How NOT to Conduct Monetary Policy:
The Case of Turkiye

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The Case of Türkiye

Taher E. Fahmi*

Abstract

This work quantifies the welfare cost of unorthodox monetary policy conduct in Türkiye during 2021-2023 through a counterfactual experiment based on an estimated Markov-switching DSGE (MS-DSGE) model. This episode marks a sharp departure from conventional, inflation-stabilizing policy despite rising inflation, providing an ideal setting for evaluating welfare losses caused by politically driven departures from orthodoxy. The analysis uses quarterly data from 2006Q1 to 2025Q1 and specifies four candidate models, three of which allow for regime-switching in Taylor rule parameters and shock volatilities. Estimation results indicate that the model with the best fit is one with switching in the inflation-response and interest-rate smoothing parameters, alongside volatility switching in cost-push shocks. Using the best fitting model, the counterfactual experiment estimates welfare gains of 155–177% had the central bank refrained from unorthodoxy during said episode.

Keywords: Unorthodox Monetary Policy, Markov-Switching DSGE model, Bayesian Estimation, Türkiye

JEL Classification: C11, C63, E31, E32, E52

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1 Introduction

Monetary policy in Türkiye between 2021 and 2023 diverged from orthodoxy and convention, as interest rates were cut despite the accelerating inflation. This policy behavior, known as "Erdoğanomics", is associated with President Recep Tayyip Erdoğan's view of interest rates as "the father and mother of all evil". Following this period was an inflationary surge and a loss of credibility that diminished welfare and standards of living. To study this context, this work estimates a Markov-switching Dynamic Stochastic General Equilibrium (MS-DSGE) model to quantify the welfare losses from unorthodox monetary policy through a counterfactual in its absence. Before presenting the specification and results, I preface the analysis with a discussion on Türkiye's monetary policy developments which motivates the adoption of a regime-switching framework.

Following the COVID-19 pandemic, the Central Bank of the Republic of Türkiye (CBRT) initially cut policy rates[2] to counter the slowdown in economic activity. Under Governor Murat Uysal, rates declined from 12 percent at the beginning of 2020 to 8.25 percent by May of the same year. In light of the increasing inflationary pressures, the subsequent governor, Naci Ağbal, raised rates to 19 percent by March 2021. However, he was dismissed shortly after the final interest rate increase, a decision widely interpreted as a reflection of political dissatisfaction with the tighter monetary policy stance (Al Jazeera, 2021; BBC News, 2021; Coskun and Spicer, 2021).

This work focuses on the subsequent period under Governor Şahap Kavcıoğlu, whose time in office was marked by a rather aggressive easing monetary policy stance, that is more aligned with Erdoğan's economic views. During Kavcıoğlu tenure, from 2021Q2 – 2023Q2, the CBRT reduced the policy rate by a cumulative 1050 basis points, despite the acceleration in headline inflation, which peaked at 86 percent in October 2022. In the period mentioned, the Turkish lira depreciated by approximately 30 percent against the US Dollar over the first ten months of 2022, international reserves declined, public debt significantly expanded, and fiscal balances deteriorated (Thorbecke and Sengonul, 2023; IMF, 2023, 2024). CBRT press releases in 2021 and 2022 repeatedly justified the easing cycle using the same reasons, stated *verbatim*, emphasizing the need to maintain *"growth momentum in industrial production"* and sustain the *"positive trend in employment"* (CBRT, 2022b,a,c,d). These developments occurred in the lead up to the 2023 presidential elections, which might have suggested that the Bank was forced to maintain this accommodative monetary policy stance. Following President Erdoğan's reelection in 2023, a marked policy shift occurred with the appointment

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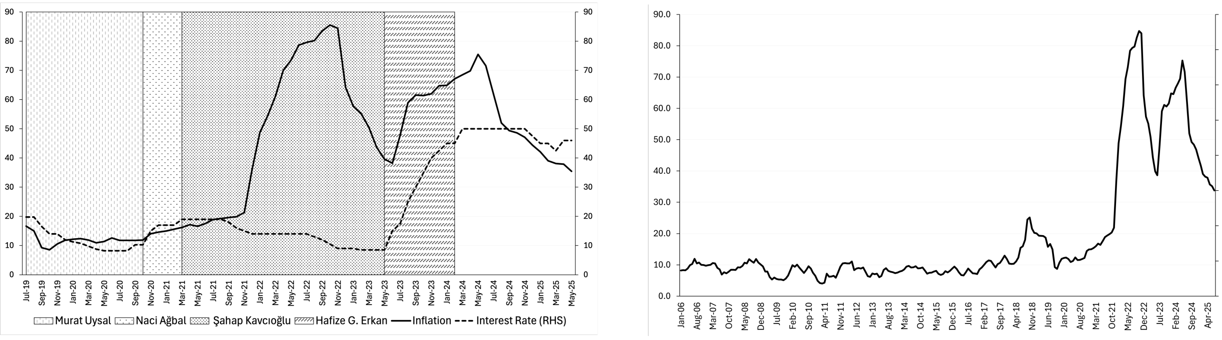
[2] This refers to the 1-week repurchase agreement (repo) rate, which has been the CBRT's key policy rate since 2018.

of Governor Hafize Gaye Erkan, who committed to policy convention by tightening the CBRT's stance again, which signaled a return to orthodox monetary policy conduct.

The aforementioned dynamics can be seen in Figure (1a), which showcases the evolution of the policy rate and inflation across the different CBRT governors. From a monetary policy regime standpoint, the contrast across these episodes is striking: while Uysal's period largely followed conventional practice, Ağbal's brief time in office reflects an active policy response to inflation, whereas Kavcıoğlu's tenure exhibited a highly unorthodox stance by lowering rates despite accelerating inflation. Thereafter, a return to an active regime followed under Erkan.

Figure 1: Türkiye's Headline Inflation and Interest Rates (YoY, in %)[3]



(a) Headline Inflation & Interest Rates vis-à-vis CBRT Governors' Tenure

(b) Historical Headline Inflation

It is also evident that under Kavcıoğlu's tenure, Türkiye's inflation environment experienced a structural break compared to its long term trend. As shown in Figure (1b), the country maintained an average inflation rate of around 10 percent between 2006 and 2020. However, from 2021 to 2025Q2, inflation shifted to a substantially higher average of 49 percent. Similarly, other emerging economies also faced rising inflation rates following the COVID-19 pandemic and the Russo–Ukraine crisis. However, Türkiye's unconventional monetary policy undoubtedly had a role in exacerbating these pressures. This resulted in inflation remaining persistently high thereafter.

The structural break in Türkiye's inflation post 2021, together with the break from orthodoxy under Kavcıoğlu's tenure, provides the rationale for adopting a regime-switching framework. In this context, I estimate and compare three candidate MS-DSGE specifications alongside a benchmark without regime switching. Results show that the model allowing for regime switching in the central bank's reaction to inflation and interest rate smoothing, as well as in the volatility of cost-push shocks, provides the best empirical fit. The counterfactual experiment based on this specification finds that the Turkish economy would have experienced

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[3] Source: IFS, CBRT

welfare gains of 155–177 percent in the absence of the unorthodox conduct of monetary policy. In doing so, this work contributes to the literature on MS-DSGEs in emerging market economies. To the best of my knowledge, no DSGE study has been conducted for Türkiye over this period, nor has any incorporated regime switching into the analysis.

The remainder of the paper is organized as follows. Section 3 presents the microfoundations of the model along with the candidate specifications for estimation. Section 4 describes the data and estimation strategy and presents the posterior estimates, regime probabilities, impulse response functions, and historical decomposition. Section 5 presents the counterfactual experiment and results. Section 6 discusses limitations and future research areas for this work and section 7 concludes.

2 Literature Review

This study draws on four key strands of literature. First, it builds on the seminal work of Smets and Wouters (2003, 2007), whose research marked a turning point in advancing Bayesian methods to estimate DSGE models. Their model includes complexities that established a benchmark framework for monetary policy analysis in the US and Euro area through incorporating features such sticky prices and wages, habit formation, capital adjustment costs, among others, as well a plethora of structural shocks, including productivity, labor supply, preference, investment, cost-push, and monetary policy shocks. This paper also draws from the canonical New Keynesian framework of Galí (2015). Bayesian estimation, introduced by Schorfheide (2000) and formalized by An and Schorfheide (2007) and Herbst and Schorfheide (2016), emphasizes the role of priors and Markov Chain Monte Carlo sampling, highlighting how prior beliefs improve posterior estimates. Collectively, these works provide a methodological framework for the methodology developed in this study. Yet, because they focus largely on advanced economies under stable regimes, it is less clear how well Bayesian DSGEs perform in environments of policy instability, central bank credibility loss, or high inflation, which are conditions central to the Turkish case.

A second strand of the literature extends to DSGE frameworks that introduce regime-switching in policy rules and shock processes, which is directly related to this study. Among the most influential contributions, Bianchi (2013) develops DSGE model for the US with switching policy parameters and shock volatilities. He shows how changing agents' beliefs and shifts between hawk and dove policy regimes are essential to understand post-WW2 macroeconomic dynamics. His work also lays the groundwork for Bayesian estimation of MS-DSGE models, particularly in the specification of priors across different regimes. Building on this framework, Chen et al. (2017) examine US monetary policy using a MS-DSGE also with time variation in both shock volatilities and Taylor-rule parameters, assessing whether the *Great Moderation* reflected “good policy” or “good luck”. They find that the best-fitting model is a time-consistent targeting rule with regime shifts in shock volatilities. Their counterfactuals indicate that it was “good luck” that accounted for the *Great Moderation.* While their focus was on distinguishing the sources of macroeconomic stability, their use of counterfactual experiments provides the methodological motivation for this dissertation’s own counterfactual design. Together, these studies serve as benchmarks for this dissertation and underscore that MS-DSGEs typically fit the data better than models without switching. Yet applications remain largely focused on the U.S. and advanced economies, leaving their relevance for emerging markets open, where regime shifts may reflect institutional weakness rather than deliberate dovish policy.

This study is informed by a third strand of literature that uses DSGE models on developing and emerging economies, extending the framework beyond advanced ones. Zamarripa (2021) applies a small open-economy DSGE model with rolling-window Bayesian estimation to Mexico over the period 1995–2019. He documents parameter drifts in the Taylor rule whereby the Bank of Mexico has maintained a strong inflation response over the period, whereas output and exchange rate reactions diminished after 2002. For Brazil, De Oliveira et al. (2024) apply a Markov-switching DSGE and find that, in line with Bianchi (2013); Chen et al. (2017), model versions with regime shifts fit the data better, with one regime reflecting strong anti-inflationary policy and another prioritizing output and exchange-rate stabilization. Extending this perspective, Ortiz et al. (2009) analyze 18 emerging economies during systemic sudden stops between 1990 and 2006. They show that procyclical tightening amplified output losses, highlighting both the welfare costs of this rigid policy conduct and the value of policymaking agility, which informs this dissertation’s assessment of Türkiye’s unorthodox regime. Bi et al. (2016) study Argentina’s post-default period and show how weak revenues and large depreciations undermine debt sustainability. Their analysis of a high-inflation, volatile emerging market economy with credibility challenges also provides useful context for guiding prior choices and evaluating model results when estimating this models for Türkiye. Arbatli and Moriyama (2011) estimate a DSGE model for Egypt (2005–2010) and find a weak interest rate channel alongside high policy inertia, rendering monetary policy procyclical rather than countercyclical as per convention. Their findings inform this dissertation, as they show that ineffective conduct of monetary policy is tied to policy inertia, underscoring the importance of active policy and effective transmission mechanisms. Collectively, these studies offer comparative reference points against which new results can be evaluated.

The final strand of literature that this study builds on consists of estimated DSGE applications to Türkiye. Cebi (2012) estimates a small open-economy DSGE model for 2002–2009 to study monetary–fiscal interactions. The results show that while monetary policy mainly targeted inflation, it responded only weakly to output gap deviations, whereas fiscal policy was primarily focused on debt sustainability. Yuksel (2013) employs a medium-scale DSGE model for 2002-2012 and finds that technology shocks, rather than investment shocks, were the main drivers of business cycle fluctuations in Türkiye. Importantly, the paper highlights that major policy shifts in Türkiye generate structural breaks in the data, highlighting the need for models that include a "policy switch" to capture longer sample periods, a point directly relevant to this dissertation. Demirok et al. (2023) estimate a small open economy DSGE model for Türkiye (2003–2020) and emphasize that technology, preference, and risk-premium shocks were the main drivers of business cycle fluctuations, and that the CBRT's focus on exchange-rate stabilization came at the cost of weaker output stabilization. Similar to Yuksel (2013), Demirok et al. (2023) also highlight the practical challenges in constructing consistent nominal interest rate series for estimation in light of changes in the CBRT's main policy tool, and propose alternative measures to address this issue. Complementing this, Alp and Elekdağ (2011) estimate an open-economy DSGE model over 2002–2010 and show that during the global financial crisis, countercyclical monetary easing combined with exchange-rate flexibility prevented a much deeper contraction, underscoring the stabilizing role of Türkiye's inflation-targeting framework. Although these studies provide valuable building blocks, they share a limitation as none of these contributions cover the period examined in this paper, the 2021–2023 episode of unorthodox easing. Nonetheless, they remain essential benchmarks, offering empirical guidance for modeling Turkish dynamics and motivating the priors used in this study.

3 Model

In this section, I lay the microfoundations of the model used in this work, which builds on a simplified version of the Smets and Wouters (2003, 2007) DSGE setup, with some notational conventions following Galí (2015). The model features a representative household, firms, and a central bank (CB).

3.1 Households

Households aim to maximize lifetime utility, which takes the following form:

$$U = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \theta \frac{N_t^{1+\varphi}}{1+\varphi} \right)$$

where C_t denotes real consumption, N_t labor supply (hours worked), β the household discount factor, σ the coefficient of relative risk aversion, φ the inverse of the Frisch elasticity of labor supply, and θ represents the labor disutility of work parameter.

This is subject to (i) the household's intertemporal budget constraint:

$$P_t\, C_t + P_t\, I_t + P_t\, B_t = P_t\, W_t\, N_t + P_t\, R_t^k\, K_{t-1} + P_{t-1}\, B_{t-1}\, R_{t-1} + P_t\, T_t$$

And to (ii) the capital accumulation equation:

$$K_t = (1-\delta)\, K_{t-1} + I_t$$

where P_t denotes the price level, I_t the real investment, B_t the nominal bond holdings purchased in period t, W_t the real wage, R_t^k the rental rate of capital, K_{t-1} denotes the capital stock at time $t-1$, R_{t-1} the gross nominal interest rate, T_t real lump-sum transfers, and δ the depreciation rate of capital.

Combining both household constrains, yields the following:

$$C_t + K_t + B_t = W_t N_t + (R_t^k + 1 - \delta) K_{t-1} + \frac{R_{t-1}}{\Pi_t} B_{t-1} + T_t$$

where gross inflation is defined as $\Pi_t \equiv \frac{P_t}{P_{t-1}}$.

Solving the household's problem[4] by choosing consumption, labor, capital, and bond holdings, we obtain the following optimality conditions:

Euler Equation for Bonds

$$C_t^{-\sigma} = \beta\, \mathbb{E}_t \left[C_{t+1}^{-\sigma}\, \frac{R_t}{\Pi_{t+1}} \right] \tag{1}$$

Labor Supply Schedule

$$W_t = \theta\, N_t^{\varphi}\, C_t^{\sigma} \tag{2}$$

Euler Equation for Capital

$$C_t^{-\sigma} = \beta\, \mathbb{E}_t \left[C_{t+1}^{-\sigma} (R_{t+1}^k + 1 - \delta) \right] \tag{3}$$

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[4] The full household optimization problem and the Lagrangian setup can be found in Appendix A.1.

3.2 Firms

The setup for firms, also inspired by Smets and Wouters (2003, 2007), includes monopolistically competitive firms in the intermediate good market where they produce differentiated goods. The economy produces one final good, which is an aggregation of a continuum of differentiated intermediate goods. Additionally, firms face adjustment costs as they re-optimize their prices every period and thus introduce nominal rigidities to the economy by setting prices à la Rotemberg (1982)[5]. As in Ireland (2007); Basu and Sarkar (2016), I include price indexation for firms that were not able to re-optimize their prices, which introduces a hybrid inflation dynamic and in turn a hybrid New Keynesian Philips Curve (NKPC).

Final Good Producers

The final good is produced by aggregating the continuum of intermediate goods into a composite good Y_t using a CES aggregator:

$$Y_t = \left(\int_0^1 Y_t(i)^{\frac{\varepsilon_t - 1}{\varepsilon_t}} \, di \right)^{\frac{\varepsilon_t}{\varepsilon_t - 1}}$$

where ε_t is the time-varying elasticity of substitution between intermediate goods, which determines the markup $\mu_t = \frac{\varepsilon_t}{\varepsilon_t - 1}$. It's assumed that the elasticity evolves according to the stochastic process:

$$\log \varepsilon_t = (1 - \rho_\varepsilon) \log \varepsilon + \rho_\varepsilon \log \varepsilon_{t-1} + \eta_t^\varepsilon$$

where ε is the steady-state elasticity of substitution, and η_t^ε is a mean-zero i.i.d. shock, which can be interpreted as a cost-push shock.

Intermediate Goods Producers

Each intermediate good producer i produces a slightly differentiated good, via the following production technology:

$$Y_t(i) = A_t K(i)_{t-1}^{\alpha} N(i)_t^{1-\alpha}$$

where $Y_t(i)$ denotes output of firm i, $K_{t-1}(i)$ and $N_t(i)$ denote the capital and labor input of firm i, respectively, α is the share of capital in production function and A_t is the level of aggregate productivity. A_t evolves via the following AR(1) process:

$$\log A_t = \rho_a \log A_{t-1} + \eta_t^a$$

with η_t^a representing a mean-zero i.i.d. technology shock.

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[5] This is a deviation from the Smets and Wouters (2003, 2007) model, for ease of derivation.

Intermediate Good Producers Price-Setting Problem

The profit for the individual firm takes the following form:

$$\frac{P_t(i)}{P_t}Y_t(i) - \big(W_t N_t(i) + R_t^K K_{t-1}(i)\big) - \frac{\phi_p}{2}\left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma} P_{t-1}(i)} - 1\right)^2 Y_t$$

where $P_t(i)$ denotes the price set by firm i, ϕ_p the Rotemberg (1982) price adjustment cost parameter, and γ the degree of indexation to past inflation.

Each intermediate firm chooses its price, capital and labor that maximizes its expected discounted stream of profits:

$$\max_{\{P_t(i),L(i)_t,K(i)_{t-1}\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \Lambda_t \left[\frac{P_t(i)}{P_t}Y_t(i) - \big(W_t N_t(i) + R_t^K K_{t-1}(i)\big) - \frac{\phi_p}{2}\left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma} P_{t-1}(i)} - 1\right)^2 Y_t\right]$$

subject to the demand schedule for its good:

$$Y_t(i) = \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t} Y_t$$

and the production technology:

$$Y_t(i) = A_t K_{t-1}(i)^{\alpha} N_t(i)^{1-\alpha}$$

where Λ_t is the stochastic discount factor.

Solving the intermediate good producer's problem[6] by choosing labor, capital and price, and having $\Lambda_t = \beta^t \frac{\lambda_t}{\lambda_0}$ we obtain the following optimality conditions:

Real Wage Condition

$$W_t = mc_t(i)\,(1-\alpha)\,A_t \left(\frac{K_{t-1}(i)}{N_t(i)}\right)^{\alpha} \tag{4}$$

Rental Rate of Capital

$$R_t^K = mc_t(i)\,A_t \left(\frac{N_t(i)}{K_{t-1}(i)}\right)^{1-\alpha} \tag{5}$$

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[6] The full intermediate good producer optimization problem and the Lagrangian setup can be found in the Appendix A.2.

New Keynesian Phillips Curve

$$\begin{aligned}&\Bigg[\left(\frac{(1-\varepsilon_t)Y_t}{P_t}\right)\left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t}-\phi_p\left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma}P_{t-1}(i)}-1\right)\left(\frac{Y_t}{\Pi_{t-1}^{\gamma}P_{t-1}(i)}\right)\\&\quad+\left(\frac{\varepsilon_t\, mc_t(i)\, Y_t}{P_t}\right)\left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t-1}\Bigg]\\&\quad+\beta\,\mathbb{E}_t\left[\frac{\lambda_{t+1}}{\lambda_t}\,\phi_p\,Y_{t+1}\left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma}P_t(i)}-1\right)\left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma}P_t(i)^2}\right)\right]=0\end{aligned} \tag{6}$$

where $\lambda_t = C_t^{-\sigma}$.

Rearranging and multiplying (6) by $\frac{P_t}{Y_y}$:

$$\begin{aligned}&\Bigg[(1-\varepsilon_t)\left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t}-\phi_p\left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma}P_{t-1}(i)}-1\right)\left(\frac{P_t}{\Pi_{t-1}^{\gamma}P_{t-1}(i)}\right)\\&\quad+\varepsilon_t\, mc_t(i)\left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t-1}\Bigg]\\&\quad+\beta\,\mathbb{E}_t\left[\frac{C_t^{\sigma}}{C_{t+1}^{\sigma}}\,\phi_p\left(\frac{Y_{t+1}}{Y_t}\right)P_t\left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma}P_t(i)}-1\right)\left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma}P_t(i)^2}\right)\right]=0\end{aligned} \tag{7}$$

Assuming a symmetric equilibrium, all intermediate firms make identical decisions, which results in $P_t(i) = P_t$, $K_{t-1}(i) = K_{t-1}$, $N_t(i) = N_t$, $Y_t(i) = Y_t$, and $mc_t(i) = mc_t$. Substituting these expressions back into equation (7) and rearranging, obtains the NKPC:

$$\left(\frac{\Pi_t}{\Pi_{t-1}^{\gamma}}\right)\left(\frac{\Pi_t}{\Pi_{t-1}^{\gamma}}-1\right)=\beta\,\mathbb{E}_t\left[\frac{C_t^{\sigma}}{C_{t+1}^{\sigma}}\,\frac{Y_{t+1}}{Y_t}\left(\frac{\Pi_{t+1}}{\Pi_t^{\gamma}}-1\right)\left(\frac{\Pi_{t+1}}{\Pi_t^{\gamma}}\right)\right]+\frac{\varepsilon_t}{\phi_p}\left(mc_t-\frac{\varepsilon_t-1}{\varepsilon_t}\right) \tag{8}$$

3.3 Central Bank

To close the model, the following specification of the monetary policy reaction function is included:

$$i_t = \rho_i\, i_{t-1} + (1-\rho_i)\left(\frac{1-\beta}{\beta} + \phi_{\Pi}\log(\Pi_t) + \phi_x x_t\right) + \eta_t^i \tag{9}$$

The term $(1-\rho_i)\frac{1-\beta}{\beta}$ ensures consistency with the steady-state nominal interest rate implied by the household's Euler equation. The parameter ρ_i captures interest rate smoothing, while ϕ_Π and ϕ_x govern the responses to inflation and the model-defined output gap[7], x_t, respectively. The output gap is defined as the growth rate of output, $x_t = \log\left(\frac{Y_t}{Y_{t-1}}\right)$. Finally, η_t^i is a mean-zero i.i.d. monetary policy shock.

3.4 Market Clearing

In the Rotemberg framework under a symmetric equilibrium, the aggregate output is satisfied by:

$$Y_t = A_t K_{t-1}^{\alpha} N_t^{1-\alpha} \tag{10}$$

and clearing in the goods market implies:

$$Y_t = C_t + I_t + \frac{\phi_p}{2}\left(\frac{\Pi_t}{\Pi_{t-1}^{\gamma}} - 1\right)^2 Y_t \tag{11}$$

with clearing in the bond market $B_t = 0$.

3.5 Equilibrium

The equilibrium of the model is characterized by the households' and firms' optimality conditions, the law of motion of capital, the economy's resource constraint, aggregate output, the monetary policy reaction function, alongside the exogenous shock processes as follows:

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[7] Hereafter, all references to the output gap pertain to this model-defined output gap.

$$C_t^{-\sigma} = \beta\,\mathbb{E}_t\left(C_{t+1}^{-\sigma}\,\frac{R_t}{\Pi_{t+1}}\right) \tag{12}$$

$$W_t = \theta\,N_t^{\varphi}\,C_t^{\sigma} \tag{13}$$

$$C_t^{-\sigma} = \beta\,\mathbb{E}_t\left[C_{t+1}^{-\sigma}(R_{t+1}^{k} + 1 - \delta)\right] \tag{14}$$

$$W_t = mc_t\,(1-\alpha)\,A_t\left(\frac{K_{t-1}(i)}{N_t(i)}\right)^{\alpha} \tag{15}$$

$$R_t^{K} = mc_t\,A_t\left(\frac{N_t(i)}{K_{t-1}(i)}\right)^{1-\alpha} \tag{16}$$

$$\left(\frac{\Pi_t}{\Pi_{t-1}^{\gamma}}\right)\left(\frac{\Pi_t}{\Pi_{t-1}^{\gamma}} - 1\right) = \beta\,\mathbb{E}_t\left[\frac{C_t^{\sigma}}{C_{t+1}^{\sigma}}\,\frac{Y_{t+1}}{Y_t}\left(\frac{\Pi_{t+1}}{\Pi_t^{\gamma}} - 1\right)\left(\frac{\Pi_{t+1}}{\Pi_t^{\gamma}}\right)\right] + \frac{\varepsilon_t}{\phi_p}\left(mc_t - \frac{\varepsilon_t - 1}{\varepsilon_t}\right) \tag{17}$$

$$Y_t = C_t + I_t + \frac{\phi_p}{2}\left(\frac{\Pi_t}{\Pi_{t-1}^{\gamma}} - 1\right)^2 Y_t \tag{18}$$

$$Y_t = A_t K_{t-1}^{\alpha} N_t^{1-\alpha} \tag{19}$$

$$K_t = (1-\delta)\,K_{t-1} + I_t \tag{20}$$

$$i_t = \rho_i\,i_{t-1} + (1-\rho_i)\left(\frac{1-\beta}{\beta} + \phi_{\Pi}\log(\Pi_t) + \phi_x x_t\right) + \eta_t^{i} \tag{21}$$

$$x_t = \log\left(\tfrac{Y_t}{Y_{t-1}}\right) \tag{22}$$

$$\log\varepsilon_t = (1-\rho_{\varepsilon})\,\log\varepsilon + \rho_{\varepsilon}\log\varepsilon_{t-1} + \eta_t^{\varepsilon} \tag{23}$$

$$\log A_t = \rho_a \log A_{t-1} + \eta_t^{a} \tag{24}$$

3.6 Regime Switching Extensions

The benchmark model described above features fixed policy parameters and constant shock volatilities. To capture the unorthodox conduct of monetary policy and the time-varying volatility observed in the Turkish economy, I augment the model by introducing regime switching in two dimensions: (i) in the coefficients of the central bank's monetary policy reaction function, and (ii) in the volatility of the cost-push shock. This allows the model to account for shifts in monetary policy conduct as well as changes in inflation volatility.

Monetary Policy States

The central bank's Taylor rule (equation 21) is augmented with state-dependent parameters:

$$i_t = \rho_i^{MP} i_{t-1} + (1-\rho_i^{MP})\left(\frac{1-\beta}{\beta} + \phi_{\Pi}^{MP}\log(\Pi_t) + \phi_x^{MP} x_t\right) + \eta_t^{i},$$

where $MP \in \{1, 2\}$ indicates the prevailing monetary policy regime, with $MP = 1$ and $MP = 2$ denoting the orthodox and unorthodox states, respectively. In the orthodox state, the Taylor principle holds with $\phi_{\Pi}^{(MP=1)} > 1$. In the unorthodox state, $\phi_{\Pi}^{(MP=2)}$ may fall below unity, reflecting the CBRT's conduct during 2021–2023.

The MP states evolves according to a Markov chain with transition probabilities:

$$P^{MP} = \begin{bmatrix} p_{11} & 1 - p_{11} \\ 1 - p_{22} & p_{22} \end{bmatrix}.$$

where p_{11} (p_{22}) measures the persistence of the orthodox (unorthodox) state.

Shock Volatility States

In addition to the switching in policy parameters, I allow the variance of the cost-push shock η_t^{ε} (in equation 23):

$$\eta_t^{\varepsilon} \overset{\text{i.i.d.}}{\sim} \mathcal{N}\big(0, \sigma_{\varepsilon}^{2,VOL}\big).$$

to vary across two states, where $VOL \in \{1, 2\}$ indicates the prevailing volatility state, with $VOL = 1$ and $VOL = 2$ denoting the low volatility and high volatility states, respectively.

The volatility regime evolves according to the following Markov chain with transition matrix:

$$P^{VOL} = \begin{bmatrix} q_{11} & 1 - q_{11} \\ 1 - q_{22} & q_{22} \end{bmatrix},$$

Similarly, q_{11} (q_{22}) denotes the probability of remaining in the low-volatility (high-volatility) state. This specification allows the model to capture episodes of heightened macroeconomic uncertainty as well as shifts in inflation dynamics over time.

Taken together, the two Markov chains imply four possible joint regimes. ***Regime 1*** corresponds to orthodox monetary policy combined with a low volatility environment, while ***Regime 2*** represents unorthodox monetary policy under low volatility. ***Regime 3*** captures orthodox policy with high volatility, and ***Regime 4*** reflects the combination of unorthodox policy and heightened volatility.

3.7 Model Variants for Estimation

Given the model framework outlined above, I select four versions of the model to continue with their estimation. I include the Benchmark model along with three regime-switching variants that differ only in which objects are allowed to switch; all other features are identical across specifications.

Benchmark Model The Benchmark model features fixed policy parameters and constant shock variances. It corresponds to the system of equations 12–24.

$\mathcal{M}_1$ This specification introduces regime switching in the policy coefficients only $\{\rho_i, \phi_\pi, \phi_x\}$, governed by the monetary-policy transition matrix P^{MP} defined above. Shock variances remain constant across both regimes.

$\mathcal{M}_2$ Building on $\mathcal{M}_1$, this model also allows the variance of the cost-push shock, η_t^ε, to switch across a low and a high-volatility state, with the volatility chain governed by P^{VOL}. Thus, both the policy coefficients $\{\rho_i, \phi_\pi, \phi_x\}$ and σ_ε^2 are regime switching.

$\mathcal{M}_3$ This specification is identical to $\mathcal{M}_2$ except that the output-gap coefficient is fixed across regimes.[8]

For ease of reference, I refer to these models as *Benchmark* and $\mathcal{M}_1$–$\mathcal{M}_3$ throughout. Estimation details, priors, data, and model comparison criteria are presented in Section 4.

4 Results

The model is solved and estimated via Bayesian methods, initially introduced by Schorfheide (2000) and popularized by Smets and Wouters (2003, 2007), by means of the RISE toolbox.[9] This section presents the dataset employed, the calibration of structural parameters, the specification of priors, the posterior estimates of the model parameters, smoothed state and regimes probabilities, impulse response functions (IRFs), as well as the historical decomposition of observed variables.

4.1 Data

For the estimation of the model, I use quarterly data spanning 2006Q1–2025Q1 on three macroeconomic indicators: (i) the price level, measured by the headline consumer price

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[8] Some literature highlights that particular specifications of DSGE models can suffer from weak identification in structural parameters, which may include Taylor rule parameters (see, e.g., Canova and Sala, 2009). To guard against this, I treat the output-gap coefficient as fixed across regimes to assess if reversing this restriction adds explanatory power.

[9] RISE is a MATLAB toolbox for solving and estimating MS-DSGE models. For such models, it is preferable to employ the perturbation strategy proposed by Maih and Waggoner (2018), which effectively accounts for the additional uncertainty from Markov processes. An complimentary solver, `dsge_schur`, relies on the generalized Schur decomposition and is adopted here in line with Chang et al. (2021). See `https://github.com/jmaih/RISE_toolbox`.

index, (ii) seasonally-adjusted real GDP (in levels), and (iii) a measure of the nominal interest rate. This period is chosen to capture the explicit adoption of the inflation-targeting regime in Türkiye in 2006 and to extend through the 2021–2023 episode of unorthodox policy, until present (Alp and Elekdağ, 2011; Yuksel, 2013). The first two data series are sourced from the IMF's International Financial Statistics database, however, obtaining a consistent series for the nominal interest rate is more challenging. This comes due to the CBRT shifting its main policy tool a few times since 2006.[10] For the purposes of this study, I use the Late Liquidity Window lending rate as the measure of the nominal interest rate, obtained from the CBRT's data portal.

As consistent with the literature, all observable variables have been demeaned by their sample means to avoid any mean mismatch. Additionally, the nominal interest rate is divided by four to be consistent with the model's frequency. Finally, both the CPI and real GDP enter the model in log difference form[11].

4.2 Calibrated Parameters

The calibration of model parameters follows values commonly employed in the DSGE literature, while ensuring that key steady-state ratios are satisfied. Table 1 includes said calibrated values, which are broadly consistent with existing studies on Türkiye, whilst closely following Alp and Elekdağ (2011); Cebi (2012); Yuksel (2013) and Demirok et al. (2023). The household discount factor, β, is set to imply an annual steady-state real interest rate of approximately four percent. The steady-state markup calibrated at $\mu = 1.15$ in the literature, which corresponds to an elasticity of substitution between intermediate goods of $\varepsilon \approx 7.7$. The depreciation rate of capital, $\delta = 0.035$, corresponds to an annual depreciation rate of approximately 14%. The capital share in production, $\alpha = 0.30$, reflects the widely accepted benchmark in the literature. The calibration also aimed to preserve the "great ratios" of the Turkish economy, such as the ratios of consumption and investment to output. All aforementioned studies adopt an open-economy framework for the Turkish Economy, where consumption is calibrated at around 70% of GDP and investment at roughly 20% of GDP, with the residual attributed to net exports. However, the closed-economy framework employed in this study changes these ratios, as consumption represents approximately 80% of output and investment remains close to 20%.

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[10] See Appendix B for a detailed discussion of the CBRT's policy rates.

[11] Refer to Appendix A.3 for the model's measurement equations.

Table 1: Calibrated Structural Parameters

Parameter	Symbol	Value
Household discount factor	β	0.99
Rotemberg price adjustment cost	ϕ_p	75
Depreciation rate	δ	0.035
Steady-state elasticity of substitution	ε	7.7
Labor disutility of work	θ	1
Share of capital in production function	α	0.30

4.3 Priors

Priors have been set to align with values commonly employed in the DSGE literature, while also incorporating prior distributions from studies on the Turkish economy. These are presented in Table 2.

Table 2: Prior Distributions of Structural Parameters

Parameter	Symbol	Density	Mean	Std. Dev.*
Structural Parameters				
Inflation Indexation	γ	Beta	0.70	0.10
Coeff. of Relative Risk Aversion	σ	Normal	3.00	0.75
Inverse Frisch Elasticity	φ	Normal	2.00	0.25
Markov Switching Taylor Rule Parameters				
Interest Rate Smoothing	$\rho_{i\,(MP=1=2)}$	Beta	0.50	0.20
Output Gap Response	$\phi_{x\,(MP=1=2)}$	Gamma	0.40	0.20
Inflation Response (Orthodox)	$\phi_{\Pi\,(MP=1)}$	Gamma	1.50	0.50
Inflation Response (Unorthodox)	$\phi_{\Pi\,(MP=2)}$	Normal	0.20	–
Shock Processes				
Technology Persistence	ρ_a	Beta	0.80	0.10
Cost-push Shock Persistence	ρ_ε	Beta	0.80	0.10
Std. Dev. MP Shock	σ_i	Inv. Gamma	0.04	3
Std. Dev. TFP Shock	σ_a	Inv. Gamma	0.08	3
Markov Switching Standard Deviation of Shocks				
Std. Dev. Cost-push Shock	$\sigma_{\varepsilon\,(VOL=1=2)}$	Inv. Gamma	0.40	3
Transition Probabilities				
Remain in Orthodox Regime	p_{11}	Beta	0.98	0.015
Remain in Unorthodox Regime	p_{22}	Beta	0.85	0.08
Remain in Low Volatility Regime	q_{11}	Beta	0.90	0.05
Remain in High Volatility Regime	q_{22}	Beta	0.90	0.05

*For Inverse Gamma priors, degrees of freedom are reported instead of standard deviation. Notation: $(MP=1)$ and $(MP=2)$ denote regime-specific priors, whereas $(MP=1=2)$ or $(VOL=1=2)$ denotes the same prior is imposed across regimes.

Persistence parameters and indexation are assigned Beta distributions, which are naturally bounded between zero and one. The prior mean for inflation indexation, γ, is set to 0.70 with a standard deviation of 0.10, consistent with the Cebi (2012); Demirok et al. (2023). Normal priors are used for the coefficient of relative risk aversion, σ, and the inverse Frisch elasticity, φ, with prior means of 3 and 2, respectively, following Fragetta and Kirsanova (2010); Cebi (2012).

The Taylor rule coefficient on inflation in the orthodox regime, $\phi_{\Pi}^{(MP=1)}$, is assigned a Gamma prior with mean 1.5 and standard deviation 0.5, following Lubik and Schorfheide (2007); Cebi (2012). By contrast, the inflation coefficient in the unorthodox regime, $\phi_{\Pi}^{(MP=2)}$, has a Normal prior with mean 0.20, which allows the central bank to respond weakly to inflation during the unorthodox period. Setting asymmetric priors on the central bank's response to inflation is consistent with Bianchi (2013); Chen et al. (2017), reflecting a prior belief that the response to inflation differs markedly across regimes. Furthermore, following Bianchi (2013), I impose the parameter restriction $\phi_{\Pi}^{(MP=1)} > \phi_{\Pi}^{(MP=2)}$. The priors for ϕ_x and ρ_i are specified symmetrically across both states, with ϕ_x following a Gamma prior (mean 0.40, standard deviation 0.20) and ρ_i a Beta prior (mean 0.50, standard deviation 0.20), in line with Cebi (2012).

The technology persistence, ρ_a, and cost-push shock persistence, ρ_ε, are both centered at 0.80, with Beta densities, reflecting the strong persistence typically found in said processes, in accordance with Alp and Elekdağ (2011); Yuksel (2013).

Shock standard deviations are given loose Inverse-Gamma priors, allowing the data to determine their magnitude following (Adolfson et al., 2007; Yuksel, 2013). The MP shock's standard deviation, σ_i, is centered at 0.04, while the TFP shock, σ_a, has mean of 0.08. The prior mean for the standard deviation of the cost-push shock, σ_ε, is set relatively higher at 0.40 in both the low and high volatility states, subject to the restriction $\sigma_\varepsilon^{(VOL=2)} > \sigma_\varepsilon^{(VOL=1)}$. The larger prior mean reflects the expectation that inflation dynamics in Türkiye are characterized by pronounced and time-varying volatility, consistent with Yuksel (2013); Isik et al. (2025), as the country's status as a small open economy has historically exposed it to large and frequent cost-push shocks.

Finally, the transition probabilities between regimes are modeled with Beta priors. The prior for remaining in the orthodox monetary policy regime, p_{11}, is centered at 0.98, implying high persistence. In contrast, the probability of remaining in the unorthodox regime, p_{22}, is set at 0.85. This asymmetry reflects the assumption that unorthodox episodes, though persistent, are less so than orthodox ones, facilitating reversion to the orthodox state. For the volatility chain, both the low and high volatility regimes are assigned prior means of 0.90 (q_{11} and q_{22}, respectively) following Chen et al. (2017).

4.4 Posterior Estimates

In this subsection, I present the posterior estimates of the four candidate models introduced in Section 3.7, which are reported in Table 3. The discussion focuses on both the individual parameter estimates and the relative empirical performance of the models in order to identify the specification that provides the best fit to the data.

It is important to note that comparisons with existing estimates for the Turkish economy should be treated with caution. No previous study covers the sample period under study here, nor do they incorporate the recent episode of high inflation. As a result, direct one-to-one comparisons may not always be valid, though they nonetheless provide a useful benchmark for interpreting the results.

Comparing the estimates across the four model variants serves as a robustness check. Thereby assessing whether the results remain stable when extending the benchmark specification to include regime switching in policy behavior and shock volatilities.

Structural parameters

The estimated degree of inflation indexation, γ, is stable across specifications, with values ranging from 0.282 in the benchmark to 0.304 in $\mathcal{M}_2$. This indicates a moderate degree of backward-looking price setting that does not appear sensitive to the inclusion of regime switching. These estimates are broadly in line with previous studies on the Turkish economy where Alp and Elekdağ (2011) and Yuksel (2013) report values of 0.46 and 0.30, respectively. The relatively low value of γ suggests that, even during the recent high-inflation period, inflation dynamics in Türkiye were shaped more by expectations than by indexation to past inflation. This suggests that the forward looking price setting behavior, combined with deteriorating inflation expectations and central bank credibility, amplified inflationary pressures rather than dampening it. Moreover, the posterior mean noticeably departs from its prior, indicating that the data was informative in shaping the posterior.

The coefficient of relative risk aversion, σ, varies across models. In the benchmark and $\mathcal{M}_1$, it is estimated above 3.5, while in $\mathcal{M}_2$ and $\mathcal{M}_3$ it falls closer to 3. This pattern may suggest that allowing for volatility regime switching reduces the role of preferences in capturing consumption dynamics. In terms of the intertemporal elasticity of substitution ($1/\sigma$), the estimates range from 0.29 to 0.33, implying that (i) households are generally risk averse, consistent with Ceritoğlu (2013), and (ii) households are reluctant to adjust consumption in response to interest rate changes, which weakens the effectiveness of the monetary policy transmission. The results for σ are broadly in line with Cebi (2012), who reports a value of 3.35 for Türkiye, and are also close to U.S. evidence, where Chen et al. (2017) report a value of 2.9.

The inverse Frisch elasticity, φ, is estimated to be between 2.770 and 3.037 across models, implying a Frisch elasticity of 0.33–0.36. This suggests that Turkish households weakly adjust labor supply to wage changes, consistent with a rigid labor market (Aldan and Yüncüler, 2016). These values are also close to the estimate of 3.54 reported by Bi et al. (2016) for Argentina, pointing to inelastic labor supply as a feature in emerging markets.

Taylor rule coefficients

The interest rate smoothing parameter in the orthodox regime is estimated between 0.56 and 0.60 in the regime-switching models, compared to 0.695 in the benchmark, suggesting a slightly less gradual adjustment of policy rates once regime switching is allowed. These values are consistent with previous estimates for Türkiye, where Yuksel (2013) reports 0.67 and Cebi (2012) 0.62, as well as with evidence from other economies, including Mexico (0.51), Brazil (0.46), and the United States (0.61) (Zamarripa, 2021; De Oliveira et al., 2024; Fragetta and Kirsanova, 2010). By contrast, the unorthodox regime features stronger interest rate smoothing, with posterior means ranging from 0.780 to 0.938, indicating a more inertial policy stance. This reflects the CBRT's tendency to rely heavily on past interest rates rather than actively adjusting to current inflationary pressures, an approach that is indicative of an ineffective monetary policy transmission mechanism, as evidenced by Arbatli and Moriyama (2011) in the case of Egypt. Such behavior is in line with the broader findings that less active regimes, feature relatively higher inertia, as shown in evidence on Brazil and the US (De Oliveira et al., 2024; Chen et al., 2017).

The output-gap response exhibits an interesting pattern across specifications. In the benchmark, ϕ_x is around 0.39. Allowing monetary policy coefficients to switch in $\mathcal{M}_1$ lowers the estimates, to 0.17 in the orthodox regime and 0.25 in the unorthodox regime, indicating a diminished role for output stabilization. With volatility regime switching in $\mathcal{M}_2$, the coefficients rise again to 0.38 and 0.43, respectively, close to benchmark values. The low estimates in $\mathcal{M}_1$ suggests that CBRT's responsiveness to output gap deviations was understated when volatility shifts were not accounted for. This becomes evident once volatility switching is incorporated, and thus the output-gap response returns close to its level in the benchmark model. In $\mathcal{M}_3$, where ϕ_x is fixed, the estimate remains near 0.39, consistent with the benchmark.These findings are broadly consistent with previous studies on Türkiye where Demirok et al. (2023) report values between 0.375 and 0.513, and Cebi (2012) obtains an estimate of 0.41. They are also in line with De Oliveira et al. (2024), who estimate values of 0.28–0.48

for Brazil, Ortiz et al. (2009), who report average coefficients of 0.34 on output across a sample of developing countries, as well as in Zamarripa (2021) who obtains 0.47 for Mexico.

Inflation responses are stable in the orthodox regime, estimated between 1.4 and 1.5 across all models, consistent with the Taylor principle and robust across specifications. These values are consistent with previous studies on Türkiye (Alp and Elekdağ, 2011; Yuksel, 2013; Demirok et al., 2023) and with the findings of Smets and Wouters (2003). They also align with evidence from other emerging economies, including Chile (Ortiz et al., 2009) and Egypt (Arbatli and Moriyama, 2011). By contrast, the unorthodox regime produces coefficients well below one, 0.114 in $\mathcal{M}_1$, 0.643 in $\mathcal{M}_2$, and 0.848 in $\mathcal{M}_3$, marking a clear departure from the Taylor principle and from orthodox monetary policy. The upward shifts in the estimates with volatility regime switching suggests that the richer specifications capture inflation dynamics more effectively, but the response remains too weak to qualify as orthodox, leaving the economy vulnerable to self-fulfilling inflationary cycles as expectations remain unanchored.

Structural shocks

Technology shocks are moderately persistent in the benchmark and $\mathcal{M}_1$ (0.79 and 0.70), and become more persistent in $\mathcal{M}_2$ and $\mathcal{M}_3$ (0.95 and 0.94). Cost-push shocks are also estimated to be highly persistent across all model variants, with values above 0.90, indicating that such shocks contribute to the persistence of inflation in Türkiye.

The standard deviation of the MP shock, σ_i, is estimated at 0.016 in the benchmark model. Once regime switching is introduced, the estimates become more consistent, and stabilizing around 0.008–0.01 in $\mathcal{M}_2$ and $\mathcal{M}_3$. These results are also inline with Alp and Elekdağ (2011). The volatility of technology shocks remains relatively stable across specifications, with posterior means ranging between 0.052 and 0.077, showing little sensitivity to the introduction of regime switching.

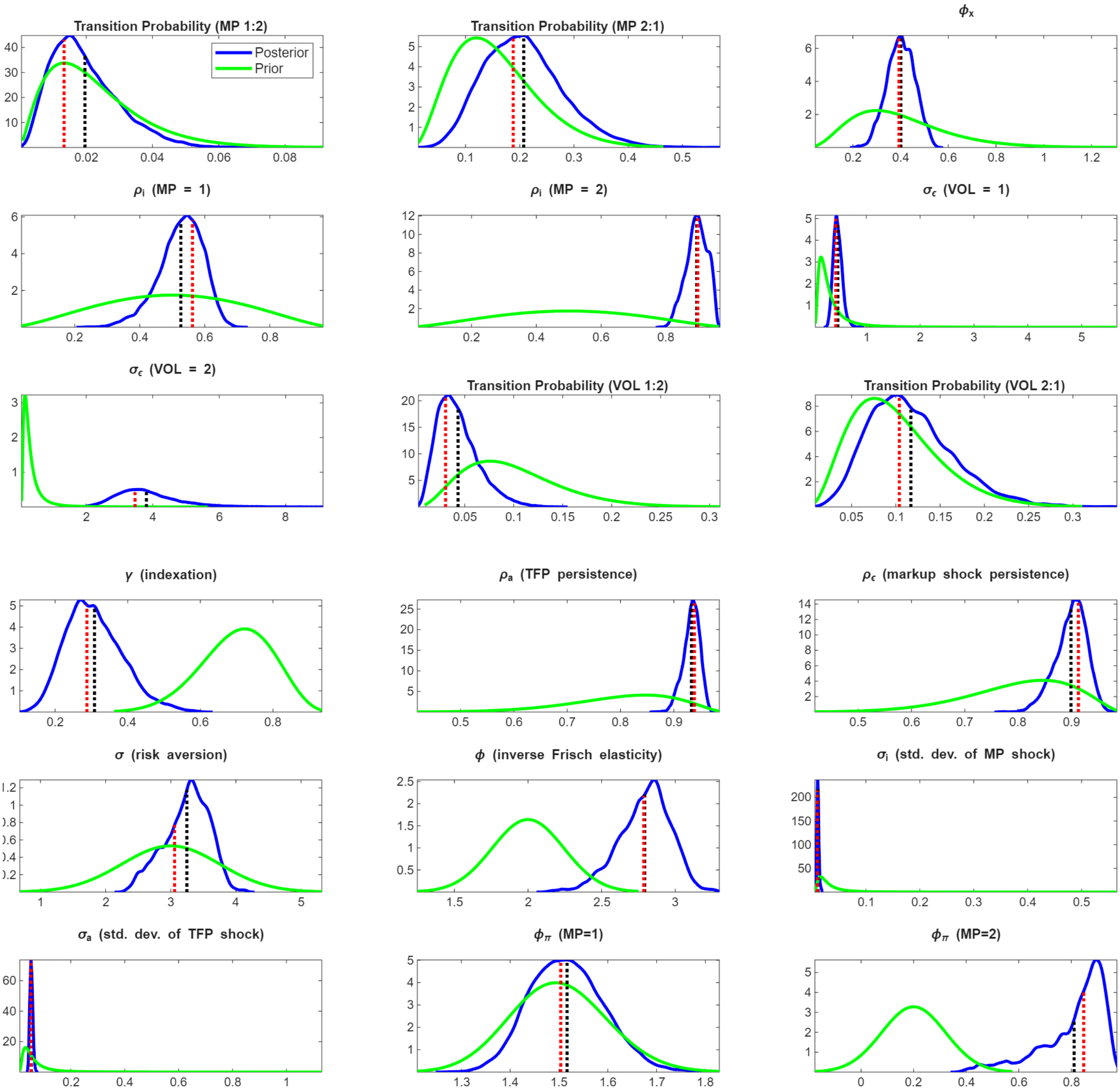
The most notable differences arise in the estimates of cost-push shock volatility. In the benchmark and in $\mathcal{M}1$, σ_ε is estimated between 0.42 and 0.56, with $\mathcal{M}_2$ and $\mathcal{M}_3$ delivering values in the same range for the low-volatility state. Once regime switching in volatility is introduced, however, the model identifies a second regime with posterior means above 3.4. The markedly higher estimate reflects the existence of two distinct volatility environments in Türkiye, consistent with the elevated inflation observed after 2021 compared to earlier periods in this study's sample.

Transition probabilities

The MP regimes are asymmetric in persistence. The orthodox regime is highly persistent, with p_{11} between 0.976 and 0.989 (implied expected durations of roughly 42–91 quarters), whereas the unorthodox regime is short-lived, with p_{22} between 0.818 and 0.864 (about 5.5–7.4 quarters). This asymmetry indicates that Turkish monetary policy is typically anchored in long orthodox spells, interrupted by comparatively brief unorthodox episodes.

Volatility regimes are also persistent, though less so than the MP regimes. In $\mathcal{M}_2$ and $\mathcal{M}_3$, the low-volatility state has q_{11} estimated at 0.955–0.970 ($\approx$22–33 quarters), while the high-volatility regime has q_{22} at 0.896–0.915 ($\approx$9.6–11.8 quarters). Thus, low volatility tends to prevail for multi-year periods, while high-volatility episodes are shorter-lived but still persistent, consistent with the phase of elevated inflation in recent years.

Figure 2: Prior and posterior marginal densities for the estimated parameters of $\mathcal{M}_3$.



Based on the log marginal data densities (log MDD) reported in Table 3, $\mathcal{M}_3$ provides the best empirical fit among the four candidate specifications, with a value of 501.5. To formalize this comparison, the log MDDs can be translated into Bayes factors, which provide a measure of the relative evidence in favor of one model over another (Kass and Raftery, 1995). According to the interpretive scale in Kass and Raftery (1995), the differences Log MDD reported and their equivalent in Bayes factor constitute *decisive evidence* in favor of $\mathcal{M}_3$ relative to the other specifications. Particularly, this is consistent with the plethora of studies that indicate the adding regime switches in parameters and/or shock variances enhances a model's fit and explanatory power (Bianchi, 2013; Chen et al., 2017; De Oliveira et al., 2024). The prior and posterior marginal densities for $\mathcal{M}_3$ are reported in Figure 2, which further illustrate the identification of the key structural and regime-switching parameters. Consequently, $\mathcal{M}_3$ is selected as the preferred model, and the subsequent analysis of impulse responses, historical decompositions, and counterfactuals is conducted using this specification.

Table 3: Posterior Estimates Across Models

Parameters	**Symbol**	**Benchmark**	$\mathcal{M}_1$	$\mathcal{M}_2$	$\mathcal{M}_3$
Structural parameters					
Inflation indexation	γ	0.282 [0.268, 0.296]	0.292 [0.265, 0.319]	0.304 [0.275, 0.333]	0.287 [0.233, 0.342]
Coeff. of rel. risk aversion	σ	3.510 [3.451, 3.568]	3.856 [3.681, 4.031]	2.922 [2.900, 2.943]	3.060 [2.973, 3.147]
Inverse Frisch elasticity	φ	2.957 [2.907, 3.006]	3.037 [2.952, 3.122]	2.770 [2.728, 2.812]	2.784 [2.739, 2.829]
Taylor Rule Coefficients					
Interest rate smoothing (orthodox)	$\rho_{i\,(mp=1)}$	0.695 [0.677, 0.714]	0.606 [0.583, 0.628]	0.569 [0.548, 0.590]	0.562 [0.516, 0.608]
Interest rate smoothing (unorthodox)	$\rho_{i\,(mp=2)}$	–	0.780 [0.747, 0.812]	0.938 [0.930, 0.946]	0.898 [0.880, 0.915]
Output gap response (orthodox)	$\phi_{x\,(mp=1)}$	0.397 [0.375, 0.419]	0.176 [0.141, 0.212]	0.380 [0.357, 0.403]	0.393 [0.369, 0.417]
Output gap response (unorthodox)	$\phi_{x\,(mp=2)}$	–	0.250 [0.204, 0.296]	0.436 [0.409, 0.464]	–
Inflation response (orthodox)	$\phi_{\Pi\,(mp=1)}$	1.445 [1.375, 1.514]	1.400 [1.367, 1.433]	1.496 [1.466, 1.527]	1.503 [1.441, 1.565]
Inflation response (unorthodox)	$\phi_{\Pi\,(mp=2)}$	–	0.114 [0.090, 0.138]	0.643 [0.617, 0.668]	0.848 [0.809, 0.887]
Shock processes (AR coefficients)					
Technology persistence	ρ_a	0.785 [0.754, 0.817]	0.695 [0.657, 0.732]	0.952 [0.941, 0.963]	0.939 [0.929, 0.949]
Cost-push persistence	ρ_ε	0.973 [0.951, 0.995]	0.934 [0.910, 0.957]	0.906 [0.890, 0.922]	0.913 [0.892, 0.934]
Shock standard deviations					
Std. dev. MP shock	σ_i	0.016 [0.013, 0.019]	0.0079 [0.0054, 0.0103]	0.0097 [0.0078, 0.0116]	0.0099 [0.0081, 0.0117]
Std. dev. TFP shock	σ_a	0.077 [0.064, 0.091]	0.077 [0.062, 0.092]	0.056 [0.047, 0.064]	0.052 [0.044, 0.060]
Std. dev. Cost-push shock (low-vol)	$\sigma_{\varepsilon\,(vol=1)}$	0.556 [0.453, 0.659]	0.556 [0.536, 0.576]	0.421 [0.390, 0.452]	0.432 [0.341, 0.523]
Std. dev. Cost-push shock (high-vol)	$\sigma_{\varepsilon\,(vol=2)}$	–	–	3.716 [3.527, 3.906]	3.472 [2.336, 4.608]
Transition probabilities (MP)					
Remain in orthodox regime	p_{11}	–	0.989 [0.972, 1.000]	0.976 [0.958, 0.994]	0.987 [0.972, 1.000]
Remain in unorthodox regime	p_{22}	–	0.864 [0.795, 0.933]	0.864 [0.821, 0.907]	0.818 [0.706, 0.931]
Transition probabilities (VOL)					
Remain in low-vol regime	q_{11}	–	–	0.955 [0.924, 0.986]	0.970 [0.944, 0.996]
Remain in high-vol regime	q_{22}	–	–	0.915 [0.885, 0.945]	0.896 [0.808, 0.984]
log Marginal Data Density		450.1	466.7	471.8	501.5

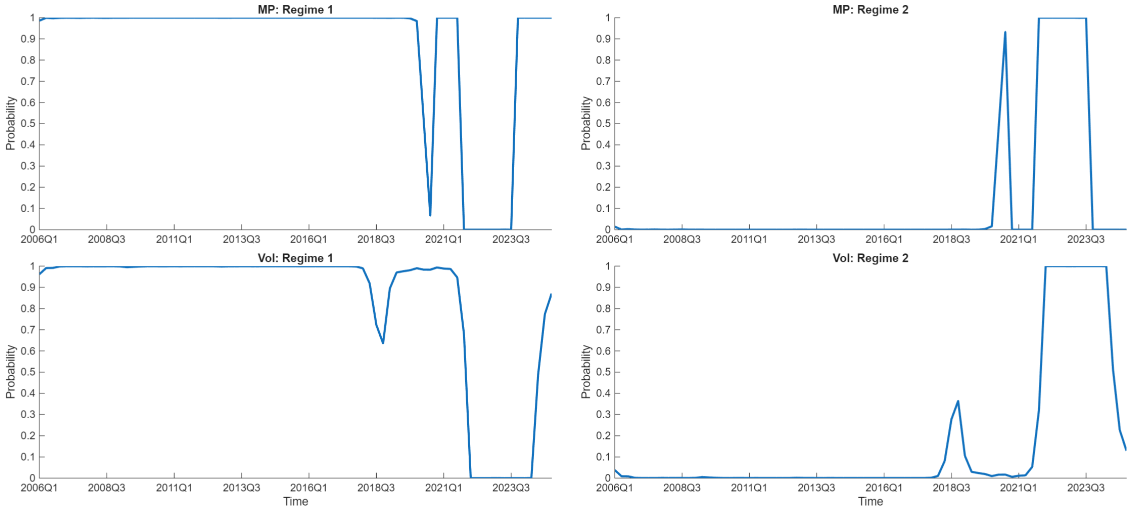
95% Confidence intervals are presented between square brackets.

These results are obtained through four parallel chains and 20,000 MCMC draws obtained via the Metropolis–Hastings algorithm. The acceptance rate is approximately 35 percent.

4.5 Smoothed State and Regime Probabilities

Figure 3 reports the smoothed state probabilities implied by the Bayesian estimation. The model identifies four states: an orthodox state ($MP = 1$), in which policy responds actively to inflation in line with the Taylor principle; an unorthodox state ($MP = 2$), in which the response to inflation is markedly weaker; a low volatility state ($VOL = 1$), where the volatility of the cost-push shock is muted; and a high volatility state ($VOL = 1$), where the economy is facing heightened cost push shocks.

Figure 3: Smoothed State Probabilities



The top panels of Figure 3 show that the orthodox regime is highly persistent, with probabilities equal to unity for nearly the entire sample period from 2006Q1 to 2021Q2. The only temporary departure occurred in the 2020Q2–2020Q3 window during COVID-19, which the model captures as a brief, incomplete departure from orthodoxy that quickly reverted to unity. This indicates that the CBRT's conduct during this period is best characterized by conventional policy practice. In contrast, from 2021Q2 onwards, the probability of the unorthodox state sharply increases to one. This state remains dominant until 2023Q2, approximately corresponding to Kavcıoğlu's tenure where the policy rate was cut in the face of rising inflation. The model correctly interprets this period as a distinct state, since the interest rate path diverged from conventional stabilization practices and instead accommodated inflationary pressures. By 2023Q3, the probability mass shifts back to the orthodox state, coinciding with the change in CBRT leadership and reversal towards more conventional policy setting.

The bottom panel of Figure 3 indicates that the model has clearly defined two volatility states for cost-push shocks. For the overwhelming majority of the sample, Türkiye is relatively classified in the low-volatility state. However, the probability of the high-volatility state briefly rises in 2018, aligning with the Turkish economic crisis, sharp currency depreciation, and associated cost-push inflation that followed. This episode quickly subsides, before a more persistent switch occurs in 2021Q4, when the probability of the high-volatility state reaches one. This high volatility state remains dominant through 2023Q2, reflecting the combined effect of the unconventional easing cycle and persistent inflation that followed. The reversion back to the low-volatility state after 2024Q2 coincides with the deceleration of inflation rates as well as the reversion to conventional monetary policy setting which preceded that. Appendix C.1 provides an overlay of inflation and the nominal interest rate with the smoothed state probabilities.

Figure 4 reports the smoothed probabilities of the four joint regimes previously described in subsection 3.6. The key result is that the model delivers a clean identification of the 2021Q2–2023Q2 turbulent period as Regime 4 (seen in the bottom right panel), where unorthodox monetary policy coincided with heightened volatility, which corresponds to the exact tenure of governor Kavcıoğlu.

Figure 4: Smoothed Joint Regime Probabilities[12]

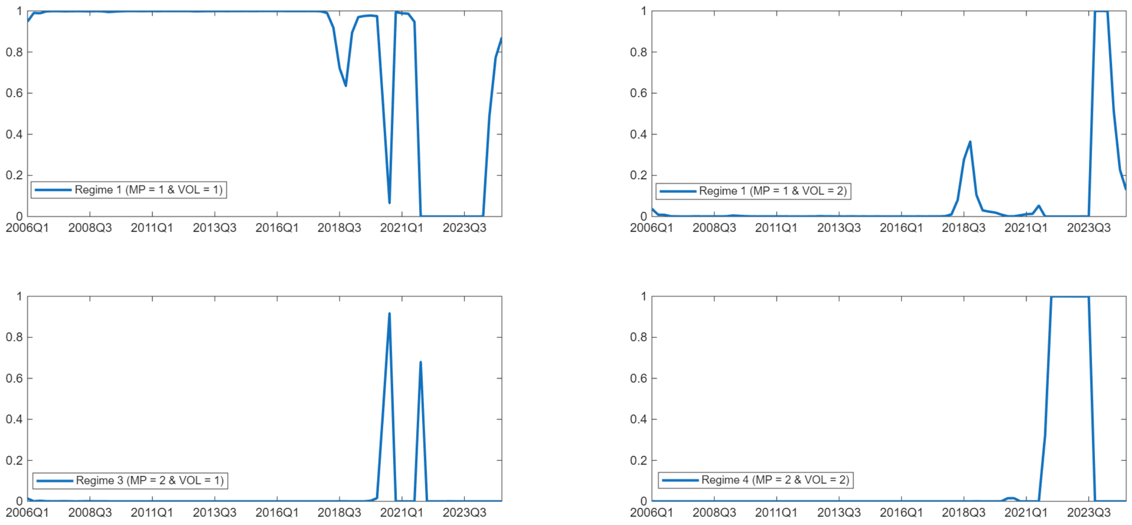


Figure 5 overlays the probability of Regime 4 with inflation and the interest rate. The figure makes clear that during 2021–2023 inflation surged to record highs while the CBRT simultaneously cut interest rates. The model assigns a probability of one during this period, offering a clear visual representation of how the model associates this episode with both unconventional policy and heightened inflation pressures.

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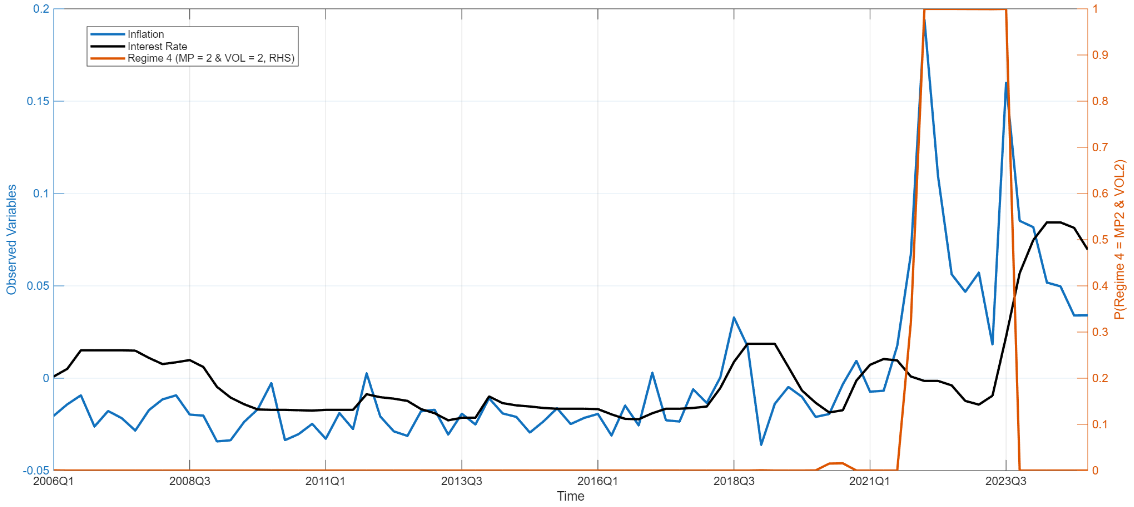
[12] MP = 1, MP = 2, VOL = 1, VOL = 2 denote orthodox policy, unorthodox policy, low volatility, and high volatility, respectively.

Figure 5: Observed Variables and Smoothed Probability of Regime 4



Overall, the regime-switching specification captures two structural features of the Turkish economy: the brief unorthodox policy state under Kavcıoğlu and the high inflation environment that followed.

4.6 Impulse Response Functions

This section reports impulse response functions (IRFs) under the regime-switching specification, contrasting the orthodox–low volatility regime (Regime 1) with the unorthodox–high volatility regime (Regime 4).

Figure 6 shows the responses to a contractionary MP shock, where responses of both Regimes are similar in pattern, albeit sharper in Regime 4. The shock raises the nominal interest rate, with the real interest rate increasing and remaining higher for longer under Regime 4 due to stronger interest-rate smoothing. The persistence of high real rates depresses consumption due to the substitution effect and decreases investment by raising the rental rate of capital, thereby reducing the capital stock sharply in Regime 4 compared to Regime 1. Output falls, due to the depressed demand in light of the real interest rate rising, with the decline more pronounced in Regime 4, due to the fall in labor input and capital. The sharper fall in output under Regime 4 initially drives a larger negative output gap, compared to Regime 1, which leads to a temporary fall in the policy rate. In the subsequent period, however, the output gap turns strongly positive, and through the Taylor rule this reversal triggers a sharp increase in the nominal interest rate, thereby reinforcing the policy tightening. Importantly, since the estimated variance of the cost-push shock is substantially higher in Regime 4, the responses generated through the NKPC are amplified and, in turn, propagate sharper adjustments across the entire economy. The sharper and more persistent decline in consumption and capital illustrate how the unorthodox regime transmits adverse effects to the real economy.

Figure 6: Impulse Responses to a Monetary Policy Shock

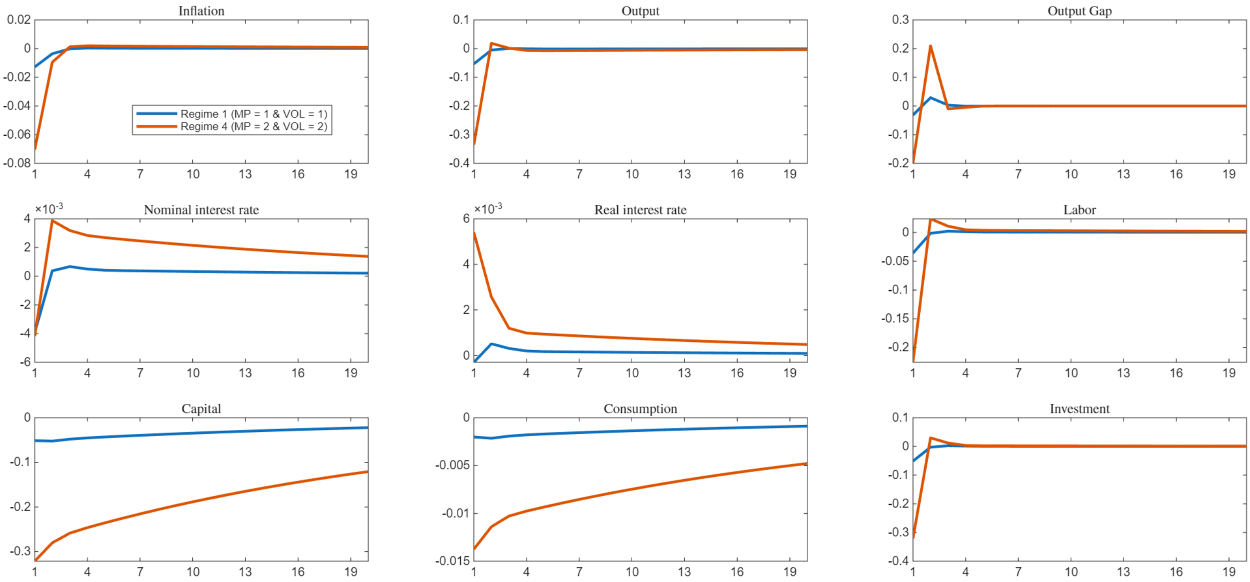
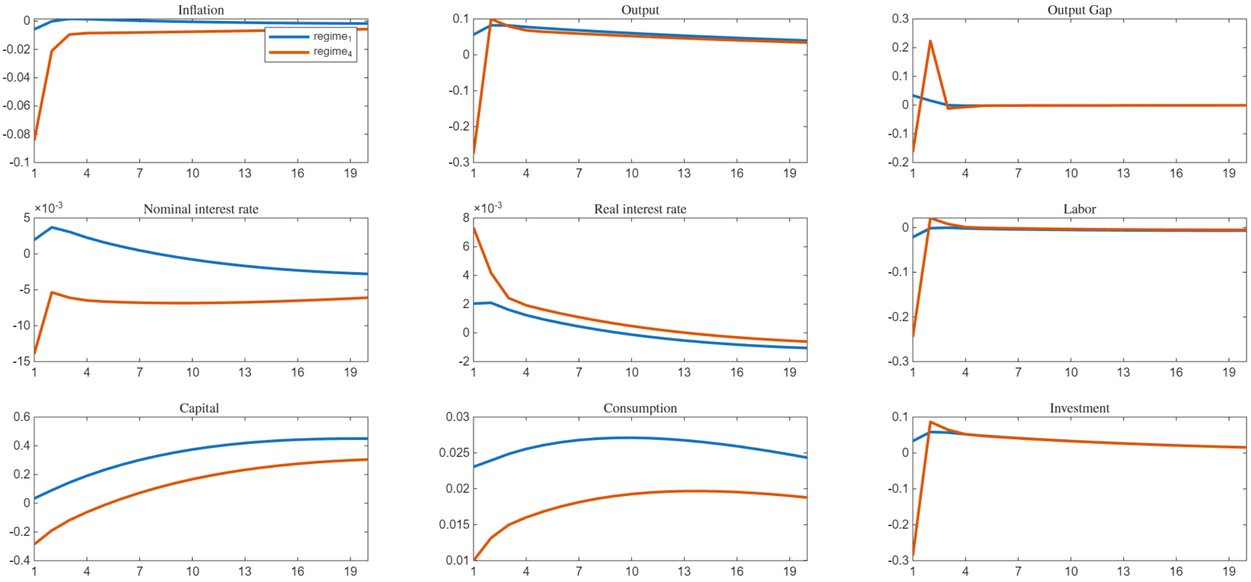


Figure 7 presents the responses to a positive TFP shock. Higher productivity raises output, supported by increases in both consumption and investment, with the latter gradually expanding the capital stock. Labor input falls, however, as efficiency gains reduce the need for workers and households substitute towards leisure. The improvement in productivity lowers marginal costs, generating disinflation. The Central Bank response differs across regimes: in Regime 1, the nominal interest rate rises slightly on impact (as the positive output gap partially offsets the disinflationary pressure) before gradually declining as inflation remains subdued and slightly negative. By contrast, Regime 4, weaker inflation feedback allows disinflation to persist, and stronger interest-rate smoothing prolongs the adjustment, so the nominal policy rate falls into negative territory and remains below steady state for an extended period. In addition, the higher estimated variance of the cost-push shock in Regime 4 magnifies amplifies the effects in the economy, reinforcing the sharper and more persistent adjustments observed under Regime 4. This divergence illustrates how the different regimes differ in the propagation of technology shocks, with gains in output, consumption and investment muted under the unorthodox regime.

Figure 7: Impulse Responses to a TFP Shock

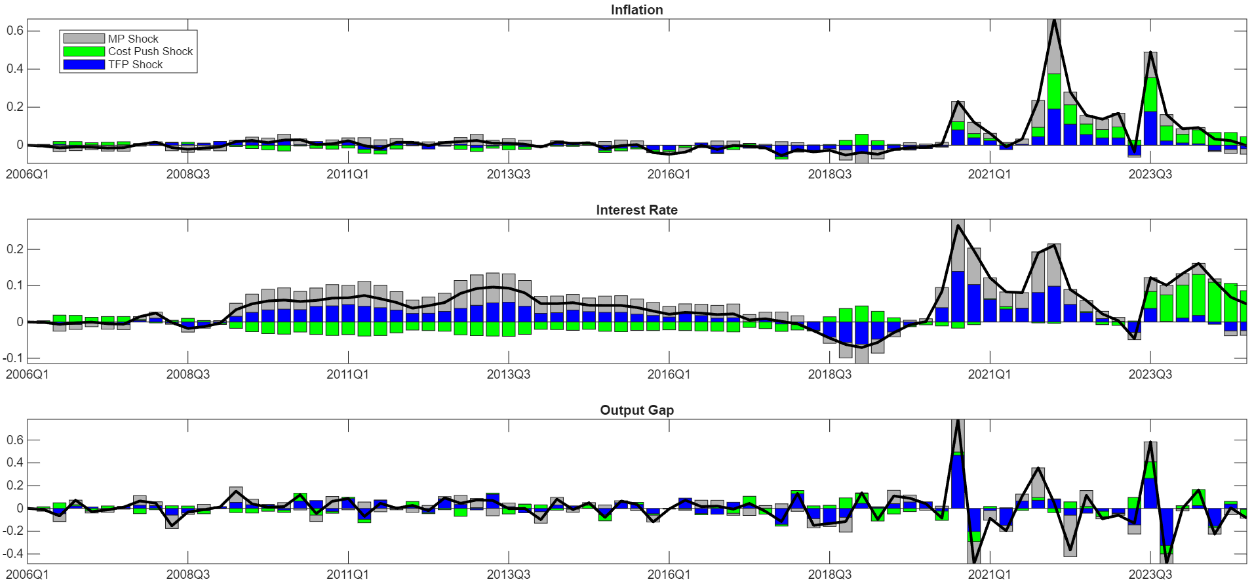


For completeness, I also consider the responses to a markup shock. While Regime 1 generates the expected rise in inflation, whereas Regime 4 is not able to produce this pattern, with inflation falling following a markup shock. Since the focus of this dissertation is quantifying welfare effects, I do not emphasize these results. Nevertheless, the full set of IRFs are reported in Appendix C.2, with further discussion of this issue provided in Section 6

4.7 Historical Decomposition

The historical decompositions of inflation, the policy interest rate, and the output gap into their structural shock components are shown in Figure 8. These decompositions illustrate the contributions of each shock to the movements in the observed variables, and in turn allows for linking them to the different regimes identified in Figure 4.

Figure 8: Historical Decomposition of Inflation, Interest Rate, and Output Gap[13]



The structural shocks are: (i) monetary policy shocks, representing unexpected deviations from the systematic component of the central bank's reaction function; (ii) cost-push shocks, capturing unexpected fluctuations in inflation not driven by demand or productivity (e.g., exchange rate pass-through, supply chain disruptions, etc.); and (iii) technology (TFP) shocks, representing innovations to productivity that change the economy's productive capacity.

Inflation's historical decomposition indicates that the sharp increase in 2021–2023 was primarily driven by the combined effects of monetary policy and cost-push shocks, consistent with the environment captured by Regime 4. The large positive contributions of MP shocks correspond to the unorthodox easing cycle, which, along with elevated cost-push shocks, compounded inflationary pressures. This suggests that the easing cycle itself acted as an inflationary force, actively exacerbating price pressures rather than containing them.

It is important to interpret the historical decomposition of the interest rate in light of the estimated regime-switching monetary reaction function. During the 2021–2023 period, the model assigns almost 100% probability to Regime 4 as per Figure 4, in which the estimated parameters are $\phi_\pi \approx 0.85 < 1$, $\phi_x \approx 0.4$, and $\rho_i \approx 0.9$. These values imply a passive and highly inertial policy rule that accommodates inflation rather than stabilizing it. In light of the aforementioned, the decomposition identifies sizeable *positive MP shocks*. By construction, these represent upward deviations relative to what the systematic component of the reaction function dictated at the time. In other words, in absence of these shocks, the policy rate would have been even *lower*.

---

[13] The figure abstracts from initial values. The complete set of historical decompositions is reported in Appendix C.3.

This interpretation highlights that the systematic component of policy itself implied rate cuts in the face of rising inflation, underscoring the unorthodox conduct of monetary policy during this period.[14]

5 Counterfactual Analysis

The historical decompositions in Section 4.7 demonstrated that monetary policy shocks were systematically inflationary during the unorthodox regime (2021—2023). To assess the macroeconomic cost of this policy shift, I construct a counterfactual scenario in which monetary policy shocks are removed during the unorthodox window only.

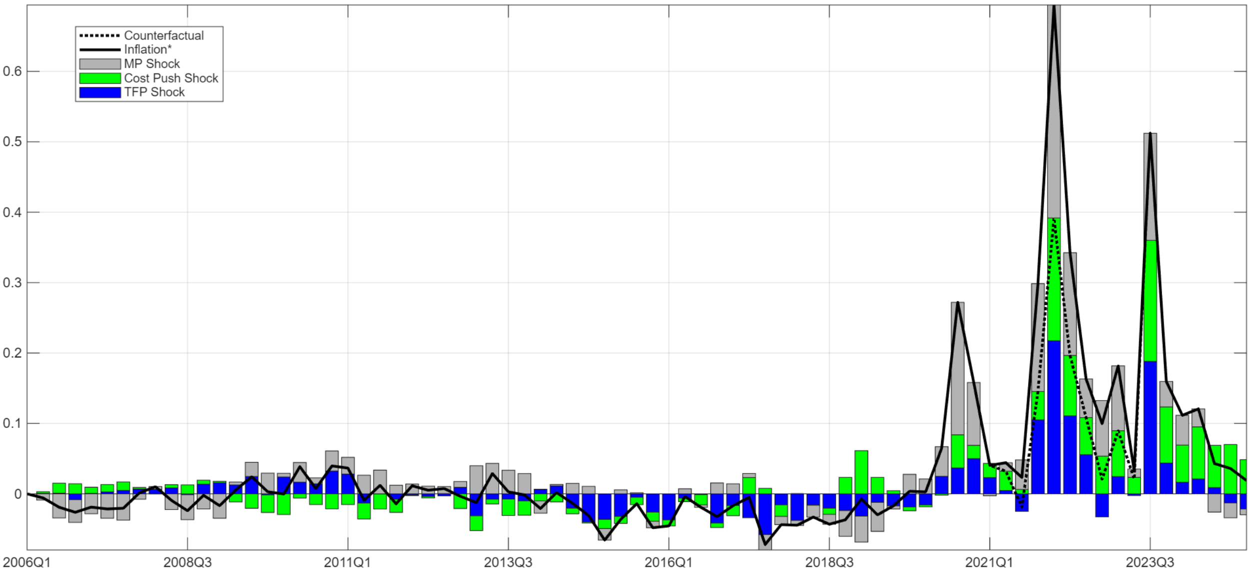
The counterfactual is built directly from the historical decomposition results. Specifically, I remove the contribution of monetary policy shocks from inflation and the output gap historical decompositions during the unorthodox regime, while leaving the rest of the sample unchanged. This provides alternative series that show how these variables would have evolved had such shocks not occurred.

Figure 9a plots inflation (solid line) against the counterfactual path with monetary policy shocks removed during 2021–2023 (dashed line). The results show that inflation would have risen far less sharply in absence of the MP shocks, *ceteris paribus*, highlighting their inflationary role during this period. Figure 9b presents the corresponding exercise for the output gap.

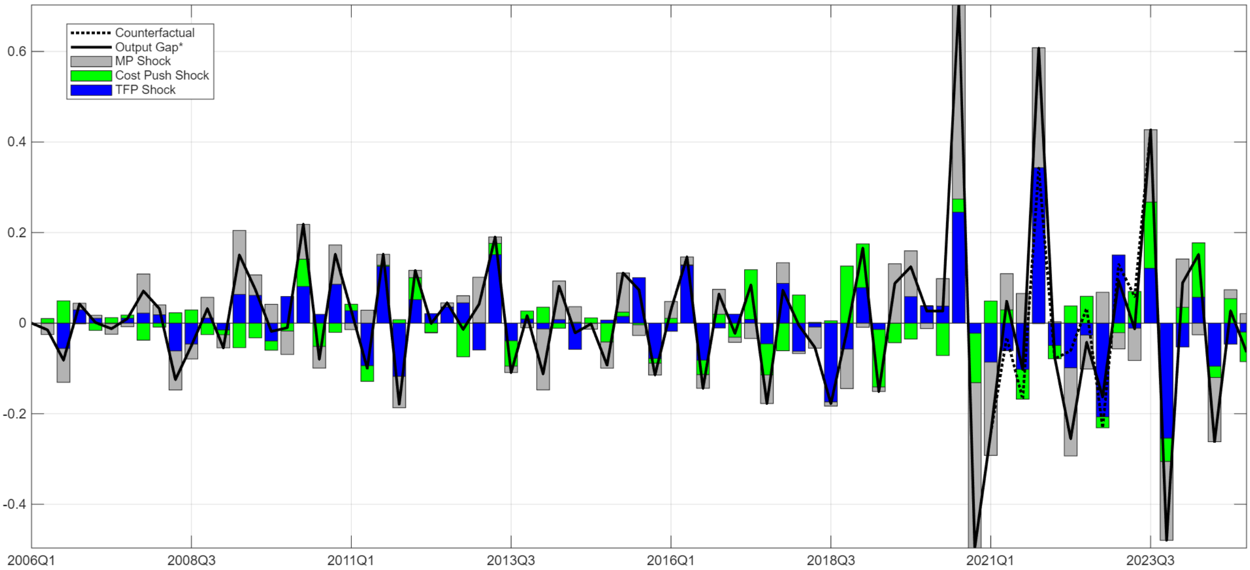
---

[14] Since the model assigns nearly 100% probability to Regime 4 (i.e. MP = 2 and VOL = 2) during the $2021 - 2023$ episode, the decomposition is evaluated under the parameterization of said regime (Maih, 2025b). The positive MP shocks should therefore be read not as evidence of actual tightening, but as deviations from an already unorthodox and inflation-accommodating Taylor rule.

Figure 9: Counterfactual simulations of inflation and output gap (excluding MP shocks in 2021Q2–2023Q2).[15]



(a) Inflation: Actual vs. Counterfactual



(b) Output gap: Actual vs. Counterfactual

To quantify the repercussions of the unorthodox MP conduct, I use the standard quadratic loss function from Clarida et al. (1999):

$$\widehat{\mathcal{L}} = \sum_{t=0}^{T} \beta^t \left(\Pi_t^2 + \lambda x_t^2 \right)$$

---

[15] The series marked with an asterisk (*) is not the observed inflation nor output gap, as the graphs abstract from initial conditions. For the corresponding version with initial conditions, see Appendix C.4.

where Π_t is inflation, x_t is the output gap, and λ is the central bank's relative weight on output stabilization. I evaluate use the function to measure loss over both the full sample and the unorthodox window (2021Q2–2023Q2) against different values for λ.

Table 4: Welfare losses with and without MP shocks

	Full sample $\widehat{\mathcal{L}}$		**Unorthodox window $\widehat{\mathcal{L}}$**		**Relative welfare gain in 2021–2023 (%)**
λ	Baseline	Counterfactual	Baseline	Counterfactual	
0.10	0.8	0.4	1.1	0.4	177.8
0.25	0.99	0.6	1.2	0.4	172.2
0.50	1.3	0.9	1.3	0.5	164.9
0.75	1.7	1.2	1.5	0.6	159.5
1.00	2.0	1.5	1.6	0.6	155.4

The results in Table 4 show that welfare losses are consistently lower in the counterfactual scenario, across all values for λ, with relative welfare gains in the unorthodox window ranging from 155% to 177.8%. This serves as a quantitative measure of the sizeable welfare cost that the unorthodox conduct of monetary policy had on the Turkish economy.

6 Limitations and Future Research

This work includes some limitations that motivate extensions for future research. The first concerns the treatment of cost-push shocks, or shocks in the firms' markup. While the model includes a switching-regime chain for the volatility of the cost-push shock and has correctly identified the timings via the smoothed state and regime probabilities figures, it was not able to produce the canonical transmission of such shocks in Regime 4, particularly with respect to inflation. This might suggest a missing feature in the specification of the price-setting block or in its interaction with the monetary policy reaction function. To this point, future work can include enriching the nominal and real rigidities in this setup, or by reconsidering the priors that govern related parameters in the model.

Second, while the Turkish economy is usually studied in an open-economy setup, this work adopts a closed-economy one. The absence of the exchange rate and trade channels, which play a central role in shaping macroeconomic dynamics in Türkiye, is a noteworthy limitation. Extending the framework to an open-economy setting would provide a richer representation of Türkiye's macroeconomy and allow for a comprehensive assessment of the CBRT's monetary policy stance.

Third, this setup abstracts from including a government sector. Given that Fiscal policy plays an active and influential role in Türkiye's economy, incorporating a fiscal block would add an important dimension; particularly by expanding the scope of the model to asses monetary-fiscal policy interactions alongside the current regime switching.

Finally, the historical decompositions presented in Figure 15 highlight an additional challenge, namely the persistence of initial conditions. While this might suggest model misspecification, it is important to note that exact historical decompositions do not exist for nonlinear models (Maih, 2025a). Since MS-DSGE models are nonlinear by nature, the decompositions reported in Figure 15 should be viewed as approximations. As clarified by Maih (2025a), in nonlinear MS-DSGE models each regime switch introduces new initial conditions that continue to influence dynamics in the model moving forward. This mechanism explains why the gray bars remain visible throughout the sample, rather than gradually disappearing as in non-switching DSGEs. That being said, the persistence of the gray bars may also indicate that additional structural shocks could be considered in future research to better account for fluctuations in observable variables.

7 Conclusion

This paper estimates a MS-DSGE for the Republic of Türkiye over the period 2006Q1–2025Q1 to study the welfare cost of unorthodox monetary policy conduct during 2021 – 2023. Four candidate models are estimated, each allowing regime switching through two Markov chains: one governing the Taylor rule coefficients and the other the volatility of cost-push shocks. Results show that the specification with regime switching in the Taylor rule's response to inflation and interest rate smoothing, together with volatility in cost-push shocks, provides the best empirical fit. This model is then used to conduct the counterfactual experiment, in which a standard central bank loss function was used to quantify the welfare losses encountered. The study estimates welfare gains of approximately 155 – 177% had the CBRT refrained from pursuing unorthodox monetary policy.

Nevertheless, the limitations of this work underscore the scope for further development. Future work could build on the present framework by refining the treatment of markup shocks, extending the model to an open-economy setting, incorporating a fiscal block, and introducing additional structural shocks to improve empirical performance.

Finally, this dissertation contributes to the limited literature on regime-switching DSGE models in emerging market economies. By modeling shifts in both policy conduct and shock volatilities, it demonstrates the ability of MS-DSGEs to capture the nonlinearities frequently faced by and that characterize emerging markets, given their size and openness. At the same time, the results underscore the importance of central bank independence and highlight the need for data-driven, evidence-based, methodical responses to macroeconomic disturbances, rather than the pursuit of populist policies.

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A Technical Appendix

A.1 Household Optimization Problem

Objective

The representative household chooses $\{C_t, N_t, K_t, B_t\}_{t=0}^{\infty}$ to maximize expected lifetime utility:

$$\max_{\{C_t,N_t,K_t,B_t\}} \quad \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \theta_t \frac{N_t^{1+\varphi}}{1+\varphi} \right)$$

Budget Constraint

$$C_t + K_t + B_t = W_t N_t + (R_t^k + 1 - \delta) K_{t-1} + \frac{R_{t-1}}{\Pi_t} B_{t-1} + T_t$$

Setting up the Lagrangian

$$\begin{aligned}\mathcal{L} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \Bigg\{ & \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \theta \frac{N_t^{1+\varphi}}{1+\varphi} \right) \\ & + \lambda_t \left[W_t N_t + (R_t^k + 1 - \delta) K_{t-1} + \frac{R_{t-1}}{\Pi_t} B_{t-1} + T_t - C_t - K_t - B_t \right] \Bigg\}\end{aligned} \tag{25}$$

First-Order Conditions:

$$\frac{\partial \mathcal{L}}{\partial C_t} = C_t^{-\sigma} - \lambda_t = 0 \quad \Rightarrow \quad \lambda_t = C_t^{-\sigma} \tag{26}$$

$$\frac{\partial \mathcal{L}}{\partial N_t} = -\theta N_t^{\varphi} + \lambda_t W_t = 0 \quad \Rightarrow \quad \lambda_t W_t = \theta N_t^{\varphi} \tag{27}$$

$$\frac{\partial \mathcal{L}}{\partial K_t} = -\lambda_t + \beta \mathbb{E}_t \left[\lambda_{t+1} (R_{t+1}^k + 1 - \delta) \right] = 0 \quad \Rightarrow \quad \lambda_t = \beta \mathbb{E}_t \left[\lambda_{t+1} (R_{t+1}^k + 1 - \delta) \right] \tag{28}$$

$$\frac{\partial \mathcal{L}}{\partial B_t} = -\lambda_t + \beta \mathbb{E}_t \left[\lambda_{t+1} \frac{R_t}{\Pi_{t+1}} \right] = 0 \quad \Rightarrow \quad \lambda_t = \beta \mathbb{E}_t \left[\lambda_{t+1} \frac{R_t}{\Pi_{t+1}} \right] \tag{29}$$

Combining equations (26) and (29), with the use of the envelope theorem, we obtain the **Euler Equation for Bonds**:

$$C_t^{-\sigma} = \beta \, \mathbb{E}_t \left[C_{t+1}^{-\sigma} \frac{R_t}{\Pi_{t+1}} \right] \tag{30}$$

Combining equations (26) and (27), we get the **Labor Supply Schedule**:

$$W_t = \theta N_t^{\varphi} C_t^{\sigma} \tag{31}$$

Combining equations (26) and (28), we obtain the **Euler Equation for Capital**:

$$C_t^{-\sigma} = \beta\, \mathbb{E}_t \left[C_{t+1}^{-\sigma} (R_{t+1}^k + 1 - \delta) \right] \tag{32}$$

A.2 Intermediate Firms Optimization Problem

Objective

Each intermediate firm chooses $P_t(i)$, $N_t(i)$, and $K_{t-1}(i)$ to maximize expected discounted real profits:

$$\max_{\{P_t(i), N_t(i), K_{t-1}(i)\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \Lambda_t \left[\frac{P_t(i)}{P_t} Y_t(i) - \big(W_t N_t(i) + R_t^K K_{t-1}(i)\big) - \frac{\phi_p}{2} \left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma} P_{t-1}(i)} - 1 \right)^2 Y_t \right]$$

Budget Constraints

$$Y_t(i) = \left(\frac{P_t(i)}{P_t} \right)^{-\varepsilon_t} Y_t \tag{i}$$

$$Y_t(i) = A_t K_{t-1}(i)^{\alpha} N_t(i)^{1-\alpha} \tag{ii}$$

Setting up the Lagrangian

Substituting (ii) into (i), the Lagrangian becomes:

$$\begin{aligned} \mathcal{L} = \mathbb{E}_0 \sum_{t=0}^{\infty} \Lambda_t \Bigg\{ & \left(\frac{P_t(i)}{P_t} \right)^{1-\varepsilon_t} Y_t - \big(W_t N_t(i) + R_t^K K_{t-1}(i) \big) \\ & - \frac{\phi_p}{2} \left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma} P_{t-1}(i)} - 1 \right)^2 Y_t \\ & + mc_t(i) \left[A_t K_{t-1}(i)^{\alpha} L_t(i)^{1-\alpha} - \left(\frac{P_t(i)}{P_t} \right)^{-\varepsilon_t} Y_t \right] \Bigg\} \end{aligned}$$

where $\Lambda_t = \beta^t \cdot \frac{\lambda_t}{\lambda_0}$.

First-Order Conditions

$$
\begin{aligned}
\frac{\partial \mathcal{L}}{\partial N_t(i)} &= \Lambda_t \left(-W_t + mc_t(i) A_t (1-\alpha) K_{t-1}(i)^{\alpha} N_t(i)^{-\alpha}\right) = 0 \\
&\Rightarrow \quad W_t = mc_t(i)(1-\alpha) A_t \left(\frac{K_{t-1}(i)}{N_t(i)}\right)^{\alpha} \qquad (33) \\
\frac{\partial \mathcal{L}}{\partial K_{t-1}(i)} &= \Lambda_t \left(-R_t^K + mc_t(i) \cdot A_t \cdot \alpha \cdot K_{t-1}(i)^{\alpha-1} \cdot N_t(i)^{1-\alpha}\right) = 0 \\
&\Rightarrow \quad R_t^K = mc_t(i) \cdot A_t \cdot \alpha \cdot \left(\frac{N_t(i)}{K_{t-1}(i)}\right)^{1-\alpha} \qquad (34) \\
\frac{\partial \mathcal{L}}{\partial P_t(i)} &= \Lambda_t \Bigg[\left(\frac{(1-\varepsilon_t) Y_t}{P_t}\right) \cdot \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t} - \phi_p \left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma} P_{t-1}(i)} - 1\right) \cdot \left(\frac{Y_t}{\Pi_{t-1}^{\gamma} P_{t-1}(i)}\right) \\
&\quad + \left(\frac{\varepsilon_t mc_t(i) Y_t}{P_t}\right) \cdot \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t - 1} \Bigg] \\
&\quad + \mathbb{E}_t \left[\Lambda_{t+1} \cdot \phi_p \cdot Y_{t+1} \left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma} P_t(i)} - 1\right) \cdot \left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma} P_t(i)^2}\right) \right] = 0 \qquad (35)
\end{aligned}
$$

Rearranging and multiplying equation (35) by $\frac{P_t}{Y_y}$:

$$
\begin{aligned}
\frac{\partial \mathcal{L}}{\partial P_t(i)} &= \Bigg[\left(\frac{(1-\varepsilon_t) Y_t}{P_t}\right) \cdot \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t} - \phi_p \left(\frac{P_t(i)}{\Pi_{t-1}^{\gamma} P_{t-1}(i)} - 1\right) \cdot \left(\frac{Y_t}{\Pi_{t-1}^{\gamma} P_{t-1}(i)}\right) \\
&\quad + \left(\frac{\varepsilon_t \, mc_t(i) \, Y_t}{P_t}\right) \cdot \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t - 1} \Bigg] \\
&\quad + \beta \, \mathbb{E}_t \left[\frac{\lambda_{t+1}}{\lambda_t} \cdot \phi_p \cdot Y_{t+1} \left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma} P_t(i)} - 1\right) \cdot \left(\frac{P_{t+1}(i)}{\Pi_t^{\gamma} P_t(i)^2}\right) \right] = 0 \qquad (36)
\end{aligned}
$$

A.3 Measurement Equations

The following measurement equations link the model's theoretical variables to the observed data series used in the estimation:

$$y_t^{obs} = \log\left(\frac{Y_t}{Y_{t-1}}\right), \tag{37}$$

$$r_t^{obs} = \log(R_t), \tag{38}$$

$$\pi_t^{obs} = \log(\Pi_t). \tag{39}$$

Where y_t^{obs} denotes observed demeaned output growth, r_t^{obs} represents the observed demeaned nominal interest rate, and π_t^{obs} corresponds to observed demeaned inflation. Demeaning ensures that the observables are centered around zero before estimation.

It is important to note that the number of structural shocks in the model matches the number of observables thereby avoiding stochastic singularity.

B CBRT's Policy Rate

From 2006 to 2010, the CBRT operated under a corridor regime, adjusting overnight borrowing and lending rates, with the one-week repo rate secondary. In May 2010, the one-week repo rate became the *de jure* policy rate, but the CBRT still mainly conducted policy through the corridor system. From early 2017 to May 2018, the Bank discontinued repo funding, and forced banks to use the Late Liquidity Window (LLW) facility, making the LLW the *de facto* policy rate (IMF, 2018). Since June 2018, the system was simplified, consolidating the one-week repo rate as the sole policy tool, and set the overnight and LLW rates strictly relative to it (CBRT, 2018).

For the purposes of this study, I use the LLW lending rate as the measure of the nominal interest rate. After examining its correlation with alternative CBRT rates, I find that the LLW provides the most consistent representation of overall interest rate movements across the sample period.

C Figures

C.1 Smoothed State Probabilities

This appendix shows the smoothed state probabilities against inflation and the interest rate.[16]

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[16] For reference: MP = 1 denotes orthodox policy, MP = 2 denotes unorthodox policy, VOL = 1 denotes low volatility, and VOL = 2 denotes high volatility.

Figure 10: Inflation against Smoothed State Probabilities

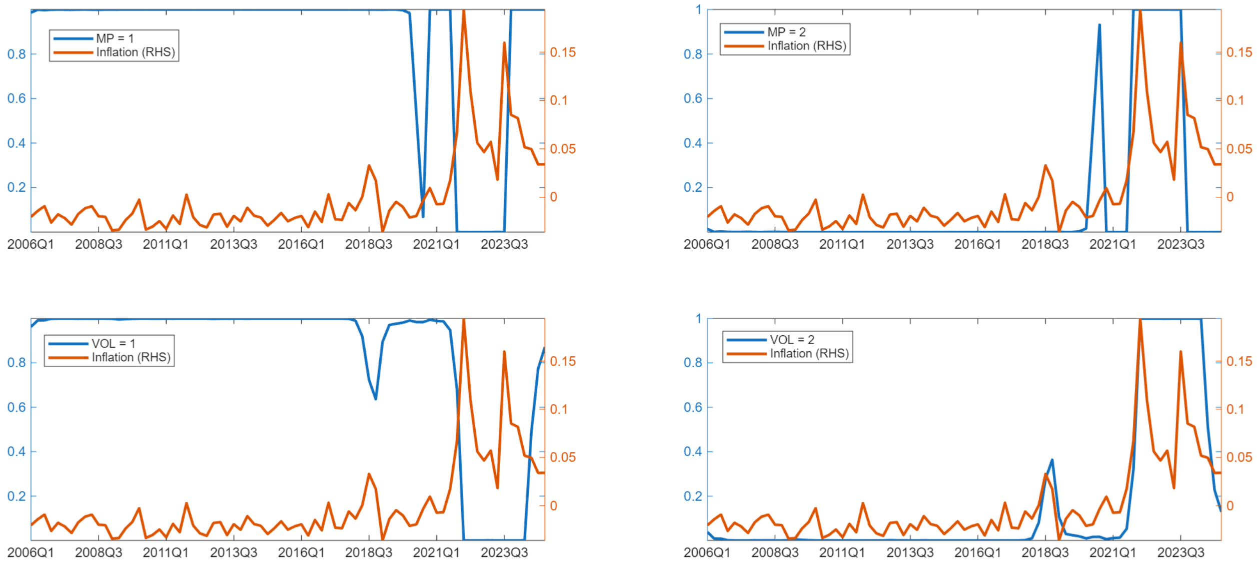
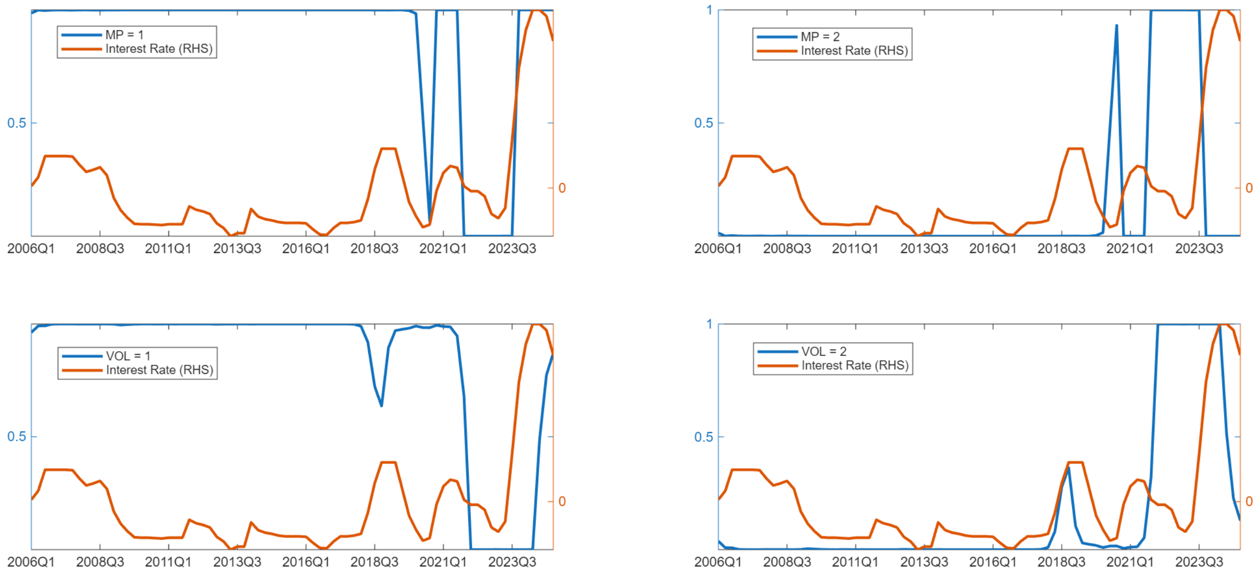


Figure 11: Interest Rate against Smoothed State Probabilities



C.2 Impulse Response Functions

This appendix reports the complete set of IRFs for all model variables under the three structural shocks across all four regimes.

Figure 12: Impulse Response Functions to MP Shock

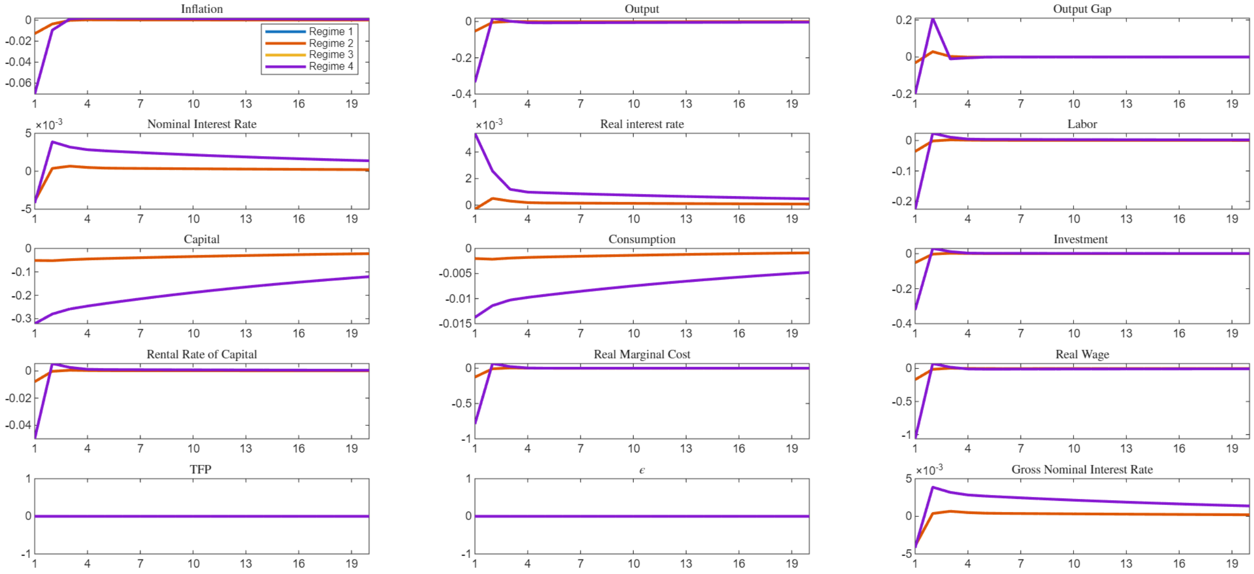


Figure 13: Impulse Response Functions to TFP Shock

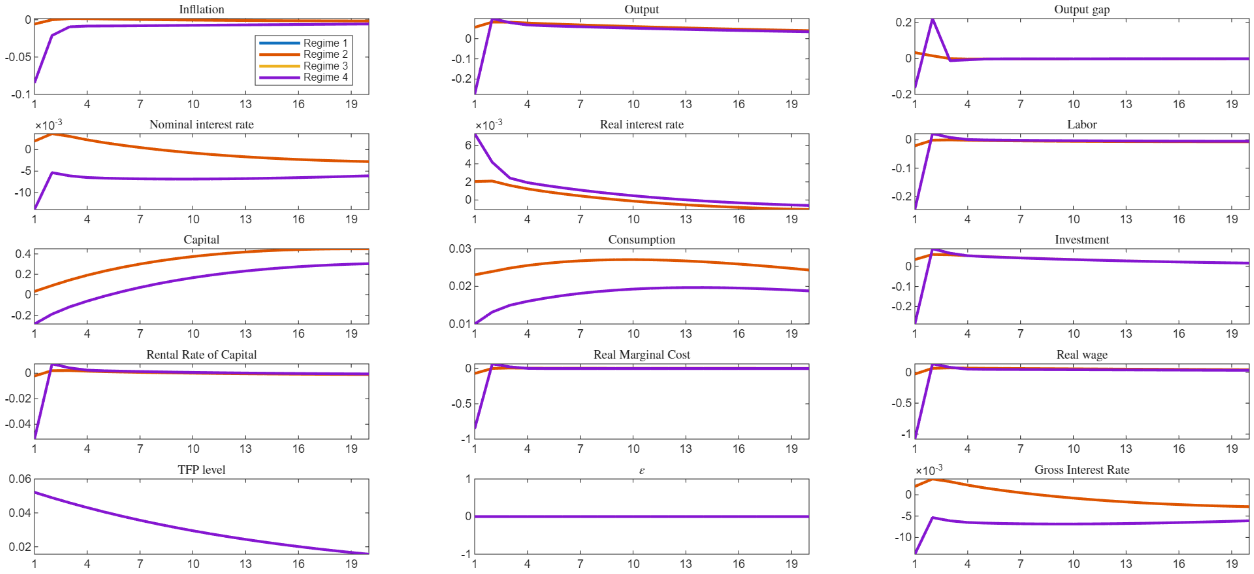
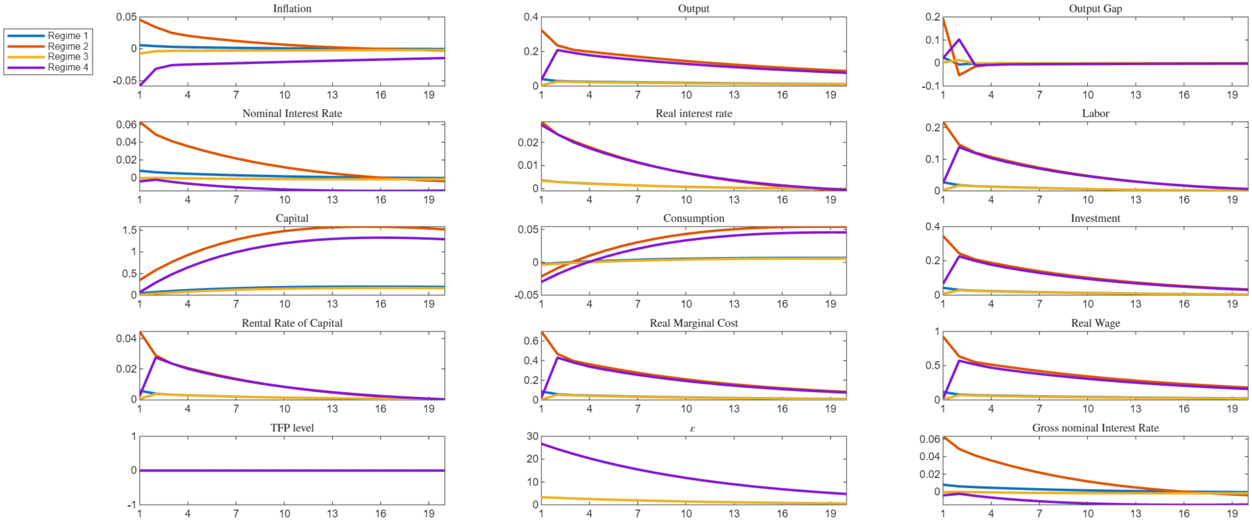


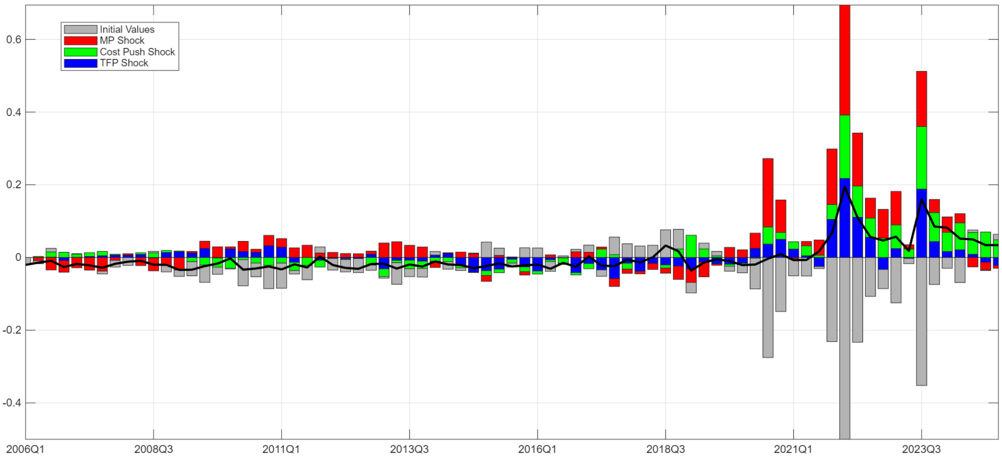
Figure 14: Impulse Response Functions to Cost-Push Shock



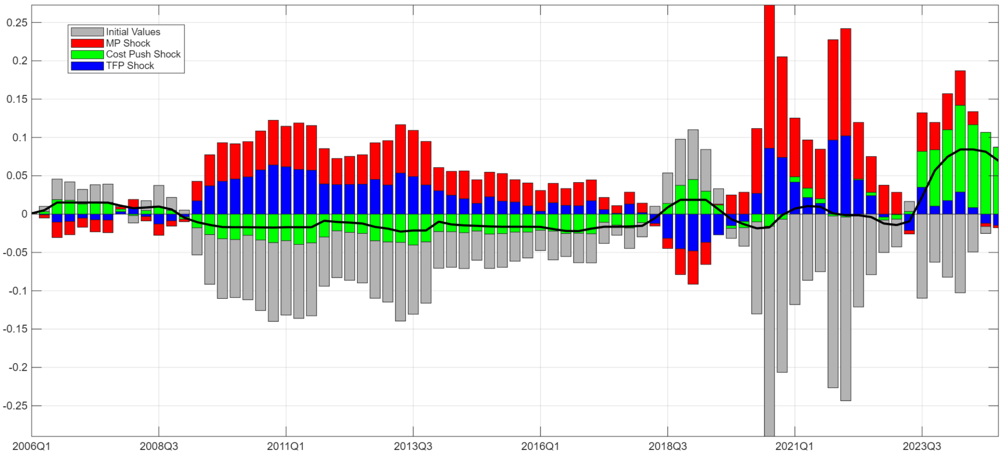
C.3 Historical Decomposition

This appendix reports the full historical decompositions of inflation, the policy interest rate, and the output gap, with the contribution of initial conditions.

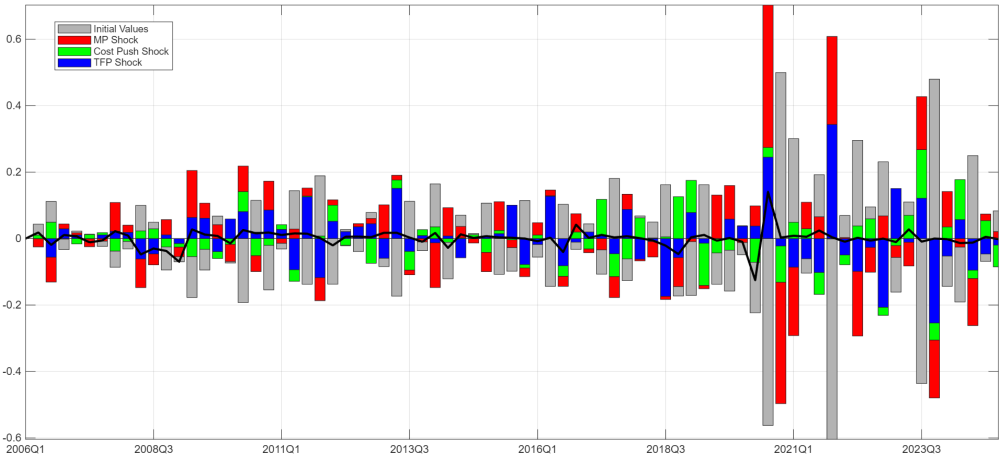
Figure 15: Historical decompositions including initial conditions.



(a) **Inflation**



(b) **Policy Interest Rate**

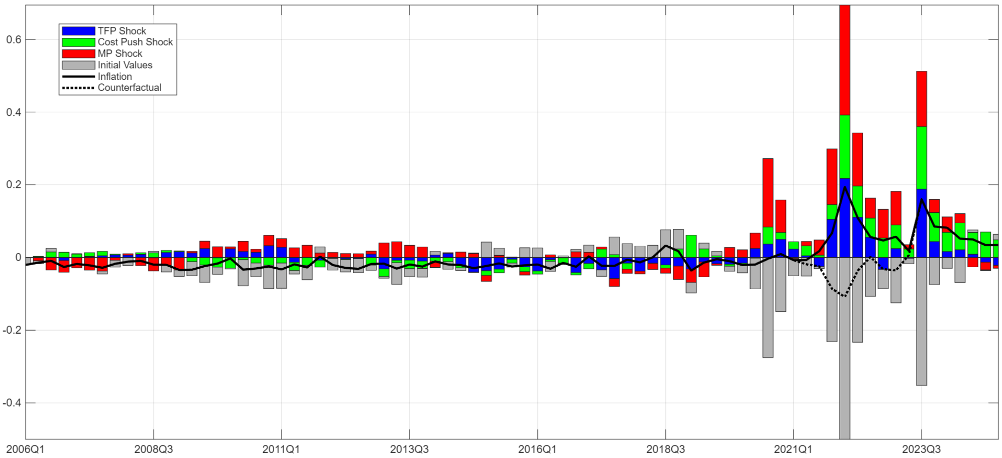


(c) **Output Gap**

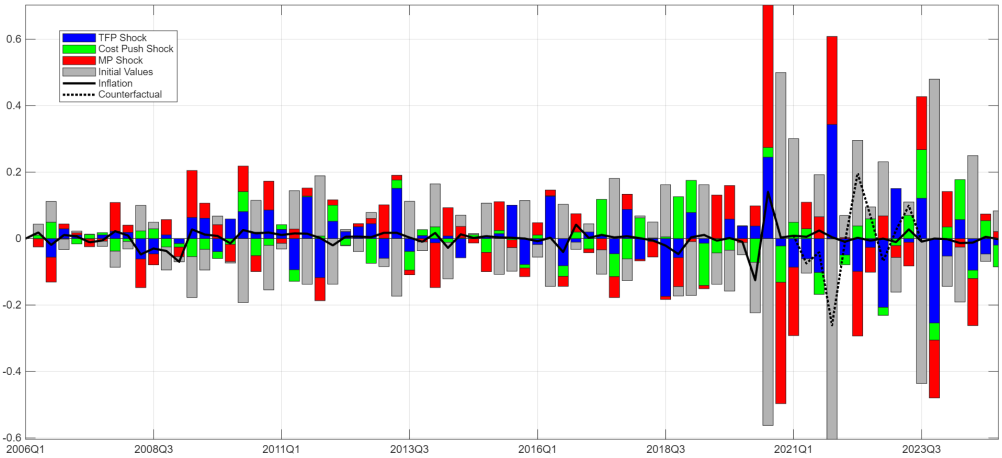
C.4 Counterfactuals

This appendix reports the counterfactual experiments of inflation and the output gap, with the contribution of initial conditions.

Figure 16: Counterfactual simulations including initial conditions



(a) Inflation



(b) Ouptput Gap