A Work Project, presented as part of the requirements for the Award of a Master Degree in Economics from the Nova School of Business and Economics.

Monetary Policy Evolution in Turkey: Recursive Analysis of Inflation Responsiveness Through Structural Breaks and Unorthodox Strategies

João Dias Martins

58945

Work project carried out under the supervision of:

Professor Miguel Lebre Freitas

Lisboa, December 17th, 2024

Abstract

This study investigates the variability of the inflation response coefficient (β) in Turkey's monetary policy within the Taylor rule framework, as a key driver of high inflation since early 2005. Recursive analysis identifies three structural breaks: in 2010, 2022, and 2023. These breaks correspond to a shift in monetary policy towards a Neo-Fisherian approach, which ultimately destabilized inflation expectations and eroded central bank credibility. The 2023 return to orthodox strategies shows signs of stabilization, suggesting that conventional approaches are more effective in controlling inflation than Neo-Fisherian approaches.

Keywords: Taylor rule, Neo-Fisher effect, Inflation response Coefficient (β) and Recursive Estimation.

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209)

1 Introduction

High inflation is a critical concern for emerging economies, particularly in the context of political and economic instability. In Turkey, contemporaneous inflation has imposed significant challenges for the Central Bank of the Republic of Turkey (CBRT), raising the question on why inflation has increased so dramatically.

Central banks typically rely on predictable responses to inflation to ensure stability, with the Taylor Rule's beta coefficient reflecting the sensitivity of interest rate adjustments to inflation. In Turkey, however, beta variability has undermined the CBRT’s ability to anchor inflation expectations, complicating efforts to maintain inflation under control. This inconsistency has also raised concerns about CBRT’s credibility among political and economic challenges.

In late 2021, Turkey adopted policies that deviate from traditional economic thinking, with parallels to the Neo-Fisher hypothesis, which suggests that lowering interest rates could potentially reduce inflation in the long run. These measures represent a significant departure from New Keynesian (NK) models, which advocate raising interest rates to control inflation.

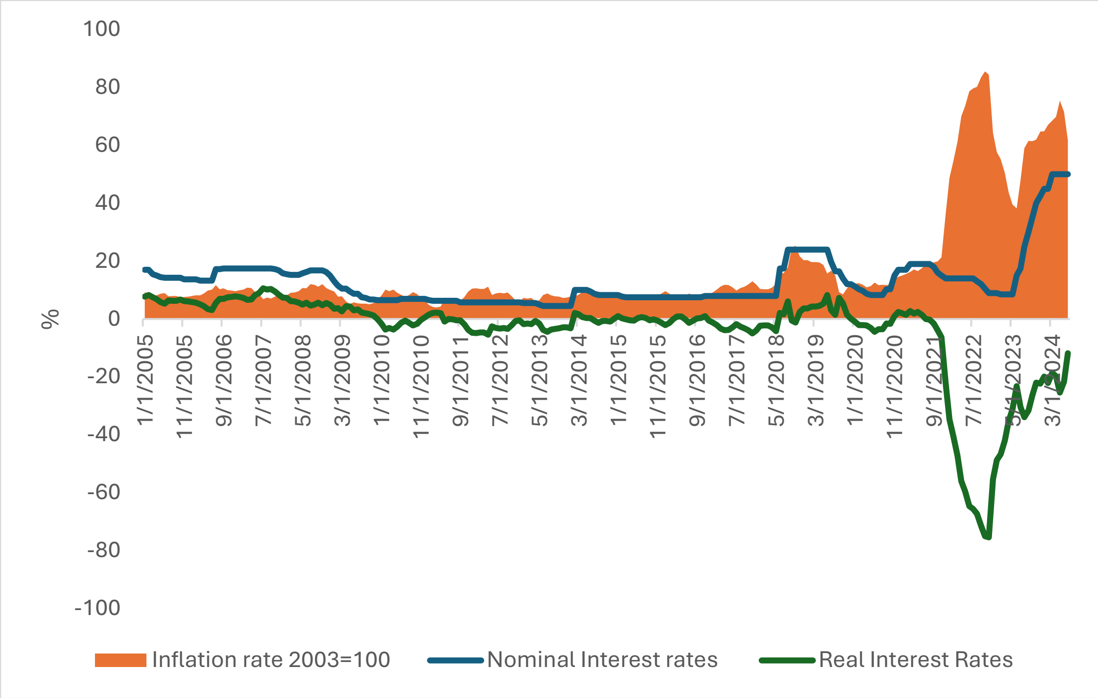
This paper analyzes the evolution of Turkey’s monetary policy through the recursive estimation of the Taylor Rule. It examines the CBRT's transition from orthodox to unorthodox practices, assessing their impact on inflation and institutional credibility. By combining theoretical insights and empirical evidence, it tracks beta's evolution since the early 2000s, identifying structural breaks in monetary policy during 2010, 2022, and 2023. These findings highlight the implications of unconventional monetary policies and their role in shaping the CBRT's policy framework.

Section 2 examines the recent evolution of Turkey’s monetary policy, focusing on its apparent parallels to Neo-Fisher strategies. Section 3 provides a theoretical analysis of the Neo-Fisher effect within the New Keynesian framework. Section 4 discusses the evolution of the Taylor

Rule over time and reviews relevant studies that empirically analyze the inflation response coefficient (β). Sections 5 to 7 detail the methodology of the empirical analysis, explaining the techniques and approaches used to study β within Turkey's monetary policy framework. Section 8 presents the results of the analysis and situates them within the historical and economic context of the Turkish economy, highlighting key events that align with the identified structural breaks. This paper contributes to the literature by identifying recent structural breaks in the inflation response coefficient within the Taylor Rule and by exploring the macroeconomic implications of unorthodox policies in Turkey.

2 Recent Monetary Policy Evolution in Turkey: The Path to Neo-Fisher Strategies

By late 2021, Turkey's monetary policy, long characterized by unorthodox practices, became more evidently aligning with an approach very similar to the Neo-Fisher hypothesis, marking a clear departure from traditional economic principles. The Neo-Fisher hypothesis suggests that lowering nominal interest rates could reduce inflation over time, challenging the conventional wisdom of raising rates to combat inflation. While President Recep Tayyip Erdoğan strongly opposed high interest rates, describing them as the "mother of all evil" and part of the "devil's triangle" alongside inflation and exchange rates, he also rooted his stance in religious beliefs, stating, "As a Muslim, I'll continue to do what is required by nas," referring to Islamic teachings that forbid the receiving or charging of interest. Despite these religious justifications, some of his advisors wanted to provide an economic rationale by referencing Neo-Fisherian ideas, attempting to align the policy direction with theoretical frameworks rather than solely ideological motivations (The Economist, 2022). Furthermore, several academic papers such as Refet S. Gürkaynak, Burçin Kısacıkoğlu, and Sang Seok Lee (2023) have noted similarities between Turkey's monetary policies during this period and Neo-Fisherian strategies, emphasizing the unconventional nature of these measures.



Graph 1: Trends in Interest Rates and Inflation (2005–2024), from CBRT.

In Graph 1 around late 2021 despite inflation rising rapidly the Central Bank of the Republic of Turkey (CBRT) implemented sharp interest rate cuts. This move reflected the political priority of maintaining low borrowing costs over traditional inflation control. Some policymakers suggested that reducing rates could eventually lower production costs and consumer prices, a rationale that aligns with aspects of the Neo-Fisher narrative. However, the policy's implementation overlooked critical requirements for its success, particularly the need for strong central bank credibility and well-anchored inflation expectations, as the paper is going to explore.

As interest rates were cut aggressively in late 2021, inflation soared, as traditional models predicted, reaching nearly 90% by 2022, one of the highest rates globally. The rapid depreciation of the Turkish lira amplified import costs, further fueling inflationary pressures. Instead of achieving the desired reduction in inflation, the unorthodox experiment led to widespread economic instability, unanchored expectations and further eroded confidence in CBRT.

3 Fisher and Neo-Fisher Effects

The Fisher effect, firstly introduced by Fisher (1930), suggests that, in the long run, an increase in nominal interest rates leads to a proportional rise in inflation, assuming a constant real interest rate. Uribe (2018) explores how the impact of changes in nominal interest rates on inflation depends on whether the changes are transitory or permanent, and whether they are analyzed in the short run or the long run.

	Long run effect	**Short run effect**
Transitory shock	0	↓
Permanent shock	↑	↑ ?

Figure 1: Effect of an Increase in the Nominal Interest Rate on Inflation (Uribe 2018).

Notes: Entry (2, 1): The Fisher effect. Entry (2, 2): The Neo-Fisher effect.

A transitory increase in nominal interest rates raises the real interest rate, reducing aggregate demand and dampening inflation in the short run (1,2 in Figure 1). However, inflation eventually returns to its previous trend as the effect fades (1,1). In contrast, a permanent increase in nominal rates leads to higher inflation in the long run, as predicted by the Fisher Effect, due to rising inflation expectations (2,1). This can also support the Neo-Fisher effect, where sustained higher nominal rates raise inflation even in the short term (2,2). The Neo-Fisher effect relies on the empirical validity of the Fisher hypothesis, which links nominal interest rates and inflation over the long run.

Literature Review

The Fisher Effect has been extensively studied with mixed results. Rose (1988) found that inflation rates were often nonstationary while nominal interest rates were stationary in the U.S. and OECD countries (1901–1950), contradicting the Fisher hypothesis. Crowder and Hoffman (1996) and Evans and Lewis (1995) identified long-term relationships between inflation and nominal interest rates but with slope coefficients below one, indicating partial support. Later studies, such as Christopoulos and Leon-Ledesma (2007), argued that non-linear models might better capture this relationship, while Berument (2007) found evidence for the Fisher hypothesis in G7 and some developing economies. In Turkey, Bayat (2011) reported no effect of inflation on interest rates (2002–2011), contrasting with Kiran (2013), who found support for the Fisher effect from 1990 to 2010.

Firstly introduced by Jim Bullard (2010), the Neo-Fisher effect is a recent and highly debated concept in economic theory, challenging conventional views and sparking significant controversy among economists. Schmitt-Grohé and Uribe (2010, 2014) suggest that consistent increases in nominal interest rates can immediately raise inflation expectations, even with price stickiness. Cochrane (2017) supports this using dynamic general equilibrium (DGE) models, showing that temporary rate increases in passive monetary policy settings can boost short-term inflation. Uribe (2017, 2018) extended these findings, arguing that permanent nominal rate increases could stimulate inflation and output by rapidly aligning inflation expectations, as seen in Japan and the Eurozone. Williamson (2019) and Lukmanova and Rabitsch (2022) add that flexible prices and imperfect information can shape Neo-Fisher outcomes, though the effect is often delayed.

However, Neo-Fisherian ideas face significant criticism. Schmidt and Woodford (2015) argue that slow adjustments in expectations limit its applicability, while Evans and McGough (2020) use adaptive learning models to show that high-rate pegs can worsen deflation and reduce output. Empirical studies like Crowder (2018) find that nominal rates do not causally impact inflation, challenging Cochrane's claims. Azizirad (2022) critiques the Neo-Fisher hypothesis further, demonstrating that incorporating liquidity premiums into monetary models aligns more closely with Keynesian theories, suggesting that raising rates reduces inflation by dampening demand. These critiques highlight the practical limitations of Neo-Fisherian policies, particularly in real-world contexts.

Model

In the short run, the Fisher equation can be written as:

$$i_t = r_t + \pi^e_{t+1} \tag{1}$$

where i_t is the nominal interest rate, r_t is the real interest rate, and π^e_{t+1} is the expected inflation rate for the next period, conditional on available information. This equation implies that the nominal interest rate is determined by the real interest rate plus the expected inflation rate.

In the long run, a critical assumption is made, expected inflation equals actual inflation. Under this condition, the Fisher equation becomes:

$$i = \overline{r_t} + \overline{\pi_t} \tag{2}$$

Here, $i, \overline{r_t}$ and $\overline{\pi_t}$ represent the long-run nominal interest rate, real interest rate, and inflation rate, respectively. In this framework, the real interest rate, also known as the natural rate of interest, is assumed to be independent of inflation and beyond the control of monetary policymakers. This implies that in the long run, nominal interest rates cannot be set independently of the inflation rate by central banks Bullard (2016). In the long run it is assumed that any permanent changes in inflation will eventually be reflected in proportional changes in nominal interest rates, as central banks must adjust nominal rates to maintain a stable real interest rate, higher inflation causes higher nominal interest rates in the long term, and vice versa.

Neo-fisher

At its core, the Neo-Fisher effect stems from the Fisher equation, in the long run the real interest rate is determined by economic fundamentals, such as productivity growth, and is assumed to be constant. Consequently, a permanent reduction (increase) in the nominal interest rate implies a corresponding reduction (increase) in future inflation and, by extension, current inflation π_t, this is the Neo Fisher in simpler terms.

Focusing on the short-term impacts of such policy, the foundational framework for this analysis is the basic New Keynesian model, which comprises an IS curve and a Phillips curve. The Neo-Fisher effect extends this logic within the New Keynesian framework where fiscal policy is passive, through the forward-looking Phillips curve, which links current inflation (π_t) to expected future inflation (π^e_{t+1}):

$$\pi_t = \phi(\pi^e_{t+1}) + \phi_y y_t \tag{3}$$

Here, ϕ represents the degree of forward-looking behavior, and ϕ_y reflects price stickiness. A permanent reduction in nominal rates lowers expected future inflation, which, through backward induction, reduces current inflation.

In this context, a straightforward Taylor-type rule can effectively illustrate the dynamics at play.

$$i_t = \overline{r_t} + \overline{\pi_t} + \beta(\pi_t - \pi^*) + \phi_y y_t + \vartheta_t \tag{4}$$

It is assumed that the inflation target π^* is equal to the steady state inflation $\overline{\pi_t}$ and also it is assumed that the real interest rate $\overline{r_t}$ is constant and independent form monetary policy and again output gap does not influence the setting of nominal interest rate $\phi_y y_t = 0$.

Trough Equation (4) it is possible to understand the relationship between the short-term policy rate and the steady-state dynamics described by the policy rule. The parameter β captures how the central bank adjusts the interest rate in response to deviations of inflation from its target. Additionally, ϑ_t represents a shock term that introduces random deviations from the policy rule, assumed to be mean-zero and independently and identically distributed. At steady state, when inflation aligns with the target and shocks are absent, the nominal interest rate reflects the sum of the steady-state real interest rate and the inflation target, equation (2).

In the New Keynesian framework, the model is stable and well-defined when the Taylor principle is satisfied, requiring $\beta > 1$. This condition ensures that the central bank increases the policy interest rate by more than any rise in inflation, raising the real interest rate, reducing aggregate demand, and helping bring inflation down, thereby creating a unique and stable trajectory toward the steady state. When $\beta > 1$, inflation deviations are corrected, guaranteeing the path to stability. However, if $\beta <1$, the model becomes indeterminate, allowing expectations to drive outcomes unpredictably and making it unlikely for the economy to return to equilibrium without coordinated beliefs (Galí, 2015).

The Neo-Fisher effect is grounded in the idea that permanently lowering the nominal interest rate can reduce inflation by influencing expectations. This is modeled using Equation (4), to achieve lower inflation there is a permanent decrease on nominal interest rates, to offset this decrease something on the right side of the equation must be decrease, the neo fishers believe that the constant term $\overline{\pi_t}$ is the one that will be reduced so the central bank must credibly reduce the inflation target to push the steady-state inflation rate down, also pushing expectations to adjust downward and align with the lower target. This mechanism lowers both expected and current inflation through the forward-looking structure of the New Keynesian model, allowing the system to stabilize.

For this dynamic to succeed, the public must trust the central bank's commitment to achieving the lower inflation target. If the central bank's credibility is weak, the reduction in the inflation target fails to influence public expectations, which remain unchanged. As a result, inflation does not decline despite the implementation of lower nominal interest rates. In the end Equation (4) still needs to hold in the eyes of the public, the shock term ϑ_t, which averages to zero, cannot offset the imbalance, leaving the central bank's response parameter beta which determines the strength of its reaction to inflation deviations as the critical adjustment factor.

Even though a steady state with lower inflation as described in Equation (2) theoretically exists, weak monetary policy creates an environment where there are infinitely many potential equilibria around this steady state. These equilibria are driven by non-fundamental factors, known as "sunspot shocks," which are random events that influence expectations without any underlying economic justification. As a result, inflation becomes highly sensitive to self-fulfilling expectations that align with the weak policy rule, a phenomenon discussed in Lubik and Schorfheide (2004), who highlight how passive monetary policy contributes to such indeterminacy.

In contrast, a strong policy rule adhering to the Taylor principle would ensure a unique and stable path to the steady state, avoiding this instability. Such a policy would prevent violations of transversality conditions, guaranteeing that inflation would converge predictably to the target over time. However, in the presence of sunspot equilibria, the predictability of inflation dynamics is lost. Questions like how long it will take for inflation to close the gap with its target become meaningless because inflation may remain arbitrarily distant from the target indefinitely.

This highlights a key limitation of the New Keynesian model, while it remains consistent with the Fisher effect, its ability to accommodate the Neo-Fisher effect depends entirely on whether economic agents believe that lower interest rates credibly signal a lower inflation target. Without this credibility, weak monetary policy fails to anchor expectations, leading to indeterminate and unstable inflation outcomes, marking the beginning of the New Keynesian indeterminacy.

4 Evolution and Structural Breaks in Monetary Policy Rules

The evolution of monetary policy rules has been greatly influenced by the rational expectations revolution of the 1960s and 1970s, which emphasized rules over discretion to improve policy credibility and reduce time inconsistency, as argued by Friedman (1960) and Barro and Gordon (1983). This shift laid the foundation for modern monetary policy, where central banks adjust short-term nominal interest rates in response to economic conditions, as highlighted by Romer (2012).

John Taylor's (1993) Taylor Rule became a landmark framework, proposing that interest rates should respond systematically to deviations in inflation from its target and in output from potential GDP. Its simplicity and alignment with U.S. monetary policy from 1987 to 1992 made it a benchmark for assessing central bank behavior. Extensions by Clarida, Galí, and Gertler (1998) introduced forward-looking elements, using expected inflation, and interest rate smoothing, reflecting gradual adjustments in policy rates.

Research has shown that when the inflation response coefficient in the Taylor Rule is below 1, as noted by Clarida et al. (1998), economies can face indeterminacy, where inflation expectations become unanchored, complicating inflation control. This underscores the importance of a strong inflation response to maintain stability across different monetary regimes.

In Turkey, unique economic challenges, including high inflation and exchange rate volatility, have shaped the Central Bank of the Republic of Turkey's (CBRT) approach. Studies, such as

Civcir & Akçağlayan (2010), highlight CBRT’s forward-looking strategy, prioritizing forecasted inflation to anchor expectations. Additionally, Gürkaynak et al. (2015) note the inclusion of the depreciation rate in augmented Taylor Rule estimations for Turkey, reflecting CBRT's response to exchange rate fluctuations under a flexible exchange rate regime, rather than targeting the exchange rate directly as in fixed regimes.

Furthermore, the study of structural breaks in the Taylor rule has provided valuable insights into shifts in monetary policy behavior. For example, Oliveira et al. identified significant changes in Brazil's policy approach during the 2000-2011 period. Similarly, Yilmazkuday et al. (2008) analyzed structural breaks in the Taylor rules of the Czech Republic, Hungary, and Poland, uncovering significant changes linked to their transitions to inflation targeting and shifts in monetary priorities. Finally, both Gürkaynak et al. (2015) and Yağcıbaşı and Yıldırım (2019) identified a structural break in Turkey's monetary policy framework around 2010, highlighting a significant shift in the Central Bank's focus. Gürkaynak et al. (2015) emphasized changes in the inflation response coefficient, while Yağcıbaşı and Yıldırım (2019) noted a transition from a high-interest rate regime focused on inflation stabilization to a low-interest rate regime with greater emphasis on output gap stabilization.

5 Empirical Approach

This section estimates baseline and augmented Taylor rules for Turkey using rolling and expanding window methods to track the evolving inflation coefficient β over time. This approach captures changes in Turkey's monetary policy response to inflation, reflecting shifts in central bank priorities due to economic conditions, political influences, and structural reforms.

The baseline Taylor rule focuses on inflation and the output gap, the augmented Taylor rule incorporates the depreciation rate, providing a broader perspective on monetary policy by accounting for exchange rate dynamics. This analysis highlights periods of effective inflation control as well as phases where alternative priorities took precedence, offering insights into the evolving stance of Turkey's monetary policy.

Baseline Taylor rule:

$$i_t = \alpha + \beta(\pi_t - \pi *) + \gamma \cdot Output_{Gap\,t} + \varepsilon_t \tag{6}$$

The augmented Taylor rule can be formulated as:

$$i_t = \alpha + \beta(\pi_t - \pi *) + \gamma\, Output\_Gap_t + \delta\, Depreciation\_Rate_t + \varepsilon_t \tag{7}$$

In both models, i_t represents the policy interest rate $(\pi_t - \pi *)$ is the inflation gap, $\gamma\, Output\_Gap_t$ captures deviations in economic activity from potential, and $\delta\, Depretiation\_Rate_t$ is the depreciation of the Turkish Lira against the Euro, included only in the augmented model. Each coefficient reflects the central bank's responsiveness to inflation, economic stabilization, and exchange rate dynamics, shedding light on shifts in Turkey's monetary policy approach and structural influences. This analysis excludes an interest rate smoothing term Clarida, R., Galí, J., & Gertler, M. (1998), often used to capture gradual policy adjustments, as Turkey's recent history includes abrupt rate changes. By omitting smoothing, the model more accurately represents the central bank’s direct responses to inflation, output gaps, and depreciation, offering a clearer view of its evolving policy stance during both stable and volatile periods.

6 Data

For this analysis, I focus on Turkey's key economic indicators that align with the Taylor rule framework. The sample covers monthly data from January 2005 to July 2024. Given data limitations, I have adapted certain proxies to measure Turkey's economic activity and inflation response.

Following most of the literature, Turkey's One-Week Repo Rate is used as the interest rate variable. This rate serves as the primary policy instrument for Turkey's central bank, reflecting short-term monetary policy adjustments. Data on the One-Week Repo Rate is sourced from the Central Bank of the Republic of Turkey.

The output gap is calculated using the seasonally adjusted Industrial Production Index (IPI) 2021=100 as a proxy, due to the absence of monthly GDP data. First, I applied a Hodrick-Prescott (HP) filter to the natural logarithm of the IPI to smooth out cyclical variations. The output gap is then derived by calculating the difference between the log of IPI and the trend series generated by the HP filter, providing an estimate of economic activity relative to potential output. This approach aligns with common practices in monthly data estimation. The IPI data is retrieved from the Turkish Statistical Institute (TurkStat).

Inflation is measured using the seasonally and calendar-adjusted Consumer Price Index (CPI), which reflects the annual percentage change in consumer prices. To account for the impact of exchange rate dynamics on inflation in Turkey's open economy, this study uses the depreciation rate of the Turkish Lira against the Euro due to the flexible nature of the exchange rate in Turkey. The inflation target rate is determined by the Central Bank of the Republic of Turkey, serving as a benchmark for the policy objectives analyzed.

7 Estimation

The baseline and augmented Taylor rules were estimated using regression models with robust standard errors, ensuring consistent and reliable coefficient estimates across the full sample. A recursive analysis was then performed for both models, with a specific focus on tracking the evolution of the inflation response coefficient (β) over time. By employing simpler regression models with robust standard errors, the analysis remained stable and avoided unnecessary variability.

To gain a comprehensive perspective on the inflation response coefficient (β), both baseline and augmented Taylor rules were examined through two complementary approaches, expanding window and rolling window analyses.

The expanding window approach began with an initial sample of 24 months and incrementally added observations over time. This method captured long-term structural shifts in the Central Bank's monetary policy responsiveness. The rolling window analysis utilized fixed window lengths of 60, 80, and 100 months. Shorter windows emphasized short-term fluctuations and immediate policy changes, while longer windows smoothed out volatility, revealing broader trends over an extended period. This dual approach provided a broad understanding of how β evolved over time.

Following the recursive analysis, the Bai-Perron test for multiple structural breaks was applied to pinpoint the exact breakpoints where significant changes occurred in the β coefficient. The test identified important structural breaks in the data, which were further supported by visual inspection of the recursive estimation graphs. Based on these results, the sample was divided into three distinct periods to analyze the Taylor rule more precisely.

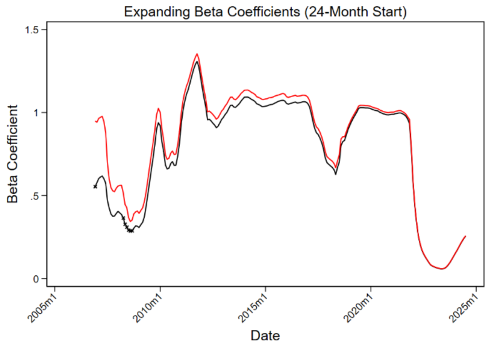
To further validate these structural breaks, both baseline and augmented Taylor rules were re-estimated separately within each sample period. The results, including pre- and post-break β coefficients, R-squared values, and Chow test statistics, confirmed the statistical significance of the identified breakpoints. These findings are presented in Tables 1 to 3, providing clear numerical evidence of the structural shifts, and are complemented by the recursive estimation plots in Figure 2, which illustrate the dynamic evolution of β over the entire sample.

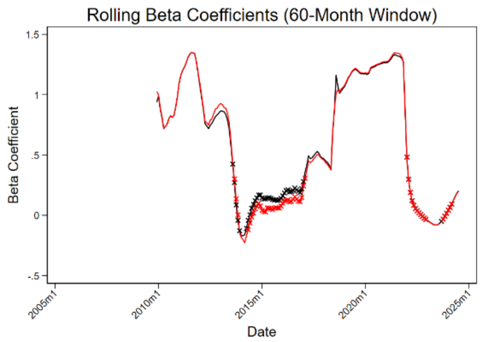
8 Empirical Results and Historical Context of Turkey's Monetary Policy Shifts

The results clearly illustrate the evolution of Turkey's monetary policy over time. The recursive analysis graph in Figure 2 highlights the dynamic changes in the inflation response coefficient (β), revealing significant declines after 2010 and 2022, followed by a sharp recovery starting in mid-2023. These findings are further validated by the structural break analysis in the tables, which confirms the identified breakpoints and provides statistical evidence of shifts in β.

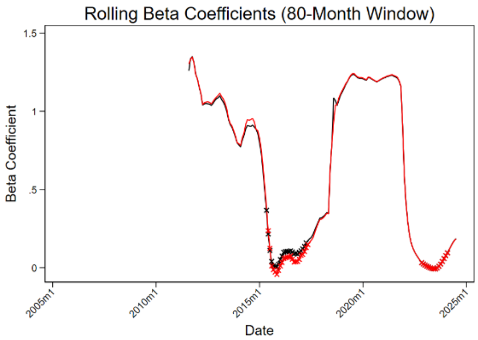
The results show a reduced focus on inflation control after 2010, with weaker monetary policy responses, and a further decline in 2022 during the adoption of unconventional policies. The recovery in 2023 aligns with a return to orthodox policies, reflected in the rising β values. However, the short study period following the shift in 2023 limits the ability to observe long-term outcomes, constraining robust conclusions about the effectiveness and sustainability of these orthodox strategies.

Throughout the period, β fluctuated significantly, ranging from negative levels to approximately 1.5, highlighting inconsistencies in the Central Bank of Turkey's policy approach. These fluctuations underscore the absence of a coherent and systematic monetary plan, contributing to persistently high inflation levels. Together, Figure 2 and the Tables offer a complementary view, with the recursive analysis capturing evolving trends and the structural break analysis pinpointing key moments of change.

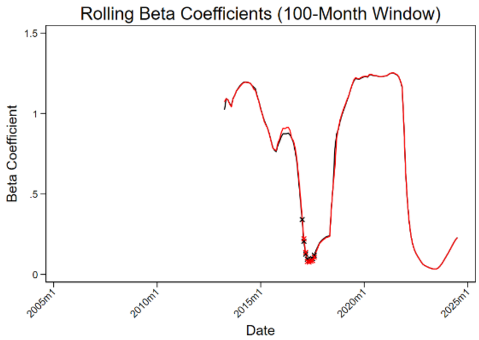




(a) 60-Month Window



(b) 80-Month Window



(c) 100-Month Window

Baseline Augmented X Insignificant

Figure 2: Expanding and Rolling Beta Coefficients Across Different Window Sizes

Model	Pre-Break Period	Post-Break Period	Beta Coefficient (Pre)	Beta Coefficient (Post)	R-squared (Pre)	R-squared (Post)	F-Statistic (Chow Test)
Baseline	2005m1–2010m1	2010m2–2017m2	0.92	0.09	0.61	0.051	15.19***
Augmented	2005m1–2010m1	2010m2–2017m2	1.1	0.061	0.62	0.063	9.92***

Table 1:Structural Break Analysis of Baseline and Augmented Taylor Rule Models for the 2010m2 Break.

Model	Pre-Break Period	Post-Break Period	Beta Coefficient (Pre)	Beta Coefficient (Post)	R-squared (Pre)	R-squared (Post)	F-Statistic (Chow Test)
Baseline	2017m2–2021m12	2022m1–2023m7	0.87	0.02	0.49	0.29	17.79***
Augmented	2017m2–2021m12	2022m1–2023m7	0.88	0.035	0.5	0.33	12.08***

Table 2: Structural Break Analysis of Baseline and Augmented Taylor Rule Models for the 2022m1 Break.

Model	Pre-Break Period	Post-Break Period	Beta Coefficient (Pre)	Beta Coefficient (Post)	R-squared (Pre)	R-squared (Post)	F-Statistic (Chow Test)
Baseline	2022m1–2023m6	2023m7–2024m7	0.042	1.25	0.37	0.77	109.99***
Augmented	2022m1–2023m6	2023m7–2024m7	0.057	1.34	0.44	0.84	72.73***

Table 3: Structural Break Analysis of Baseline and Augmented Taylor Rule Models for the 2023m7 Break.

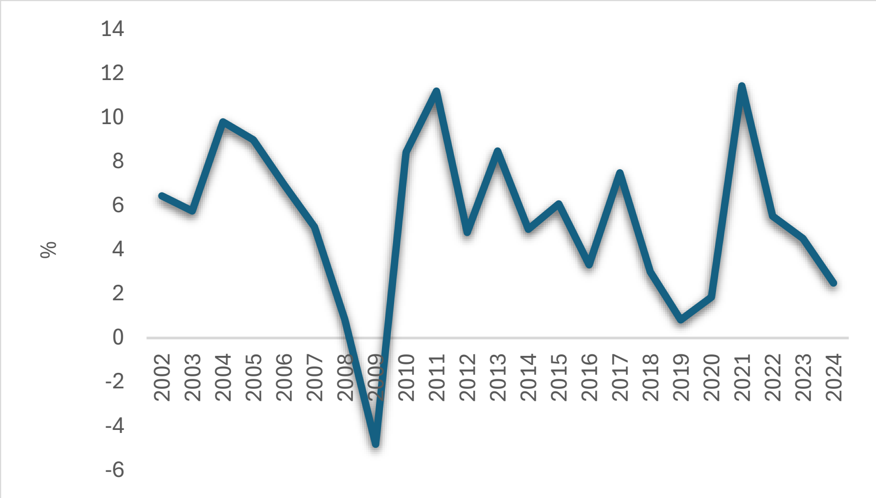
The Early 2000s and Post-Crisis Reforms (2001–2008)

The structural changes in Turkey's monetary framework began in response to the 2001 financial crisis. The crisis, fueled by the collapse of the fixed exchange rate system, a weak banking sector, and fiscal instability, led to extensive reforms backed by the IMF. These included the adoption of a floating exchange rate system and the introduction of an inflation-targeting framework by the Central Bank of the Republic of Turkey (CBRT).

From 2002 to 2008, CBRT focused on price stability, operating under an implicit inflation-targeting framework that became formalized in 2006. The beta coefficients during this period, particularly in smaller rolling windows, reflected values close to 1, signaling a strong and systematic response to inflation. However, early signs of structural weaknesses became evident as GDP growth began to slow in 2006, Graph 2, leaving the economy vulnerable to the global financial crisis.

Post-2008 Global Financial Crisis

The global financial crisis of 2008 brought severe and unprecedented challenges, significantly disrupting Turkey's economy. The sharp downturn in global markets led to reduced international capital flows, a collapse in external demand, and severe pressure on Turkey's already fragile economy. Turkish exports plummeted, asset prices fell, credit spreads widened, and significant capital outflows increased the economic stress. Rising uncertainty further depressed consumer spending, business investment, and credit availability, culminating in one of the steepest economic contractions globally. Turkey's GDP growth experienced a significant drop during the 2008 global financial crisis. It fell from approximately 5% in 2007 to around -4.8% in 2009, marking a decrease of nearly 10 percentage points over this period, Graph 2.



Graph 2: Annual GDP Growth (real terms) from World Bank.

During this crisis, Turkey's vulnerabilities came out to be evident. The economy's reliance on private sector borrowing and short-term foreign capital to finance the persistent current account deficit left it highly exposed to external shocks. These structural weaknesses, a shift from the previous reliance on public borrowing, made inflation control more challenging and reduced the CBRT's ability to mitigate the crisis effectively.

Despite these difficulties, CBRT acted decisively. Employing aggressive and traditional monetary policy tools, it lowered interest rates significantly to ease financial conditions, reduced borrowing costs, and stimulated the economy. This rapid and robust response stabilized the economy and drove a strong recovery in economic output, highlighting the effectiveness of conventional monetary policy during the immediate aftermath of the crisis.

The Structural Shift Beginning in 2010

After the 2008 financial crisis, Turkey benefited from a strong fiscal position and favorable market perceptions, reducing the need for significant monetary policy intervention. The country's fiscal stability minimized the risk of fiscal dominance, allowing it to recover from the global financial crisis without heavy reliance on the Central Bank of the Republic of Turkey

(CBRT). Turkey's investment-grade credit ratings, low credit default swap spreads, and minimal budget deficits signaled strong investor confidence and fiscal discipline, as highlighted by Gürkaynak, Kısacıkoğlu, and Lee (2023).

However, this period marked a shift in monetary policy. Despite a notable recovery from the 2008 crisis, CBRT decided to push for low interest rates even with rising inflation and a closed output gap. This shift is evident in the inflation response coefficient (β), which shows a structural break during the early 2010s, confirmed by the Chow test, Table 2, and already confirmed by the literature, such as in Gürkaynak, Kantur, Taş, & Yıldırım-Karaman (2015).

Rolling and expanding window analyses further illustrate this change, with the beta coefficient declining and becoming statistically insignificant in shorter rolling windows. This reflects a weaker response to inflation as CBRT adopted unconventional tools, such as reserve requirement adjustments and interbank rate manipulations, disconnecting policy rates from economic fundamentals.

Weak institutions exacerbated these challenges. According to Gürkaynak, Kısacıkoğlu, and Lee (2023), political interference and declining governance undermined investor confidence and disrupted inflation expectations, limiting CBRT's ability to conduct effective monetary policy. This period represents a significant divergence in Turkey's economic and monetary policy trajectory.

COVID-19: Shift to Conventional Monetary Policy Amid Economic Pressures

Around 2020, the beta coefficients on both the rolling and expanding window graphs show an increase, reaching values closer to those seen during traditional monetary policy responses. This period marks a temporary departure from Turkey's unorthodox monetary policy trajectory. The global recession caused by the COVID-19 pandemic left the country with a significant negative output gap, and sharp economic contraction, making monetary easing necessary. Unlike earlier episodes, such as in the 2010s, where rate cuts were implemented despite overheating conditions, CBRT's decision to maintain and lower interest rates during this period was a pragmatic and appropriate response to the economic downturn. However, this change is not particularly significant as it was a temporary event, mainly driven by the sharp decrease in the output gap during this period, causing the beta coefficient to rise temporarily in alignment with conventional theories. This response provided short-term relief, supported GDP recovery, and helped stabilize the economy.

Structural Break in Early 2022 and the Unorthodox Experiment

Following the COVID-19 pandemic, low interest rates were initially crucial for Turkey's economic recovery. However, as stabilization began, President Recep Tayyip Erdoğan controversially insisted on maintaining these low rates, arguing that high interest rates cause inflation, aligning with the Neo-Fisher effect. This marked the start of an unconventional monetary experiment.

In 2022, the Turkish CB aimed to reduce inflation by permanently lowering nominal interest rates. However, as analyzed in the present paper, for this strategy to succeed, the inflation response coefficient (β) must exceed one ($\beta > 1$) to ensure stability. Instead, β dropped sharply, violating the Taylor principle and pushing monetary policy into a state of indeterminacy. In this state, inflation outcomes became unpredictable, driven by self-fulfilling expectations and external shocks.

A key issue was the Central Bank of Turkey's inability to anchor inflation expectations effectively. Without trust in its commitment to permanently lower rates, inflation expectations remain high, preventing inflation from decreasing as anticipated, instead the public perceived that the CB was acting less responsibly to the inflation, reducing beta. This disconnect weakened the relationship between inflation and interest rate adjustments, further reducing β

and exacerbating instability. The Chow test confirmed a structural break in early 2022, signaling a clear departure from the traditional Taylor Rule framework and highlighting CBRT's inability to systematically address inflation pressures.

Instead of achieving stability, the low rates fueled domestic demand, weakened the lira, and worsened inflation, which soared to nearly 90% by mid-2022. This failure underscores the dangers of unanchored expectations, diminished credibility, and the abandonment of robust monetary principles.

Return to Orthodoxy in 2023 and Signs of Recovery

The turning point in Turkey's period of unorthodox monetary policies came in June 2023 with the appointment of Mehmet Şimşek as finance minister, marking a significant shift towards orthodox monetary strategies. Under Şimşek's leadership, the Central Bank of the Republic of Turkey undertook aggressive actions, raising its policy rate from 8.5% to 50% by mid-2023 to combat inflation. These measures are aimed at restoring market confidence and stabilizing the economy after years of unconventional approaches.

This shift to conventional policy is also validated by the Chow test analysis, which detected a structural break in inflation responsiveness around mid-2023, indicating a shift back towards more orthodox monetary responses. This move in the beta coefficient marks a renewed attempt to restore credibility and regain control over monetary policy. However, restoring the credibility of the Turkish Central Bank is a challenging and gradual process. Credibility, once lost, cannot be regained overnight. It requires consistent and reliable policy measures over an extended period to rebuild trust among investors and the public.

While initial results, such as improved investor sentiment and rising international capital inflows, hint at progress, inflation remains persistently high. The small but noticeable rebound in the beta coefficient through all the graphs, especially towards the end of 2023, represents a potential early signal of stabilization. This suggests that CBRT's renewed commitment to orthodox policies gradually enhances its effectiveness in addressing inflation, but the path to fully re-establishing credibility and stability will take time and sustained effort.

9 Conclusion

This study highlights the significant role of structural breaks in understanding Turkey’s monetary policy evolution and its impact on inflation. The identified structural breaks in 2010, beginning of 2022, and mid 2023 reveal critical shifts in the (CBRT) approach to inflation control, as captured by the variability in the inflation response coefficient (β) within the Taylor rule framework.

The 2010 structural break marked the beginning of a departure from orthodox monetary policies, with β coefficients declining significantly, reflecting a weakened response to inflation. This shift coincided with the adoption of unconventional measures, undermining CBRT’s effectiveness. The 2022 break represents the most dramatic departure, where policies resembling Neo-Fisher ideas led to an extreme drop in β coefficients, violating the Taylor principle and plunging the economy into a state of indeterminacy. This failure resulted in soaring inflation, unanchored expectations, and a collapse in central bank credibility.

The structural break in 2023, however, signals a turning point. Under the leadership of Mehmet Şimşek, a return to orthodox policies was initiated, marked by a sharp rise in β coefficients. This renewed focus on inflation targeting and policy rate adjustments represents an initial step toward restoring credibility and stability. The Chow test results reinforce the importance of these structural shifts in understanding Turkey’s monetary policy trajectory, with the 2023 break offering a potential pathway to stabilization.

The findings underscore that Turkey's persistently high inflation has been deeply influenced by unorthodox monetary policy decisions. While the reintroduction of orthodox monetary strategies in 2023 provides hope, fully re-establishing CBRT's credibility will require sustained, independent, and credible policy measures over time. These results emphasize the critical need for stability and consistency in monetary policy to anchor inflation expectations and achieve long-term economic stability, while demonstrating that conventional strategies are more effective in stabilizing inflation than Neo-Fisherian approaches

Future research could build on these findings by exploring the applicability of non-linear Taylor rules, which may better capture the variability in the inflation response coefficient (β) over time. Non-linear approaches could offer a more nuanced understanding of CBRT's policy shifts, particularly during periods of extreme economic instability or unconventional monetary strategies. Additionally, comparative studies with other emerging economies that have faced similar challenges could provide further insights into the effectiveness of diverse monetary policy frameworks in achieving stability.

10 References

Arısoy, I. (2013). Testing for the Fisher Hypothesis under Regime Shifts in Turkey: New Evidence from Time-Varying Parameters. *International Journal of Economics and Financial Issues, 3*(2), 496-502. ISSN: 2146-4138.

Azizirad, M. (2022). Fisher vs Keynes: Does an Interest Rate Hike Cause Inflation to Increase or Decrease? *Latest Version*. Simon Fraser University.

Başçı, E., & Kara, H. (2011). Finansal istikrar ve para politikası. *İktisat İşletme ve Finans*, *26*(302), 9-25.

Barro, R. J., & Gordon, D. B. (1981). A Positive Theory of Monetary Policy in a Natural-Rate Model (NBER Working Paper No. 807). National Bureau of Economic Research.

Bayat, T. (2011). Turkiye'de Fisher Etkisinin Geçerliliği: Doğrusal Olmayan Eşbütünleşme Yaklaşımı. Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, (38), 47-60.

Berument, H., & Malatyali, K. (2001). Determinants of interest rates in Turkey. *Russian & East European Finance and Trade, 37*(1), 5–16.

Berument, H., Ceylan, N. B., & Olgun, H. (2007). Inflation uncertainty and interest rates: is the Fisher relation universal? *Applied Economics*, *39*(1), 53–68.

Bullard, J. (2016, November 10). *Safe real interest rates and Fed policy*. Federal Reserve Bank of St. Louis.

Bullard, J. (2010). Seven faces of" the peril". *Federal Reserve Bank of St. Louis Review*, *92*(September/October 2010).

Çebi, C. (2012). The interaction between monetary and fiscal policies in Turkey: An estimated New Keynesian DSGE model. *Economic Modelling*, *29*(4), 1258-1267.

Civcir, I., & Akçağlayan, A. (2010). Inflation targeting and the exchange rate: Does it matter in Turkey?. *Journal of Policy Modeling*, *32*(3), 339-354.

Clarida, Richard, Jordi Galí, and Mark Gertler (Dec. 1998). "Monetary Policy Rules in Pratice: Some International Evidence". In: European Economic Review 42, pp. 1033–1067. — (Feb. 2000). "Monetary Policy Rules and Macroeconomic Stability: Evidence And Some Theory". In: Quarterly Journal of Economics 115, pp. 147–180.

Cochrane, J. H. (2017). Michelson-Morley, Fisher, and Occam: The radical implications of stable quiet inflation at the zero bound. In M. Eichenbaum & J. A. Parker (Eds.), *NBER Macroeconomics Annual* (Vol. 32, pp. 113–226). Chicago, IL: University of Chicago Press.

Crowder, W. J., & Hoffman, D. L. (1996). The long-run relationship between nominal interest rates and inflation: The Fisher equation revisited. *Journal of Money, Credit and Banking, 28*(1), 102-118.

Crowder, W. J. (2020). The Neo-Fisherian Hypothesis: Empirical Implications and Evidence. *Empirical Economics*.

Christopoulos, D.K., Leon-Ledesma, M.A. (2007), A long-run nonlinear approach to the Fisher effect, Journal of Money, Credit, and Banking, 39, 543-559

Evans, G. W., & McGough, B. (2020). Adaptive learning in macroeconomics. *Oxford Research Encyclopedia of Economics and Finance*.

Evans, M. D., & Lewis, K. K. (1995). Do expected shifts in inflation affect estimates of the long-run Fisher relation?. *The Journal of Finance*, *50*(1), 225-253.

Friedman, Milton (1960). A Program for Monetary Stability. Vol. 541. Fordham University Press New York.

Galí, J. (2015). Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework and Its Applications, 2nd edn, Princeton University Press, Princeton.

García-Schmidt, M., & Woodford, M. (2015). Are low interest rates deflationary? A paradox of perfect-foresight analysis. *NBER Working Paper No. 21614.* National Bureau of Economic Research.

Gürkaynak, R. S., Kantur, Z., Taş, M. A., & Yıldırım-Karaman, S. (2015). Monetary Policy in Turkey after Central Bank Independence. *İktisat İşletme ve Finans*, 30(356), 9–38.

Gürkaynak, R. S., Kısacıkoğlu, B., & Lee, S. S. (2023). Exchange rate and inflation under weak monetary policy: Turkey verifies theory. *Economic Policy*, *38*(115), 519-560.

Hatemi-J, A., & Irandoust, M. (2008). The Fisher effect: A Kalman filter approach to detecting structural change. *Department of Business and Management, University of Kurdistan-Mawler; Department of Economics and Finance, University of Skövde; UAE University.*

Kiran, B. (2013). A fractional cointegration analysis of Fisher hypothesis: Evidence from Turkey. Quality & Quantity, 47(3), 1077–1084.

Lubik, T. A., & Schorfheide, F. (2004). Testing for Indeterminacy: An Application to U.S. Monetary Policy. The American Economic Review, 94(1), 190–217. http://www.jstor.org/stable/3592775

Lukmanova, E., & Rabitsch, K. (2022). New evidence on monetary transmission: interest rate versus inflation target shocks. Available at SSRN 4164365.

Oliveira, N. S. M. N., Medeiros, E. R., Medeiros, G. B., Aragón, E. K. da S. B., & Filho, U. A. S. (2013). Testando mudanças estruturais na regra de Taylor: um estudo empírico para o Brasil (2000–2011). Revista de Economia, 39(2), 28–50.

Romer, David (2012). Advanced Macroeconomics, 4th Edition. McGraw-Hill.

Schmitt-Grohé, S., & Uribe, M. (2014). Liquidity Traps: An Interest-rate-based Exit Strategy. *The Manchester School*, *82*(S1), 1–24.

Rose, A. K. (1988). Is the Real Interest Rate Stable? *The Journal of Finance*, *43*(5), 1095–1112. Wiley for the American Finance Association.

Taylor, J. B. (1993). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, *39*, 195-214.

The Economist. 2022. “Is Recep Tayyip Erdogan’s Monetary Policy as Mad as It Seems?” *The Economist Explains*, January 27. https://www.economist.com/the-economist-explains/2022/01/27/is-recep-tayyip-erdogans-monetary-policy-as-mad-as-it-seems.

Uribe, M. (2018). The Neo-Fisher Effect: Econometric Evidence from Empirical and Optimizing Models. *NBER Working Paper No. 25089.* National Bureau of Economic Research.

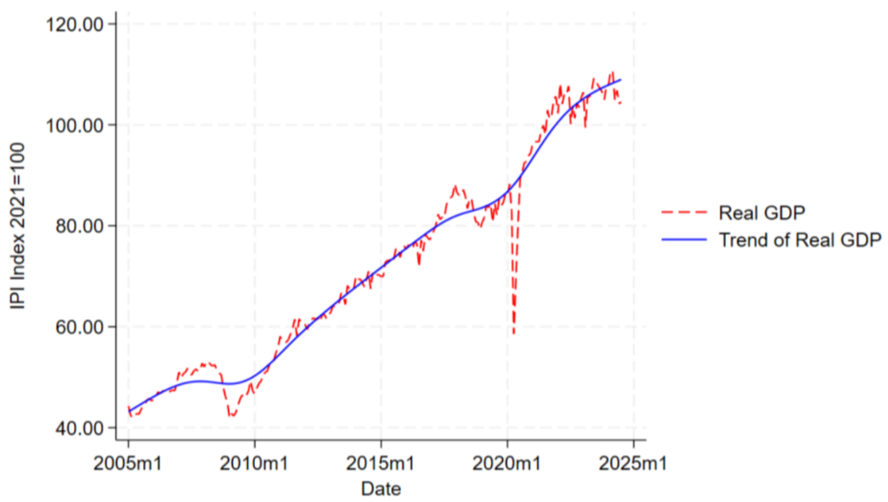
Uribe, M. (2017). The Neo-Fisher Effect in the United States and Japan. *NBER Working Paper No. 23977*. National Bureau of Economic Research.

Williamson, S. D. (2019). Low real interest rates and the zero lower bound. *Review of Economic Dynamics*, *31*, 36-62.

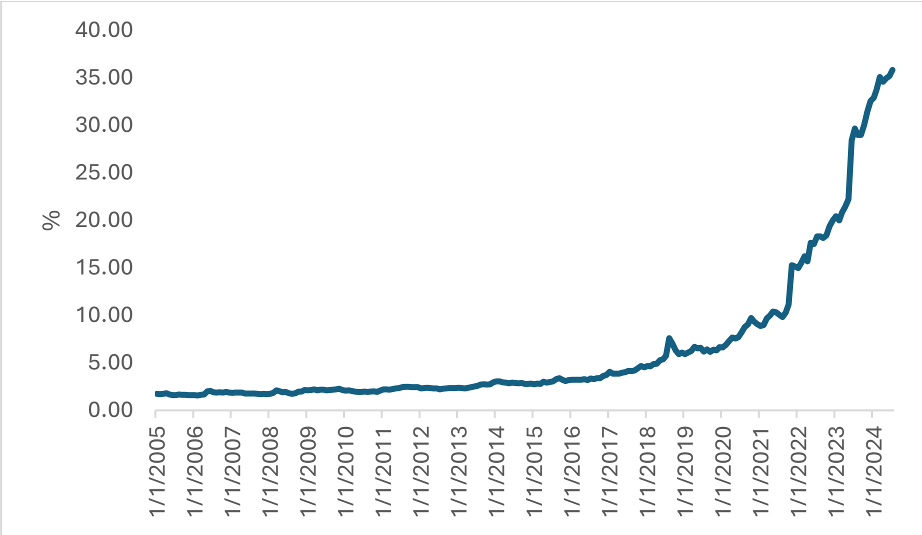
Yağcıbaşı, Ö. F., & Yıldırım, M. O. (2019). Estimating Taylor rules with Markov switching regimes for Turkey. *Romanian Journal of Economic Forecasting*.

Yilmazkuday, H. (2008). Structural breaks in monetary policy rules: Evidence from transition countries. *Emerging Markets Finance & Trade*, *44*(6), 87–97.

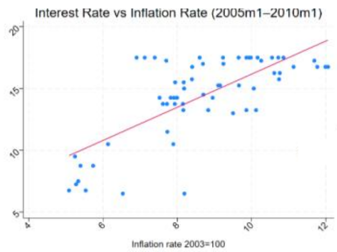
11 Appendix



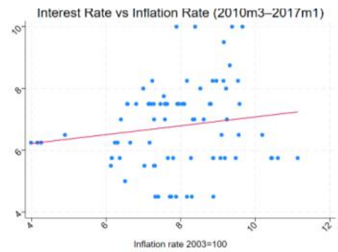
Graph 3: Real GDP and Trend of Real GDP.



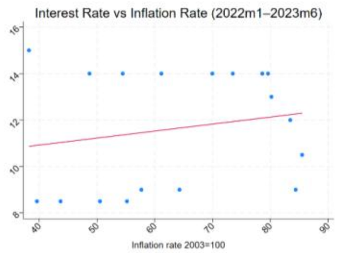
Graph 4: Exchange Rate EUR/TUY from ECB.



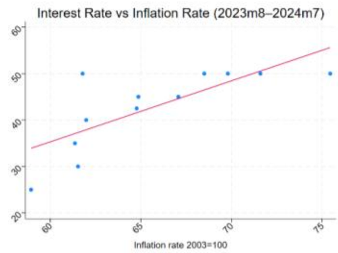
(a) 2005m1–2010m1



(b) 2010m3–2017m1



(c) 2022m1–2023m6



(d) 2023m8–2024m7

Figure 3: Evolution of the Relationship Between Interest Rates and Inflation Across Different Time Periods