NAVIGATING RESILIENT INFLATION: MONETARY POLICY RESPONSES AND THE MACROECONOMIC DETERMINANTS OF PERSISTENCE IN TURKEY

DİRENÇLİ ENFLASYONLA BAŞA ÇIKMA: PARA POLİTİKASI TEPKİLERİ VE TÜRKİYE'DE KALICILIĞIN MAKROEKONOMİK BELİRLEYİCİLERİ

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ABSTRACT

The confluence of factors such as the emergence of inflationary pressures, the structural persistence of inflation dynamics, sensitivity to implemented policies, and the impact of both domestic and external shocks, contributes to the chronic nature of inflation. Inflation persistence can be defined as the continuation of inflation in response to shocks, notwithstanding policy interventions. In this context, the theoretical framework of the study is grounded in the tenets of the Monetarist and New Keynesian schools of thought. This study empirically investigates the determinants of inflation persistence within the Turkish economy, covering the period from 2005Q1 to 2023Q4. Consequently, the analytical model incorporates the following variables: the inflation rate, broad money supply (M2), the policy interest rate, the nominal exchange rate, and the output gap. The stationarity of the variables employed in the study was assessed using the ADF unit root test. The presence of a long-run cointegrating relationship was examined via the ARDL bounds test, and causality was investigated using the Toda-Yamamoto test. The findings derived from the empirical analysis indicate that the nominal exchange rate exerts the most significant long-run impact on inflation. This is followed, in order of magnitude, by the output gap and the policy interest rate. The results suggest that among the factors shaping and determining inflation in the Turkish economy, demand-side pressures and exchange rate pass-through effects are robust, whereas policy credibility appears to be weak. In this regard, the study underscores the necessity for policymakers to acknowledge and address the strengthening of the monetary policy transmission mechanism, which would aid in mitigating the structural impacts of chronic inflation.

Keywords: Inflation Resilience, ARDL Bounds Testing, Exchange Rate Pass-Through, Monetary Policy, Turkish Economy .

JEL Classification Codes: E30, E31, E40, E51, C11.

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ÖZ

Enflasyonist baskıların ortaya çıkması, enflasyonun dinamiklerinin yapısal kalıcılığı, uygulanan politikalara duyarlılık gibi sebepler ile birlikte ülke içinden ve dışından gelen şokların etkisi, enflasyonu kronik hale getirmektedir. Enflasyon direnci, politika müdahalelerine rağmen enflasyonun şoklara tepki vererek devam etmesi olarak tanımlanabilmektedir. Bu bağlamda çalışmanın kuramsal çerçevesi Monetarist ve Yeni Keynesyen ekolün teorik temellerine dayanmaktadır. Türkiye ekonomisinde enflasyon direncinin belirleyicileri kapsamında yapılan bu çalışma 2005Q1-2023Q4 yılları arası dönemi ampirik olarak incelenmektedir. Buna göre analiz için gerekli modelde enflasyon oranı, geniş para arzı (M2), politika faizi, nominal döviz kuru ve çıktı açığı değişkenleri kullanılmıştır. Çalışmada kullanılan değişkenlerin durağanlığı ADF birim kök testi ile; uzun dönem eşbütünleşik ilişkinin durumu ARDL sınır testi ile; nedensellik durumu Toda-Yamamoto testi ile sınanmıştır. Ampirik analiz neticesinde elde edilen bulgular enflasyon değişkeni üzerinde en güçlü uzun dönem etkisinin döviz kuru değişkeninde meydana geldiğini göstermektedir. Sırasıyla bunu çıktı açığı ve politika faizi izlediği görülmektedir. Sonuçlar, Türkiye ekonomisinde enflasyonu şekillendiren ve belirleyen unsurların arasında talep yönlü baskıların ve kur geçişkenliğinin güçlü; politika güvenilirliğinin ise zayıf olduğunu göstermektedir. Bu bağlamda çalışma, para politikası mekanizmasının güçlendirilmesinin bilinmesi, politika yapıcıları açısından dikkate alınması gerektiğini ve kronik enflasyon hastalığının yapısal etkilerinden kurtulmaya fayda sağlayacağını ortaya koymaktadır.

Anahtar Kelimeler: Enflasyon Direnci, ARDL Sınır Testi, Döviz Kuru Geçişkenliği, Para Politikası, Türkiye Ekonomisi

JEL Sınıflandırma Kodları: E30, E31, E40, E51, C11.

1. INTRODUCTION

The phenomenon of inflation, characterized as a discernible and sustained rise in the general level of prices within an economy, can constitute a primary macroeconomic challenge, particularly in less developed nations (Mishkin, 2015). Turkey, historically grappling with inflation, successfully curbed inflation rates to single digits in the early 2000s, a consequence of stringent fiscal and monetary policies. However, commencing in 2017, a confluence of domestic and external economic shocks propelled inflation first into double digits and subsequently, during certain periods, towards levels approaching triple digits, occasionally characterized as hyperinflation (TÜİK, 2023).

The persistently high inflation rate, exacerbated by the currency crisis of 2018 in conjunction with the low-interest-rate policy pursued post-2001, has re-emerged as a significant macroeconomic concern in recent years. For instance, in October 2022, the consumer price index reached 85.5%, marking its highest level in 24 years, exemplifying this predicament. In this context, the imperative of achieving price stability, understood as controlling the general price level, has brought economic discussions concerning money back to the forefront, centering on the concept of inflation resilience.

A review of the literature reveals the recent emergence of "inflation resilience," a concept that offers insights into the responsiveness of the general price level to shocks and gauges the extent to which an economy can withstand prevailing inflationary pressures. Stated differently, inflation resilience not only serves as a litmus test for the efficacy of fiscal and monetary policies but also possesses the capacity to illuminate the structural characteristics of pricing behavior within the given economy (Cecchetti & Schoenholtz, 2021). In this vein, inflation resilience also signifies that inflation becomes more "sticky" over time, failing to decline despite policy interventions aimed at price control. This situation is notably aggravated when economic expectations deteriorate following exchange rate shocks, and when unforeseeable policy decisions are made, thereby contributing further to the entrenchment of inflation.

Within the specific context of Turkey, the most prominent indicators among the fundamental determinants of inflation include exchange rate fluctuations, expansions in the money supply, policy interest rates, and domestic demand indicators (Koçoğlu, 2023; Karahan, 2020). Furthermore, the varying impact of these variables on inflation across different periods is noteworthy. For example, external shocks such as currency shocks or increases in oil prices, and internal shocks like surges in public expenditure and demand, can destabilize the economy to different degrees depending on the period. Consequently, understanding which factors predominantly shape inflation in the Turkish economy and how they do so is of critical economic importance.

This study, encompassing the period 2005-2023 for the Turkish economy and utilizing quarterly data for analysis, aims to analyze the impact of money supply (M2), exchange rate (EXF), policy interest rate (INT), and output gap (GAP) variables on inflation (INF) using time-series empirical methods. The ARDL bounds test was employed to ascertain the long-run cointegrating relationship between the variables; the Toda-Yamamoto test was used to determine causality; and the ADF unit root test was applied to identify the stationarity level of the series.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

Inflation is widely regarded as the primary indicator of price stability in economies, particularly in developing countries. However, beyond the level of inflation, understanding an economy's resilience to inflationary pressures is also crucial for policy effectiveness. Accordingly, the concept of inflation resilience, which has gained prominence in recent literature, is accepted as a notion that provides clues about the degree of deviation in inflation resulting from both internal and external shocks, and the correctability of this distortion and deviation through relevant policy instruments (Cecchetti & Schoenholtz, 2021).

2.1. Classical and Modern Determinants of Inflation

According to the classical economic approach, notably the Monetarist school, inflation is posited to be "always and everywhere a monetary phenomenon" (Friedman, 1968). The fundamental premise underlying this view is that an uncontrolled, continuous increase in the money supply leads to a rise in the general price level. However, the reasons why this assertion may not fully hold in developing countries imply that the cause-and-effect relationship between money supply and inflation is not solely sufficient (Altay & Demir, 2013).

In contrast, the modern Keynesian approach posits that the determinants of inflation include factors such as wage and price rigidities, as well as the output gap and expectations, based on microeconomic foundations. According to the Phillips curve, a stronger inflationary tendency is acknowledged during periods when the output gap, defined as the economy growing above its potential, is positive (Koçoğlu, 2023). This perspective, which internalizes inflationary expectations along with demand-side pressures, is known to retain its validity in countries with growth potential like Turkey.

2.2. Exchange Rate Pass-Through

Exchange rate pass-through, which holds a significant place among the determinants of inflation, particularly in open economies, exerts upward pressure on inflation by directly increasing the costs of imported goods and services. This pass-through effect is especially pronounced in economies sensitive to exchange rates and with high import dependency, particularly during crisis periods (Çiftçi & Yılmaz, 2018). Inflation, triggered upwards by an increase in the exchange rate, can also affect the prices of goods and services through expectations, potentially resulting in an inflationary price spiral (Akçay, 2021).

2.3. Policy Interest Rate and Monetary Policy Transmission

The policy interest rate is recognized as one of the most effective primary tools for countries in their fight against inflation. This is attributed to the interest rate's ability to influence liquidity, thereby guiding current expectations and demand conditions. According to the classical school, an increase in interest rates can be used as a tool to control inflation by curtailing credit expansion. However, routinely implemented monetary policies in Turkey can sometimes lead to a weakening of this relationship (Işık, Mert, & Ulug, 2025).

2.4. Policy Interest Rate and Monetary Policy Transmission

The stickiness of inflation in an economy can stem from the projection of past price developments onto the future by relevant economic units. For instance, consumers who act on the assumption that a past period of high inflation will persist into the future can diminish the effectiveness of policy tools, thereby fostering inflation resilience against the prevailing situation. It is surmised that the primary cause of this effect may originate from the unsuccessful application of expectation management methods (Cecchetti & Schoenholtz, 2021). In short, the recently observed surge in inflationary expectations in Turkey is known to complicate efforts to reduce inflation and is considered a structural impediment.

2.5. Variable Selection Based on Theoretical Foundations

A review of economic literature and theoretical underpinnings indicates that the following variables are generally employed and accepted in econometric analyses for investigating inflation resilience in the Turkish economy, and have yielded significant results:

Table 1. Variable Selection Based on Theoretical Foundations

Variable	Theoretical Basis	Expected Effect
Money Supply (M2)	Monetarist Approach	Positive
Exchange Rate (USD/TRY)	Pass-Through Effect; Cost-Push Inflation	Positive
Policy Interest Rate (INT)	Monetary Policy Transmission Mechanism	Negative
Output Gap (GAP)	New Keynesian Phillips Curve (NKPC)	Positive
Inflation (INF)	Dependent Variable	—

The variables, presented in Table 1 and identified in alignment with established literature and theoretical frameworks, were subjected to empirical analysis utilizing the ARDL model and Toda-Yamamoto tests.

3. LITERATURE REVIEW

It is widely acknowledged that the causes and structural characteristics of inflation constitute a central focus of macroeconomic research in virtually all developed and developing nations. Particularly in economies such as Turkey, which possess a protracted history of high inflation, the determinants and persistence of this phenomenon are considered strategic areas of analysis by both policymakers and academics. Consequently, in addition to macroeconomic variables intrinsically linked to inflation, such as money supply, policy interest rate, output gap, and exchange rate, the concept of inflation resilience has also frequently appeared in recent literature.

According to Friedman (1968), inflation is purely a monetary phenomenon, defined as an increase in the general price level resulting from a continuous expansion of the money

supply. This view, forming the cornerstone of the Monetarist school, also posits a strong and linear correlation between inflation and money supply. Notwithstanding this assertion, discussions regarding the magnitude and direction of this relationship in developing countries underscore the importance of nuance in interpreting this perspective.

Karahan (2020), in his study utilizing quarterly data for the period 2006–2018, found that the impact of an increase in money supply on inflation was less than anticipated. This finding suggests that the money supply-inflation nexus does not exert a uniform effect across all countries or all time periods.

Altay and Demir (2013), employing time-series methods, analyzed the relationship between money supply and inflation for the period 1987–2011. They reported that an increase in money supply significantly elevated inflation, but noted that the magnitude and impact of this increase varied across different periods.

Akçay (2021), investigating the impact of exchange rate shocks on inflation, determined that in open economies, particularly those with intensive use of imported inputs, such shocks exert pressure on inflation and leave lasting effects. The study concluded that this impact is more pronounced during periods of structural breaks in the national economy.

Çiftçi and Yılmaz (2018) highlighted in their work that exchange rate pass-through intensifies excessively during crisis periods, stating that a 10% increase in the exchange rate leads to a 3-4% rise in inflation. These results imply that exchange rate volatility is a significant contributor to the emergence of inflation persistence in the Turkish economy.

Koçoğlu (2023), using monthly data for the period 2000–2021, demonstrated that exchange rate pass-through, cost shocks, and demand-side pressures render the inflationary process more distinct. However, the most significant finding of the study was the statistically significant and positive impact of the output gap on inflation.

Işık et al. (2025) examined the bidirectional relationship between the interest rate and the inflation variable. The empirical findings indicated that the effect of interest rates on inflation is statistically lagged and weak. Conversely, when considering the impact of inflation on interest rates, it was found to influence the decisions of authorities responsible for setting interest rate levels. This situation, where the relationship between interest rates and inflation in the Turkish economy deviates from theoretical underpinnings and yields different outcomes, may also signify weak policy credibility within the country's economy.

A review of the literature underscores that variables such as the output gap and exchange rate are influential in the formation of inflation in the Turkish economy. However, it is understood that the impact coefficient of traditional and classical instruments like money supply and interest rates on inflation varies according to prevailing periodic conditions. In this context, the development of inflation persistence appears to be directly linked to exchange rate pass-through, expectations, and policy credibility.

4. METHODOLOGY

In this study, which aims to measure the parameters through which inflation resilience affects the Turkish economy, the dataset for the determinants of inflation—namely, the

exchange rate, policy interest rate, and output gap—was compiled using quarterly data spanning the period 2005:Q1–2023:Q4. The use of a quarterly dataset provides meaningful and consistent results for the measurement of long-run macroeconomic variables. Information regarding the variables employed in the study can be summarized as follows:

Inflation (CPI): Expressed as the annual percentage change in the inflation rate compared to the same period of the previous year. Data sourced from the Central Bank of the Republic of Turkey (CBRT) Electronic Data Delivery System (EVDS) are based on figures from the Turkish Statistical Institute (TURKSTAT).

Money Supply (M2): The M2 money supply dataset, obtained by adding time deposits to M1 money supply, is denominated in billions of Turkish Lira. Values for the 2005–2017 period were compiled from CBRT statistics, while post-2018 data were gathered and compiled from the CBRT's money and banking statistics bulletins.

Exchange Rate (USD/TRY): The exchange rate data, representing the value of 1 US dollar in Turkish Lira, were obtained from the CBRT EVDS database.

Policy Interest Rate: The policy interest rate variable, representing the CBRT's one-week repo auction rate, was utilized with values obtained as of the end of each quarterly period. Data were procured from the CBRT EVDS database.

Output Gap: The output gap was calculated using the Real Gross Domestic Product (RGDP) dataset, which was seasonally adjusted. Data were sourced from the national income statistics on the TURKSTAT website.

The table containing information about the variables is arranged as follows:

Table 2. Definitions and Sources of Variables Employed

Variable	Definition	Source	Unit
INF	Annual Percentage Change in CPI	TURKSTAT	%
M2	Broad Money Supply	CBRT	Billion TRY (log)
EXR	Nominal Exchange Rate (USD/TRY)	CBRT	TRY (log)
INT	Policy Interest Rate	CBRT	%
GAP	Output Gap	TURKSTAT	%

The descriptive statistics incorporated within the empirical analysis furnish information regarding the variables utilized in the study, thereby aiding in the comprehension of the datasets employed and the constructed model prior to its formal establishment. In this context, the descriptive statistics pertaining to the variables are presented in Table 3 below. Table 3, which contains descriptive information about each variable, individually displays the mean, standard deviation, minimum, and maximum values. Accordingly, the inflation rate (INF) exhibited significant volatility during the period under review, fluctuating between a minimum of %4.2 and a maximum of %85.5. Similarly, the exchange rate (EXR) and the policy interest rate (INT) also traversed a wide band. The output gap (GAP), conversely, by assuming both positive and negative values, reflects the impact of economic cycles.

While this study provides a robust empirical analysis through the ARDL framework, it is crucial to acknowledge its potential limitations to ensure a balanced interpretation of the findings. Firstly, the model may be susceptible to omitted variable bias. Factors such as global commodity and energy price shocks, shifts in fiscal policy stance, and measures of political or institutional uncertainty, which were not explicitly included, could also hold significant explanatory power for inflation dynamics in an open economy like Turkey (Baharumshah, Slesman, & Wohar, 2016). Secondly, the analysis period (2005Q1–2023Q4) encompasses significant structural breaks, including the 2008 global financial crisis, the 2018 currency crisis, and the COVID-19 pandemic. Such breaks can potentially affect the stability of the long-run cointegrating relationships. Although a detailed analysis of these breaks is beyond the scope of this paper, future research employing econometric techniques that explicitly account for structural breaks could offer deeper insights and verify the stability of the reported coefficients (Balcilar, Ozdemir, & Arslanturk, 2010). Acknowledging these limitations frames the current results as a significant, yet not exhaustive, explanation of inflation persistence in Turkey.

Table 3. Descriptive Statistics for the Variables (2005Q1 – 2023Q4)

Variable	Mean	Std. Dev.	Min.	Max.	Description
Inflation (INF)	18.7	21.3	4.2	85.5	Annual CPI Inflation Rate (%)
Money Supply (M2)	13.2	1.7	10.4	16.4	Logarithmic M2 Money Supply (Billion TRY)
Exch. Rate (EXR)	5.6	4.1	1.3	18.9	Logarithmic USD/TRY Exchange Rate
Policy Rate (INT)	12.4	6.3	6.5	24.0	CBRT Policy Interest Rate (%)
Output Gap (GAP)	-0.3	3.2	-10.1	5.2	Output Gap (%)

The datasets prepared for the methodologies employed in the empirical analysis were sequentially utilized in unit root, cointegration, and causality tests to derive empirical evidence. All computations were performed with the aid of EViews and Stata statistical software packages, and the results have been interpreted and discussed in the findings section, supported by tables and graphs.

5. FINDINGS

Prior to presenting the empirical findings, the dataset employed in the analysis was initially examined graphically. Subsequently, the empirical findings were interpreted and evaluated.

5.1. Determinants of Inflation in Turkey: A Graphical Examination (2005–2023)

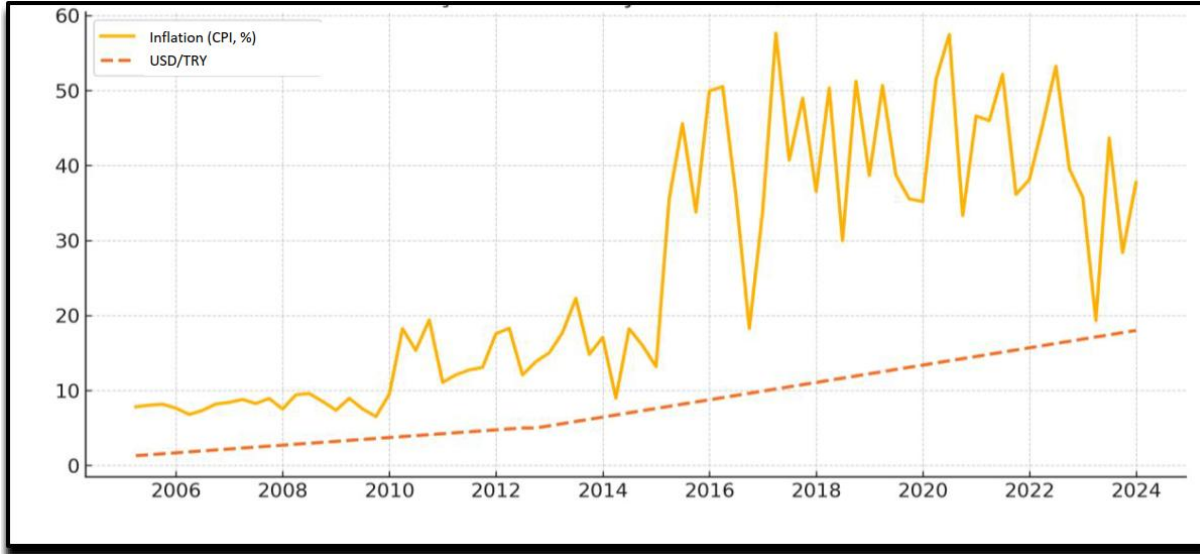**Figure 1.** Inflation and the USD/TRY Exchange Rate (2005Q1 – 2023Q4)

Figure 1 illustrates the relationship between Turkey's annual Consumer Price Index (CPI), an indicator of inflation, and the exchange rate, representing the value of the US dollar against the Turkish Lira. Observing Figure 1, the inflation-exchange rate relationship, which has followed a fluctuating upward trend over the years, appears to have particularly contributed to inflation following surges in the exchange rate, notably after 2018 and 2021. These observations provide evidence of the detrimental impact of exchange rate pass-through on inflation.

**Figure 2.** Inflation and Money Supply (M2) (2005Q1 – 2023Q4)
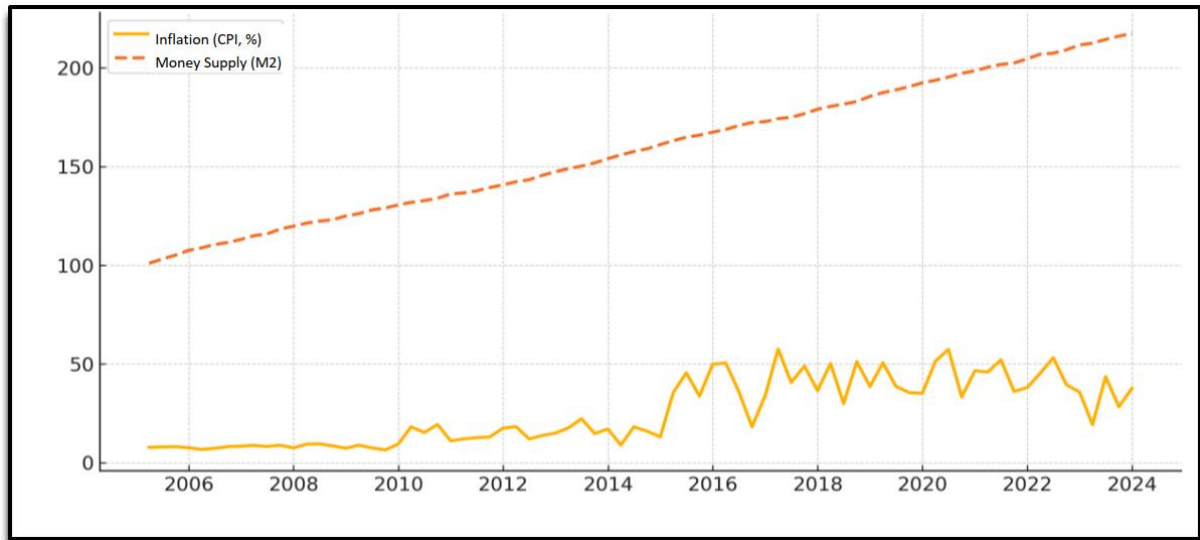
Examining Figure 2, which depicts the relationship between broad money supply (M2) and the inflation variable, it is discernible that despite an indirect and somewhat tenuous connection, increases in the money supply tend to exert an upward pressure on inflation in the long run. These findings suggest that while monetary growth is a relevant factor in explaining inflation, it is insufficient as a sole explanatory variable.

Figure 3. Inflation and the Policy Interest Rate (2005Q1 – 2023Q4)
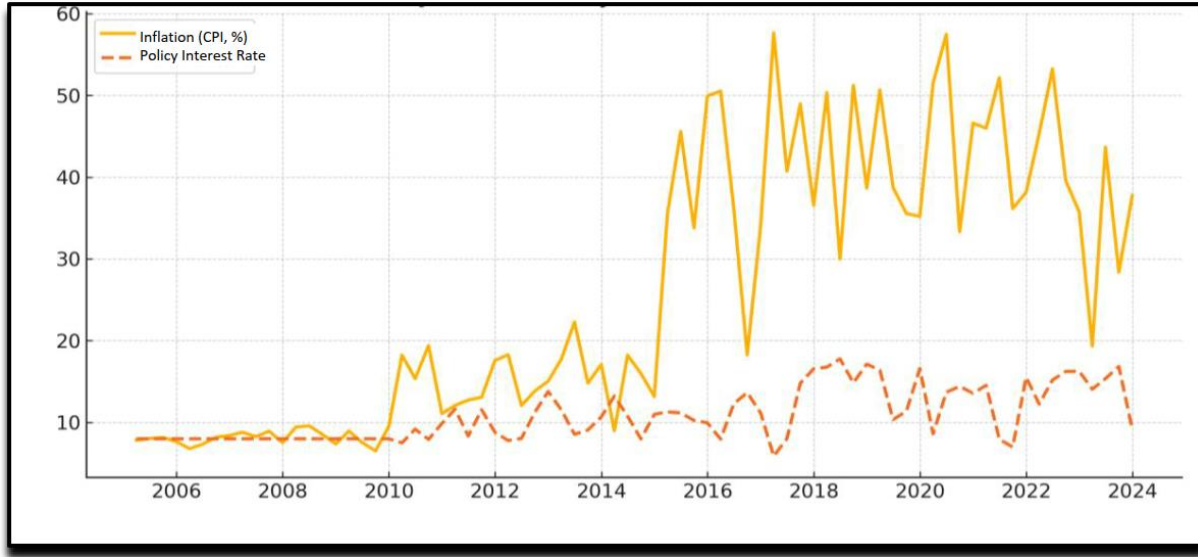
A review of Figure 3, illustrating the relationship between inflation and the policy interest rate, indicates that increases in interest rates possess the potential to maintain inflation within certain bounds. However, in the Turkish case, this relationship does not appear robust, and an increase in the interest rate variable does not consistently translate into a reduction in inflation; indeed, it is plausible that increases in interest rates are observed subsequent to the inflationary process.

Figure 4. Inflation and the Output Gap (2005Q1 – 2023Q4)
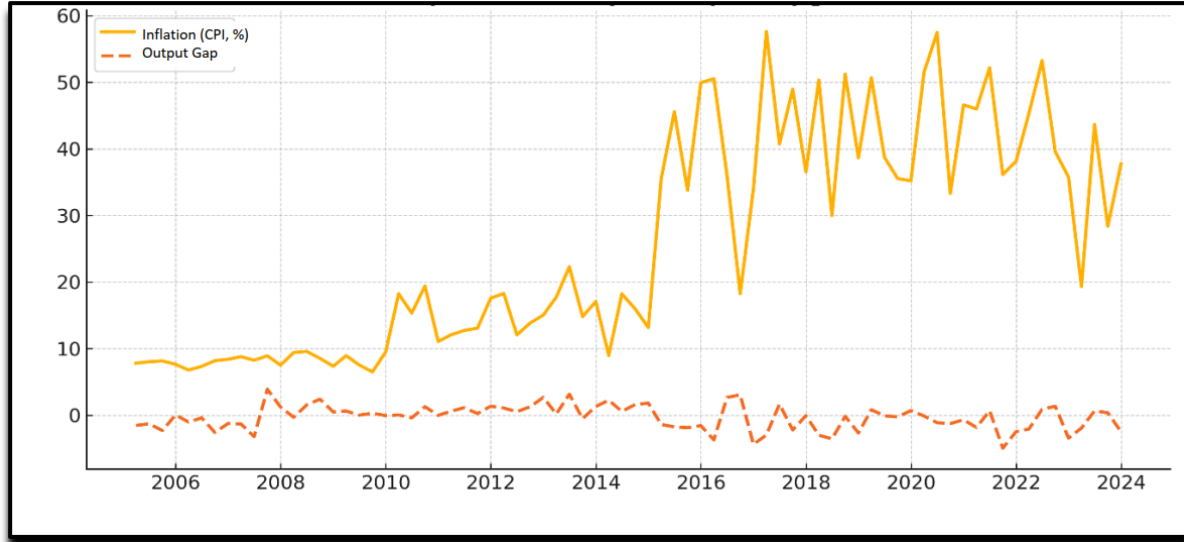
Considering Figure 4, which shows the relationship between inflation and the output gap, it is evident that during periods of a positive output gap, signifying growth above potential, inflation tends to rise concomitantly. These observations offer evidence that domestic demand influences inflation. All the graphical findings presented above are consistent with the cointegration and causality test results detailed in the empirical section of this study, yet

they also suggest that inflation tends to move more closely in tandem with money supply and the exchange rate.

5.2. Empirical Findings

5.2.1.Unit Root Test Results

In econometric analyses, tests that measure the stationarity level of series, commonly referred to as unit root tests, are of considerable importance for yielding meaningful, consistent, and unbiased results (Coşkun et al., 2023: 367). If the series corresponding to the variables constituting the model contain a unit root at their level values, then their first differences, and if necessary, second differences, are taken to achieve stationarity. The stationarity of series at their level values is denoted as I(0) in the literature; stationarity after taking their first differences is denoted as I(1); and stationarity after taking their second differences is denoted as I(2) (Çelik et al., 2020: 94).

Among the unit root tests used to analyze the stationarity level of variables, the ADF test is one of the most popular. The results of the analysis conducted to determine whether the variables used in the study possess a unit root are presented in Table 4 below. According to the ADF unit root test results presented in Table 4, the inflation rate does not contain a unit root in the model with a constant, as its test statistic exceeded the critical value. This implies that the series is stationary at its level value (I(0)). Since the money supply (M2) variable possessed a unit root at its level value, it was rendered stationary by taking its first difference (I(1)). The exchange rate (TRY/USD) series was also purged of a unit root by including a trend and taking its first difference (I(1)). The policy interest rate variable achieved stationarity at the 5% significance level after its first difference was taken, while the output gap was found to be stationary at its level value at the 1% significance level, without differencing. This outcome suggests the presence of a long-run cointegrating relationship between inflation and its explanatory variables.

Table 4. ADF Unit Root Test Results

Variable	Level	First Difference	Stationarity / Order of Integration
INF	Significant at 1%	—	I(0)
M2	Insignificant	Significant at 1%	I(1)
EXR	Insignificant	Significant at 1%	I(1)
INT	Insignificant	Significant at 5%	I(1)
GAP	Significant at 1%	—	I(0)

5.2.2.ARDL Cointegration Test Results

The ARDL cointegration test, developed by Pesaran et al. (2001), is recognized as one of the frequently utilized cointegration tests due to its capacity to yield significant results even when the series corresponding to the variables constituting the model exhibit different levels of stationarity (I(0) and I(1)). In this respect, it can test for a long-run relationship even if the series are I(0) or I(1). The existence of a long-run relationship between inflation and the variables of money supply, exchange rate, policy interest rate, and output gap at the 5% significance level is determined by comparing the critical value with the F-statistic. Accordingly, if the obtained test result, the F-statistic, is greater than the upper bound critical value, the presence of cointegration among the series in the long run is accepted. Once the existence of a cointegrating relationship is established, an ARDL model is constructed by obtaining long-run coefficient estimates between the inflation variable and the other determinant variables. Based on this, the test results determined the optimal lag structure as ARDL(1,1,1,0,1) according to the Akaike Information Criterion. This lag structure is understood as 1 lag for inflation, 1 lag for money supply, 1 lag for the exchange rate, 0 lags for the policy interest rate, and 1 lag for the output gap. According to Table 5, since the F-statistic result is 5.85, which is greater than the upper bound of 4.01 at the 5% significance level, it signifies the existence of a balanced and statistically significant cointegrating relationship among the variables in the long run.

The ARDL bounds test is employed to examine the long-run cointegrating relationship between the inflation variable (INF) and the selected determinants. The optimal lag structure, determined according to the Akaike Information Criterion (AIC), was identified as ARDL(1,1,1,0,1). The findings obtained from the analysis are presented in Table 5 below. According to Table 5, the econometric significance of the cointegrating relationship between the variables also implies that the variables and inflation converge towards a consistent equilibrium path in the long run. For instance, in the short run, inflation may deviate from equilibrium as a consequence of economic shocks; however, in the long run, it will revert to equilibrium by moving in concert with other determinants, principally the exchange rate. Understanding the impact of these determinants is considered among the important findings for comprehending the sources of inflation persistence. Thus, the presence and impact strength of the fundamental variables causing inflation can be utilized in guiding inflation in the long term.

Table 5. ARDL Long-Run Coefficient Estimates

Variable	Coefficient	t-statistic	Significance
M2	+0.08	1.15	(p > 0.10)
EXR	+0.47	4.32	***
INT	-0.10	1.98	**
GAP	+0.36	2.20	**
Constant	+2.10	—	—

Notes: ***, *, and * denote significance at the 1%, 5%, and 10% levels, respectively. (p > 0.10) indicates that the coefficient is not statistically significant at conventional levels.

Table 6 presents the long-run coefficient estimation data obtained from the ARDL model as follows:

Table 6. ARDL Model Long-Run Coefficient Estimates (2005-2023)

Variable	Long-Run Coefficient	t-statistic	Significance
Money Supply (M2)	+0.08	1.15	*
Exchange Rate (USD/TRY)	+0.47	4.32	***
Policy Interest Rate (%)	-0.10	1.98	**
Output Gap (%)	+0.36	2.20	**
Constant	+2.10	—	—

Notes: ***, *, and * denote significance at the 1%, 5%, and 10% levels, respectively. $(p > 0.10)$ indicates that the coefficient is not statistically significant at conventional levels.

Observing Table 6, it is evident that the exchange rate exerts the most potent long-run influence on inflation. For instance, a sustained 10% appreciation in the exchange rate is understood to precipitate a 4.7% increase in the annual inflation rate over the long term. This implies that currency shocks are among the primary factors fueling inflation within the Turkish economy. An illustrative example of this is the 44% depreciation of the Lira following the policy interest rate cuts in 2021, which corresponded with an 85% surge in inflation. Upon examination of Table 6, all variables, with the exception of the money supply variable, yield statistically significant results in the long run. The interest rate variable exhibits a statistically significant negative effect, whereas the other variables demonstrate a positive influence. However, among these variables, the exchange rate is identified as the parameter with the most substantial impact on inflation.

Considering the results for the output gap, the coefficient is positive and statistically significant. The findings indicate that a one-percentage-point increase in the output gap leads to a 0.36-percentage-point rise in inflation in the long run. This points to the existence of demand-pull inflationary pressures. When considering Turkey's economic structure, these results align with the observation that inflation tends to increase during periods of high economic growth and decrease during periods of recession. For example, during the rapid growth phases post-2010, inflation escalated to double-digit figures, whereas during the recessionary period post-2019, a decline in inflation was observed concurrently with the output gap turning negative.

The policy interest rate coefficient is -0.10 for the long run at the 5% significance level. These results imply that a 1-percentage-point increase in interest rates reduces inflation by 0.10 percentage points in the long run. This outcome suggests that monetary policy instruments do have an impact on inflation, albeit a limited one. Consequently, it can be inferred that an interest rate hike might induce a more pronounced effect by indirectly influencing currency stability, thereby aiding in the control of inflation. In other words, this signifies that the capacity of interest rates to control inflation is low and constrained. Regarding the broad money supply (M2) variable, although the long-run coefficient is positive at the 10% significance level, it is not statistically significant. This result, while

seemingly at odds with the classical Monetarist assertion, is consistent with a substantial body of empirical literature on inflation in high-inflation and emerging market economies. In contexts characterized by high and persistent "currency substitution" (para ikamesi), as observed in Turkey, the traditional relationship between the domestic money supply and inflation weakens considerably. Empirical studies on the Turkish economy demonstrate that currency substitution plays a significant role in the inflationary process and strengthens the impact of the exchange rate on domestic prices (Kara and Sağır, 2021). When economic agents hold a significant portion of their assets in foreign currency and use it for pricing decisions, the exchange rate becomes the dominant nominal anchor and the primary channel for price shocks, overshadowing the more indirect and slower-moving influence of M2 growth. Moreover, as De Grauwe and Polan (2005) empirically demonstrated, the strong correlation between money growth and inflation often holds robustly only in hyperinflationary contexts, and even then, the direction of causality can be ambiguous. The endogeneity of the money supply—where the central bank accommodates inflationary pressures—can further obscure a clear causal link, a point supported by our finding of causality running from inflation to M2. Therefore, this result does not negate monetary theory but rather highlights that in the structurally unique context of the Turkish economy, where dollarization is pervasive and exchange rate shocks are dominant, the M2 channel has been superseded by the exchange rate as the preeminent driver of inflation.

5.2.3. Toda-Yamamoto Causality Test Results

The causal relationship between the variables was examined using the Toda-Yamamoto (1995) test. This approach, which allows for the testing of Granger causality using the Wald test, conducts the analysis by adding extra lags to the VAR model, equivalent to the maximum order of integration of the series. This enables the procurement of significant causality test results without necessitating the stationarity condition for the series constituting the model. The method, capable of performing bidirectional Granger causality analysis, seeks to answer the following questions pertinent to the model:

- Do changes in the money supply cause inflation, or does an increase in inflation affect the money supply?
- Can fluctuations in the exchange rate be a cause of inflation, or is the converse true?
- Do policy interest rate decisions made by governments affect inflation, or do developments in inflation determine the policy interest rate?
- Does the output gap have a causal effect on inflation, or does the occurrence of inflation affect the output gap?

The existence of a causal relationship between the variables used in the study is presented in Table 7 as follows:

Table 7. Results of the Toda-Yamamoto Granger Causality Test

Null Hypothesis (H₀: No Causality)	Wald Statistic (χ^2)	P-value / Significance Level
M2 → INF	0.85	Significant at 5%
INF → M2	4.12	Significant at 1%
EXR → INF	7.77	Significant at 5%
INF → EXR	5.30	Insignificant
INT → INF	2.09	Significant at 1%
INF → INT	6.68	Significant at 5%
GAP → INF	4.85	Insignificant
INF → GAP	0.92	Significant at 5%

Money Supply → Inflation: The existence of causality running from money supply to inflation is not statistically significant. These results indicate that changes in the M2 money supply are not the cause of inflation. In other words, this can also be interpreted as money supply alone cannot determine inflation. However, when the reverse situation is analyzed, changes in inflation are accepted as the cause of money supply at the 5% significance level. This causality may have arisen through mechanisms resulting from increased nominal money demand during periods of high inflation, the Central Bank's expansion of the money supply to ensure market liquidity, and the response of monetary aggregates to inflation. In summary, causality is only discernible from inflation to money supply.

Exchange Rate → Inflation: Causality from the exchange rate to the inflation variable was found to be valid at the 1% significance level, and findings indicated that exchange rate movements are a Granger cause of inflation. This confirms the notion that changes in the exchange rate will predict future inflation. When the reverse situation was analyzed, the existence of a causal relationship with inflation affecting the exchange rate was observed at the 5% significance level. This implies that during inflationary periods, the rise in the general price level can fuel the exchange rate. Increased demand for foreign currency and falling real interest rates during times of rising inflation can weaken the local currency. Furthermore, expectations of hyperinflation can, over time, exert pressure on the exchange rate, leading to dollarization. In short, a bidirectional causal relationship exists between the exchange rate and inflation.

Interest Rate → Inflation: The results for causality running from the interest rate to inflation were not statistically significant. That is, changes in interest rates are not, in a unidirectional manner, an explanatory factor for future inflation. In the Turkish economy, policymakers generally use interest rate decisions as a reactive measure to ensure monetary stability during inflationary processes, thus causality is often observed to operate in reverse. That is, changes in inflation are a cause of interest rate adjustments. The obtained findings confirm this situation at the 1% significance level. The decrease or control of inflation as a result of interest rate hikes due to high inflation between 2005 and 2015 serves as an example of this.

Output Gap → Inflation: The existence of a Granger causal relationship from the output gap to inflation is statistically significant. According to these results, changes in the output gap resulting from demand are at a level that can affect future inflation. The emergence of inflationary increases, particularly during periods of buoyant domestic demand, exemplifies this situation. Conversely, no causality is observed in the reverse direction, i.e., from inflation to the output gap. In other words, inflation shocks do not significantly affect the output gap. However, the absence of any Granger effect of high inflation on growth necessitates attention to the possibility that it could lead to adverse effects on growth during periods of uncertainty and instability.

When the findings obtained from the analysis are evaluated comprehensively, it is observed that factors affecting domestic demand and the exchange rate are leading elements that fuel and trigger inflation, while the policy interest rate and money supply are shown to be variables that react more to inflation. These results are consistent with the underlying structural mechanism of inflation persistence in the Turkish economy. This is because, in Turkey, currency shocks and demand pressures lead to rapid triggers in an inflationary environment, whereas monetary actors are known to be employed to ensure stability after inflation has occurred. Furthermore, the presence of inflation persistence in the country's economy implies that once the country is exposed to high inflation, exiting it will take longer than normal estimates would suggest.

CONCLUSION AND RECOMMENDATIONS

Economic literature posits that phenomena such as the exchange rate, money supply, output gap, and interest rate are influential among the dynamics and determinants of inflation. Among these parameters, while the exchange rate, money supply, and output gap theoretically have a significant and positive impact on inflation, policy interest rates are known to be viewed as an inflation control tool, albeit with a negative effect on inflation in the short term and a weaker one in the long term. Accordingly, this study sought to determine the extent of the inflation persistence phenomenon among the determinants of inflation in the Turkish economy for the period 2005Q1-2023Q4.

In line with the study's objective, the stationarity level of the variables was tested using the ADF unit root test. It was found that the inflation and output gap rates were stationary at their level values (I(0)), while the money supply, exchange rate, and interest rate variables became stationary (I(1)), i.e., did not possess a unit root, after their first differences were taken.

The existence of a long-run cointegrating relationship between the variables was established using the ARDL bounds test. Accordingly, all variables except for the money supply variable are statistically significant in the long run. The interest rate variable has a statistically negative effect, while other variables have a positive effect. However, among the variables, the exchange rate is seen to have the most potent impact on inflation.

In other words, when evaluating the relationship between the fundamental determinants of inflation and inflation persistence, it is shown that the exchange rate has a strong impact on the Turkish economy in both the short and long term. Determinants such as money supply

and policy interest rate are understood to be insufficient to control inflation on their own. The finding that money supply lacks a significant long-run impact, while counterintuitive under a classical framework, underscores the structural realities of the Turkish economy, where high dollarization and the dominance of the exchange rate channel temper the traditional role of monetary aggregates. While our model captures key macroeconomic drivers, future research could build upon these findings by explicitly incorporating external factors like global commodity prices or utilizing models that account for structural breaks to further refine our understanding. Although the output gap variable plays a role in the rise of inflation from the demand-side perspective, its small and weak effect indicates that cost shocks and exchange rate fluctuations are more dominant and influential on inflation. Accordingly, the following policy recommendations can be suggested to break inflation persistence and achieve price stability in the Turkish economy:

Exchange Rate Stability and Credible Monetary Policy: The fact that the exchange rate is among the most powerful determinants affecting inflation demonstrates the indispensability of achieving exchange rate stability. For this, the Central Bank needs to pursue a consistent and credible monetary policy. During periods when the TL depreciates and inflation expectations rise, inflation persistence can be weakened through the independent use of traditional monetary policy tools to achieve price stability. Thus, a sense of confidence can be established through the exchange rate by positively shaping market expectations.

Institutional Credibility and Expectation Management: To combat inflation, it is important to anchor market expectations to disinflation. In this context, the Central Bank and the government need to focus jointly on inflation targeting in a compatible and coordinated manner. As much as the monetary policy implemented by the Central Bank, fiscal policy and reform movements in the economic structure will benefit the economy by both reducing inflation and improving expectations. This could lead to the breaking of inflation persistence.

Measures to Reduce Exchange Rate Pass-Through: In economies that are overly sensitive to exchange rate shocks, the fragility of inflation is inevitable. Therefore, implementing policies to reduce exchange rate pass-through is crucial. Policies aimed at increasing import substitution through domestic production, ensuring energy security and supply, and promoting domestic production, along with reducing input prices, can control currency shocks in the medium term and lessen the impact of the exchange rate on inflation. Gaining depth in financial markets and increasing foreign exchange liquidity will also prevent sudden exchange rate fluctuations, thereby benefiting the achievement of price stability.

Supportive Role of Fiscal Policy: In the fight against inflation, the role of fiscal policy is as important as monetary policy. Ensuring discipline in public finances is effective in managing domestic demand and expectations. Therefore, intervening with tight fiscal policy tools during inflationary periods will help control demand-side pressures and stabilize inflation. Furthermore, the Central Bank and the government determining a policy consistent with the inflation target and acting together, and in this vein, influencing inflation dynamics through practices such as suspensions, tax cuts, incentives, and wage increases, can lead to lasting results in achieving price stability.

Structural Reforms and Productivity Growth: One of the effective methods for permanently reducing inflation persistence is to increase supply along with productivity. Disruptions in the supply chain can cause inflationary pressures over time. Similarly, increasing competition,

raising labor productivity, and achieving long-term productivity growth in agriculture and other sectors are important for price control. These supply-side policies can prevent inflation from showing resistance on the demand side and, through structural reform movements, help control inflation and achieve price stability.

Communication and Coordination: It is known that an inflation crisis in a country is a macroeconomic problem that can be overcome through a collective struggle, taking into account the effects of the Central Bank, government, business world, and external actors. Therefore, it is important for the main actors within the economy to act in a coordinated and strong communicative manner. For instance, programs implemented under the banner of a comprehensive fight against inflation can be more effective when applied as a result of the expectations of households, firms, the government, and foreign capital. Failure to establish this connection and communication can result in potential inflation expectations materializing in the future. This shows us that success can be achieved by policymakers ensuring a reliable, stable, and sustainable economic and political environment.

YAZARLARIN BEYANI / DECLARATION OF THE AUTHORS

Declaration of Contribution Rate: %100

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