The Effects of Active and Passive Monetary Policy Stances under the Neo-Fisher Effect

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1. Introduction

Traditionally, monetary policy has been employed as a tool to stabilize short-term business cycle fluctuations. When inflation or output rises above its steady-state level due to changes in private-sector demand, the policy interest rate is raised to curb the excess; conversely, when these variables fall below their steady-state levels, the rate is lowered to prevent further decline. Thus, the short-run relationship between nominal interest rates and inflation tends to exhibit a negative correlation.

On the other hand, conventional monetary policy has generally been regarded as neutral with respect to long-term steady-state trends. Nevertheless, according to the classical Fisher effect, the levels of nominal interest rates and inflation move in the same direction in the long run, and this positive relationship is an empirically robust fact.

Furthermore, an important aspect in evaluating the effectiveness of monetary policy concerns the policy stance — often characterized as dovish (passive) or hawkish (active) — toward combating inflation. During the high-inflation era of the 1970s, monetary policy is generally perceived to have been dovish, thereby allowing inflationary pressures to persist. In contrast, the low-inflation environment of the 1980s is often attributed to a hawkish monetary stance that prioritized price stability. The differences in economic outcomes arising from such contrasting policy stances have been one of the central themes in the traditional literature on monetary policy.

In our study, we extend this discussion by quantitatively examining how the distinction between hawkish and dovish stances affects macroeconomic outcomes not only over the short-run business cycle—typically emphasized in the conventional literature—but also over the long run, when the Fisher effect implies that the levels of nominal interest rates and inflation move together. Specifically, we investigate how these policy stances influence the long-run co-movement between inflation and nominal interest rates.[1)]

Uribe (2022) provides an analysis of the U.S. economy focusing on the Neo-Fisher effect shown in Table 1, which posits a positive long-run correlation between nominal interest rates and inflation. His main finding is that a permanent monetary shock that raises both nominal interest rates and inflation in the long run also leads to

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1) Cochrane (2017) and Schmitt-Grohé and Uribe (2017) discuss the long-run implications of the Fisher equation under situations such as the zero lower bound and liquidity traps.

Table 1: Effect of Monetary Policy on Inflation

	Long Run Inflation	Short Run Inflation
Transitory MP shock	0	↓
Permanent MP shock	↑	↑ ?

increases in interest rates, inflation, and output in the short run. These variables reach their new long-run levels within roughly one year. Furthermore, he shows that under such a permanent rise in policy rates, there is no loss in output, and the real interest rate actually declines.

Building on Uribe (2022), our study aims to quantitatively analyze how shifts in the monetary policy stance — between hawkish and dovish positions — affect macroeconomic variables within the New Keynesian framework. To this end, we employ a regime-switching DSGE model of monetary policy, as proposed by Davig and Leeper (2007), in which policy alternates between hawkish and dovish regimes.

Our study contributes to the literature by demonstrating that incorporating regime-switching monetary policy into a New Keynesian framework fundamentally alters the long-run implications of the Fisher relationship. Using a regime-switching DSGE model, we show that when monetary policy alternates between hawkish and dovish regimes with realistic persistence, the region of equilibrium determinacy expands, relaxing the conventional Taylor principle. Impulse response analyses reveal Neo-Fisherian dynamics: both permanent and transitory inflation-target shocks move inflation, nominal interest rates, and output in the same direction. Importantly, a credible and persistent hawkish policy stance not only enhances price stability but also strengthens long-run economic growth. These findings highlight that monetary policy, traditionally viewed as neutral in the steady state, can exert meaningful and persistent real effects when regime credibility and long-run expectations are explicitly considered.[2)]

The remainder of this paper is organized as follows. Section 2 presents the model, in which we modify the monetary policy rule in Uribe's (2022) New Keynesian framework to incorporate regime-switching behavior. Section 3 explains the solution method for the regime-switching DSGE model, focusing on the approach proposed by Cho (2021), which is one of the representative methods in this field. Section 4 reports the computational results. We first describe the determinacy region, then present and evaluate impulse responses to a long-run monetary shock under the two regimes—hawkish and dovish. Section 5 concludes.

2. The model

2.1 A New-Keynesian Model with Permanent Trend-Inflation Shocks

This section describes a small-scale New Keynesian model augmented with a permanent monetary shock — capturing permanent shifts in the inflation target — and two temporary monetary shocks with high and low persistence following Uribe (2022). These shocks compete with other monetary and real disturbances in explaining the data. This section aims to assess, within a standard New Keynesian DSGE framework, the significance of monetary shocks with high and low persistence that give rise to neo-Fisherian effects.[3)]

2）De Michelis and Iacoviello (2016) examine a monetary policy that raises the inflation target in the context of Japan's Abenomics.

3）The basic structure of the New Keynesian model is well summarized in Gali (2008). Christiano et al. (2005) present the formulation of a medium-scale New Keynesian model.

Households and Firms

Households have preferences over consumption and labor effort with external habit formation:

$$E_0 \sum_{t=0}^{\infty} \beta^t e^{\xi_t} \left\{ \frac{\left[(C_t - \delta \tilde{C}_{t-1})(1 - e^{\theta_t} h_t)^{\chi} \right]^{1-\sigma} - 1}{1 - \sigma} \right\}, \tag{1}$$

where C_t is consumption, $\tilde{C}_{t-1}$ is average lagged consumption, h_t is hours worked, and ξ_t, θ_t are preference and labor-supply shocks, respectively. The parameters $\beta, \delta \in (0,1)$ and $\sigma, \chi > 0$ are standard.

The household budget constraint is

$$P_t C_t + \frac{B_{t+1}}{1 + I_t} + T_t = B_t + W_t h_t + \Phi_t, \tag{2}$$

where P_t is the consumption price level, B_t denotes nominal bonds, I_t is the nominal interest rate, T_t are lump-sum taxes, W_t the nominal wage, and Φ_t profits.

Each differentiated variety $i \in [0,1]$ is aggregated as

$$C_t = \left(\int_0^1 C_{it}^{1-1/\eta} \, di \right)^{1/(1-1/\eta)},$$

with elasticity of substitution $\eta > 0$. Firms face Rotemberg-type quadratic price-adjustment costs[4] and produce output

$$Y_{it} = e^{z_t} X_t h_{it}^{\alpha}, \tag{3}$$

where z_t and X_t denote stationary and nonstationary productivity shocks. Profits in real terms are

$$E_0 \sum_{t=0}^{\infty} q_t \left[\frac{P_{it}}{P_t} C_{it} - \frac{W_t}{P_t} h_{it} - \frac{\phi}{2} X_t \left(\frac{P_{it}/P_{it-1}}{1 + \tilde{\Pi}_t} - 1 \right)^2 \right], \tag{4}$$

where $1 + \tilde{\Pi}_t = (1 + \tilde{\Pi}_{t-1})^{\gamma_m} (1 + \Pi_t)^{1-\gamma_m}$. Parameters $\phi > 0$ and $\gamma_m \in [0,1]$ govern price stickiness and backward-looking behavior, respectively.

Monetary Policy with Regime Switching Stances

The monetary authority sets the nominal interest rate according to a Taylor-type rule with interest rate smoothing. Furthermore, over the long run, it is assumed that the monetary authority's policy stance switches between active and passive regimes; that is, the response coefficient to inflation in the Taylor-type rule is allowed to take two distinct values depending on the prevailing regime.

$$\frac{1 + I_t}{\Gamma_t} = \left[A \left(\frac{1 + \Pi_t}{\Gamma_t} \right)^{\alpha_\pi(S_t)} \left(\frac{Y_t}{X_t} \right)^{\alpha_y} \right]^{1-\gamma_I} \left(\frac{1 + I_{t-1}}{\Gamma_{t-1}} \right)^{\gamma_I} e^{z_t^m}, \tag{5}$$

4） The basic framework of price rigidity was developed by Rotemberg (1982).

where $\alpha_\pi(S_t)$ denotes the policy response coefficient to inflation in the Taylor rule, and represents the policy regime (active or passive). The value of this coefficient switches between two distinct levels depending on the regime prevailing in each period. And standard transitory interest-rate shock (z_t^m) causes a temporary fall in inflation and output.

The parameter Γ_t in equation (5) represents the inflation target, which is defined by the following equation.

$$\Gamma_t = X_t^m e^{z_t^{m2}} \tag{6}$$

where a permanent increase in the inflation target (X_t^m) leads to a gradual normalization of the policy rate and an immediate reflation without output loss. Transitory but persistent inflation target shocks (z_t^{m2}) also generate rising inflation and interest rates, consistent with the theoretical mechanism proposed by Garín, Lester, and Sims (2018). The growth rate of inflation target; $g_t^m = \ln(X_t^m / X_{t-1}^m)$, is stationary.

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 (2025), our model can be expressed as a canonical form of the Markov-switching rational expectations model:

$$x_t = A(s_t) E_t x_{t+1} + B(s_t) x_{t-1} + C(s_t) z_t, \tag{7}$$

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).

3.2 The minimum of modulus (MOD) solution

Cho (2021) adopts *mean-square stability* as the relevant stability concept, following Farmer et al (2009, 2011), 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 regimeswitching models and the intractability of the full solution space.

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 McCallum (2007) to the regime-switching context. This method constructs a sequence of matrices recursively:

$$\Phi^{(1)}(s_t) = B(s_t),$$
$$\Phi_{(k)}(s_t) = \mathrm{h}\,In - \mathrm{E}_t\,A(s_t, s_{t+1})\Phi_{(k-1)}(s_{t+1})_{i-1}\,B(s_t), \qquad \text{for } k \geq 2. \tag{8}$$

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.

4 Numerical Results

In our study, we adopt the same parameter values as those used in Uribe (2022). These values are presented in Table 2. First, following Cho (2021), we compute the determinacy region of the model. In line with Davig and Leeper (2007), we construct three alternative patterns of transition probabilities, each representing the likelihood of shifting between the hawkish and dovish regimes, and calculate the determinacy region for each case.

In Figure 1, the transition probabilities between the two regimes are identical and set at a high value of 99 percent. This corresponds to an average regime duration of 100 quarters, or approximately 25 years (= 1/0.01). In this graph, the horizontal axis plots the Taylor-rule coefficient of regime 1, ranging from 0.8 to 1.8, while the vertical axis plots the Taylor-rule coefficient of regime 2 over the same range. The white area indicates the region in which the equilibrium is determinate (i.e., a unique solution exists), whereas the gray area represents the indeterminacy region, where multiple equilibria arise. The figure shows that when the average duration of a regime extends to as long as 25 years, the mechanism allowing for switching between the two regimes does not contribute to enlarging the determinacy region. In other words, similar to a standard model without regime switching, the Taylor principle holds: the determinacy and indeterminacy regions are separated at the threshold value of one for the Taylor coefficient.

Table 2: Calibrated Parameters in the New-Keynesian Model

Parameter	Value	Description
β	0.9982	subjective discount factor
σ	2	inverse of intertemporal elasticity of substitution
η	6	intratemporal elasticity of substitution
α	0.75	labor share parameter
g	0.004131	mean output growth rate
θ	0.4055	preference parameter
χ	0.625	preference parameter

Figure 1: Regions of Determinacy and Indeterminacy

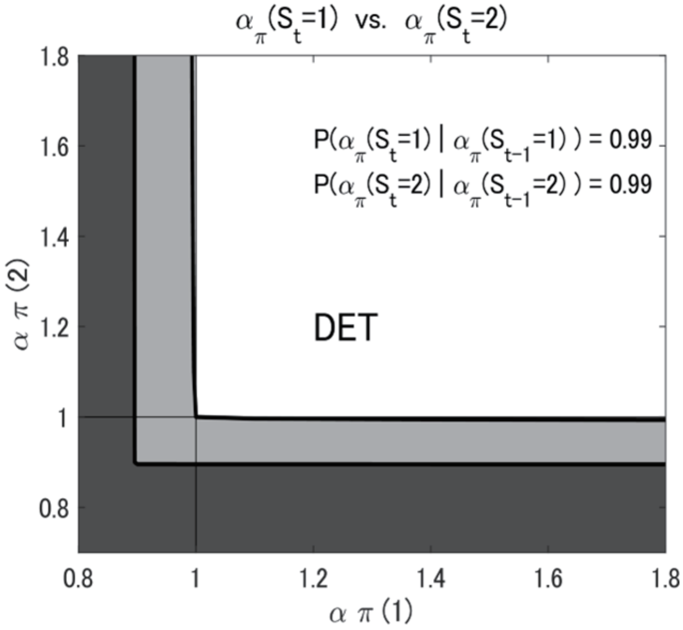
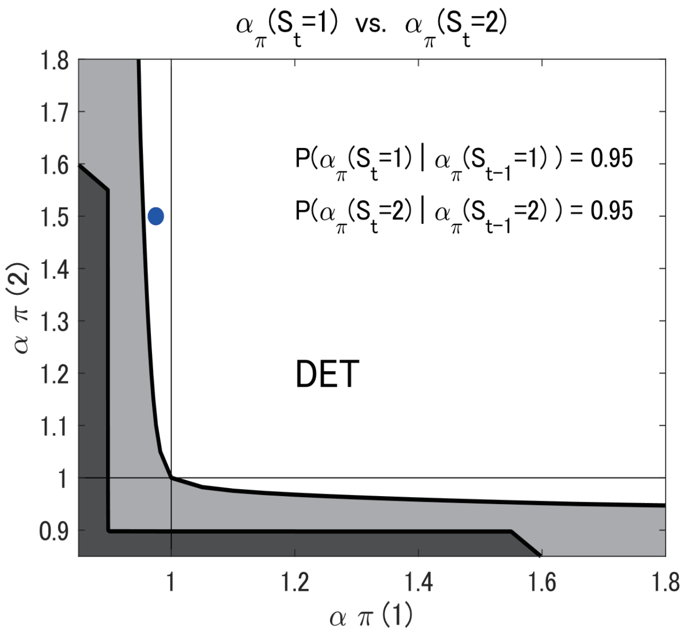
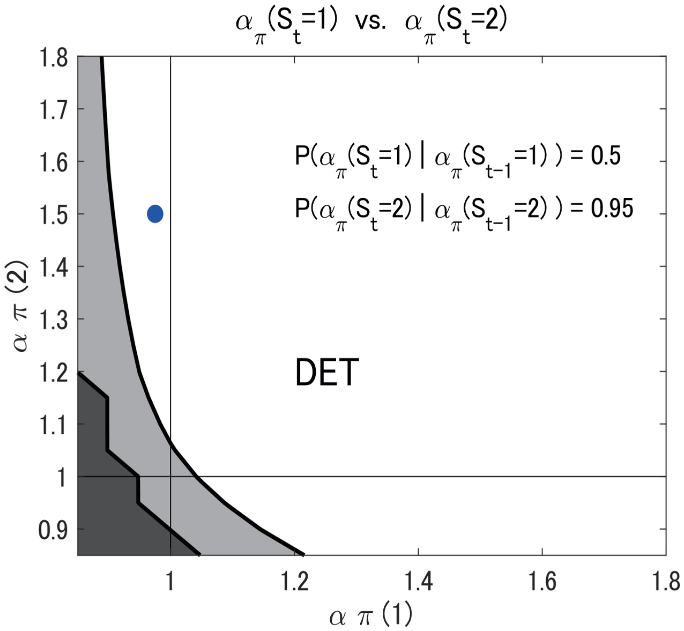


Figure 2: Regions of Determinacy and Indeterminacy



In Figure 2, the transition probabilities between the two regimes are reduced to 95 percent, corresponding to an average regime duration of 20 quarters, or about five years (= 1/0.05) — a more realistic horizon for regime switching. As shown in the figure, when the duration of each regime becomes shorter, the determinacy region

Figure 3: Regions of Determinacy and Indeterminacy



expands even under this realistic five-year setting, implying that the Taylor principle becomes less stringent. For example, the blue dot in the figure marks the point where the Taylor-rule coefficient in regime 1 is 0.975 and that in regime 2 is 1.50; this point lies within the determinate region. In other words, even if the central bank adopts a dovish policy stance in one regime (with a Taylor coefficient of 0.975), the equilibrium remains unique as long as it takes a hawkish stance in the other regime (with a Taylor coefficient of 1.5).

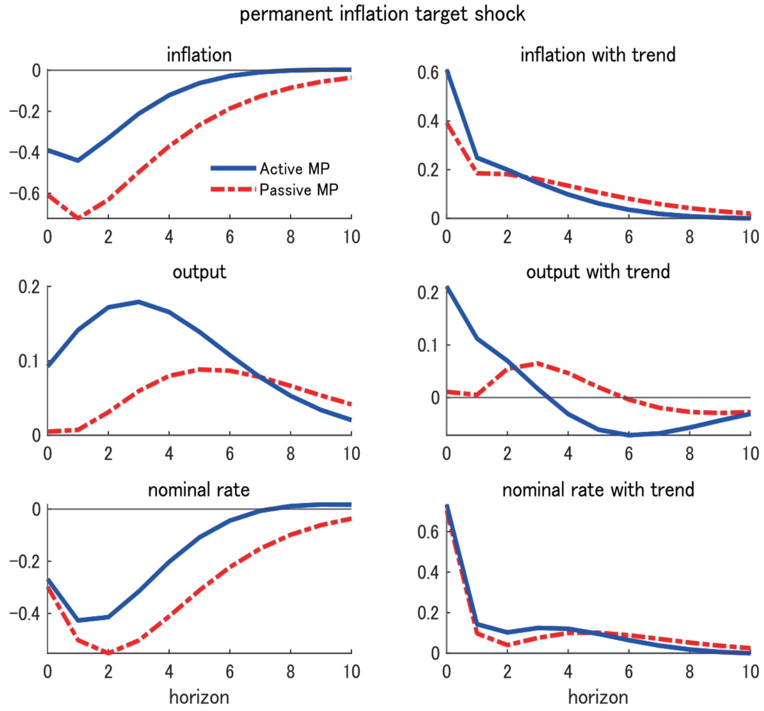
In Figure 3, we examine an extreme case in which the transition probability of regime 1 is further reduced to 50 percent. This corresponds to an average regime duration of only two quarters, or roughly half a year (= 1/0.5). In this case, the determinate region — the white area in the figure — expands even further, indicating a broader range of parameter values under which the equilibrium is unique.

Next, let us examine the impulse responses of the three monetary policy shocks under the transition probabilities shown in Figure 2 — namely, when both regimes share a realistic transition probability of 95 percent. Figure 4 presents the impulse responses to the long-run inflation-target shock, ${g^m}_t$, introduced in Section 2. Figure 4 consists of six panels. The three panels on the left display the short-run deviations of macroeconomic variables — inflation, output, and the nominal interest rate—from their steady-state values. The three panels on the right show the same variables in the same order but include their long-run trend components.

The blue solid line represents a hawkish monetary policy stance with a Taylor-rule coefficient of 1.5, while the red dashed line represents a dovish stance with a coefficient of 0.975. In both cases, under a long-run monetary policy shock, all three macroeconomic variables respond in the same direction.

Focusing first on the left-hand panels (de-trended series), inflation and the nominal interest rate decline, whereas output rises. In contrast, as shown in the right-hand panels (trend-adjusted series), all three variables increase. This result is consistent with Uribe (2022), who obtained the same qualitative responses in a standard New Keynesian

Figure 4: IRF to permanent inflation target shock



model without regime switching.

In our model, which additionally incorporates shifts in monetary policy stance, the responses under the hawkish case (blue line) are larger in magnitude than those under the dovish case (red dashed line) for all three variables. In particular, the response of output — which also reflects economic growth — is notably stronger. This finding implies that adopting a hawkish monetary policy stance contributes positively to sustaining long-run economic growth.

Figure 5 illustrates the impulse responses to a transitory inflation-target shock. In the right-hand panels, which include the trend component, all three variables show positive responses — similar to those observed in Figure 4. Likewise, the left-hand panels, which depict deviations from the steady state without the trend component, also exhibit positive responses. What can be inferred from this figure, consistent with the long-run shock results in Figure 4, is that adopting a hawkish monetary policy stance—represented by the blue solid line — leads to better overall economic performance.

Figure 6 displays the impulse responses to an orthodox Taylor-type monetary policy shock. In this case, both the left-hand panels (without trend) and the right-hand panels (with trend) show responses in the same direction. From the left-hand panels, it can be seen that the hawkish response (blue solid line) is smaller than the dovish response (red dashed line). However, in the right-hand panels, which include the long-run trend component, there is little difference between the two policy stances. This result indicates that once long-term economic growth — represented by the trend component — is taken into account, the short-run differences between hawkish and dovish monetary policy stances become negligible.

Figure 5: IRF to transitory inflation target shock

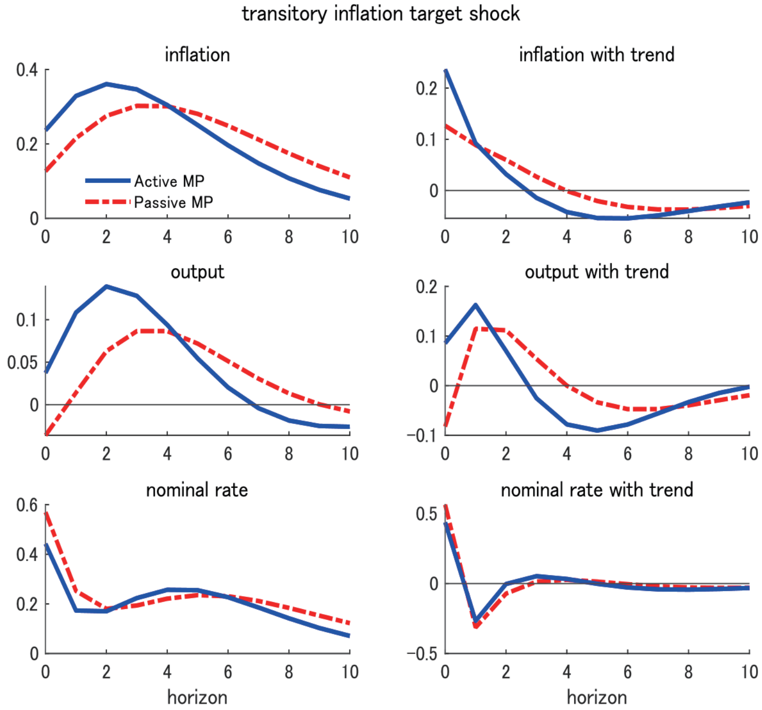
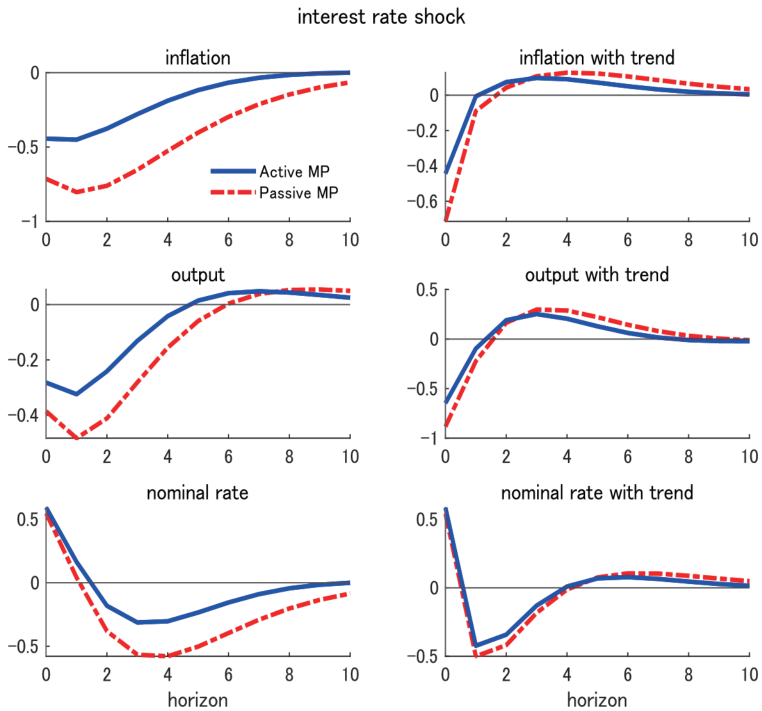


Figure 6: IRF to interest rate shock



5 Conclusion

This study has examined the medium- to long-term effects of monetary policy by explicitly taking into account the Fisher equation, which represents the long-run relationship between the nominal interest rate and inflation. While traditional monetary policy analysis has focused mainly on shortto medium-term business cycle stabilization, our research extends the scope to explore how monetary policy stances — whether active or passive, or equivalently hawkish or dovish — influence long-run macroeconomic dynamics and economic growth.

To address this question, we adopted the New Keynesian framework with Permanent TrendInflation Shocks developed by Uribe (2022) and incorporated regime-switching behavior into the monetary policy rule following Davig and Leeper (2007). The model was solved using the regimeswitching DSGE solution method proposed by Cho (2021), allowing us to analyze quantitatively how changes in policy stance and regime persistence affect equilibrium determinacy and macroeconomic responses.

Our results show that the average duration of monetary policy regimes plays a crucial role in determining the uniqueness of equilibrium. When regimes are highly persistent — for instance, with an average duration of 25 years (99 % transition probability) — the regime-switching mechanism does not expand the determinacy region, and the standard Taylor principle continues to hold. However, when the duration becomes more realistic, such as five years (95 % transition probability), the determinacy region widens, implying that the Taylor principle becomes less restrictive. Even if one regime adopts a dovish stance (Taylor coefficient of 0.975), equilibrium remains determinate as long as the other regime is hawkish (coefficient of 1.5). This indicates that moderate regime switching contributes to macroeconomic stability by enhancing determinacy.

The impulse response analysis reveals that both permanent and transitory inflation-target shocks z^{m2} generate Neo-Fisherian dynamics — that is, inflation, nominal interest rates, and output move in the same direction. When long-run trends are included, all three variables increase simultaneously, consistent with Uribe's (2022) findings in a standard New Keynesian model. Moreover, the hawkish stance yields larger positive responses in inflation, the nominal interest rate, and particularly in output, implying that a hawkish monetary policy stance promotes not only price stability but also sustained economic growth.

In contrast, for standard Taylor-type policy shocks z^{m}, both hawkish and dovish regimes produce similar macroeconomic outcomes once long-term trends are accounted for, suggesting that short-run differences between policy stances become negligible when the long-term growth component is included.

Overall, this study demonstrates that adopting a credible and persistent hawkish monetary stance is effective in supporting both inflation stabilization and long-run economic growth. By integrating the Neo-Fisher effect into a regime-switching DSGE framework, this analysis highlights the importance of considering long-term interactions between inflation, interest rates, and policy credibility in evaluating the broader macroeconomic impact of monetary policy.

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A. Appendix

A.1 Equilibrium Equations •

- FOC wrt consumption

$$\lambda_t = \exp(\xi_t)(y_t - \delta\frac{y_{t-1}}{\exp(g_t)})^{-\sigma}(1 - \exp(\theta_t)h_t)^{\chi(1-\sigma)} \tag{9}$$

- labor supply

$$w_t = \frac{\chi\,\exp(\theta_t)\,(y_t - \delta\frac{y_{t-1}}{\exp(g_t)})}{(1 - \exp(\theta_t)h_t)} \tag{10}$$

- Euler equation

$$\lambda_t = \beta\,(1 + i_t)\,E_t\left[\frac{\lambda_{t+1}}{1 + \pi_{t+1}}\exp(-g^m_{t+1} - \sigma g_{t+1})\right] \tag{11}$$

- output

$$y_t = \exp(z_t)h_t^{\alpha} \tag{12}$$

- Labor demand

$$w_t = \alpha\,\exp(z_t)h_t^{\alpha-1}\,mc_t \tag{13}$$

- Phillips curve

$$\frac{1 + \pi_t}{1 + \tilde{\pi}_t}\left(\frac{1 + \pi_t}{1 + \tilde{\pi}_t} - 1\right) = \beta\,E\left[\exp((1-\sigma)g_t)\frac{\lambda_{t+1}}{\lambda_t}\frac{1 + \pi_{t+1}}{1 + \widetilde{\pi_{t+1}}}\left(\frac{1 + \pi_{t+1}}{1 + \widetilde{\pi_{t+1}}} - 1\right)\right] + \frac{1}{\phi(\mu - 1)}(\mu\,mc_t - 1)y_t \tag{14}$$

- Taylor-type Interest-rate feedback rule

$$\frac{(1 + i_t^{not})}{\exp(z^{m2}_{,t})} = \left(A\left(\frac{1 + \pi_t}{\exp(z^{m2}_t)}\right)^{\alpha_\pi} y^{\alpha_y}\right)^{(1-\gamma_i)}\left(\frac{1 + i_{t-1}}{\exp(z^{m2}_{t-1})}\right)^{\gamma_i}\exp(z^m_t) \tag{15}$$

- Inflation including trend component

$$g\pi_t = \frac{(1 + \pi_t)\,\exp(g^m_t)}{1 + \pi_{t-1}} + g\pi_{t-1} \tag{16}$$

- Interest rate including trend component

$$gi_t = \frac{(1 + i_t)\,\exp(g^m_t)}{1 + i_{t-1}} + gi_{t-1} \tag{17}$$

- GDP growth rate

$$gy_t = \frac{y_t \exp(g_t)}{y_{t-1}} \tag{18}$$

- Discount factor shock

$$\xi_t = \rho_\xi \xi_{t-1} \tag{19}$$

- Labor disutility shock

$$(\theta_t - \Theta) = \rho_\theta(\theta_t - \Theta) \tag{20}$$

- Permanent growth rate shock –> Trend

$$(g_t - G) = \rho_g(g_{t-1} - G) \tag{21}$$

- TFP shock

$$z_t = \rho_z z_{t-1} + \varepsilon_t^z \tag{22}$$

- Permanent Inflation Shock

$$g_t^m = \rho_{gm} g_{t-1}^m + \varepsilon_t^{gm} \tag{23}$$

- Transitory MP Shock

$$z_t^m = \rho_{zm} z_{t-1}^m + \varepsilon_t^{zm} \tag{24}$$

- Average level of inflation

$$(1 + \tilde{\pi}_t) = \left[\frac{1 + \widetilde{\pi_{t-1}}}{\exp(g_t^m)}\right]^{\gamma_m} (1 + \pi_t)^{1-\gamma_m} \tag{25}$$

- interest-rate inflation differential (real rate)

$$(i_t - \pi_t) = \frac{1 + i_t}{1 + \pi_t} \tag{26}$$

- Transitory inflation-target shock

$$z_t^{m2} = \rho_{zm2} z_{t-1}^{m2} + \varepsilon_t^{zm2} \tag{27}$$