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Research Article

Monetary and Non-Monetary Determinants of Inflation in the Kyrgyz Republic: An Overview

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Abstract

To develop effective inflation control policies, it is essential to thoroughly examine all the underlying dynamics that lead to inflation. In this context, monetary and non-monetary factors, such as real economic growth, external debt, public spending, imports, and structural economic problems, must be considered. This study examines the monetary and non-monetary causes of inflation in Kyrgyzstan within a theoretical framework and analyzes the effects of both groups of factors on inflation empirically. The ARDL model was used with quarterly data from 2007Q1 to 2024Q3. According to the study's findings, monetary causes of inflation, such as the money supply and nominal interest rates, have an inflationary effect. An appreciation in the exchange rate, on the other hand, has a deflationary effect. A review of non-monetary factors reveals that public spending and economic growth can lead to inflation in the long term. On the other hand, imports and external debt can have a deflationary effect, provided that the budget deficit is kept under control. Balanced monetary policy and fiscal discipline are important for controlling inflation in the long term.

Keywords: M2, Nominal Interest Rate, Exchange Rate, Public Expenditures, Real GDP, Imports, Government Debt

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1. Introduction

Price stability is the objective of the monetary policy pursued by the National Bank. However, inflation is a complex process, and not all of its driving forces are under the National Bank's control. Kyrgyzstan is an open economy that depends on imports and is directly affected by global changes. This situation makes the Central Bank's monetary policies aimed at combating inflation ineffective for achieving sustainable economic growth and makes it difficult to regulate price stability.

Since the early 1990s, inflation has been a serious macroeconomic problem in the Kyrgyz Republic, particularly during the transition period. The hyperinflation of 62% observed in 1994, as shown in Figure 1, demonstrated the structural weaknesses of the country's monetary and financial systems, as well as high price volatility. In subsequent years, the introduction of the national currency and the implementation of liberal reforms partially controlled inflation, though levels remained relatively high. For instance, inflation was 34.8% in 1996. Although inflation has been relatively stable since the 2000s, it reached 20% in 2008 due to shocks in the global food and oil markets. These events demonstrate

that inflation is driven by both internal and external factors. From 2021 to 2024, the effects of the pandemic, supply chain disruptions, geopolitical tensions, and food security issues drove up inflation levels once again. Despite the Central Bank's efforts to keep interest rates at around 9% through monetary policy, inflation rose to 14.7% in 2022. In 2024, inflation stood at approximately 6.3%. These historical trends show that inflation in Kyrgyzstan has complex origins, is vulnerable to external shocks, and is multifaceted. Generally, categorizing the causes of inflation as either monetary or non-monetary is an important foundation for understanding their interrelationships and developing policy measures.

This study analyzed monetary and non-monetary inflation variables to better understand and accurately analyze the factors affecting price levels in Kyrgyzstan. Monetary factors include variables such as the money supply, interest rates, and exchange rates. Friedman (1963, p. 18) explicitly stated that inflation is fundamentally driven by an increase in the money supply, clearly identifying it as a monetary variable. Interest rates and exchange rates are defined as tools of monetary policy in the IS-LM and Mundell-Fleming models by Hicks (1937, p. 153) and Mundell (1963, p. 476) and thus fall under the monetary category. Conversely, variables such as GDP, external debt, public spending, and imports are not directly related to monetary policy, but rather to fiscal policy and the real sector. Keynes (1936, p. 47) emphasizes that the relationship between GDP and public spending is real and fiscal, not monetary. External debt and imports also fall under non-monetary factors because they are shaped by public finance and the balance of trade (Heckscher, 1935, p. 47). Thus, the aforementioned variables can be classified as monetary or non-monetary based on theoretical foundations. The Bank of Russia (2017, p. 8) presents this distinction in a table showing monetary and non-monetary factors separately. Esian (2022, p. 89) examined whether inflation in Nigeria was caused by monetary or non-monetary factors when analyzing global studies. Using real GDP, money supply, and interest rates as variables, Esian found that inflation is not merely a monetary phenomenon, but also stems from non-monetary factors. Smant and Melger (1997) examined the monetary and non-monetary factors of inflation in the Netherlands, a small, open economy. They based their work on the consensus that inflation is a monetary process whereby an increase in the money supply raises the price level. Somova and Vaganova (2023) note that the effect of monetary factors decreases under conditions of economic growth and exerts an indirect influence. The effects of production expansion, income growth, and oil prices are significant. Ganiev and Atabaev (2016), for example, examined the impact of monetary factors on money supply and exchange rate variables in panel studies on the effectiveness of monetary policy for EAEU countries. Japarova and Shabieva (2021) found that non-monetary factors significantly impact the price level in Kyrgyzstan, and fiscal policy plays a crucial role in managing inflation. However, these studies have addressed inflation dynamics in Kyrgyzstan within a one-sided framework (either monetary or non-monetary).

In this context, no comprehensive, empirical study in the literature addresses inflation in Kyrgyzstan holistically, considering both monetary and non-monetary factors. This study aims to address this gap by analyzing the impact of monetary and non-monetary factors on inflation in Kyrgyzstan. Additionally, the study intends to contribute to a better understanding of the structure of inflationary processes in Kyrgyzstan and provide a scientific source of information for long-term strategic planning through the obtained findings.

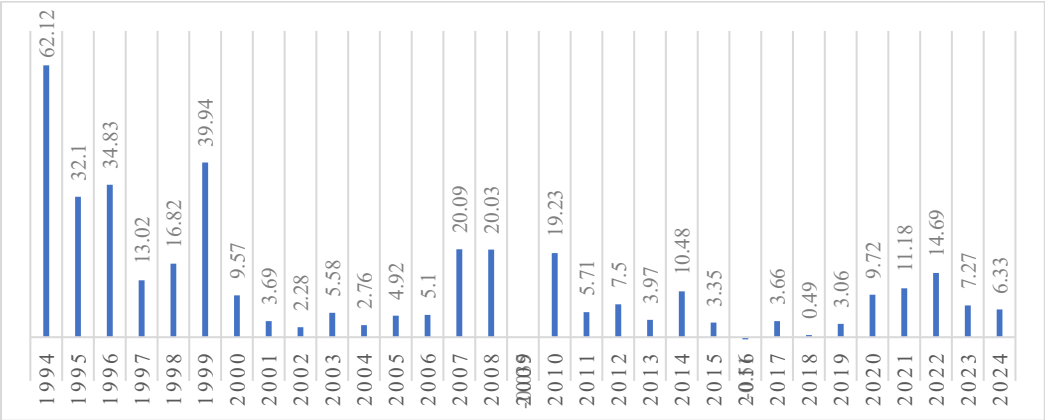
2. Theoretical Framework

The debate over the causes of inflation is at the heart of a long-standing theoretical divide in economic literature. In this context, the monetarist approach explains inflation as an increase in the money supply. Friedman (1956, p. 17) concluded from an empirical analysis of U.S. history that an increase in the money supply directly affects the price level: "Inflation is always and everywhere a monetary phenomenon." Based on this conclusion, monetarists identified the primary source of inflation as the expansion of the money supply, thereby emphasizing the role of monetary policy. Similarly, classical and neoclassical economists argue that the money supply affects only the price level and has no effect on real variables. This forms the basis of the Quantity Theory developed by Fisher (1911, p. 159). According to this theory, money only affects nominal variables in the economy, and changes in the money supply do not affect real indicators such as output, employment, and growth. Modern economists such as Mishkin (2007, p. 334) and Svensson (2009, p. 15) advocate for increasing monetary neutrality and emphasize that the long-term effects of monetary policy are limited.

However, many historical events have shown that inflation cannot be explained by monetary factors alone. For example, the stagflation crisis of the 1970s, during which high unemployment and high inflation occurred simultaneously, was explained by Bruno and Sachs (1985, p. 134) as a supply-side shock. As globalization accelerated in the 2000s, Rogoff

(2004, p. 56) observed that growth in foreign trade led to price stability but also disrupted the balance of capital movements. Finally, Blanchard and Bernanke (2023, p. 15) presented the supply chain disruptions following the Covid-19 pandemic as a contemporary example of the impact of non-monetary shocks on inflation.

Figure 1. Inflation Outlook for Kyrgyzstan



Source: National Bank of the Kyrgyz Republic, www.nbkr.kg, Date of Access: 23.04.2025

The New Classical approach has also expanded to include the theory of rational expectations, which informs economic actors and limits the impact of economic policies. According to Lucas (1972, p. 115), inflation results from unexpected monetary policy; however, this effect is eliminated if the policy aligns with the expectations of economic actors. Gali and Gertler (1999, pp. 195–222) and Woodford (2003, p. 117) emphasize the importance of micro-based models in explaining inflation dynamics, highlighting the role of expectation mechanisms in pricing behavior. The Austrian school argues that inflation stems from both the money supply and credit expansion. Mises (1981, p. 297) posits that artificial growth occurs when the credit system is liberalized. Hülsmann (2010, p. 610) claims that the central bank causes economic actors to borrow excessively by lowering interest rates, thereby encouraging an increase in the general price level. In this approach, the structural characteristics of the financial system are among the fundamental determinants of inflation.

In response to the monetarist view, structural economists generally attribute inflation to supply-side issues and external dependencies. Prebisch (1950, p. 47) and Furtado (1963, p. 143), for example, argue that inflation in developing countries is caused by the deterioration of their import-based production structures, which leads to foreign exchange shortages and is reflected in the general price level. Ocampo (2009, p. 710) and Easterly and Fischer (2001, p. 170), however, attribute inflation to the expansion of the money supply, imbalances in foreign trade structures, institutional weaknesses, and production constraints.

Conversely, New Keynesians contend that simultaneous changes in prices and wages may result in the breakdown of market mechanisms in the short term, leading to heightened inflationary pressures. Ball and Mankiw (2002, p. 128) claim that wages and prices are inflexible and vulnerable to economic shocks. Blanchard and Gali (2007, p. 25) point out that economists have developed theoretical models that demonstrate the intricacy of price dynamics due to the gradual updating of expectations and information asymmetry.

Post-Keynesian economists who hold these views see them as resulting from conflicts over income distribution and financial instability. Robinson (1962, p. 74) observed that wage demands create upward pressure on prices. Minsky (1986, p. 256), on the other hand, claimed that borrowing cycles and financial speculation trigger inflation and threaten economic stability.

3. Empirical Review

Most empirical studies on the determinants of inflation do not emphasize the distinction between monetary and non-monetary factors. However, certain factors tend to stand out in most studies. One of these is the money supply. Yenisu (2019) analyzed monthly data from 2010M1 to 2017M12 using the Toda-Yamamoto method (1995) and identified the money supply, budget deficit, exchange rate, interest rates, external debt, oil prices, and bank loans as the variables with the greatest impact on inflation. According to the short-term analysis, the money supply and oil prices were found

to cause inflation in Turkey. The money supply, in particular, has a strong effect on inflation. However, the other variables were not found to cause inflation. Furthermore, Özmen and Koçak (2012), Nigusse et al. (2019), Ayad (2020), and Asghar et al. (2023) also identified a positive relationship between the money supply and inflation.

Another important monetary factor is interest rates. The relationship between interest rates and inflation is empirically complex and varies by country, period, and macroeconomic conditions. Göçer and Ongan (2020) examined the Fisher effect in the United Kingdom using an ARDL model over the periods 1995Q1–2009Q9 and 2008Q10–2018Q1. They discovered an asymmetric and partial relationship between inflation and interest rates in the long term. Asgharpur et al. (2007) examined 40 Islamic countries between 2002 and 2005 using panel data methods and concluded that there is a positive relationship between interest rates and inflation. While many researchers argue that inflation raises interest rates, others argue that increases in interest rates can raise production costs and thus increase inflation. However, empirical findings reveal one-way causality from interest rates to inflation. These findings suggest that interest rates are an active monetary policy tool that directly affects inflation, rather than a passive reflection of it.

The relationship between exchange rates and inflation is one of the widely studied subjects in both theoretical and empirical literature. Naptania et al. (2022), for example, used panel data regression to examine the effects of inflation and exchange rates on exports in Indonesia, Singapore, Thailand, Malaysia, and the Philippines from 2010 to 2020. El Alaoui et al. (2019) examined the relationship between money supply, interest rates, inflation, exchange rates, the industrial production index, and equity indices in Malaysia using wavelet techniques. Based on their observations, the researchers found almost no correlation between the money supply and inflation in the short term. This implies that changes in the money supply do not impact the short term. Turna and Özcan (2021) analyzed the relationship between inflation, exchange rates, and interest rates in Turkey from 2005 to 2019 using the ARDL model. According to the results, both variables positively and significantly affect inflation in the short and long term. Specifically, the exchange rate's effect is stronger than the interest rate's effect.

In the context of non-monetary factors, imports have emerged as a key variable in the era of growing trade relations. Shiyalinia (2019) examined the impact of imports on inflation in Sri Lanka from 1977 to 2017. According to the ARDL bounds test results, a long-term positive relationship was found between the variables. These results reflect cost-push inflationary pressures in particular. Tuğcu et al. (2019) found that imports positively and significantly affect inflation in Turkey. In particular, energy and intermediate goods imports increase cost inflation. Conversely, some studies have shown that import volume has a dampening effect on inflation. For instance, Feyisa (2024) conducted an ARDL analysis on Ethiopia and found that the import volume index has a downward effect on inflation in both the short and long term.

Empirical studies confirm that fiscal policy tools play a role in price increases. For example, Hamadouche's (2024) empirical study on Algeria reveals a significant long-term relationship between public spending and inflation. According to the Augmented Dickey-Fuller (ADF) model, which is based on time series data from 1973 to 2022, a 1% increase in public spending leads to a 0.23% increase in inflation over the long term. However, Kara and Yuliawan (2023) found that public spending negatively affected inflation in Indonesia between 2000 and 2021. Similarly, Maharani et al. (2024) found that public spending negatively affects inflation in 31 Asian countries between 2018 and 2023. Therefore, an increase in spending reduces inflation.

Public debt is also one of the non-monetary factors of inflation. Barquero and Loaiza (2017) discovered that an increase in public debt substantially increases inflation in indebted developing countries. However, this relationship does not apply to developed countries. They emphasized that fiscal discipline is a decisive factor in inflation in countries with high debt-to-GDP ratios. Mehmeti and Deda (2022) examined the impact of public debt on inflation by analyzing Kosovo and North Macedonia. Their analysis, which used data from 2010 to 2021, found a positive and statistically significant relationship between public debt and inflation. Aimola and Nicholas (2022) examined the relationship between total public debt and inflation in Gambia using data from 1978 to 2019 and a nonlinear approach (NARDL). The results revealed an asymmetric relationship between these two variables in the short and long term. Karakaplan (2009) shows that the effect of external debt on inflation depends on countries' financial market development. Using GMM estimates based on a panel dataset covering 121 countries between 1960 and 2004, Karakaplan shows that the inflationary effect of external debt is lower in developed countries with developed financial markets. The relationship between price levels and the money supply, as well as how public debt affects this relationship, is examined in detail by Castro et al. (2003).

Furthermore, numerous studies have examined the relationship between inflation and inflation uncertainty (Munir and Riaz, 2020; Khatır et al., 2020).

Another key factor influencing price increases is economic growth. Mallik and Chowdhury (2001) examined the relationship between inflation and gross domestic product (GDP) growth using annual data from Bangladesh, India, Pakistan, and Sri Lanka. Their analysis, which used cointegration and error correction models, found a positive long-term relationship between inflation and economic growth in all four countries. These results imply that moderate inflation may promote growth, though high growth rates can also trigger inflation. Conversely, Özyılmaz (2022), Barro (2013), and Akter and Smith (2021) discovered an inverse relationship between these two variables. Mohd et al. (2013) examined the relationship between inflation, inflation uncertainty, and economic growth in five ASEAN countries from 1980 to 2011 using an EGARCH model. Their findings suggest that inflation uncertainty does not directly cause inflation. However, there is evidence of a negative impact of inflation on growth, both directly and indirectly through the inflation uncertainty channel.

In conclusion, empirical studies show that inflation is primarily determined by monetary factors, such as money supply, interest rates, and exchange rates, as well as non-monetary factors, such as imports, public spending, public debt, and economic growth. The VAR, VECM, and ARDL methods are frequently used and considered more appropriate analytical tools.

4. Data Set, Variables and Empirical Findings

In accordance with econometric assumptions, all variables included in the model analyzed in this study were converted to natural logarithms. The dependent variable in the model is the logarithm of the consumer price index (CPI), or inflation. The explanatory variables are divided into two groups: monetary and non-monetary determinants. Monetary variables: Money supply (LM2), nominal interest rate (LIR), and exchange rate (LER). Non-monetary variables: Gross domestic product (GDP), public expenditures (GEX), external debt (DE), and imports (IM).

Table 1. Data sources and measurement of variables

Variables	Description	Measurement	Source
LCPI	Consumer Prices Index	Logarithm, index	National Bank of Kyrgyzstan
LIR	Interest Rate	Logarithm, Nominal, %	
LER	Exchange Rate	Logarithm, 1 LCY/USD	
LM2	Supply of Money	Logarithm, Current, LCY	
LGE	Government Expenditures	Logarithm, Current, LCY	
LFD	Foreign Debt	Logarithm, Current, USD	
LGDP	Real Gross Domestic Product	Logarithm, index	
LIM	Import	Logarithm, Current, USD	

The time series data used in this study covers the period from the first quarter of 2007 to the third quarter of 2024. All data were obtained from the official sources of the National Bank of the Kyrgyz Republic (NBKR). These variables were selected based on similar empirical studies in the literature and are considered key to explaining the inflation dynamics of the Kyrgyz economy.

4.1. ARDL Model

Since some of the variables are stationary at the level and some are stationary at the first difference, it was appropriate to use the ARDL cointegration model. Two separate models were constructed, one for monetary factors and one for non-monetary factors.

CPI=f(M2,ER,IR)

CPI=f(GDP,GE,IM,FD) (1)

The generalized log-log form of the model used is given by the following equation:

LNCPI=α+ β1LNM2+ β2LNER+ β3LNIR+ ωT

LNCPI= α+β1LNGDP+ β2LNGE+ β3LNIM+ β4LNFD+ωT (2)

ARDL (Autoregressive Distributed Lag) model specification was used:

$\Delta LNCPI_t = \alpha+\omega T+ \beta1LNCPI_{t-1}+ \beta2LNM2_{t-1}+ \beta3LNER_{t-1}+ \beta4LNIR_{t-1}+\sum_{i-1}^{m} \delta_1 LNCPI_{t-i} +\sum_{i-0}^{n} +\delta_2 LNM2_{t-i}+ \mu_t$ (3)

$\Delta LNCPI_t = \alpha+\omega T+ \beta1LNCPI_{t-1}+\beta2LNGDP_{t-1}+ \beta3LNGE_{t-1}+ \beta4LNIM_{t-1}+\beta5LNFD_{t-1}+\sum_{i-1}^{m} \delta_1 LNCPI_{t-i} +\sum_{i-0}^{n} +\delta_2 LNGDP_{t-i}+ \mu_t$

Here, (3) in the formula, Δ represents the first difference operator; c, ω, δ, βi's, di's (i = 1 to 6) represent the coefficients; α represents the constant term and μ_t represents the error term.

$LNCPI_{t=} \alpha+\omega T+\sum_{i-1}^{m} \beta1CPI_{t-i}+\sum_{i-0}^{n} \beta2LNM2_{t-i}+\sum_{i-0}^{o} \beta3LNER_{t-i}+\sum_{i-0}^{p} \beta4LNIR_{t-i}+ \mu_t$ (4)

$LNCPI_{t=} \alpha+\omega T+\sum_{i-1}^{m} \beta1CPI_{t-i}+\sum_{i-0}^{n} \beta2LNGDP_{t-i}+\sum_{i-0}^{o} \beta3LNGE_{t-i}+\sum_{i-0}^{p} \beta4LNIM_{t-i}+\sum_{i-0}^{q} \beta5LNFD_{t-i}+\mu t$

The estimation process for long-term coefficients is described by equation (4). The final step is to obtain the short-term dynamic parameters, for which an error correction model (ECM) must be developed. The ECM consists of two parts: the estimated short-term coefficients and the error correction term (ECT). The ECT indicates the speed at which short-term dynamics adjust to the long-term equilibrium path. The ECM is estimated as follows:

$\Delta LNCPI_t = \alpha+\omega T+ \sum_{i-1}^{m}\delta_1\Delta LNCPI_{t-i}+\sum_{i-0}^{n}\delta_2\Delta LNM2_{t-i}+\sum_{i-0}^{o}\delta_3\Delta LNER_{t-i}+\sum_{i-0}^{p}\delta_4\Delta LNIR_{t-i}+\theta ECT_{t-1}+\mu_t$

$\Delta LNCPI_t=\alpha+\omega T+\sum_{i-1}^{m}\delta_1\Delta LNCPI_{t-i}+\sum_{i-0}^{n}\delta_2\Delta LNGDP_{t-i}+\sum_{i-0}^{o}\delta_3\Delta LNGE_{t-i}+\sum_{i-0}^{p}\delta_4\Delta LNIM_{t-i}+\sum_{i-0}^{q}\delta_5\Delta LNGD_{t-i}+\theta ECT_{t-1}+\mu_t$
(5)

Here, θ represents the convergence rate coefficient of the error correction term, which is expected to be negative.

Table 2. The Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variables	Level		First Difference	
	Constant	Constant&Trend	Constant	Constant&Trend
LCPI	-4.0333*** (0.0022)	-4.0911** (0.0101)	-8.0918*** (0.0000)	-7.7400*** (0.0000)
LM2	-0.1092 (0.9438)	-1.9572 (0.6139)	-6.9172*** (0.0000)	-6.8696*** (0.0000)
LER	-1.5146 (0.5200)	-3.8188** (0.0216)	-3.5599*** (0.0093)	-3.6426** (0.0338)
LIR	-1.4463 (0.5546)	-2.3359 (0.5546)	-6.2139*** (0.0000)	-6.1717*** (0.0000)
LGDP	-3.0241** (0.0381)	-2.9713 (0.1485)	-7.1566*** (0.0000)	-7.1435*** (0.0000)
LIM	-1.6624 (0.4455)	-2.8571 (0.1830)	-2.9886** (0.0432)	-2.9816 (0.1452)
LGE	0.2402 (0.9731)	-1.5182 (0.8127)	-3.2226** (0.0233)	-2.9386 (0.1580)
LFD	-3.7277*** (0.0056)	-4.2885*** (0.0057)	6.2505*** (0.0000)	-6.6056*** (0.0000)

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

This study applied the Augmented Dickey-Fuller (ADF) unit root test to determine the level of stationarity of the variables. The results of the test show that most of the variables are not stationary at the level but become stationary after the first difference is taken. The LCPI and LFD variables yielded statistically significant results and were found to

be stationary at the level. The other variables (LM2, LER, LIR, LGDP, LIM, and LGE) showed stationarity at the first-difference. Therefore, the unit root test provides strong rationale for using ARDL as an estimation technique.

Table 3. Results of ARDL Bound Cointegration test

ARDL(1,4,0,4) Selected based on Akaike Information Criteria (monetary determinants)				
Test Statistics	Value	Critical Values	I(0)	I(1)
F statistics	5.585***	10%	2.492	3.350
k	3	5%	2.976	3.896
		1%	4.056	5.158
ARDL(4,2,5,1,2) Selected based on Akaike Information Criteria(non-monetary determinants)				
Test Statistics	Value	Critical Values	I(0)	I(1)
F statistics	9.308***	10%	2.323	2.73
k	4	5%	2.743	3.792
		1%	3.71	4.965

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

The next stage of the study applied the ARDL Bounds Test method, developed by Pesaran et al. (2001), to examine the long-term relationship between inflation (LCPI) and its monetary and non-monetary determinants. Model selection was based on the Akaike Information Criterion (AIC). The EViews 9 program automatically selected the optimal lag length according to the AIC. The F-statistic value calculated for the ARDL(1,4,0,4) model, which includes monetary variables, is 5.585. This value is significant at the 1% level since it is greater than the upper critical value of 5.158 at the 1% level. Therefore, the null hypothesis that "there is no long-term relationship" was rejected, and it was concluded that there is a long-term cointegration relationship between inflation and monetary variables. For the ARDL(4,2,5,1,2) model including non-monetary variables, the F-statistic was calculated to be 9.308, which is well above the upper critical value of 4.965 at the 1% level. This result also leads to rejection of the null hypothesis, indicating a long-term relationship between inflation and non-monetary variables. In both models, the F-statistic is above the critical values of I(1), indicating a cointegration relationship between economic variables and inflation. These findings suggest that inflation is influenced by monetary (e.g., money supply, interest rate, and exchange rate) and non-monetary (e.g., GDP, public spending, imports, and external debt) factors in the long term.

Table 4. Estimated Long-Run Coefficients

Dependent variable is LCPI (monetary determinants)			
Regressor	Coefficient	t-Statistic	P-value
LM2	0.106***	3.156	0.003
LIR	0.159**	2.144	0.036
LER	-0.168**	-2.011	0.049
C	3.594***	0.375	0.0000
Dependent variable is LCPI (non-monetary determinants)			
Regressor	Coefficient	t-Statistic	P-value
LGE	0.104***	4.059	0.0002
LGDP	0.125**	2.217	0.0306
LIM	-0.037**	-2.325	0.0236
LFD	-0.155***	-3.951	0.0002
C	4.599***	15.293	0.000

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Examining long-term coefficients reveals that both monetary and non-monetary factors significantly affect inflation. Monetary variables generally have positive and significant effects, while some non-monetary variables, especially imports and external debt, have negative effects. The fact that the statistical significance levels are at or below 5% enhances the model's reliability.

According to the results, a 1% increase in the money supply increases long-term inflation (LCPI) by approximately 0.106% when other variables are held constant. This effect is statistically significant at the 1% level. Similarly, a 1% increase in the nominal interest rate leads to a 0.159% increase in inflation over the long term. This result is significant at the 5% level. Lastly, a 1% increase in the exchange rate reduces inflation by about 0.168% in the long term. This effect is statistically significant at the 5% level.

An increase of 1% in public spending raises inflation by 0.104% in the long term. This effect is also highly statistically significant. An increase of 1% in gross domestic product (GDP) raises inflation by about 0.125% in the long term. This positive relationship indicates that the increased demand associated with growth pushes prices upward. The statistical significance is at the 5% level. Conversely, a 1% increase in imports is seen to reduce inflation by 0.037%. This is also significant at the 5% level. In the long term, a 1% increase in external debt reduces inflation by 0.155%. This is highly statistically significant.

Table 5. Error Correction Model

Dependent variable is LCPI (monetary determinants)			
Regressor	Coefficient	t-Statistic	P-value
COINTEQ*	-0.547***	-4.99	0.000
D(LM2)	0.265***	2.793	0.007
D(LM2(-1))	0.004	0.048	0.962
D(LM2(-2))	-0.167**	-2.186	0.033
D(LM2(-3))	-0.189**	2.672	0.010
D(LIR)	0.281**	2.536	0.014
D(LIR(-1))	0.072	0.757	0.452
D(LIR(-2))	-0.203**	-2.150	0.036
D(LER)	-0.017	-0.149	0.882
D(LER(-1))	-0.037	-0.325	0.746
D(LER(-2))	-0.121	-1.158	0.252
D(LER(-3))	0.449***	4.428	0.000
D(LER(-4))	0.209	1.637	0.102
Dependent variable is LCPI (non-monetary determinants)			
Regressor	Coefficient	t-Statistic	P-value
COINTEQ*	-0.915***	-7.896	0.000
D(LGE)	0.021***	3.352	0.002
D(LGE(-1))	-0.034***	-5.088	0.000
D(LGDP)	0.021	0.423	0.674
D(LIM)	0.021	1.414	0.1636
D(LIM(-1))	0.029*	2.003	0.051
D(LFD)	0.066	0.865	0.391
D(LFD(-1))	0.007	0.085	0.932
D(LFD(-2))	0.309***	4.291	0.0001
D(LFD(-3))	-0.066	-0.934	0.3551
D(LFD(-4))	0.206***	3.201	0.002

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Table 5 shows the short-term inflation model, which illustrates the speed of adjustment required to reach equilibrium in the dynamic model. This lag period is obtained from the estimated long-term dynamic model. The adjustment

coefficient shows how quickly the variables converge to equilibrium. Additionally, COINTEQ should be negative and statistically significant (i.e., the p-value should be less than 0.05). In both models, the COINTEQ coefficient is negative and statistically significant at the 1% level ($p < 0.01$). In the monetary determinants model, the COINTEQ coefficient is -0.547, indicating that the current deviation from long-term equilibrium will be corrected by 54.7% in the next period. In the non-monetary determinants model, the speed of convergence to equilibrium in the upcoming period is 91.5%, based on the included variables. In both cases, the sign of the coefficient aligns with econometric expectations. These results prove that deviations from long-term equilibrium disappear over time and that the system returns to equilibrium. However, the non-monetary model's much higher error correction speed indicates that it can eliminate imbalances more quickly in the short term.

Table 6. Diagnostic Test Results

Diagnostic Test Results (monetary determinants)	
Breusch-Godfrey Serial Correlation	0.8847 [0.3321]
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.6548 [0.1577]
Jarque-Bera Normality Test	2.2758 [0.3204]
Diagnostic Test Results (non-monetary determinants)	
Breusch-Godfrey Serial Correlation	0.1092 [0.8967]
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.9551 [0.5238]
Jarque-Bera Normality Test	0.9551 [0.3843]

To ensure the reliability and validity of our model, we applied diagnostic tests to the models in Table 6. All diagnostic test results indicate that models incorporating both monetary and non-monetary determinants satisfy the classical regression assumptions of no autocorrelation, constant variance, and normally distributed residuals.

Figure 2. Cusum of Squares Test (monetary determinants)

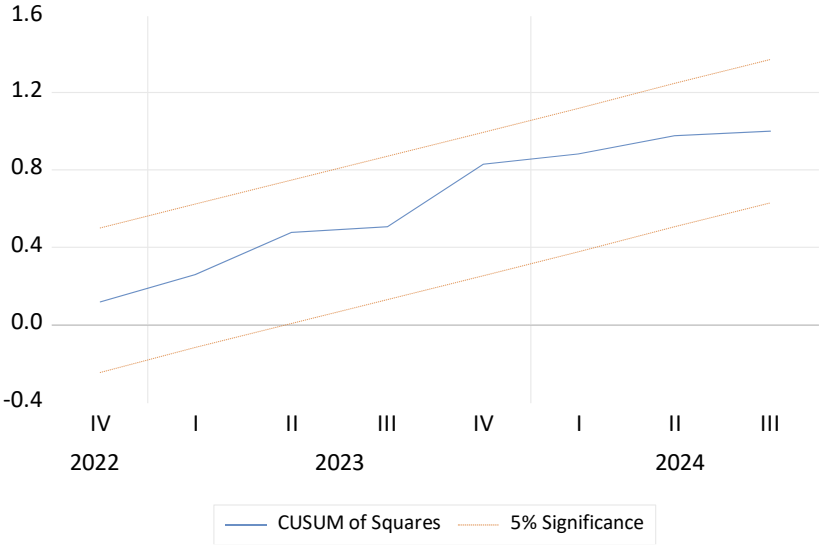


Figure 3. Cusum Test (monetary determinants)

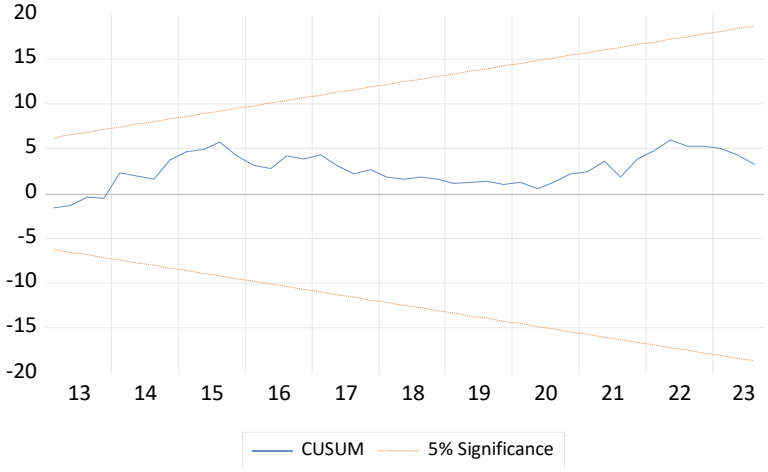


Figure 4. Cusum of Squares Test (non-monetary determinants)

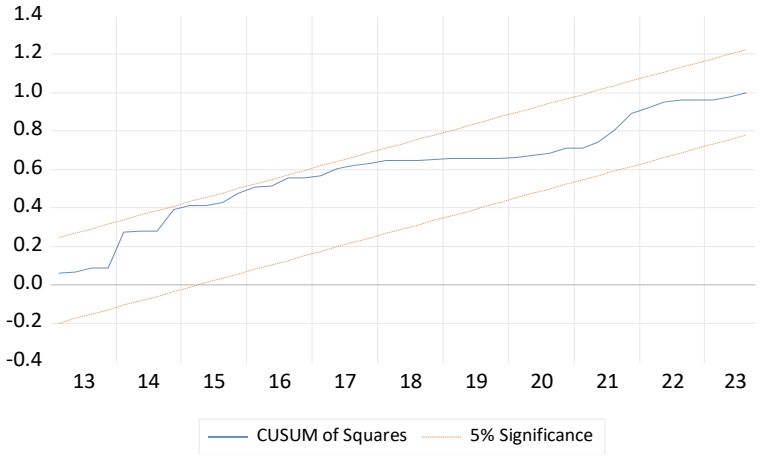
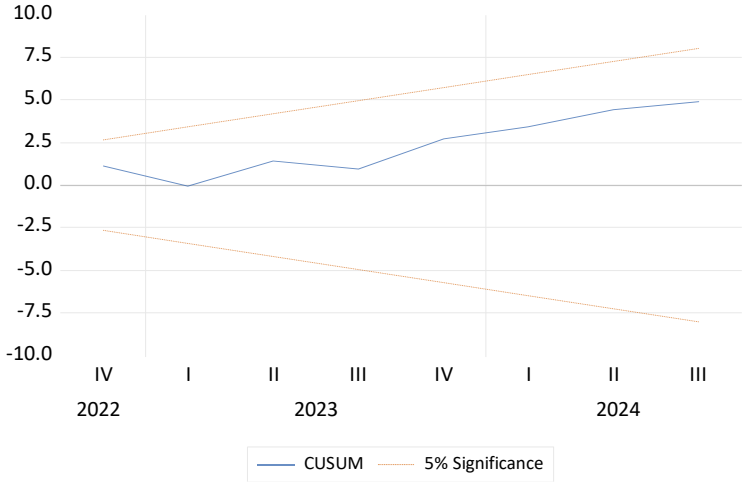


Figure 5. Cusum Test (non-monetary determinants)



The CUSUM (Graphs 2 and 4) and CUSUM of squares (Graphs 1 and 3) test results show that models based on monetary and non-monetary determinants are econometrically valid, reliable, and consistent. Therefore, the causality interpretations and policy recommendations are generalizable and not specific to a particular period.

5. Conclusion and Policy Recommendations

Overall, the findings suggest that inflation in Kyrgyzstan from 2017Q1 to 2024Q3 was influenced by monetary and non-monetary factors with multidimensional effects. Among the monetary variables examined, money supply and nominal interest rates were found to have a statistically significant impact on inflation. These results align with the perspective

of Asgharpur et al. (2007) that rising interest rates can increase production costs, which can consequently drive up inflation. However, an appreciation in the exchange rate was found to have a disinflationary effect. This shows that the exchange rate can suppress the price level and that monetary policy can effectively combat inflation. Similarly, Naptania et al. (2022) emphasize that high inflation and volatile exchange rates can reduce a country's competitiveness in international trade. Examining non-monetary factors reveals that public spending and economic growth increase inflation. In contrast, imports and external debt have a downward effect on inflation in the long term by keeping the budget deficit under control. This finding aligns with the observation of Castro et al. (2003) that government debt does not increase inflation, and may actually have a negative impact. Furthermore, Feyisa's (2024) findings support the deflationary effect of imports, showing that import volume suppresses inflation.

According to the error correction terms in the model, deviations from long-term equilibrium are corrected over time and the system returns to equilibrium. Specifically, the model's faster return to equilibrium based on non-monetary determinants indicates that imbalances can be corrected more quickly in the short term. In contrast, monetary variables affect inflation dynamics more slowly but steadily. Empirical studies conducted in different countries show that the determinants of inflation vary depending on a country's economic structure, institutional capacity, and the stability of its policies. In developing countries, the impact of monetary variables, such as the money supply, the exchange rate, and interest rates, on inflation is significant; however, non-monetary factors, such as public spending, budget deficits, supply constraints, and the structure of foreign trade, also play a critical role in inflation dynamics.

The findings of this study suggest that inflation in the Kyrgyz Republic should be addressed with a multifaceted approach. On the monetary side, careful management of the money supply, balanced use of interest rates, and stabilization of the exchange rate are necessary to contain inflationary pressures. In terms of fiscal policy, it is critical to ensure expenditure discipline while prioritizing investments that enhance productivity. Sustainable external borrowing, especially long-term and concessional financing, can mitigate inflationary risks. Trade policy also matters. While imports have a moderating effect on inflation, efforts must also be made to diversify exports and strengthen domestic production.

Finally, growth strategies should emphasize productivity-driven expansion over demand-driven expansion to reduce structural inflationary pressures over time. Enhancing credibility and policy effectiveness requires stronger institutional capacity, transparent communication, and coordination between fiscal and monetary authorities. In short, price stability in Kyrgyzstan cannot be achieved through monetary policy alone. It requires an integrated approach combining monetary, fiscal, and structural reforms.

Ethical Declaration

It is declared that scientific and ethical principles were adhered to during the execution and writing of this study, and that all sources used have been appropriately cited.

Declaration Regarding the Use of Artificial Intelligence

The authors commit to adhering to ethical principles, transparency, and responsibility in the use of artificial intelligence tools, ensuring their academic responsibility.

Declaration of Conflicting Interests

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