Money-Financed Fiscal Stimulus:
The Effects of Belief and Implementation Lag

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1 Introduction

Since the formation of modern nation-states in the 19th century, governments have frequently responded to unforeseen fiscal needs — such as those arising from wars or famines — not by increasing taxes, but rather by issuing public debt to finance the necessary expenditures. This reliance on debt-financed government spending has become even more pronounced in the 21st century. In the wake of successive global financial crises and the COVID-19 pandemic, many countries undertook large-scale fiscal stimulus programs aimed at economic recovery and job creation, with the bulk of the associated financing provided through substantial increases in government debt.

In public finance, the sustainability of such sudden and massive fiscal deficits has long been a central issue of debate. More recently, attention has also turned to the effectiveness of such debt-financed fiscal expansions — namely, the size of the associated fiscal multipliers. The aim of this study is to quantitatively assess the extent to which the magnitude of the fiscal multiplier depends on the public's confidence in the government's fiscal financing regime. Specifically, we examine whether the credibility that citizens assign to different financing schemes affects the transmission and effectiveness of fiscal policy.

Unlike monetary policy, fiscal stimulus is often subject to significant implementation lags: there is typically a substantial delay between the announcement of government spending plans and their actual execution. These lags may significantly affect the realized fiscal multiplier. Motivated by these considerations, this study develops a New Keynesian (NK) dynamic stochastic general equilibrium (DSGE) model with a Markov-switching (MS) structure, in which the economy alternates between two distinct fiscal financing regimes: one based on government bond issuance and the other on money creation. We assume that agents assign probabilistic beliefs to each regime, reflecting differing levels of credibility attributed to the government's financing strategy.

Our analysis reveals a novel interaction between regime uncertainty and implementation lags in shaping the fiscal multiplier. The main findings of our study are as follows. First, consistent with prior research based on fixed regimes such as Galí (2020) and Tsuruga and Wake (2019), we find that when the credibility of the money-financed regime is high, the fiscal multiplier is large under short implementation lags but declines as the lag length

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increases. However, this relationship breaks down when regime credibility weakens. In cases where the elasticity of money demand is high, the relationship between implementation lags and the fiscal multiplier may even reverse, depending on the economic environment. Second, in the absence of implementation lags, our results align with conventional findings: a high degree of credibility in the money-financed regime leads to a larger fiscal multiplier. When the effect of money demand is taken into account, this positive impact is further amplified. However, once implementation lags are introduced, these well established results no longer hold. Specifically, the effectiveness of fiscal policy becomes largely independent of the degree of regime credibility. Even when the elasticity of money demand is high, the variation in the fiscal multiplier becomes negligible. These findings highlight the critical importance of jointly considering belief in future regime transitions and implementation lags when evaluating the effectiveness of fiscal policy. The interaction between these two dimensions plays a pivotal role in determining the size and dynamics of the fiscal multiplier.

This study is the first to integrate implementation lags — modeled as news shocks — into a Markov-switching DSGE framework. Our main contribution lies in interpreting the transition probability between two fiscal financing regimes as a measure of regime uncertainty. This novel approach allows us to systematically analyze how the effectiveness of fiscal stimulus, as captured by the fiscal multiplier, is influenced by both implementation lags and the degree of uncertainty surrounding the government's financing strategy. The effectiveness of economic policy critically depends on whether the underlying model admits a unique equilibrium. As pointed out in previous studies such as Farmer, Waggoner, and Zha (2009), DSGE models with regime switching often feature multiple equilibria. Therefore, it is essential to investigate the conditions under which equilibrium is determinate prior to conducting any policy analysis. In this study, we first identify the regions of parameter space that ensure equilibrium uniqueness. Based on this foundation, we then examine how the degree of regime credibility influences the effectiveness of fiscal policy.

Related Literature: This paper is related to several strands of the literature on fiscal policy and macroeconomic modeling. First, our analysis builds on studies comparing money-financed and debt-financed fiscal stimulus, such as Galí (2020) and Tsuruga and Wake (2019), who highlight the differing macroeconomic implications of alternative financing schemes. While the former study demonstrates, within a New Keynesian framework under the zero lower bound (ZLB) constraint, that the fiscal multiplier tends to be larger under a money-financed regime, the latter shows that this effect can be significantly diminished when implementation lags are prolonged — even under a money-financed regime. And Okano and Eguchi (2024) further demonstrates that, by extending the closed-economy New Keynesian model to a small open economy framework, the fiscal multiplier becomes larger compared to the closed-economy case.

Second, our use of a Markov-switching DSGE framework to study fiscal financing regimes is closely related to Mao, Shen, and Yang (2023), who examine money- versus debt-financed fiscal policy under regime uncertainty.

Third, our modeling of policy credibility is also connected to the literature on the fiscal theory of the price level (FTPL), particularly the work of Bianchi, Faccini, and Melosi (2023), who consider the implications of partially unfunded debt policies.

Finally, we build on recent methodological advances in Markov-switching DSGE models, as in Cho and Moreno (forthcoming) and Barthelemy, Cho, and Marx (2024), which provide tools for incorporating regime shifts and belief-driven dynamics in macroeconomic environments.

Road Map: The structure of the paper is as follows. Section 2 presents the model. Section 3 describes the solution method for the DSGE model with regime switching. Section 4 analyzes how the fiscal multiplier is affected by the degree of belief in each regime and the length of the implementation lag, based on the simulation results from the regime-switching DSGE model. Section 5 concludes.

2 The model

Our model is a standard New Keynesian model with money as presented in Galí (2020) and Tsuruga and Wake (2019). The government can finance its spending by issuing money or government bonds. The most important feature is the stochastic regime change between money-financed (MF) and debt-financed (DF) regimes. Agents form their expectations by taking into account the possibility of the regime change. Following Farmer, Waggoner, and Zha (2009) and Cho (2021), we assume that the probability of regime change is exogenously determined because our purpose is to clarify how the degree of agents' beliefs in regime change affects the impacts of fiscal policies.

2.1 Households and firms

A representative household maximizes its lifetime utility given by

$$\sum_{t=0}^{\infty} \beta^t U(C_t, N_t), \tag{1}$$

where the instantaneous utility function is defined as

$$U(C_t, N_t) = \left[\frac{C_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\phi}}{1+\phi}\right] Z_t. \tag{2}$$

Here, C_t, N_t, and Z_t denote consumption, labor supply, and an exogenous preference shifter, respectively. The parameters satisfy $\sigma > 0$, $\phi > 0$, and $0 < \beta < 1$, representing the coefficient of relative risk aversion, the inverse of the Frisch elasticity of labor supply, and the discount factor.

Time is indexed in quarters.

The household faces both a standard budget constraint and a cash-in-advance (CIA) constraint:

$$M_t + B_t = (1 + I_{t-1})B_{t-1} + (M_{t-1} - P_{t-1}C_{t-1}) + W_t N_t + P_t D_t - P_t T_t, \tag{3}$$

$$M_t \geq P_t C_t. \tag{4}$$

In Equation (3), M_t is the household's nominal money holdings and B_t is the nominal stock of one-period government bonds paying the gross nominal interest rate I_{t-1}. P_t is the aggregate price level, and W_t is the nominal wage rate. D_t and T_t represent real firm profits and lump-sum taxes, respectively. The left-hand side of the equation captures the household's total nominal wealth carried into period t, while the right-hand side reflects its sources of income and expenses.

Equation (4) represents the CIA constraint, which requires that all consumption expenditures be made using current-period money holdings. As is standard in infinite-horizon models, a no Ponzi game condition is imposed.

The representative final goods firm operates in a perfectly competitive market and aggregates a continuum of intermediate goods using a CES production function:

$$Y_t = \left(\int_0^1 Y_t(j)^{\frac{\epsilon-1}{\epsilon}} dj\right)^{\frac{\epsilon}{\epsilon-1}}, \tag{5}$$

where $Y_t(j)$ denotes the output of intermediate good $j \in [0,1]$ and $\epsilon > 1$ is the elasticity of substitution across varieties. The associated aggregate price index is given by:

$$P_t = \left(\int_0^1 P_t(j)^{1-\epsilon} dj\right)^{\frac{1}{1-\epsilon}}. \tag{6}$$

Each intermediate goods producer operates under monopolistic competition and uses the production function:

$$Y_t(j) = N_t(j)^{1-\alpha}, \quad \text{where } \alpha \in (0,1]. \tag{7}$$

Price setting follows the Calvo (1983) mechanism. Each period, a fraction $1-\theta$ of firms can re-optimize their price. Let P_t^* denote the optimal reset price, which solves the following maximization problem:

$$\max_{P_t^*} \sum_{k=0}^{\infty} \theta^k Q_{t,t+k} \frac{1}{P_{t+k}} \left(P_t^* Y_{t+k|t} - W_{t+k} Y_{t+k|t}^{\frac{1}{1-\alpha}}\right), \tag{8}$$

subject to the demand function:

$$Y_{t+k|t} = \left(\frac{P_t^*}{P_{t+k}}\right)^{-\epsilon} Y_{t+k}, \tag{9}$$

where $Y_{t+k|t}$ is the demand faced by a firm that last reset its price in period t, and $Q_{t,t+k} \equiv \beta \frac{U_{C,t+k}}{U_{C,t}}$ is the stochastic discount factor.

The first-order condition for the optimal price is:

$$\sum_{k=0}^{\infty} \theta^k Q_{t,t+k} \frac{1}{P_{t+k}} Y_{t+k|t} \left(P_t^* - \frac{\epsilon}{\epsilon-1} W_{t+k} Y_{t+k|t}^{\frac{\alpha}{1-\alpha}}\right) = 0. \tag{10}$$

Log-linearizing this condition around a zero steady-state inflation rate yields the standard New Keynesian Phillips Curve, which links inflation dynamics to marginal costs and expected future inflation.

2.2 Government

Our paper examines the effects of a money-financed fiscal stimulus with an implementation lag of h periods. Following Galí (2020) and Tsuruga and Wake (2019), let g_t denote government purchases in excess of their steady-state level, expressed as a fraction of steady-state output, i.e.,

$$g_t \equiv \frac{G_t - G}{Y},$$

where G_t is government purchases at time t, and G and Y denote the steady-state values of government purchases and output, respectively.

At $t = 0$, the government announces a fiscal stimulus with implementation lag $h \geq 0$:

$$g_t = \begin{cases} 0 & \text{for } t < h, \\ \delta^{t-h} & \text{for } t \geq h, \end{cases} \tag{11}$$

where $\delta \in [0,1)$ governs the persistence of the fiscal shock, such that $g_{t+1} = \delta g_t$ for $t \geq h$. The magnitude of the initial fiscal stimulus is normalized to 1% of steady-state output.

When $h = 0$, the stimulus is implemented immediately. When $h > 0$, there is a delay, and households and firms adjust their behavior in the anticipation period $0 \leq t < h$ before G_t actually rises.

To study money-financed fiscal policy, we treat the government as a consolidated entity that includes both the fiscal authority and the central bank. Let M_t^s denote the nominal money supply. The consolidated nominal government budget constraint is:

$$P_t G_t + (1 + I_{t-1})B_{t-1} = P_t T_t + B_t + \Delta M_t^s, \tag{12}$$

where $\Delta M_t^s \equiv M_t^s - M_{t-1}^s$ represents newly issued money. The left-hand side of (12) captures government spending and debt repayment, while the right-hand side reflects tax revenue, new bond issuance, and seigniorage.

Dividing both sides by P_t, the real government budget constraint becomes:

$$G_t + R_{t-1}B_{t-1} = T_t + B_t + \frac{\Delta M_t^s}{P_t}, \tag{13}$$

where $R_t = (1 + I_t)\frac{P_t}{P_{t+1}}$ is the gross real interest rate, and B_t is the real value of bond holdings.

In steady state, we assume that $G_t = G$, $T_t = T$, and $\Delta M_t^s = 0$, implying:

$$G + RB = T + B.$$

Let τ_t and b_t denote deviations of taxes and bonds from their steady-state levels, expressed as fractions of steady-state output:

$$\tau_t = \frac{T_t - T}{Y}, \quad b_t = \frac{B_t - B}{Y}.$$

Taking deviations from the steady state and expressing them as shares of Y, the linearized consolidated budget constraint becomes:

$$b_t = Rb_{t-1} + Rb(i_{t-1} - \pi_t) + g_t - \tau_t - \nu^{-1}\Delta m_t^s, \tag{14}$$

where $b = B/Y$, $i_t = \ln\left(\frac{1+I_t}{R}\right)$, $\pi_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$, and $\Delta m_t^s = \ln\left(\frac{M_t^s}{M_{t-1}^s}\right)$ denotes the growth rate of the nominal money supply.

2.3 Linearized equations

The optimal dynamic behavior of each agent described in Sections 2.1 and 2.2 can be summarized in the form of a linearized system of equations. Specifically, the household's intertemporal consumption and labor supply decisions, the firm's pricing behavior under Calvo stickiness, and the government's budget constraint jointly yield a system of log-linear equations that characterize the equilibrium dynamics of the model.

$$c_t = c_{t+1} - \sigma^{-1}\left(i_t - \pi_{t+1} - \rho_t\right) \tag{15}$$

$$l_t = l_{t-1} + \Delta m_t^s - \pi_t \tag{16}$$

$$r_t = i_t - \pi_{t+1} \tag{17}$$

$$\pi_t = \beta\pi_{t+1} - \lambda\mu_t \tag{18}$$

$$\mu_t = -\sigma c_t - \frac{\varphi + \alpha}{1 - \alpha} y_t \tag{19}$$

$$y_t = (1 - \gamma)c_t + g_t \tag{20}$$

$$b_t = (1 + \rho)b_{t-1} + b(1 + \rho)\left(i_{t-1} + \pi_t\right) + g_t - \tau_t - V^{-1}\Delta m_t^s \tag{21}$$

$$\tau_t = \psi_b b_{t-1} + \tau_t^* \tag{22}$$

2.4 Regime uncertainty

2.4.1 Money-financed regime

In the money-financed (MF) regime, the money supply issued by the central bank is endogenously determined:

$$\Delta m_t^s = V g_t. \tag{23}$$

The complementary slackness condition applies to the money market equilibrium condition:

$$l_t \geq -\eta i_t + c_t, \tag{24}$$

where the equality holds when $I_t > 0$ $(I_t \equiv i_t + \ln(1 + R))$. In the system of the equations, the endogenous variables are y_t, c_t, l_t, r_t, i_t, π_t, μ_t, Δm_t^s, b_t, and τ_t. Among these variables, the subset of equations (15)–(20), (23), and (24) that consists of eight endogenous variables (y_t, c_t, l_t, r_t, i_t, π_t, μ_t, Δm_t^s) is fully independent of the remaining endogenous variables b_t and τ_t. If a large adverse demand shock in ρ_t hits the economy, it generates the liquidity trap and $I_t = 0$ (or $i_t = -\ln(1 + R)$). Given this state of the economy, the government announces the money-financed fiscal stimulus and changes the policy. When the government changes its policy and determines the money supply by (23), the liquidity trap arises if the money demand falls short of the money supply in the economy. In particular, (24) holds with inequality.

2.4.2 Debt-financed regime

In the debt-financed (DF) regime, assume that the central bank sets the nominal interest rate according to the Taylor rule. Without the ZLB, the nominal interest rate is determined by $i_t = \phi_\pi \pi_t$.

That is, the nominal interest rate is given by

$$i_t = \rho_t + \phi_\pi \pi_t, \tag{25}$$

where $\phi_\pi > 1$. Here, ρ_t arises because the central bank accommodates the demand shock (coming from the preferences) under the optimal discretionary policy. Note that (23) no longer holds since the interest rate is determined by (25). The system of equations slightly changes with this replacement so that six endogenous variables (y_t, c_t, r_t, i_t, π_t, μ_t) out of ten are independently determined by the following equations:

$$
\begin{aligned}
c_t &= c_{t+1} - \sigma^{-1}\left(i_t - \pi_{t+1} - \rho_t\right) \\
r_t &= i_t - \pi_{t+1} \\
\pi_t &= \beta\pi_{t+1} - \lambda\mu_t \\
\mu_t &= -\sigma c_t - \frac{\varphi + \alpha}{1 - \alpha} y_t \\
y_t &= (1 - \gamma)c_t + g_t \\
i_t &= \rho_t + \phi_\pi \pi_t
\end{aligned}
$$

Note that the system of the equations is independent of l_t, Δm_t^s, b_t, τ_t. These remaining endogenous variables are residually determined. In particular, l_t, and Δm_t^s are endogenously determined by the following two equations:

$$
\begin{aligned}
l_t &= -\eta i_t + c_t \\
l_t &= l_{t-1} + \Delta m_t^s - \pi_t
\end{aligned}
$$

For the rest of variables b_t and τ_t, they are determined by (21) and (22). However, there is the difference between g_t and $V^{-1}\Delta m_t{}^s$ so that the dynamics of b_t are affected by the real interest rate and the dynamics of g_t and $V^{-1}\Delta m_t^s$.

3 Methods

3.1 The Markov-switching rational expectations

We assume that households have beliefs regarding the policy regime, and that these beliefs can be captured by a two-state Markov process. As shown in Cho (2021) and Cho and Moreno (forthcoming), our model can be expressed as a canonical form of the Markov-switching rational expectations model:

$$x_t = A(s_t)E_t x_{t+1} + B(s_t)\, x_{t-1} + C(s_t) z_t, \tag{26}$$

where x_t is the vector of endogenous variables and z_t is the vector of exogenous variables at time t. The matrices of coefficients $A(s_t)$, $B(s_t)$, and $C(s_t)$ depend on the hidden state variable s_t, which captures the policy regime that is in place at time t. The government applies the MF regime when $s_t = 0$ and the DF regime when $s_t = 1$. The transition probability of switching from state s_{t-1} to s_t is given by $P_{ij} = P(s_t = j \mid s_{t-1} = i)$ where $i, j = 0{,}1$. We seek the solution of the Markov-switching rational expectations model using the algorithm presented in Cho (2021); Cho and Moreno (forthcoming).

3.2 The minimum of modulus (MOD) solution

Cho (2021) adopts *mean-square stability* as the relevant stability concept, following Farmer, Waggoner, and Zha (2009), due to its tractability and suitability for econometric inference. He provides a complete classification result for a general class of Markov-switching rational expectations (MSRE) models, encompassing linearized systems of dynamic stochastic general equilibrium (DSGE) models with regime-switching structural parameters. Specifically, he derives necessary and sufficient conditions for three equilibrium outcomes: (i) a unique stable solution (determinacy), (ii) multiple stable solutions (indeterminacy), and (iii) no stable solution. Remarkably, this classification — partitioning the model space into three mutually exclusive and exhaustive subsets — is determined solely by a particular rational expectations solution, namely, one of the minimum state variable (MSV) solutions.

This is a significant result, given the inherent nonlinearity of regime-switching models and the intractability of the full solution space.

While Mao, Shen, and Yang (2023) examine the effects of government spending under uncertain policy regimes using a regime-switching DSGE model, they rely on the existence of a minimum-state-variable (MSV) solution and do not examine the uniqueness or stability of the equilibrium. In contrast, we characterize the determinacy properties of the model by adopting Cho's approach. This approach enables us to identify the set of Taylor rule parameters consistent with unique and stable equilibria, and to evaluate how these constraints influence the effectiveness of fiscal stimulus.

The methodological contribution of Cho (2021) lies in the characterization and computation of stable solutions in Markov-switching rational expectations (MSRE) models. Building on McCallum (2007), Cho introduces the *minimum of modulus* (MOD) solution, which plays a role analogous to that of generalized eigenvalues in linear rational expectations (LRE) models. This approach provides necessary and sufficient conditions for the non-existence of stable sunspot equilibria and the uniqueness of a stable minimum state variable (MSV) solution. These conditions fully classify MSRE models into determinacy, indeterminacy, and no-solution regions.

Cho's analysis yields several key insights. First, the boundaries of determinacy and indeterminacy in MSRE models do not align with their LRE counterparts due to the nonlinearity introduced by regime switching. Second, the existence of a unique stable MSV solution does not guarantee determinacy in models with lagged endogenous variables; the non-existence of stable sunspots must also be verified. Third, the long-run Taylor principle proposed by Davig and Leeper (2007), while important, is shown to be only necessary — not sufficient — for mean-square determinacy.

To compute the MOD solution, Cho (2021) generalizes the forward solution method introduced in Cho (2016) to the regime-switching context. This method constructs a sequence of matrices recursively:

$$\begin{aligned} \Phi^{(1)}(s_t) &= B(s_t), \\ \Phi^{(k)}(s_t) &= \left[I_n - \mathbb{E}_t\left(A(s_t, s_{t+1})\Phi^{(k-1)}(s_{t+1})\right)\right]^{-1} B(s_t), \quad \text{for } k \geq 2. \end{aligned} \tag{27}$$

If this sequence converges for every s_t, then $\Phi^*(s_t) \equiv \lim_{k\to\infty} \Phi^{(k)}(s_t)$ satisfies the model's equilibrium restriction, and the forward solution $x_t = \Phi^*(s_t)x_{t-1}$ constitutes a real-valued MSV solution. Among all such solutions, it is the only one that satisfies the transversality condition.

This approach offers two key advantages. First, the existence condition for the forward solution is closely related to that of the MOD solution, and numerical experiments indicate their equivalence in all determinacy-admissible cases — although no formal proof exists. Second, the method is computationally efficient: it selects a unique MSV solution regardless of the model's dimensionality or the number of regimes. For example, even in a 10-dimensional LRE model, classification and MOD computation via the forward method or the gensys algorithm takes approximately 10^{-3} seconds, while a two-regime MSRE model requires only 10^{-3} to 10^{-2} seconds on a standard personal computer.

4 Numerical Results

4.1 Exploring the Determinacy Region of Equilibrium

In this section, we conduct a simulation of fiscal multipliers using a DSGE model with regime switching, where the economy is currently in a money-financed regime, but agents assign a positive probability to a future transition

Table 1: calibration of Parameters

regime	parameters	explanations	values
money-financed regime	η	interest semi-elasticity of money demand	0
debt-financed regime	ϕ_π	Taylor coefficient	3.5
regime-invariant	β	discount factor	0.995
	σ	degree of relative risk aversion	1.0
	ψ	inverse of Frish elasticity	5
	α	labor share of production function	0.25
	ε	elasticity of substitution	9
	θ	Calvo price	0.75
	γ	steady state of ratio of G to Y	0.2
	ρ_b	persistence of bond	0.005
	ψ_b	tax rule	0.02
	b_{ss}	steady state of bond	2.4
	$\tau *$	tax	-1
	ρ_g	persistence of government purchase	0.5
	ρ_τ	persistence of tax	0.5
	ρ_ρ	persistence of	0.5

Note: The calibration of parameter values follows Galí (2020) and Tsuruga and Wake (2019).

to a debt-financed regime. The parameter values are calibrated based on Galí (2020) and Tsuruga and Wake (2019), and listed in Table 1. Based on these settings, Figure 1 illustrates whether the model yields a determinate equilibrium or falls into indeterminacy when certain key parameters are varied. In the simulation presented in this figure, we set the implementation lag to one period ($h = 1$).

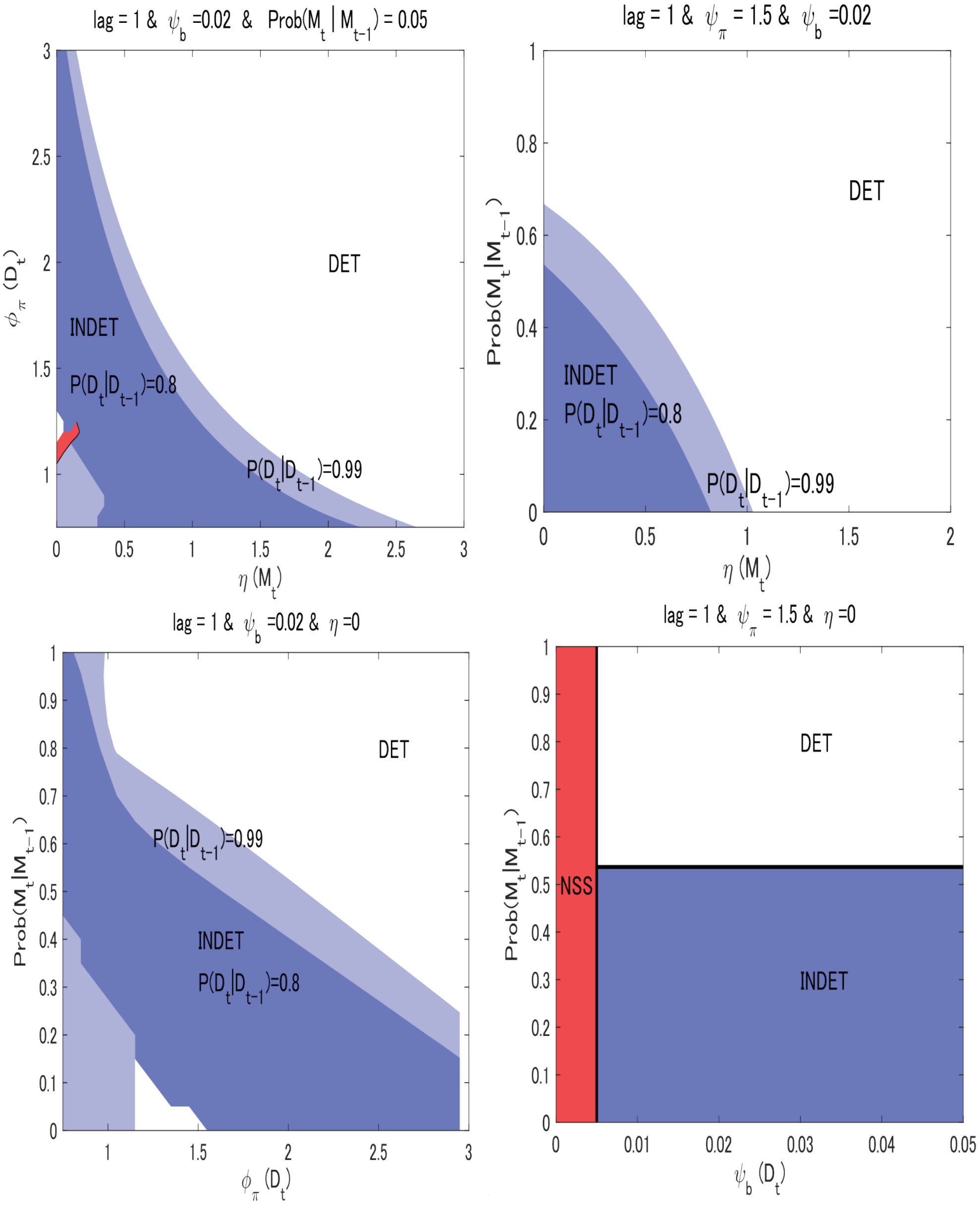
The top-left panel of Figure 1 plots the determinacy properties of the model with respect to two key parameters: the vertical axis represents the Taylor rule coefficient in the debt-financed regime: $\phi_\pi(S_t = D)$, while the horizontal axis corresponds to the elasticity of money demand in the money-financed regime: $\eta(S_t = M)$. The white area indicates the region in which the equilibrium is determinate and unique, whereas the blue area represents indeterminacy, where multiple equilibria may arise.

As shown in the figure, the region of indeterminacy expands when agents strongly believe that the debt-financed regime will persist, with the probability of staying in the debt-financed regime, $Prob(S_t = D|S_{t-1} = D)$, ranging from 80 % to 99 %. In other words, as the perceived likelihood of transitioning from a debt-financed regime to a money-financed regime increases, the area of determinacy becomes broader.

Furthermore, in this particular simulation, the probability that the money-financed regime persists — i.e., $Prob(S_t = M|S_{t-1} = M)$ — is set at a very low value of 5 %. If this persistence probability were to increase, the determinate region would expand accordingly. In fact, if the persistence of the money-financed regime were as high as around 80 %, the indeterminate region would become negligible.

Turning to the top-right panel of Figure 1, the horizontal axis again represents the elasticity of money demand: η $(S_t = M)$, while the vertical axis now indicates the persistence probability of the money-financed regime: $Prob(S_t = M|S_{t-1} = M)$. As previously discussed, a higher persistence probability tends to ensure a unique and determinate

Figure 1: Regions of Determinace and Indetermiance (h=1)



equilibrium. In contrast, when this probability is low, or when money demand is weak, the model is more likely to fall into indeterminacy.

We now turn to the bottom-right panel of Figure 1. In this case, the vertical axis again represents the persistence probability of the money-financed regime: $Prob(S_t = M|S_{t-1} = M)$, while the horizontal axis corresponds to the Taylor rule coefficient in the debt-financed regime: $\phi_\pi(S_t = D)$. The figure reveals that — even when the current regime is money-financed — the magnitude of the Taylor rule coefficient in the debt-financed regime influences the determinacy of equilibrium. The region of determinacy becomes broader as the persistence probability of the money-financed regime increases or, alternatively, as the persistence of the debt-financed regime decreases.

Lastly, in the fourth panel (bottom-left), the vertical axis remains the same — representing the persistence of the money-financed regime — while the horizontal axis now denotes the fiscal rule coefficient (denoted by ψ_b) in the debt-financed regime. Unlike the Taylor rule coefficient: $\phi_\pi(S_t = D)$, the value of ψ_b has no effect on the determinacy of equilibrium. It is also worth noting that the red-shaded region in the graph indicates parameter combinations for which no equilibrium exists.

Finally, it is worth noting that although this figure illustrates the case with an implementation lag of $h = 1$, extending the value of h did not alter the region in which a unique and determinate equilibrium exists.

4.2 The Effect of Implementation Lags on the Fiscal Multiplier

In Figure 1, we examined the determinacy of the model's equilibrium. Without a unique equilibrium, the shape of the impulse response functions shown in the subsequent analysis would not be well-defined, and thus, the numerical simulations would lack interpretive value. Demonstrating the existence of a unique equilibrium is therefore a crucial prerequisite for meaningful dynamic analysis. All simulation results presented below are based on parameter configurations that ensure equilibrium determinacy.

Figure 2 presents the dynamic responses of output under different belief structures and implementation lags. Panel (a) shows the case where money demand is set to zero — effectively imposing a cash-in-advance constraint — and the persistence probability of the money-financed regime is high, at 95 %. In contrast, panel (b) illustrates the case where this belief is weak, with the persistence probability set at just 5 %.

Both panels display results for five alternative lengths of implementation lags, ranging from 1 to 12 periods. As seen in panel (a), under strong belief in the continuation of the money-financed regime, the fiscal multiplier declines as the implementation lag increases. This result is consistent with the findings of Tsuruga and Wake (2019), who examined a model without regime switching

(i.e., without belief heterogeneity).

By contrast, in panel (b), where the belief in regime persistence is weak, the effect on output becomes more nuanced. When confidence in the money-financed regime is low, agents anticipate a likely transition to a debt-financed regime, which leads to large swings in real interest rates and, consequently, in consumption. These results demonstrate that the relationship between the fiscal multiplier and implementation lags is not monotonic, but is instead mediated by the degree of regime credibility.

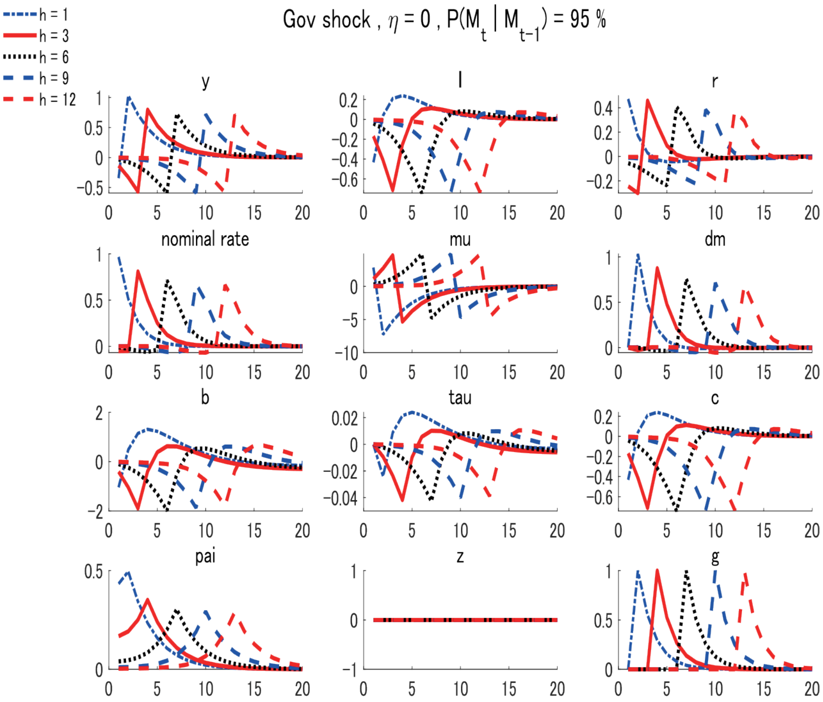
Next, we turn to Figure 3, which presents simulation results under a more general case where the elasticity of money demand is set to $\eta = 10$. The structure of the figure follows that of Figure 2. Compared to Figure 2, the fiscal effects are more clearly discernible in this setting.

As shown in panel (a), which corresponds to the case of strong belief in the persistence of the money-financed regime, the basic pattern remains consistent with Figure 2: the fiscal effect on output diminishes as the implementation lag increases. However, this negative effect becomes less pronounced as the lag lengthens further, indicating a tapering of the marginal impact of additional delay.

Panel (b) corresponds to the case with weak belief, where the persistence probability of the money-financed regime is low. While the results in Figure 2 were less conclusive in this case, the results in Figure 3 offer clearer dynamics. The responses of real interest rates and other macroeconomic variables are more orderly and

Figure 2: IRF depending on Implement Lag: $\eta = 0$

(a) Strong Belief in the Money-Finance Regime for the next period



(b) Weak Belief in the Money-Finance Regime for the next period

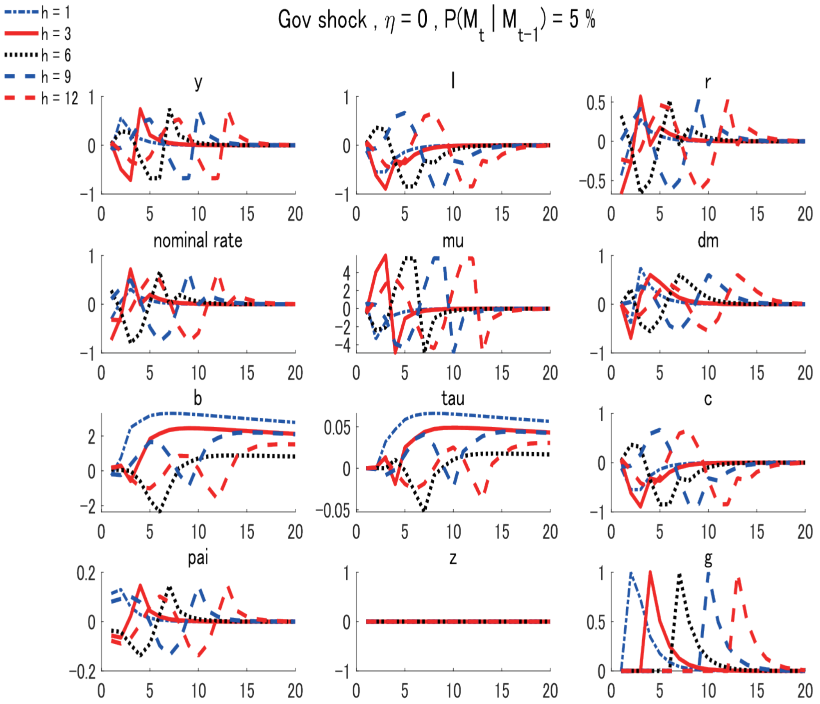
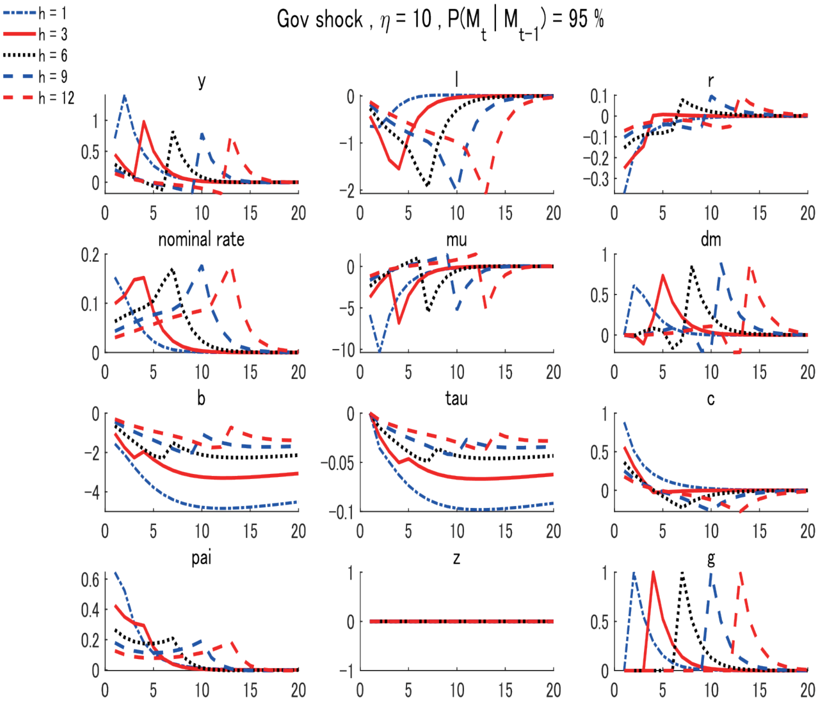
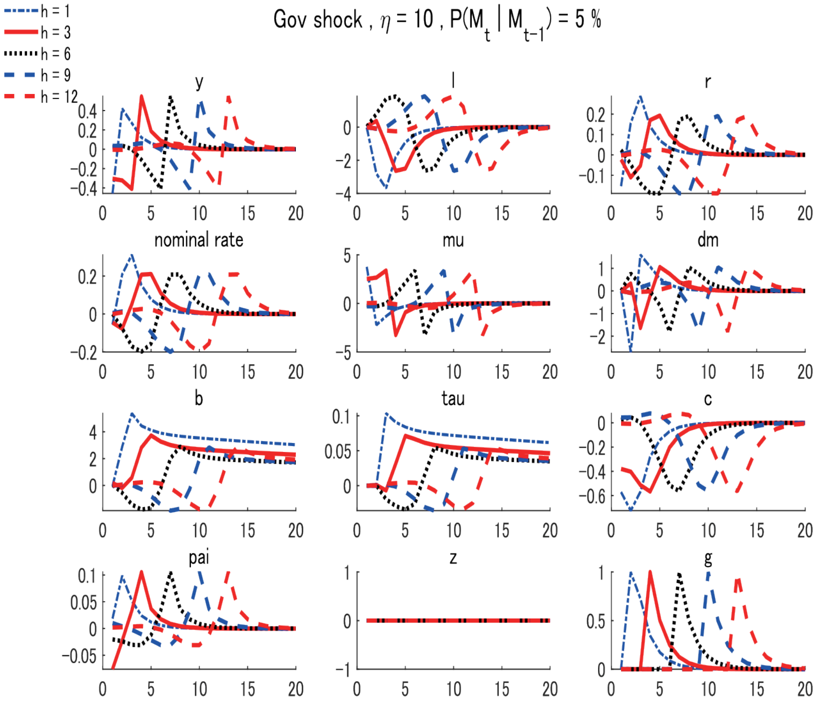


Figure 3: IRF depending on Implement Lag: $\eta=0$

(a) Strong Belief in the Money-Finance Regime for the next period



(b) Weak Belief in the Money-Finance Regime for the next period



interpretable, allowing us to more easily identify the mechanisms that weaken the fiscal multiplier. In particular, when regime credibility is low, the anticipated shift to a debt-financed regime raises real interest rates, which in turn suppresses consumption, thereby attenuating the impact of fiscal stimulus on output.

4.3 The Effect of Belief Strength on the Fiscal Multiplier

In this section, we investigate how the degree of belief in the persistence of the money-financed regime — represented by its associated transition probability — affects the fiscal multiplier. Figure 4 presents simulation results under two different assumptions regarding the elasticity of money demand, with the implementation lag fixed at one period in all cases. Panel (a) shows the case with zero money demand elasticity (i.e., a cash-in-advance constraint), while panel (b) considers the case where the elasticity is set to one.

Each panel displays impulse responses for varying degrees of regime credibility. The blue line represents the case where the probability of staying in the money-financed regime is 0 %, while the red line corresponds to full confidence (100 %). The green lines in between show intermediate cases in which the transition probability increases by 5

In panel (a), under the CIA assumption, the top-left graph shows output responses. Comparing the red and blue lines clearly indicates that a stronger belief in the persistence of the moneyfinanced regime leads to a higher fiscal multiplier. As shown in the real interest rate and consumption graphs, greater credibility reduces real interest rates and stimulates consumption, thereby amplifying the output response.

In panel (b), which corresponds to a more general setting with a money demand elasticity of 10, this pattern becomes even more pronounced. Strengthening belief in the persistence of the money-financed regime leads to a decline in money demand, which in turn induces a sharper drop in real interest rates and a stronger increase in consumption. As a result, the fiscal multiplier rises further under higher regime credibility.

Finally, we turn to the central analysis of this paper: the case in which the implementation lag is long. Figure 5 has the same structure as Figure 4, but the implementation lag is set to $h = 6$. Panel (a) presents the case with zero money demand elasticity. Comparing the blue line (which represents weak belief in the money-financed regime, with a transition probability of 0 %) and the red line (which represents full belief, with a transition probability of 100 %), we observe that the output response is nearly identical across both cases.

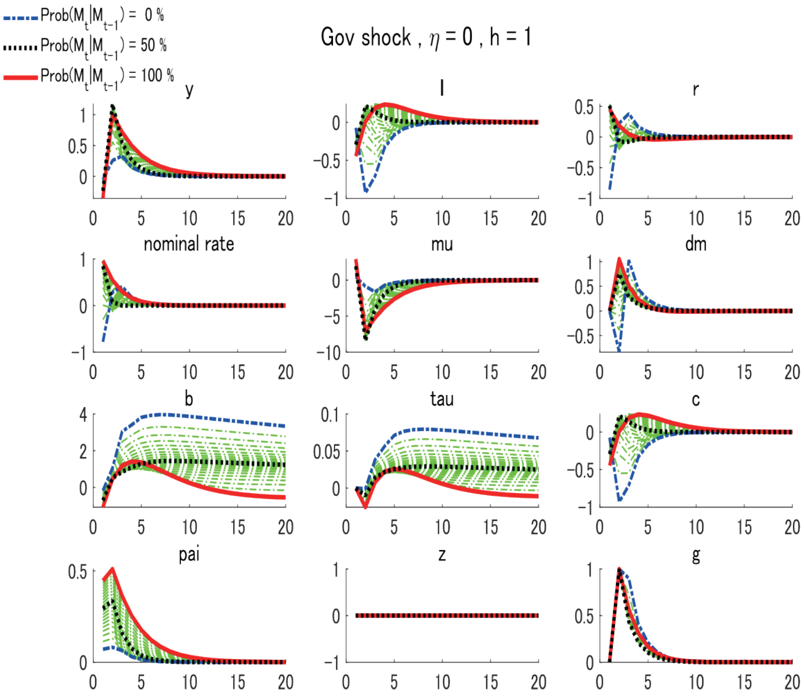
Interestingly, while real interest rates and consumption differ significantly across belief levels prior to the implementation of fiscal policy, they converge at the time of policy execution (i.e., six periods ahead), resulting in an identical output response. In both belief scenarios, real interest rates and consumption are aligned at the implementation period, which explains why income levels also converge, despite differing pre-implementation dynamics.

This result suggests that when the implementation lag is sufficiently long, the effectiveness of fiscal policy becomes independent of regime credibility. In other words, with long delays, beliefs lose their explanatory power in determining the fiscal multiplier.

Panel (b) considers the same setup under a more general case in which the elasticity of money demand is set to 10. With higher money demand elasticity, the output response at the time of implementation differs slightly between the two belief scenarios. However, the magnitude of this difference is negligible. As with panel (a), real interest rates and consumption are nearly identical at the point of policy implementation, though they diverge substantially in the periods leading up to it.

Figure 4: IRF depending on Future Belief: Implement Lag: ($h = 1$)

(a) eta = 0 (the Case of CIA)



(b) eta = 10

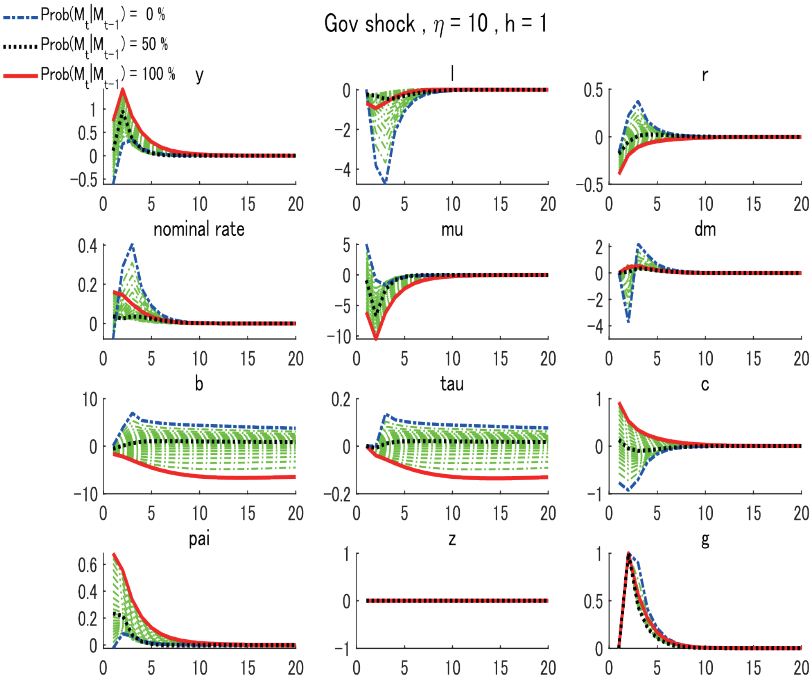
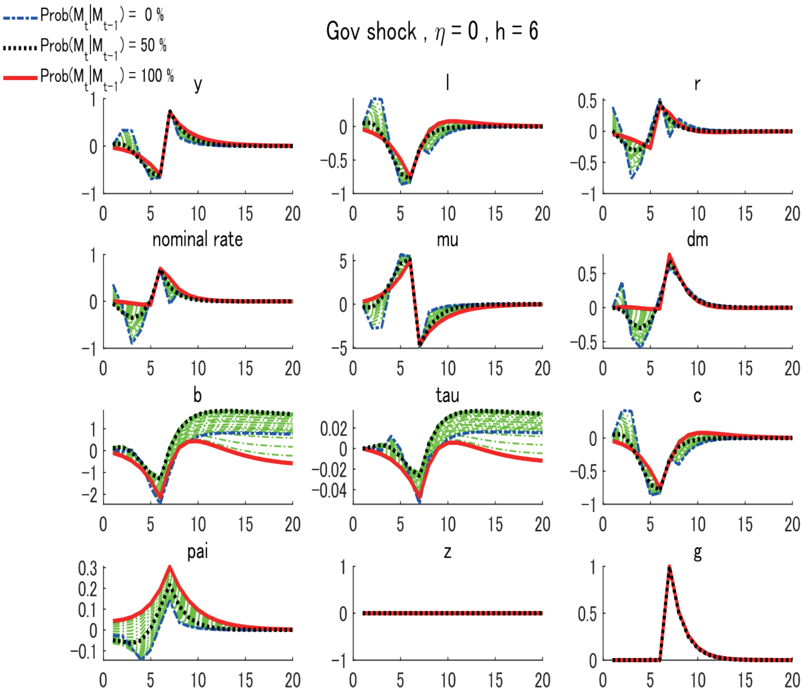
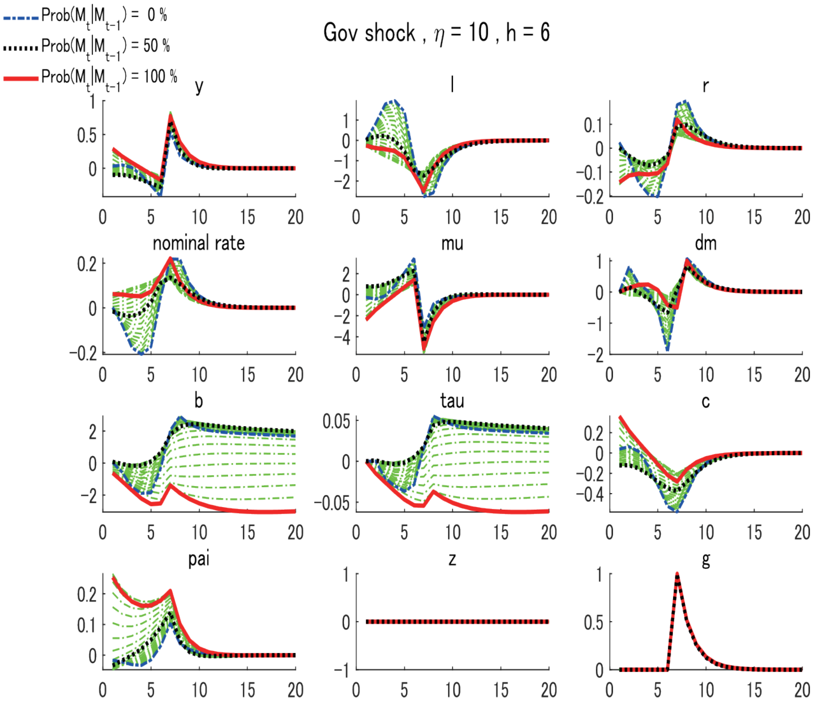


Figure 5: IRF depending on Future Belief: Implement Lag: (*h*=6)

(a) eta = 0 (the Case of CIA)



(b) eta = 10



These results underscore an important insight: although implementation lags may seem like a technical detail in macroeconomic models, when combined with regime uncertainty, they play a critical role in shaping the fiscal multiplier. The timing of policy execution, in relation to public beliefs, substantially influences macroeconomic outcomes.

5 Conclusion

This study investigates how fiscal policy effectiveness depends on the interplay between implementation lags and regime credibility. By developing a New Keynesian DSGE model with Markov-switching fiscal financing regimes, we provide a novel framework in which agents form probabilistic beliefs over two financing strategies — debt issuance and money creation — while also accounting for implementation delays modeled as news shocks.

Our quantitative analysis yields several key findings. First, consistent with prior literature, we find that under high credibility of a money-financed regime, the fiscal multiplier is large when implementation lags are short but declines as lags increase. However, when regime credibility weakens, this relationship becomes non-monotonic and, under certain conditions, may even reverse. Second, in the presence of long implementation lags, the effectiveness of fiscal policy becomes largely independent of regime credibility, even when the elasticity of money demand is high. These results highlight that both the timing of policy implementation and the public's belief in fiscal institutions play a crucial role in determining the size and persistence of fiscal multipliers.

Our model is the first to integrate implementation lags into a Markov-switching DSGE framework by interpreting regime transition probabilities as a measure of policy uncertainty. In doing so, we provide a systematic method to analyze fiscal policy under both temporal and belief-driven frictions. Our findings suggest that ignoring either dimension — policy timing or regime credibility — may lead to substantial mismeasurement of fiscal policy effectiveness, particularly in environments where monetary and fiscal coordination is critical.

From a policy perspective, our results underscore the importance of timely implementation and clear communication regarding fiscal financing strategies. In times of crisis, when confidence in fiscal institutions may fluctuate and implementation delays are common, anticipating the interaction between these two forces is essential for designing effective stabilization policies.

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