with fiscal adjustment. Our specification of fiscal adjustment imposes on the money-financing regime the counterfactual tax path that would arise under debt financing in response to the same fiscal intervention.

The main finding is that fiscal adjustment does not eliminate the expansionary effects of money-financed fiscal stimulus. In normal times, fiscal adjustment has little effect on the short-run responses to tax-cut and government-purchase interventions. It reduces the long-run cumulative effects, but under the baseline calibration, money financing with fiscal adjustment remains more expansionary than debt financing. The same qualitative result also holds in a liquidity-trap environment.

The mechanism is that future tax increases generate two opposing effects. On the one hand, higher taxes create deflationary pressure, which weakens the expansionary effect over time. On the other hand, this deflationary pressure raises real money balances and strengthens the accommodative effect. As a result, money financing with fiscal adjustment can preserve much of the short-run monetary accommodation generated by money financing without fiscal adjustment.

Our analysis also yields a key policy implication. The effectiveness of money-financed policy with fiscal adjustment depends on the speed of fiscal adjustment. Gradual fiscal adjustment preserves much of the expansionary effect of money financing, whereas rapid adjustment substantially weakens its long-run effect. Thus, fiscal adjustment is not a binary constraint. Its macroeconomic consequences depend on how future fiscal adjustment is implemented.

These results suggest that money-financed fiscal stimulus can remain effective even when legal or institutional arrangements require future fiscal adjustment. At the same time, the design of the associated fiscal adjustment is crucial. Future work could extend the analysis to richer fiscal instruments, alternative monetary policy rules, and heterogeneous-agent New Keynesian (HANK) environments.

References

Adrian, Tobias, Christopher J. Erceg, Simon T. Gray, and Ratna Sahay. 2021. "Asset Purchases and Direct Financing: Guiding Principles for Emerging Markets and Developing Economies during COVID-19 and Beyond." Departmental Paper 2021/023, International Monetary Fund, Washington, DC.

Angeletos, George-Marios, Chen Lian, and Christian K. Wolf. 2024. "Can Deficits Finance Themselves?" *Econometrica* 92 (5):1351–1390.

Auclert, Adrien and Matthew Rognlie. 2018. "Inequality and Aggregate Demand." Working Paper 24280, National Bureau of Economic Research.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub. 2020. "Micro Jumps, Macro Humps: Monetary Policy and Business Cycles in an Estimated HANK Model." Working Paper 26647, National Bureau of Economic Research.

Auerbach, Alan J. and Maurice Obstfeld. 2005. "The Case for Open-Market Purchases in a Liquidity Trap." *American Economic Review* 95 (1):110–137.

Bassetto, Marco. 2002. "A Game–Theoretic View of the Fiscal Theory of the Price Level." *Econometrica* 70 (6):2167–2195.

Bernanke, Ben S. 2003. "Some Thoughts on Monetary Policy in Japan." URL https://www.federalreserve.gov/boarddocs/speeches/2003/20030531/. Speech before the Japan Society of Monetary Economics, Tokyo, Japan, May 31.

Bianchi, Francesco, Renato Faccini, and Leonardo Melosi. 2023. "A Fiscal Theory of Persistent Inflation." *The Quarterly Journal of Economics* 138 (4):2127–2179.

Bianchi, Francesco and Leonardo Melosi. 2017. "Escaping the Great Recession." *American Economic Review* 107 (4):1030–1058.

Buiter, Willem H. 2014. "The Simple Analytics of Helicopter Money: Why It Works–Always." *Economics: The Open-Access, Open-Assessment E-Journal* 8 (1):1–51.

Cochrane, John H. 1998. "A Frictionless View of U.S. Inflation." *NBER Macroeconomics Annual* 13:323–384.

———. 2001. "Long-Term Debt and Optimal Policy in the Fiscal Theory of the Price Level." *Econometrica* 69 (1):69–116.

———. 2023. *The Fiscal Theory of the Price Level*. Princeton, NJ: Princeton University Press.

Davig, Troy and Eric M. Leeper. 2011. "Monetary–Fiscal Policy Interactions and Fiscal Stimulus." *European Economic Review* 55 (2):211–227.

Eggertsson, Gauti B. and Michael Woodford. 2003. "Zero Bound on Interest Rates and Optimal Monetary Policy." *Brookings Papers on Economic Activity* 2003 (1):139–233.

Eguchi, Masataka, Hidekazu Niwa, and Takayuki Tsuruga. 2024. "Should the Fiscal Authority Avoid Implementation Lag?" *Oxford Bulletin of Economics and Statistics* 86 (4):856–870.

Fernández-Villaverde, Jesús, Pablo Guerrón-Quintana, Keith Kuester, and Juan Rubio-Ramírez. 2015. "Fiscal Volatility Shocks and Economic Activity." *American Economic Review* 105 (11):3352–3384.

Friedman, Milton. 1948. "A Monetary and Fiscal Framework for Economic Stability." *American Economic Review* 38 (3):245–264.

———. 1969. *The Optimum Quantity of Money and Other Essays.* Chicago, IL: Aldine Publishing Company.

Fujiwara, Ippei, Tomoyuki Nakajima, Nao Sudo, and Yuki Teranishi. 2013. "Global Liquidity Trap." *Journal of Monetary Economics* 60 (8):936–949.

Galí, Jordi. 2020. "The Effects of a Money-Financed Fiscal Stimulus." *Journal of Monetary Economics* 115:1–19.

Galí, Jordi, J. David López-Salido, and Javier Vallés. 2007. "Understanding the Effects of Government Spending on Consumption." *Journal of the European Economic Association* 5 (1):227–270.

Ida, Daisuke and Mitsuhiro Okano. 2024. "Does Nominal Wage Stickiness Affect Fiscal Multiplier in a Two-Agent New Keynesian Model?" *The B.E. Journal of Macroeconomics* 24 (2):883–928.

Jung, Taehun, Yuki Teranishi, and Tsutomu Watanabe. 2005. "Optimal Monetary Policy at the Zero-Interest-Rate Bound." *Journal of Money, Credit and Banking* 37 (5):813–835.

Kuroda, Haruhiko. 2013. "Quantitative and Qualitative Monetary Easing." URL https://www.boj.or.jp/en/about/press/koen_2013/ko130412a.htm. Speech at a Meeting Held by the Yomiuri International Economic Society in Tokyo, Bank of Japan, April 12.

Leeper, Eric M. 1991. “Equilibria Under ‘Active’ and ‘Passive’ Monetary Policies.” *Journal of Monetary Economics* 27 (1):129–147.

Leeper, Eric M., Nora Traum, and Todd B. Walker. 2017. “Clearing Up the Fiscal Multiplier Morass.” *American Economic Review* 107 (8):2409–2454.

Mao, Ruoyun, Wenyi Shen, and Shu-Chun S. Yang. 2023. “Uncertain Policy Regimes and Government Spending Effects.” *European Economic Review* 152:104330.

Mountford, Andrew and Harald Uhlig. 2009. “What are the Effects of Fiscal Policy Shocks?” *Journal of Applied Econometrics* 24 (6):960–992.

Nakajima, Tomoyuki. 2008. “Liquidity Trap and Optimal Monetary Policy in Open Economies.” *Journal of the Japanese and International Economies* 22 (1):1–33.

Okano, Eiji and Masataka Eguchi. 2024. “The Effects of a Money-Financed Fiscal Stimulus in a Small Open Economy.” *IMF Economic Review* 72 (3):1212–1237.

Punzo, Chiara and Lorenza Rossi. 2023. “A Money-Financed Fiscal Stimulus: Redistribution and Social Welfare.” *Journal of Money, Credit and Banking* 55 (2-3):595–617.

Sargent, Thomas J. and Neil Wallace. 1981. “Some Unpleasant Monetarist Arithmetic.” *Federal Reserve Bank of Minneapolis Quarterly Review* 5 (3):1–17.

Schabert, Andreas. 2006. “Central Bank Instruments, Fiscal Policy Regimes, and the Requirements for Equilibrium Determinacy.” *Review of Economic Dynamics* 9 (4):742–762.

Sims, Christopher A. 1994. “A Simple Model for Study of the Determination of the Price Level and the Interaction of Monetary and Fiscal Policy.” *Economic Theory* 4 (3):381–399.

Smets, Frank and Rafael Wouters. 2024. “Fiscal Backing, Inflation and US Business Cycles.” CEPR Discussion Paper No. 19791, CEPR Press, Paris and London.

Svensson, Lars E. O. 2004. “The Magic of the Exchange Rate: Optimal Escape from a Liquidity Trap in Small and Large Open Economies.” Working Paper 7/2004, Hong Kong Institute for Monetary Research.

Tsuruga, Takayuki and Shota Wake. 2019. "Money-Financed Fiscal Stimulus: The Effects of Implementation Lag." *Journal of Economic Dynamics and Control* 104:132–151.

van der Kwaak, Christiaan G. F. 2026. "Monetary Financing Produces Neither High Inflation nor Miraculous Fiscal Multipliers." *The Economic Journal*, accepted manuscript.

Werning, Ivan. 2011. "Managing a Liquidity Trap: Monetary and Fiscal Policy." Working Paper 17344, National Bureau of Economic Research.

Woodford, Michael. 1994. "Monetary Policy and Price Level Determinacy in a Cash-in-Advance Economy." *Economic Theory* 4 (3):345–380.

———. 1995. "Price Level Determinacy Without Control of a Monetary Aggregate." *Carnegie-Rochester Conference Series on Public Policy* 43:1–46.

A The New Keynesian Economy

This appendix describes the non-policy blocks underlying the log-linearized equilibrium conditions presented in Section 3.

A.1 Households

The economy is populated by identical infinitely lived households. The representative household chooses consumption, real money balances, labor supply, and nominal government-bond holdings to maximize the following expected lifetime utility:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t Z_t \left[U(C_t, L_t) - \frac{N_t^{1+\varphi}}{1+\varphi} \right], \tag{A.1}$$

where C_t denotes consumption, N_t denotes hours worked, and $L_t \equiv M_t/P_t$ denotes real money balances, with M_t denoting nominal money holdings and P_t the price level. The variable Z_t is an exogenous preference shifter. The parameter $\varphi > 0$ denotes the inverse of the Frisch elasticity of labor supply and $0 < \beta < 1$ is the subjective discount factor.

As in Galí (2020), we assume that the marginal rate of substitution between real money balances and consumption can be written as $h(L/C) \equiv U_L(C,L)/U_C(C,L)$, where $h(\cdot)$ is continuous and decreasing. We also assume that $h(\bar{x}) = 0$ for some finite $\bar{x} > 0$, so that households reach satiation in real money balances when the nominal interest rate is at its effective lower bound.

The household's period budget constraint is

$$P_t C_t + B_t + M_t = B_{t-1}(1 + i_{t-1}) + M_{t-1} + W_t N_t + D_t - P_t T_t, \tag{A.2}$$

where B_t denotes nominal one-period government bonds, i_t denotes the net nominal interest rate, W_t denotes the nominal wage, D_t denotes nominal dividends from firms, and T_t denotes real lump-sum taxes.

The household's optimality conditions are

$$Z_t U_{c,t} = \beta(1+i_t)\mathbb{E}_t\left[\frac{Z_{t+1}U_{c,t+1}}{\Pi_{t+1}}\right], \tag{A.3}$$

$$\frac{W_t}{P_t} = \frac{N_t^{\varphi}}{U_{c,t}}, \tag{A.4}$$

$$h\left(\frac{L_t}{C_t}\right) = \frac{i_t}{1+i_t}, \tag{A.5}$$

where $\Pi_{t+1} \equiv P_{t+1}/P_t$ denotes gross inflation and $U_{c,t} \equiv U_C(C_t, L_t)$ denotes the marginal utility of consumption. The last condition holds with equality when the nominal interest rate is above the effective lower bound. At the effective lower bound, it is replaced by the corresponding complementary slackness condition discussed in Section 5.

A.2 Firms

A representative competitive final-good firm produces the homogeneous final good Y_t by combining a continuum of differentiated intermediate goods according to

$$Y_t = \left[\int_0^1 Y_t(j)^{\frac{\epsilon-1}{\epsilon}} dj\right]^{\frac{\epsilon}{\epsilon-1}}, \tag{A.6}$$

where $Y_t(j)$ denotes output produced by intermediate-good firm $j \in [0,1]$, and $\epsilon > 1$ is the elasticity of substitution across intermediate goods. Cost minimization yields

$$Y_t(j) = \left(\frac{P_t(j)}{P_t}\right)^{-\epsilon} Y_t, \tag{A.7}$$

where $P_t(j)$ denotes the price of intermediate good j, and the aggregate price level is given by

$$P_t = \left[\int_0^1 P_t(j)^{1-\epsilon} dj\right]^{\frac{1}{1-\epsilon}}. \tag{A.8}$$

Each intermediate-good firm j produces according to

$$Y_t(j) = N_t(j)^{1-\alpha}, \tag{A.9}$$

where $N_t(j)$ denotes hours worked at firm j, and $\alpha \in [0,1)$ governs decreasing returns to labor.

Intermediate-good firms are monopolistically competitive and set prices subject to Calvo rigidity. In each period, a fraction $1-\theta$ of firms can reset their prices, while the remaining fraction θ keeps its previous price.

In a symmetric equilibrium, all firms that can reoptimize in period t choose the same price, denoted by P_t^*. The aggregate price level therefore evolves according to

$$P_t^{1-\epsilon} = \theta P_{t-1}^{1-\epsilon} + (1-\theta)(P_t^*)^{1-\epsilon}. \tag{A.10}$$

A firm that resets its price in period t chooses P_t^* to maximize its expected discounted profits:

$$\max_{P_t^*} \mathbb{E}_t \sum_{k=0}^{\infty} \theta^k Q_{t,t+k} \frac{1}{P_{t+k}} \left[P_t^* Y_{t+k|t} - W_{t+k} Y_{t+k|t}^{\frac{1}{1-\alpha}} \right], \tag{A.11}$$

subject to

$$Y_{t+k|t} = \left(\frac{P_t^*}{P_{t+k}} \right)^{-\epsilon} Y_{t+k}, \tag{A.12}$$

where $Y_{t+k|t}$ denotes output in period $t+k$ of a firm that last reset its price in period t, and $Q_{t,t+k} \equiv \beta^k (Z_{t+k}/Z_t)(U_{c,t+k}/U_{c,t})$ is the household's stochastic discount factor.

The first-order condition for P_t^* is

$$\sum_{k=0}^{\infty} \theta^k \mathbb{E}_t \left[Q_{t,t+k} \frac{Y_{t+k|t}}{P_{t+k}} \left(P_t^* - \frac{\epsilon}{\epsilon-1} \frac{W_{t+k}}{1-\alpha} Y_{t+k|t}^{\frac{\alpha}{1-\alpha}} \right) \right] = 0. \tag{A.13}$$

A.3 Market Clearing and the Consolidated Government

Goods-market and labor-market clearing

$$Y_t = C_t + G_t, \tag{A.14}$$

and

$$N_t = \int_0^1 N_t(j)\, dj. \tag{A.15}$$

The consolidated government budget constraint is

$$G_t + \mathcal{B}_{t-1}\mathcal{R}_{t-1} = T_t + \mathcal{B}_t + \frac{\Delta M_t}{P_t}, \tag{A.16}$$

where $\mathcal{B}_t \equiv B_t/P_t$, $\Delta M_t \equiv M_t - M_{t-1}$, and $\mathcal{R}_t \equiv \frac{1+i_t}{\Pi_{t+1}}$. Thus, government purchases and the servicing of outstanding bonds are financed through lump-sum taxes, new bond issuance, and money creation.

A.4 Steady State and Log-Linearization

We log-linearize the model around a steady state with zero inflation and zero government purchases. Variables without time subscripts denote steady-state values. At this steady state, $\Pi = 1$ and $G = 0$. The steady-state net real interest rate, which equals the steady-state net nominal interest rate under zero inflation, is $\rho \equiv \beta^{-1} - 1$. Since $G = 0$, goods-market clearing implies $C = Y$. Accordingly, steady-state money demand satisfies $h(\chi) = \rho/(1+\rho)$, where $\chi \equiv L/Y$ denotes the steady-state inverse income velocity of money. We define $b \equiv \mathcal{B}/Y$ as the steady-state government-bond-to-output ratio. Since $\Delta M = 0$ in the steady state, the consolidated government budget constraint implies $T = \rho\mathcal{B}$. We also define the log average price markup as $\mu_t \equiv \log[(1-\alpha)P_t/(W_t N_t^{\alpha})]$. Its steady-state value is $\mu = \log[\epsilon/(\epsilon-1)]$, and we define $\widehat{\mu}_t \equiv \mu_t - \mu$.

With the remaining log-linear variables defined in Table 1, a first-order approximation around the steady state yields

$$\widehat{y}_t = \widehat{c}_t + \widehat{g}_t, \tag{A.17}$$

$$\widehat{\xi}_t = \widehat{\xi}_{t+1} + \widehat{i}_t - \pi_{t+1} - \zeta_t, \tag{A.18}$$

$$\widehat{\xi}_t = -\sigma\widehat{c}_t + \upsilon\widehat{l}_t, \tag{A.19}$$

$$\pi_t = \beta\pi_{t+1} - \kappa\widehat{\mu}_t, \tag{A.20}$$

$$\widehat{\mu}_t = \widehat{\xi}_t - \frac{\alpha+\varphi}{1-\alpha}\widehat{y}_t, \tag{A.21}$$

$$\widehat{l}_t = \widehat{c}_t - \eta\widehat{i}_t, \tag{A.22}$$

$$\widehat{l}_{t-1} = \widehat{l}_t + \pi_t - \Delta m_t, \tag{A.23}$$

$$\widehat{b}_t = (1+\rho)\widehat{b}_{t-1} + (1+\rho)b\left(\widehat{i}_{t-1} - \pi_t\right) + \widehat{g}_t - \widehat{t}_t - \chi\Delta m_t. \tag{A.24}$$

Following Galí (2020), we parameterize the local household block by σ, υ, and η, where σ governs the response of the marginal utility of consumption to consumption, υ captures the local nonseparability between consumption and real money balances, and η is the interest semi-elasticity of money demand. The slope of the New Keynesian Phillips curve is $\kappa \equiv (1-\theta)(1-\beta\theta)(1-\alpha)/[\theta(1-\alpha+\alpha\epsilon)]$. Because all shocks and policy interventions follow deterministic paths once realized, expectation operators are omitted.

B Equilibrium Systems by Regime

This appendix presents the full set of equilibrium conditions under each regime.

B.1 Debt-Financing Regime

$$
\begin{aligned}
\hat{y}_t &= \hat{c}_t + \hat{g}_t, && \text{(market clearing)}\\
\hat{\xi}_t &= \hat{\xi}_{t+1} + \hat{i}_t - \pi_{t+1} - \zeta_t, && \text{(Euler equation)}\\
\hat{\xi}_t &= -\sigma\hat{c}_t + \upsilon\hat{l}_t, && \text{(marginal utility)}\\
\pi_t &= \beta\pi_{t+1} - \kappa\hat{\mu}_t, && \text{(NK Phillips curve)}\\
\hat{\mu}_t &= \hat{\xi}_t - \frac{\alpha+\varphi}{1-\alpha}\hat{y}_t, && \text{(markup gap)}\\
\hat{l}_t &= \hat{c}_t - \eta\hat{i}_t, && \text{(money demand)}\\
\hat{l}_{t-1} &= \hat{l}_t + \pi_t - \Delta m_t, && \text{(real money balances)}\\
\hat{b}_t &= (1+\rho)\hat{b}_{t-1} + (1+\rho)b(\hat{i}_{t-1} - \pi_t) + \hat{g}_t - \hat{t}_t - \chi\Delta m_t, && \text{(government budget constraint)}\\
\hat{i}_t &= \phi_\pi\pi_t, && \text{(monetary policy)}\\
\hat{t}_t &= \psi_b\hat{b}_{t-1} + \hat{\tau}_t. && \text{(fiscal rule)}
\end{aligned}
$$

B.2 Money-Financing Regime without Fiscal Adjustment

$$
\begin{aligned}
\hat{y}_t &= \hat{c}_t + \hat{g}_t, && \text{(market clearing)} \\
\hat{\xi}_t &= \hat{\xi}_{t+1} + \hat{i}_t - \pi_{t+1} - \zeta_t, && \text{(Euler equation)} \\
\hat{\xi}_t &= -\sigma \hat{c}_t + \upsilon \hat{l}_t, && \text{(marginal utility)} \\
\pi_t &= \beta \pi_{t+1} - \kappa \hat{\mu}_t, && \text{(NK Phillips curve)} \\
\hat{\mu}_t &= \hat{\xi}_t - \frac{\alpha + \varphi}{1 - \alpha} \hat{y}_t, && \text{(markup gap)} \\
\hat{l}_t &= \hat{c}_t - \eta \hat{i}_t, && \text{(money demand)} \\
\hat{l}_{t-1} &= \hat{l}_t + \pi_t - \Delta m_t, && \text{(real money balances)} \\
\hat{b}_t &= (1+\rho)\hat{b}_{t-1} + (1+\rho)b(\hat{i}_{t-1} - \pi_t) + \hat{g}_t - \hat{t}_t - \chi \Delta m_t, && \text{(government budget constraint)} \\
\Delta m_t &= \frac{1}{\chi}\left[\hat{g}_t - \hat{t}_t + (1+\rho)b\left(\hat{i}_{t-1} - \pi_t\right)\right], && \text{(monetary policy)} \\
\hat{t}_t^{MF,j} &= \hat{\tau}_t^j, \qquad j \in \{g, \tau\}. && \text{(fiscal rule)}
\end{aligned}
$$

B.3 Money-Financing Regime with Fiscal Adjustment

$$\hat{y}_t = \hat{c}_t + \hat{g}_t, \qquad \text{(market clearing)}$$

$$\hat{\xi}_t = \hat{\xi}_{t+1} + \hat{i}_t - \pi_{t+1} - \zeta_t, \qquad \text{(Euler equation)}$$

$$\hat{\xi}_t = -\sigma \hat{c}_t + \upsilon \hat{l}_t, \qquad \text{(marginal utility)}$$

$$\pi_t = \beta \pi_{t+1} - \kappa \hat{\mu}_t, \qquad \text{(NK Phillips curve)}$$

$$\hat{\mu}_t = \hat{\xi}_t - \frac{\alpha + \varphi}{1 - \alpha} \hat{y}_t, \qquad \text{(markup gap)}$$

$$\hat{l}_t = \hat{c}_t - \eta \hat{i}_t, \qquad \text{(money demand)}$$

$$\hat{l}_{t-1} = \hat{l}_t + \pi_t - \Delta m_t, \qquad \text{(real money balances)}$$

$$\hat{b}_t = (1+\rho)\hat{b}_{t-1} + (1+\rho)b(\hat{i}_{t-1} - \pi_t) + \hat{g}_t - \hat{t}_t - \chi \Delta m_t, \qquad \text{(government budget constraint)}$$

$$\Delta m_t = \frac{1}{\chi} \left[\hat{g}_t - \hat{t}_t + (1+\rho) b \left(\hat{i}_{t-1} - \pi_t \right) \right], \qquad \text{(monetary policy)}$$

$$\hat{t}_t^{MF,j} = \hat{t}_t^{DF,j}, \qquad j \in \{g, \tau\}. \qquad \text{(fiscal rule)}$$

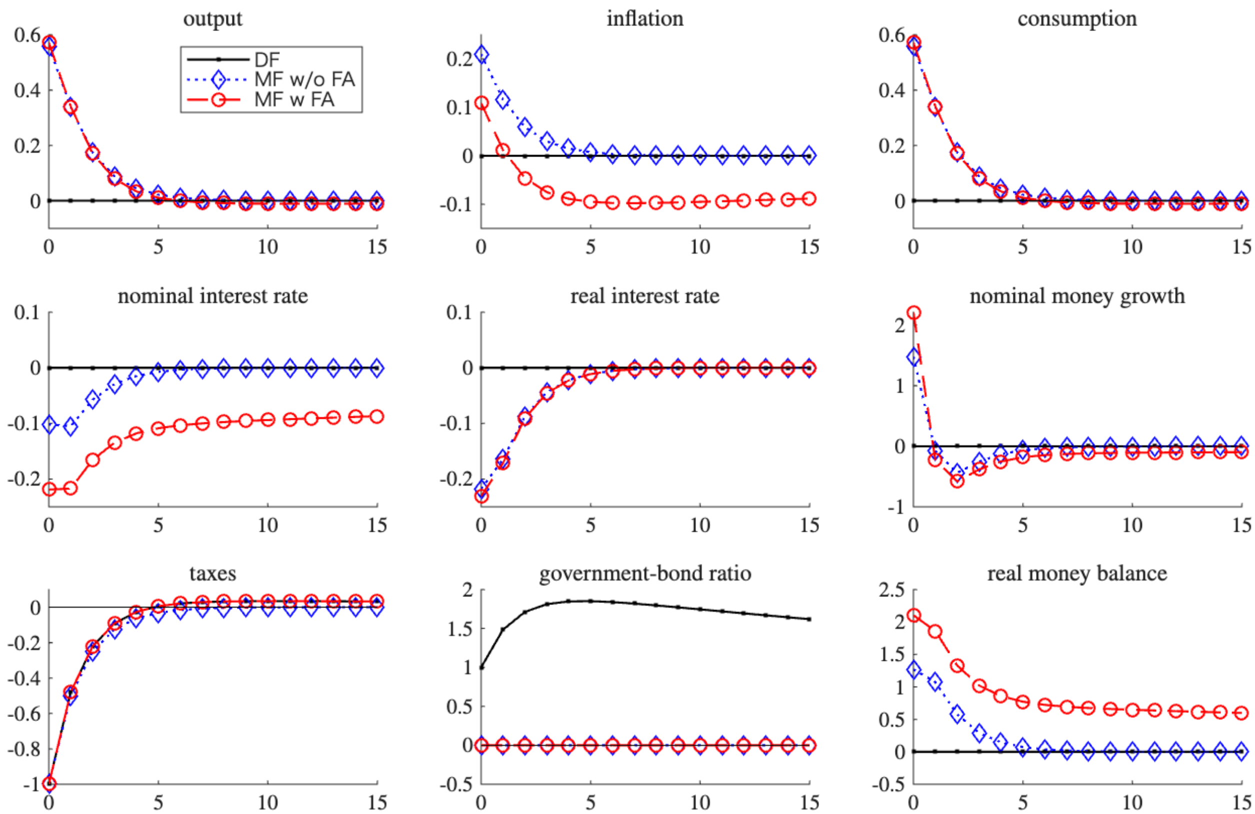


Figure 1: Effects of a Tax Cut in Normal Times

Notes: The figure shows the dynamic effects of a tax-cut intervention in normal times. The black solid line with dots denotes the debt-financing (DF) regime. The blue dotted line with diamonds denotes money financing without fiscal adjustment (MF w/o FA), and the red dashed line with circles denotes money financing with fiscal adjustment (MF w FA). All responses are reported in percent. The economy is initially at the steady state, and the initial size of the intervention is normalized to one percent of steady-state output. Inflation and interest-rate responses are reported at quarterly rates and are not annualized. The horizontal axes measure quarters after the intervention.

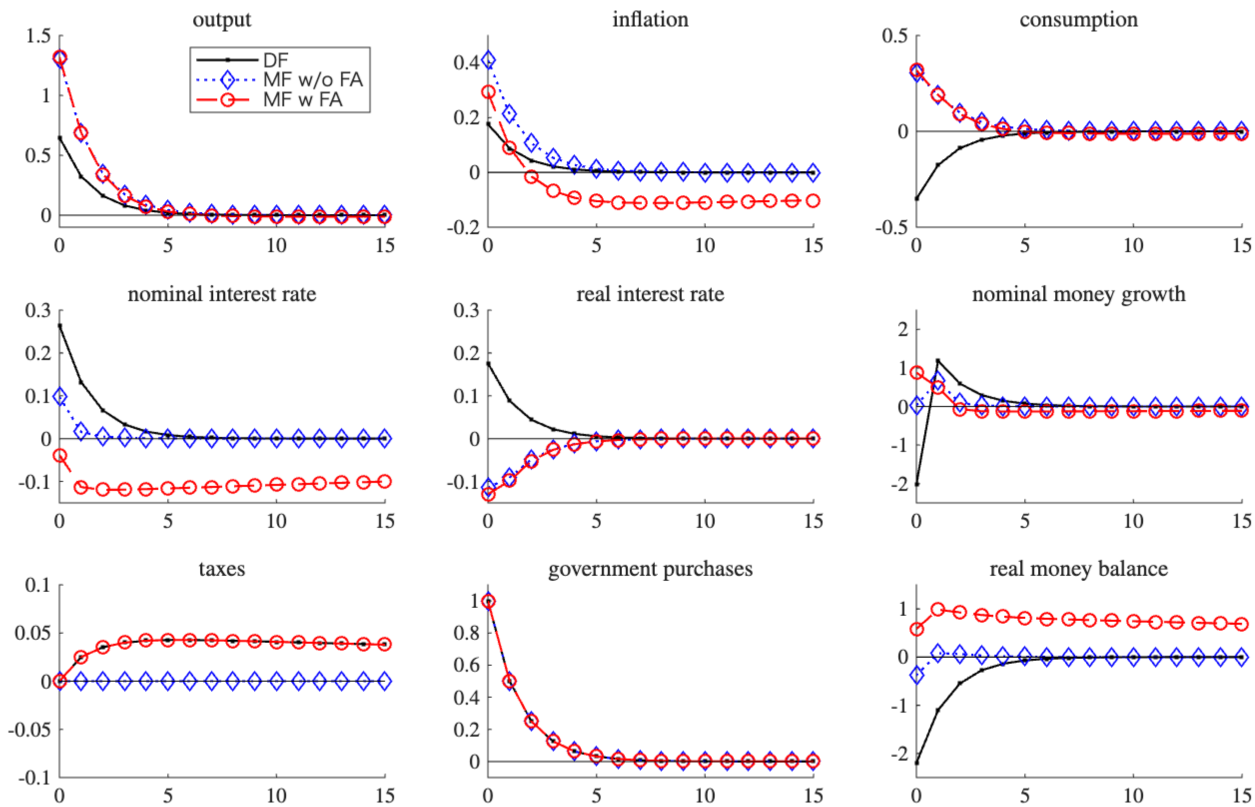


Figure 2: Effects of Government Purchases in Normal Times

Notes: The figure shows the dynamic effects of a government-purchase intervention in normal times. The black solid line with dots denotes the debt-financing (DF) regime. The blue dotted line with diamonds denotes money financing without fiscal adjustment (MF w/o FA), and the red dashed line with circles denotes money financing with fiscal adjustment (MF w FA). All responses are reported in percent. The economy is initially at the steady state, and the initial size of the intervention is normalized to one percent of steady-state output. Inflation and interest-rate responses are reported at quarterly rates and are not annualized. The horizontal axes measure quarters after the intervention.

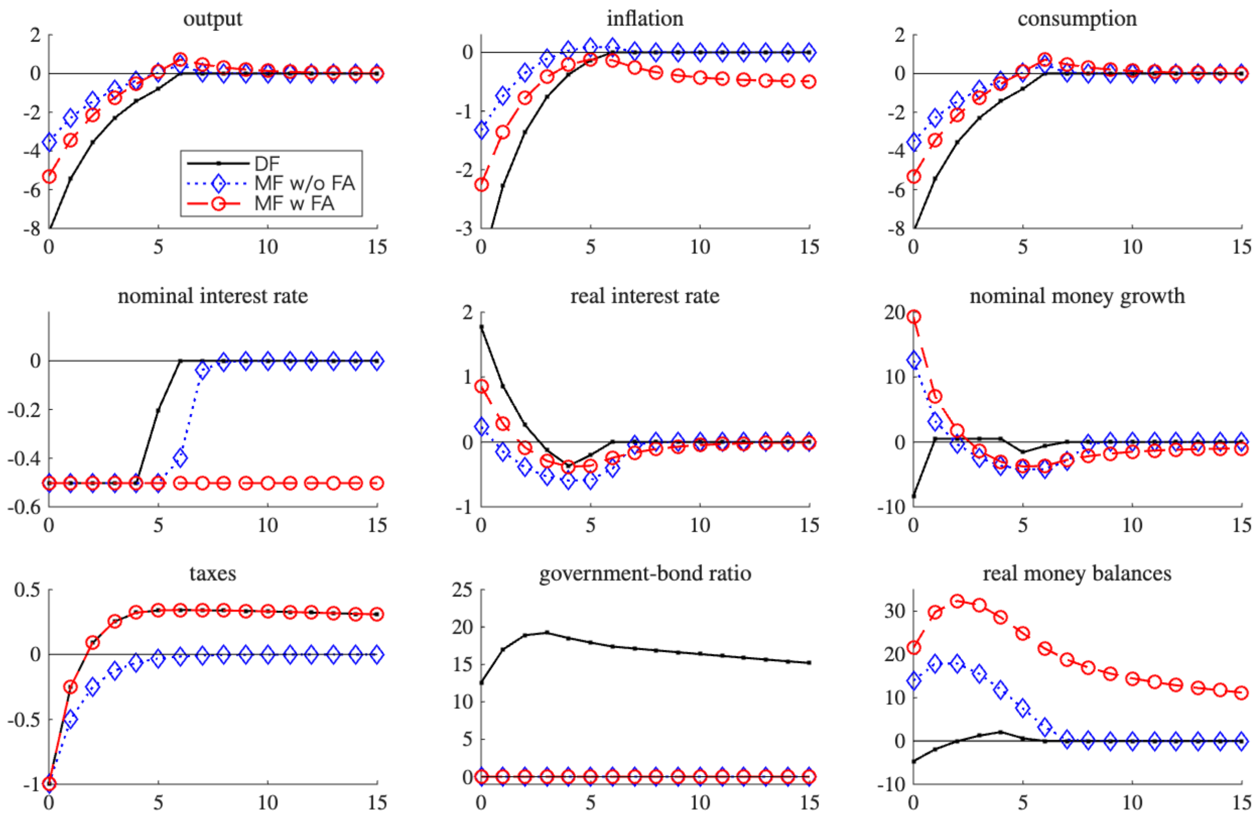


Figure 3: Effects of a Tax Cut in a Liquidity Trap

Notes: The figure shows the dynamic effects of a tax-cut intervention in a liquidity trap. The black solid line with dots denotes the debt-financing (DF) regime. The blue dotted line with diamonds denotes money financing without fiscal adjustment (MF w/o FA), and the red dashed line with circles denotes money financing with fiscal adjustment (MF w FA). All responses are reported in percent. At the time of the tax-cut intervention, the economy is caught in a liquidity trap. The initial size of the tax-cut intervention is normalized to one percent of steady-state output. Inflation and interest-rate responses are reported at quarterly rates and are not annualized. The horizontal axes measure quarters after the intervention.

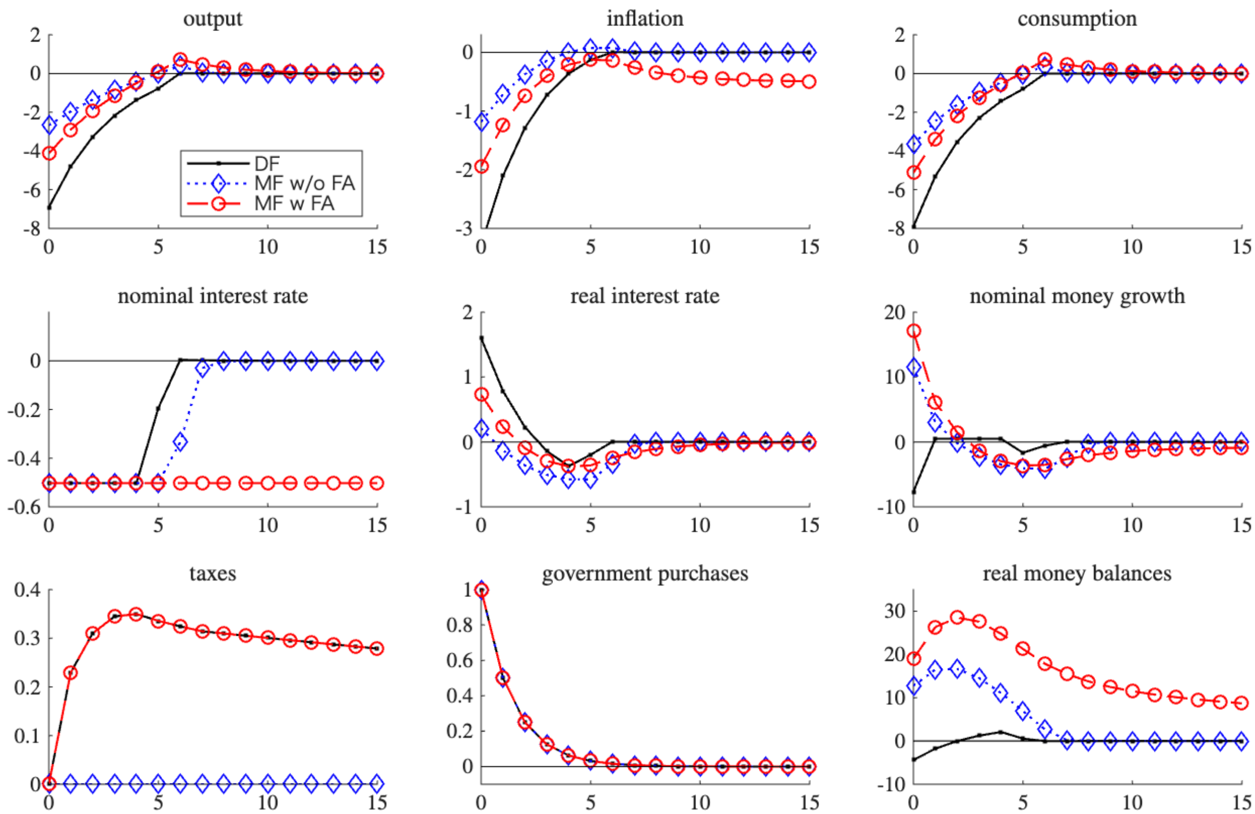


Figure 4: Effects of Government Purchases in a Liquidity Trap

Notes: The figure shows the dynamic effects of a government-purchase intervention in a liquidity trap. The black solid line with dots denotes the debt-financing (DF) regime. The blue dotted line with diamonds denotes money financing without fiscal adjustment (MF w/o FA), and the red dashed line with circles denotes money financing with fiscal adjustment (MF w FA). At the time of the government-purchase intervention, the economy is caught in a liquidity trap. The initial size of the government-purchase intervention is normalized to one percent of steady-state output. The vertical axes report responses in percent. Inflation and interest-rate responses are reported at quarterly rates and are not annualized. The horizontal axes measure quarters after the intervention.

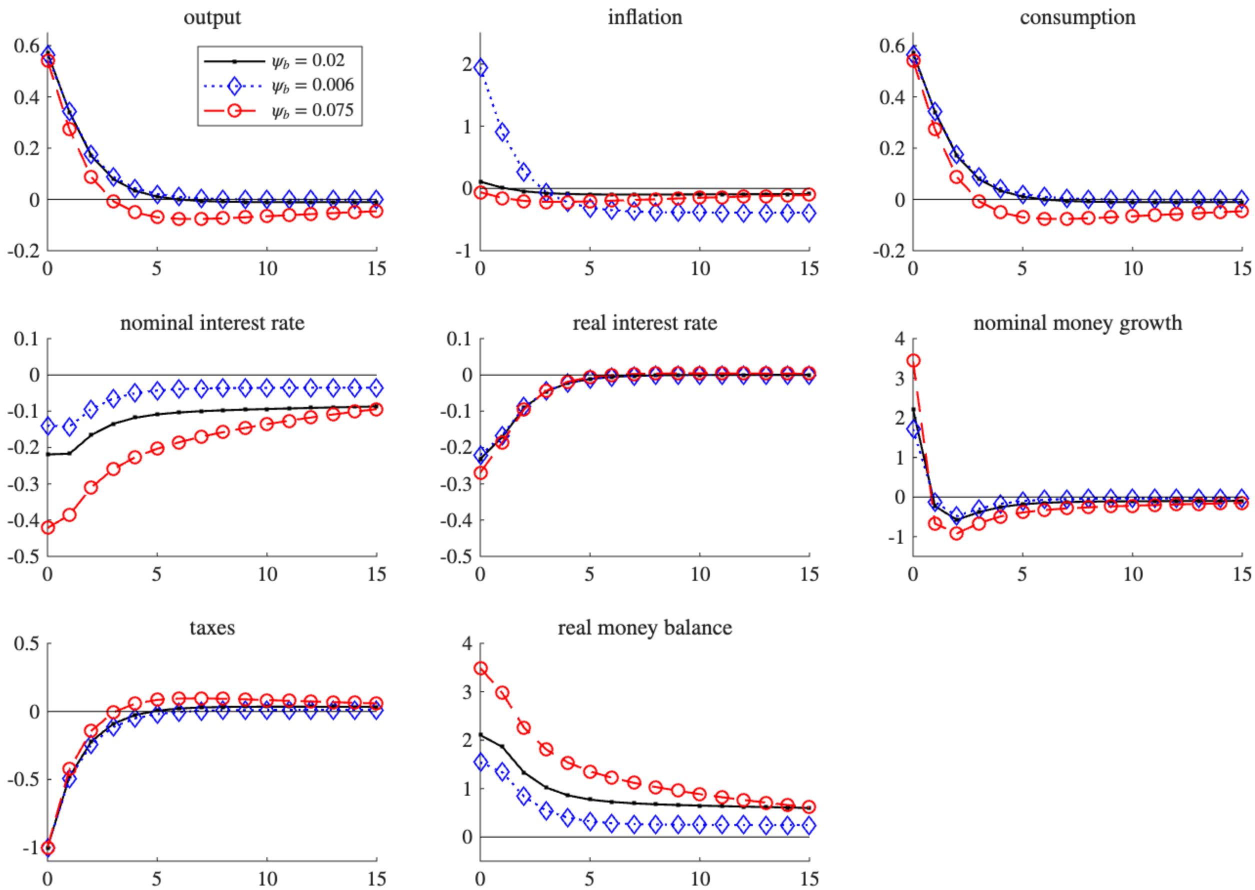


Figure 5: Effects of Fiscal Adjustment Speed: Tax Cut

Notes: The figure shows how the speed of fiscal adjustment affects the responses to a tax-cut intervention in normal times. The blue dotted line with diamonds represents the slow-adjustment case, $\psi_b = 0.006$. The red dashed line with circles represents the fast-adjustment case, $\psi_b = 0.075$. The black solid line with dots represents the benchmark case, $\psi_b = 0.02$. All responses are reported in percent. Inflation and interest-rate responses are reported at quarterly rates and are not annualized. The horizontal axes measure quarters after the intervention.

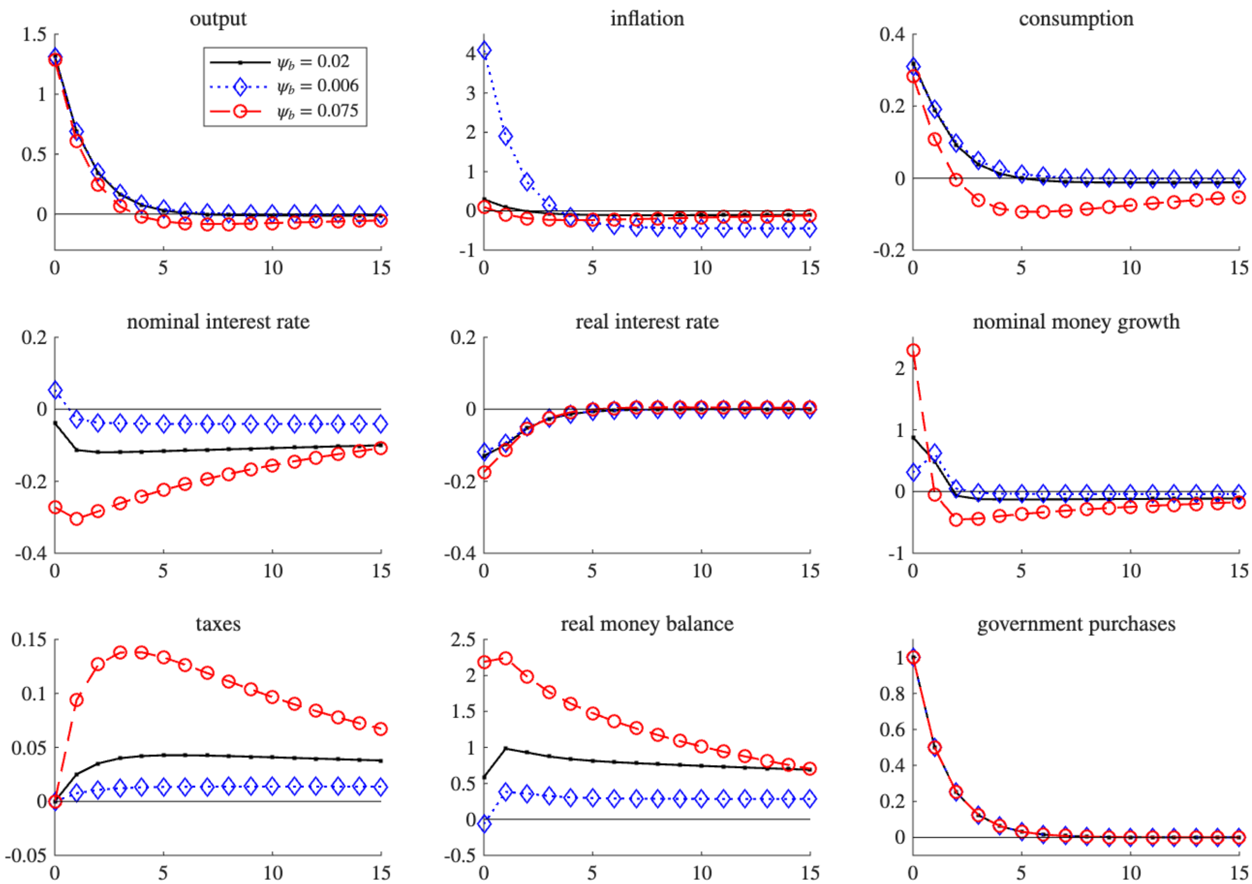
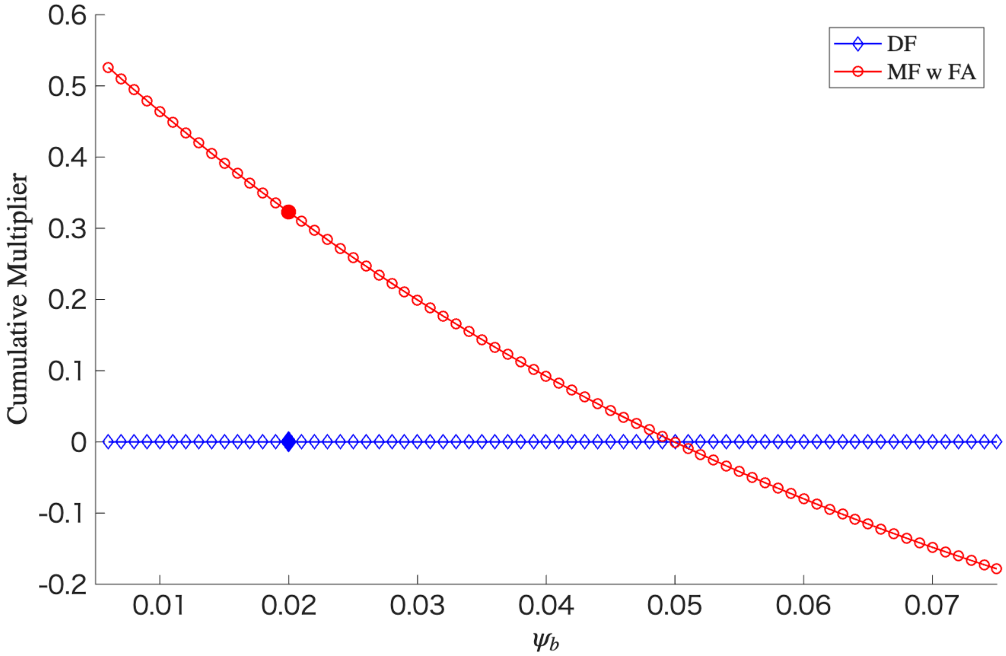
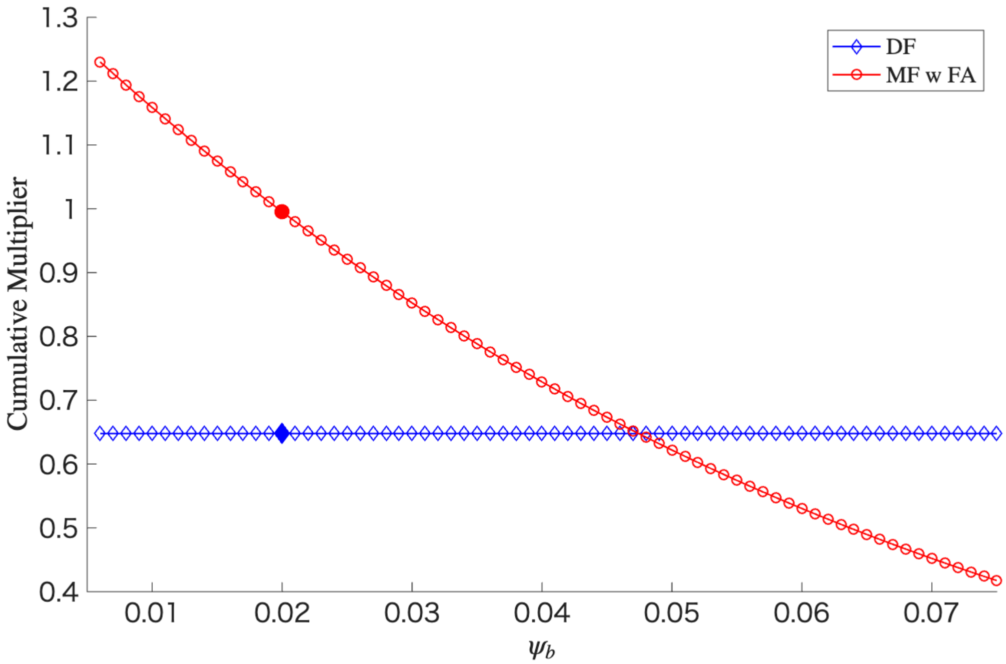


Figure 6: Effects of Fiscal Adjustment Speed: Government Purchases

Notes: The figure shows how the speed of fiscal adjustment affects the responses to a government-purchase intervention in normal times. The blue dotted line with diamonds represents the slow-adjustment case, $\psi_b = 0.006$. The red dashed line with circles represents the fast-adjustment case, $\psi_b = 0.075$. The black solid line with dots represents the benchmark case, $\psi_b = 0.02$. All responses are reported in percent. Inflation and interest-rate responses are reported at quarterly rates and are not annualized. The horizontal axes measure quarters after the intervention.



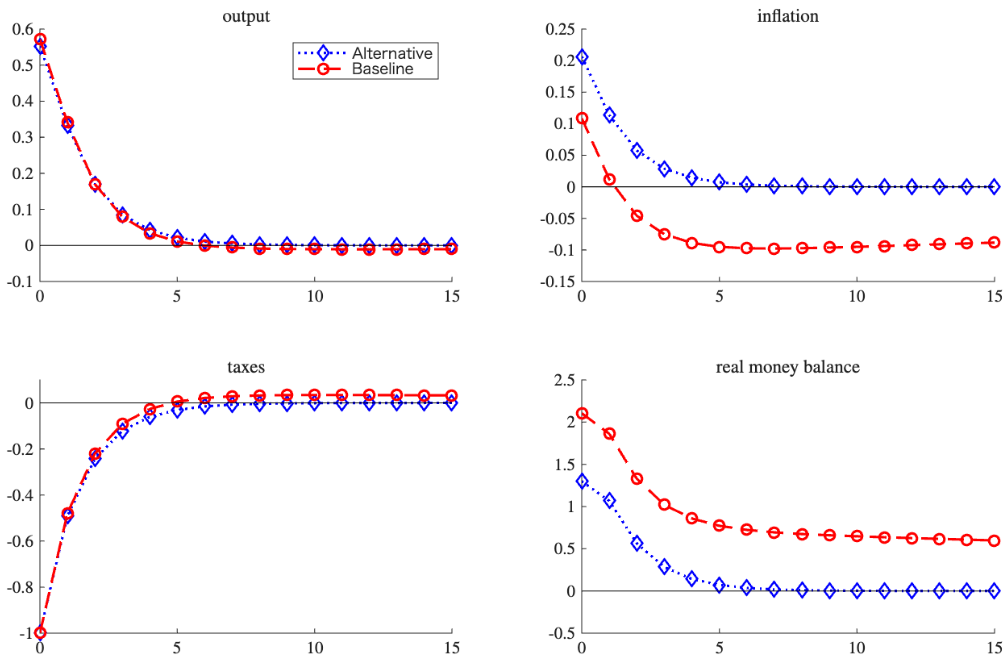
(a) Tax Cut



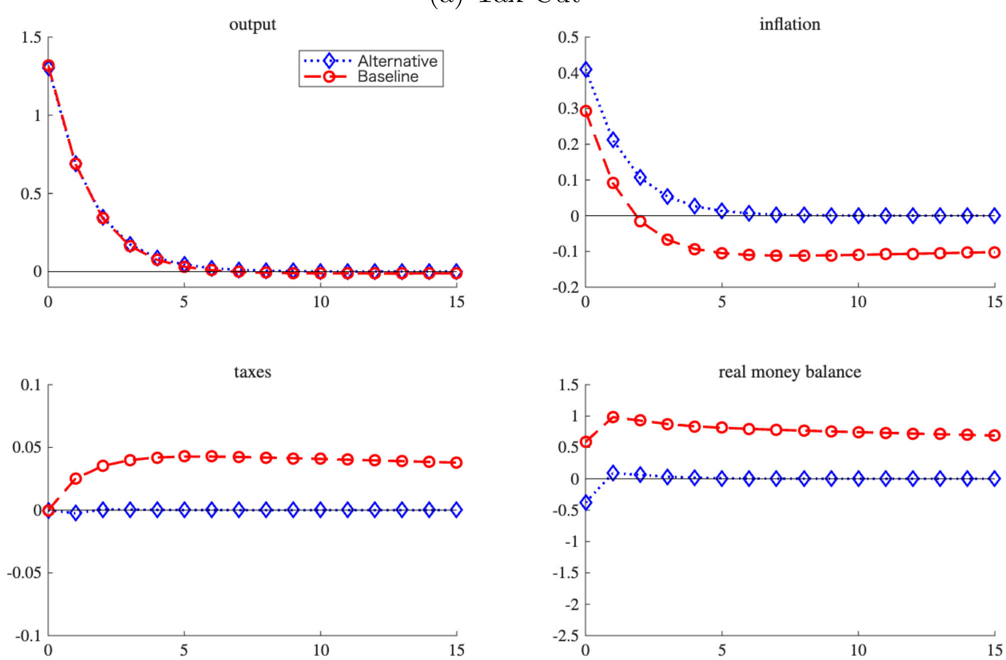
(b) Government Purchase

Figure 7: Cumulative Output Multipliers and the Speed of Fiscal Adjustment

Notes: The figure shows the cumulative multiplier for each value of ψ_b in normal times. Panel (a) reports the tax-cut intervention, and Panel (b) reports the government-purchase intervention. The blue line with diamonds denotes the DF regime, and the red line with circles denotes MF with fiscal adjustment. Filled markers indicate the benchmark value, $\psi_b = 0.02$.



(a) Tax Cut



(b) Government Purchase

Figure 8: The Effects of Money-Financed Policy Under Alternative Tax Rules

Notes: The figure shows the dynamic effects of fiscal interventions in normal times under alternative specifications of fiscal adjustment in the *MF* regime. Panel (a) reports the responses to a tax-cut intervention, and Panel (b) reports the responses to a government-purchase intervention. The blue dotted line with diamonds denotes money financing with fiscal adjustment imposed through the alternative fiscal feedback rule (19). The red dashed line with circles denotes the baseline money-financing regime with fiscal adjustment, in which the counterfactual *DF* tax path is imposed exogenously.

Table 1: Definition of Model Variables

Variable	Definition	Variable	Definition
Y_t	output	C_t	consumption
L_t	real money balances	G_t	government purchases
$\mathcal{B}_t$	real government bonds	T_t	lump-sum taxes
M_t	nominal money	Π_t	gross inflation
i_t	net nominal interest rate	μ_t	log average price markup
$U_{c,t}$	marginal utility of consumption	Z_t	exogenous preference shifter

Linearized variable	Definition	Linearized variable	Definition
$\hat{y}_t$	$\log\left(\frac{Y_t}{Y}\right)$	$\hat{c}_t$	$\log\left(\frac{C_t}{C}\right)$
$\hat{l}_t$	$\log\left(\frac{L_t}{L}\right)$	$\hat{g}_t$	$\frac{G_t-G}{Y}$
$\hat{b}_t$	$\frac{\mathcal{B}_t-\mathcal{B}}{Y}$	$\hat{t}_t$	$\frac{T_t-T}{Y}$
m_t	$\log M_t$	π_t	$\log \Pi_t$
$\hat{i}_t$	$\log\left(\frac{1+i_t}{1+\rho}\right)$	ξ_t	$\log\left(\frac{U_{c,t}}{U_c}\right)$
ζ_t	$-\log\left(\frac{Z_{t+1}}{Z_t}\right)$	$\hat{\mu}_t$	$\mu_t-\mu$

Notes: Variables without time subscripts denote their steady-state values.

Table 2: Fiscal and Monetary Policy Rules by Regime

Regime	Monetary policy	Fiscal rule
DF	$\hat{i}_t = \phi_\pi \pi_t$	$\hat{t}_t = \psi_b \hat{b}_{t-1} + \hat{\tau}_t$
MF without FA	$\Delta m_t = (1/\chi)\left[\hat{g}_t - \hat{t}_t + (1+\rho)b(\hat{i}_{t-1} - \pi_t)\right]$	$\hat{t}_t^{MF,j} = \hat{\tau}_t^j$
MF with FA	Same as MF without FA	$\hat{t}_t^{MF,j} = \hat{t}_t^{DF,j}$

Notes: FA stands for fiscal adjustment.

Table 3: Baseline Calibration

Parameter	Description	Value
σ	Coefficient of relative risk aversion	1
β	Discount factor	0.995
φ	Inverse Frisch elasticity of labor supply	5
α	Index of decreasing returns to labor	0.25
ϵ	Elasticity of substitution across differentiated goods	9
θ	Calvo probability of not resetting prices	0.75
χ	Steady-state inverse income velocity of money	1/3
η	Interest semi-elasticity of money demand	7
υ	Nonseparability between consumption and real money balances	0
ψ_b	Tax response coefficient	0.02
b	Steady-state government-bond-to-output ratio	2.4
δ	Persistence of fiscal intervention	0.5