

Determinants of inflation in Turkey: Evidence from the ARDL Model (1988–2023)

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Received: 31/03/2026

Accepted: 02/06/2026

Published: 10/06/2026

Abstract: This study aims to identify the main determinants of inflation in Turkey during the period 1988–2023 and to analyze their short-run and long-run effects. The study employs the Autoregressive Distributed Lag (ARDL) model using annual data on money supply (M2), GDP, imports, exports, and foreign direct investment (FDI). The findings reveal that money supply expansion and export growth exert significant inflationary pressures, while GDP growth and imports contribute to reducing inflation. The results also reveal that FDI has no statistically significant effect on inflation. In addition, the study confirms the existence of a stable long-run equilibrium relationship among the variables, supported by a rapid adjustment mechanism toward equilibrium after shocks. The scientific contribution of this study lies in providing updated empirical evidence on the structural determinants of inflation in Turkey over a long period marked by major economic transformations and crises, thereby offering useful implications for economic policymaking.

Keywords: Inflation; Turkey; ARDL.

JEL Codes: E31, C32, E52.

Citation: SOLTANI Ahlem Fadila, TALEB Mohamed Elamine Oualid, (2026). Determinants of inflation in Turkey: Evidence from the ARDL Model (1988–2023), *Journal of economics studies and researches in renewable energies*, 13(01), 491-510.

Introduction:

Inflation is one of the most significant and complex economic phenomena that affects economies worldwide. It represents the continuous rise in the general price level over time and exerts a profound influence on various dimensions of economic activity. Inflation directly impacts individuals' purchasing power, reshapes investment decisions, and challenges the formulation and implementation of effective macroeconomic policies. Its ripple effects extend from local markets to global trade dynamics, making it a focal point of interest for policymakers, economists, and researchers alike.

The causes and intensity of inflation vary widely across countries, shaped by unique combinations of local and global factors. Turkey provides a compelling case study in this regard, as it has experienced pronounced inflationary fluctuations over the decades. These fluctuations were amplified by several pivotal economic crises, including the 1994 crisis, which triggered a sharp currency devaluation, the 2001 financial crisis, which overhauled the nation's monetary framework, and the global financial turmoil of 2008-2009, whose effects reverberated

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across the Turkish economy. More recently, the COVID-19 pandemic introduced new layers of complexity, disrupting global supply chains and exacerbating inflationary pressures.

Beyond these crises, Turkey's inflationary trajectory has been influenced by structural factors such as exchange rate volatility, reliance on imported goods and energy, and susceptibility to global commodity price shocks. These challenges underscore the multifaceted nature of inflation in Turkey, where both external shocks and domestic policy decisions converge to shape its economic landscape.

Understanding inflation in Turkey requires an in-depth analysis that considers the factors influencing it at both the macro and micro levels. Analyzing the determinants of inflation significantly contributes to understanding its dynamics and its impact on the economy, including economic growth and financial stability. This analysis is essential for interpreting changes in inflation rates and understanding the challenges it poses to the Turkish economy, enabling researchers and policymakers to develop clearer visions for appropriate economic policies.

What are the main macroeconomic determinants of inflation in Turkey in the short and long run during the period 1988–2023?

Research Hypotheses:

Based on the theoretical and empirical literature on inflation determinants, the study tests the following hypotheses:

Main Hypothesis

- ✧ There is a statistically significant relationship between inflation and its macroeconomic determinants in Turkey during the period 1988–2023.

Sub-Hypotheses

- ❖ Money supply growth (M2) significantly affects inflation in Turkey.
- ❖ GDP growth significantly affects inflation in Turkey.
- ❖ Import growth significantly affects inflation in Turkey.
- ❖ Export growth significantly affects inflation in Turkey.
- ❖ Foreign direct investment (FDI) significantly affects inflation in Turkey.

Research Importance and Value:

The importance of this study lies in providing an econometric analysis of the determinants of inflation in Turkey during the period 1988–2023, a period marked by major economic transformations and crises. The study contributes to the literature by examining the short-run and long-run dynamics of inflation using the ARDL model and integrating key macroeconomic variables within a unified framework. Its findings provide updated empirical evidence on

inflation determinants in Turkey and offer practical implications for policymakers in designing more effective monetary and trade policies to achieve price stability and reduce inflationary pressures.

● Research Gap:

Despite the extensive literature on inflation determinants, limited empirical studies have comprehensively examined the combined effects of money supply, GDP, imports, exports, and foreign direct investment on inflation in Turkey within a unified ARDL framework covering the period 1988–2023. Moreover, previous studies often focused on shorter time spans, specific variables, or different econometric approaches, without adequately capturing both the short-run and long-run dynamics of inflation during periods of major economic and financial transformations. Therefore, this study seeks to fill this gap by providing an updated and comprehensive econometric analysis of inflation determinants in Turkey using a long annual time series and the ARDL approach.

○ Method and materials:

This study adopts an econometric approach to examine the determinants of inflation in Turkey during the period 1988–2023 using annual time-series data obtained from the World Bank Open Data database (**World Bank Open Data, 2026**). The use of annual data allows for a broader assessment of long-term macroeconomic trends, structural transformations, and major economic crises that affected inflation dynamics in Turkey over the study period. Preliminary unit root tests indicate that the variables are integrated at mixed orders $I(0)$ and $I(1)$, with no variable integrated at $I(2)$. Combined with the relatively limited sample size (34 observations), these conditions make the Autoregressive Distributed Lag (ARDL) model the most appropriate methodology for the study. The ARDL bounds testing approach is therefore employed to examine the existence of a long-run equilibrium relationship between inflation and its run dynamics. To ensure the robustness -determinants and to estimate both short-run and long and reliability of the results, several diagnostic and stability tests are conducted, including autocorrelation, heteroscedasticity, normality, CUSUM, and CUSUMSQ tests.

❖ Literature review:

The study by (**YILMAZKUDAY, 2022**) investigates the primary drivers of inflation in Turkey using a Structural Vector Autoregression (SVAR) model based on monthly data from 2005 to 2021. Inflation, measured by changes in the Consumer Price Index (CPI), is explained by global oil prices, exchange rates, policy interest rates, and unemployment. The findings indicate that external shocks play a dominant role, with oil prices and exchange rate fluctuations accounting for a significant share of inflation variance. Although monetary policy exerts a mitigating effect, its impact remains relatively limited. The study concludes that inflation in Turkey is largely driven by external vulnerabilities, particularly energy price shocks and currency depreciation.

More recent evidence based on the ARDL framework confirms these findings. A 2024 study examines the determinants of inflation over the period 2006–2023 using quarterly data and finds that exchange rate movements represent the most influential factor, followed by imports and industrial production, while oil prices appear statistically insignificant. These results emphasize the growing importance of exchange rate pass-through and structural supply-side constraints in shaping inflation dynamics. **(MAKALESİ, 2024)**

In a similar vein, the study by **(YÜRÜK & Akgül, 2024)** employs advanced causality techniques, including the Fourier Toda–Yamamoto and Hacker–Hatemi-J bootstrap tests, to analyze inflation dynamics over the period 2006–2023. The findings reveal that inflation is predominantly driven by domestic monetary factors, particularly money supply and exchange rates, while external variables such as oil prices play a relatively limited role. This suggests that internal macroeconomic imbalances are a key source of persistent inflation in Turkey.

Consistent with these results, **(Gezer, 2024)** confirms the existence of a long-run cointegration relationship between inflation and its determinants using the ARDL approach. The study highlights the dominant role of the real effective exchange rate, followed by imports and industrial production, further reinforcing the importance of structural and supply-side factors.

Similarly, the study by **(Dilber & Hatipoğlu, 2024)** identifies a stable long-run relationship between inflation and financial variables in Turkey. The findings underline the significant impact of inflation on financial intermediation and emphasize the importance of maintaining moderate inflation levels to ensure financial stability.

Using a more advanced econometric framework, **(Akarsu & Aktuğ, 2025)** decompose inflation into supply-driven and demand-driven components. Their results indicate that inflation in Turkey is primarily driven by supply-side shocks, particularly exchange rate depreciation, global supply disruptions, and rising production costs, while demand-side pressures have become less significant in the post-pandemic period.

Additionally, recent research published in Structural Change and Economic Dynamics by **(Isik, Mert, & Ulug, 2025)** employs a Quantile ARDL (Q-ARDL) model to examine inflation dynamics in Turkey. The findings suggest that cost-push factors, rather than demand-pull factors, are the dominant drivers of inflation, particularly during high-inflation regimes. The study also highlights the role of profit-driven inflation and structural rigidities in amplifying price pressures.

Finally, **(Akusta, 2026)** examines the role of energy imports using multiple cointegration techniques, including ARDL, FMOLS, and DOLS. The results show that energy imports and exchange rate depreciation significantly increase inflation, while renewable energy helps mitigate inflationary pressures. This underscores the structural dependence of the Turkish economy on imported energy and its implications for price stability.

Overall, the reviewed literature reveals a broad consensus that inflation in Turkey is a multidimensional phenomenon shaped by the interaction of monetary, structural, and external factors. While earlier studies mainly emphasized the role of exchange rate volatility, imported inflation, and external shocks, more recent contributions increasingly highlight the importance of domestic monetary expansion and supply-side rigidities in sustaining inflationary pressures. Methodologically, the literature reflects a gradual shift from traditional time-series and causality techniques toward more advanced econometric approaches such as ARDL, QARDL, FMOLS, and DOLS, allowing for a deeper understanding of both short-run and long-run inflation dynamics. Despite these valuable contributions, previous studies often focused on specific variables, shorter time periods, or particular transmission channels. In contrast, the present study provides a more comprehensive framework by integrating monetary, trade, and macroeconomic determinants within a unified ARDL model over an extended period that captures major structural transformations and economic crises in Turkey between 1988 and 2023.

○ Variables:

Dependent Variable:

✓ INF: Inflation (Consumer Prices (% Annual))

the rate at which prices are rising over time is known as inflation. Put otherwise, inflation is a measure of how quickly money depreciates. (Soltani & Taleb, 2024)

$$INF = f(M2, IMP, GDP, EXP, FDI)$$

Independent variables:

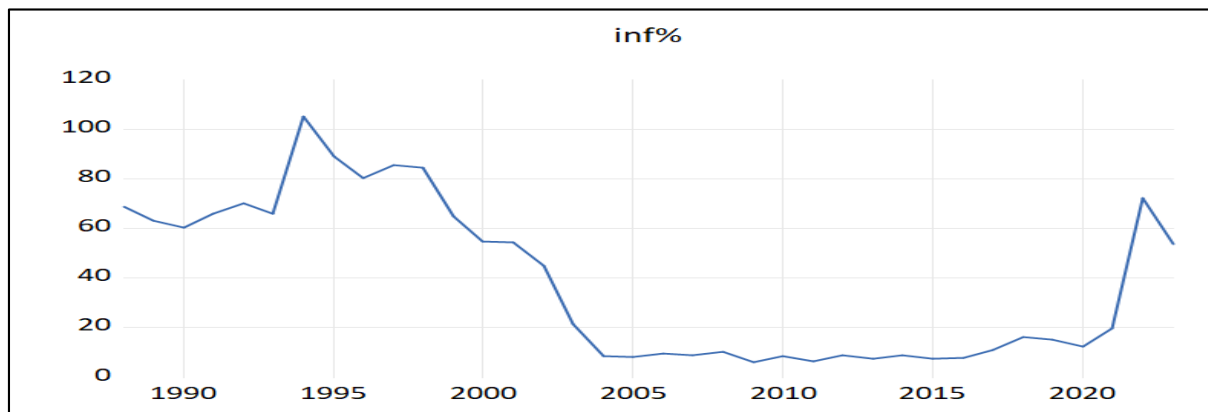
- ✓ **M2:** Broad Money Supply growth (% Annual)
- ✓ **IMP:** Imports growth (% Annual)
- ✓ **GDP:** Gross Domestic Product growth (% Annual)
- ✓ **EXP:** Export growth (% Annual)
- ✓ **FDI:** Foreign Direct Investment (Net Inflows (% of GDP))

🚩 Inflation Trends in Turkey (1988–2023):

Inflation dynamics in Turkey over the period 1988–2023 reveal a clear transition across distinct macroeconomic regimes. The late 20th century was characterized by persistently high inflation driven by structural imbalances, including fiscal deficits and weak monetary credibility. Following the 2001 crisis, comprehensive reforms supported by the International Monetary Fund led to a sustained disinflation process and improved macroeconomic stability. This was followed by a phase of relative stability, albeit with emerging vulnerabilities to external shocks. Since 2018, inflationary pressures have re-emerged due to unconventional monetary policies, currency depreciation, and heightened geopolitical risks, further intensified by the COVID-19

and the Russia-Ukraine War. Overall, the Turkish experience highlights the critical role of policy credibility and external factors in shaping inflation trajectories.

Figure 1: Trends in Inflation Rates in Turkey (1988–2023)

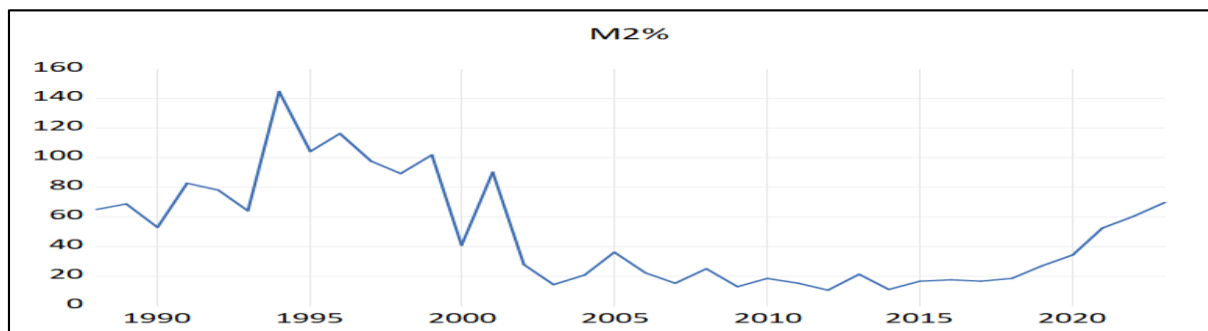


Source: prepared by researchers based on the EViews 12 program

Evolution and Volatility of Turkey's Broad Money Supply (M2) Between 1988 and 2023:

The growth of Turkey's broad money supply (M2) between 1988 and 2023 exhibited pronounced volatility, reflecting the interplay of economic crises, policy interventions, and external shocks. In the late 1980s and early 1990s, M2 growth fluctuated sharply, peaking at 69% in 1989 and rebounding to 83% in 1991, driven by inflationary pressures and stabilization efforts. The mid-1990s experienced sustained high expansion, notably a surge to 145% in 1994 amid a severe economic crisis. From 1998 to 2001, M2 growth remained highly unstable, influenced by the 1999 Marmara earthquake and culminating in the 2001 financial crisis. Post-crisis reforms from 2002 to 2008 moderated growth to around 25%, reflecting tighter monetary policies and structural adjustments. The 2008–2009 global financial crisis further constrained monetary expansion, reducing growth to 13% in 2009. Between 2010 and 2018, M2 growth stabilized at moderate rates (10–22%), balancing economic support with inflation control. From 2019 onwards, monetary expansion accelerated again, reaching 70% in 2023, driven by domestic and global challenges, including expansive fiscal and monetary measures during the COVID-19 pandemic.

Figure 2: Trends in Broad Money Supply Growth (M2) in Turkey (1988–2023)

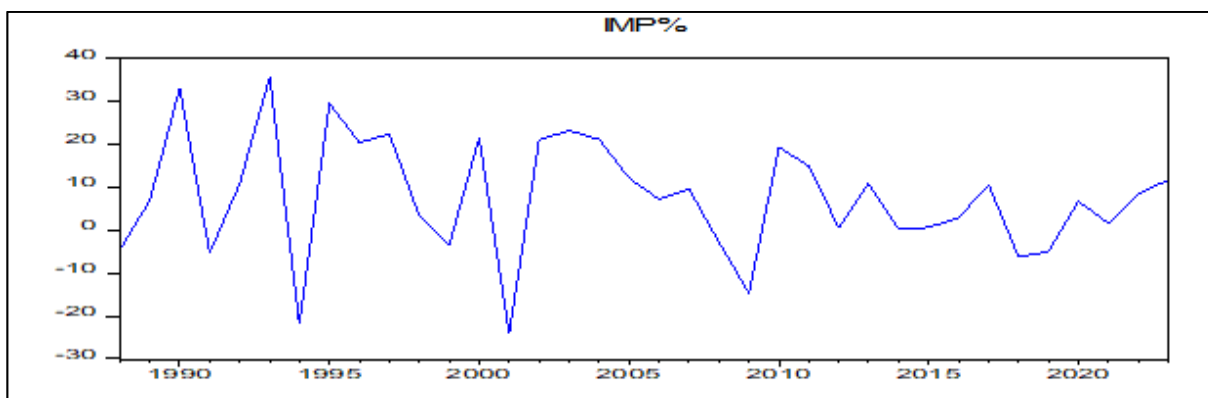


Source: prepared by researchers based on the EViews 12 program

🚩 Trends and Volatility in Turkey's Imports, 1988–2023:

Turkey's import growth rates between 1988 and 2023 exhibited noticeable fluctuations, reflecting the sensitivity of the Turkish economy to both domestic and external economic conditions. The series shows alternating periods of expansion and contraction rather than a stable upward trend, indicating the strong influence of economic crises, exchange rate movements, and changes in domestic demand. Significant volatility can be observed during periods associated with major economic disturbances, particularly the financial crises of the 1990s and early 2000s, as well as the global financial crisis of 2008–2009. Despite these fluctuations, import growth generally remained positive in most periods, supported by Turkey's dependence on imported energy, intermediate goods, and industrial inputs. In recent years, imports continued to fluctuate moderately under the effects of exchange rate instability, inflationary pressures, and global economic uncertainty, while showing relative resilience and recovery following external shocks such as the COVID-19 pandemic. Overall, the pattern highlights the structural importance of imports within the Turkish economy and their close connection to economic activity and external market conditions.

Figure 3: Trends in Import Growth Rates in Turkey (1988–2023)

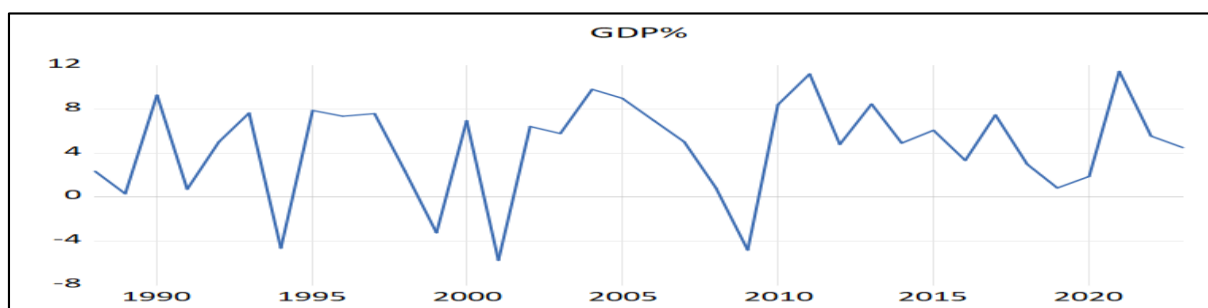


Source: prepared by researchers based on the EViews 12 program

Fluctuations and Resilience of Turkey's GDP Growth, 1988–2023:

Turkey's GDP growth between 1988 and 2023 experienced notable fluctuations, reflecting both economic resilience and vulnerability to domestic and global shocks. The late 1980s and early 1990s showed moderate growth, interrupted by contractions in 1994 due to high inflation, currency devaluation, and a widening current account deficit. Recovery in the mid-1990s was followed by downturns from the 1999 Marmara earthquake and the 2001 financial crisis, which prompted structural reforms. These reforms fostered robust growth between 2002 and 2007, peaking at 9.8% in 2004. The 2008–2009 global financial crisis temporarily slowed GDP, but growth rebounded strongly in 2010–2011, driven by exports, domestic demand, and stimulus measures. From 2012 to 2017, growth remained steady before slowing due to currency volatility, inflation, and geopolitical tensions. Despite COVID-19 challenges, the economy recovered in 2021, with subsequent stabilization in 2022–2023, highlighting Turkey's capacity for adaptation and recovery.

Figure 4: Trends in GDP Growth Rates in Turkey (1988–2023)



Source: prepared by researchers based on the EViews 12 program

Trends and Volatility in Turkey's Exports, 1988–2023:

Turkey's exports between 1988 and 2023 experienced significant fluctuations, reflecting the impact of domestic economic conditions, global demand, and external shocks. The late 1980s began with strong growth, peaking at 18.42% in 1988, followed by a slight decline in 1989. Moderate recovery occurred in the early 1990s, with a sharp surge in the mid-1990s as Turkey integrated more into global trade, reaching a peak of 21.96% in 1996. Late 1990s growth was mixed, sharply declining in 1999 due to the Marmara earthquake and global slowdown, but rebounding in 2000. Export growth stabilized in the early 2000s, with fluctuations during the global financial crisis of 2008–2009. Post-crisis recovery continued until COVID-19, which caused a steep contraction in 2020. Exports rebounded strongly in 2021, but growth moderated in 2022 and slightly declined in 2023, highlighting Turkey's sensitivity to global trade dynamics and domestic challenges.

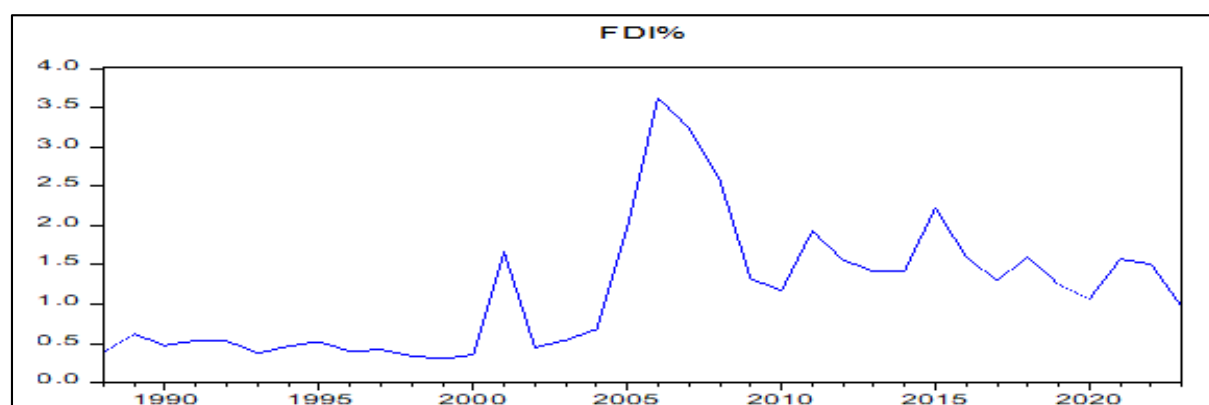
Figure 5: Trends in Export Growth Rates in Turkey (1988–2023)



Source: prepared by researchers based on the EViews 12 program

Foreign direct investment (FDI) growth rates in Turkey between 1988 and 2023 displayed considerable fluctuations, reflecting the influence of domestic economic conditions, structural reforms, and global financial developments. During the late 1980s and 1990s, FDI growth remained relatively low and unstable, indicating limited foreign investor confidence amid recurring economic and political uncertainties. A noticeable increase emerged in the early 2000s, particularly following major economic reforms and increased market liberalization after the 2001 financial crisis. The highest growth levels were recorded during the mid-2000s, reflecting improved macroeconomic stability and stronger integration into global markets. However, this upward trend weakened after the global financial crisis of 2008–2009, leading to renewed fluctuations in FDI inflows. In the following years, investment growth remained volatile under the effects of exchange rate instability, geopolitical tensions, and changing international investment conditions. Although Turkey experienced periods of recovery, particularly after global economic disruptions, the overall pattern reveals that FDI inflows remained highly sensitive to both domestic and external shocks throughout the study period.

Figure 6: Trends in Foreign Direct Investment (FDI) Growth Rates in Turkey (1988–2023)



Source: prepared by researchers based on the EViews 12 program

I. Results and discussion:

Stability Tests (unit root tests): before proceeding with the application of the ARDL model, it is necessary to examine the stationarity of the variables, as the model requires them to be either stationary at level or at first difference. To verify this condition, both the ADF test and the P.P test were employed, and their respective results are displayed in Tables 01 and 02.

Table 1: Results of the Augmented Dickey–Fuller (ADF) Unit Root Test

	Level			1 st Difference		
	Intercept	Trend and intercept	None	Intercept	Trend and intercept	None
INF	0.5635	0.9334	0.2605	0.0000	0.0141	0.0000
M2	0.6726	0.9549	0.4086	0.0000	0.0012	0.0000
IMP	0.0003	0.0019	0.0069	-	-	-
GDP	0.0000	0.0000	0.0012	-	-	-
EXP	0.0000	0.0000	0.3313	0.0000	0.0000	0.0000
FDI	0.0001	0.0004	0.0000	-	-	-

Source: prepared by researchers based on the EViews 12 program

The ADF test results show that some variables are stationary at level, while others require first differencing to achieve stationarity. The variables that proved to be stationary at level include GDP, imports (IMP), and foreign direct investment (FDI), as their p-values were below 0.05. On the other hand, variables such as inflation (INF), broad money supply (M2), and exports (EXP) were non-stationary at level, necessitating further processing to achieve stationarity.

After taking the first difference, the previously non-stationary variables (INF, M2, and EXP) became fully stationary, with their p-values significantly dropping below 0.05. This highlights the importance of applying first differencing to remove non-stationarity in some variables, while stationary variables at level can be directly used in analyses without the need for additional processing.

Table 2: Results of the Phillips–Perron (PP) Unit Root Test

	Level			1 st Difference		
	Intercept	Trend and intercept	None	Intercept	Trend and intercept	None
INF	0.5799	0.9441	0.2730	0.0000	0.0001	0.0000
M2	0.2664	0.3358	0.2981	0.0000	0.0000	0.0000
IMP	0.0003	0.0019	0.0002	-	-	-
GDP	0.0000	0.0000	0.0011	-	-	-
EXP	0.0000	0.0000	0.0001	-	-	-
FDI	0.0000	0.0004	0.0000	-	-	-

Source: prepared by researchers based on the EViews 12 program

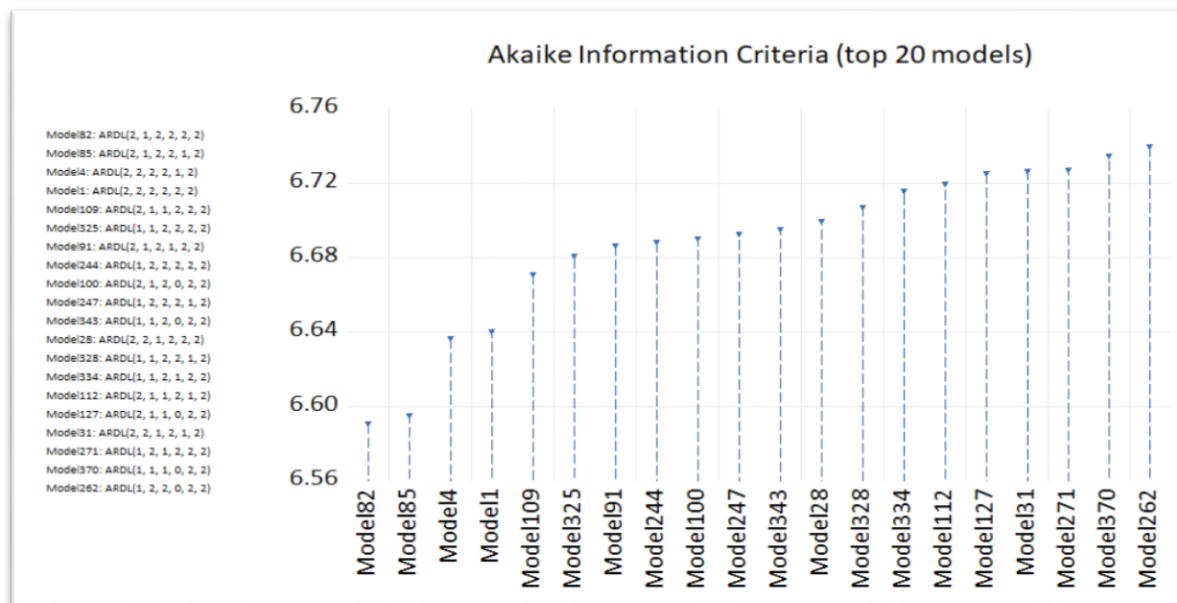
The results of the P.P (Phillips-Perron) test show that some variables are stationary at level, while others require first differencing to achieve stationarity. The variables that proved to be stationary at level include GDP, imports (IMP), exports (EXP), and foreign direct investment (FDI), as their p-values across all categories (intercept, trend and intercept, none) were below 0.05. On the other hand, variables such as inflation (INF) and broad money supply (M2) were non-stationary at level, with p-values exceeding 0.05, indicating the need for further processing.

After applying the first difference, the previously non-stationary variables (INF and M2) became fully stationary, with their p-values significantly dropping below 0.05 across all categories.

○ Lag selection criteria:

The analysis of the Akaike Information Criterion (AIC) for the determinants of inflation in Turkey shows that **Model82 (ARDL (2, 1, 2, 2, 2, 2))** is the best model. Inflation depends on its previous values and the impact of broad money supply growth, GDP growth, import growth, export growth, and foreign direct investment growth with lagged effects. The analysis indicates that the growth of the money supply leads to higher inflation, while export growth and foreign direct investment may counterbalance this effect.

Figure 7: Akaike Information Criterion (AIC) for Optimal Lag Selection



Source: prepared by researchers based on the EViews 12 program

○ ARDL Boundary test (F-Bound test) for cointegration:

The results of the F-Bounds Test indicate the presence of a cointegration relationship between inflation in Turkey and the independent variables (broad money supply growth, GDP growth,

import and export growth rates, and foreign direct investments). The calculated F-statistic (9.045476) exceeds all upper bound values (I(1)) at different significance levels. This demonstrates that these variables systematically influence inflation in the long term, with short-term imbalances likely to dissipate over time. Accordingly, it is recommended to implement economic policies that account for the long-term impact of these variables to sustainably control inflation.

Table 3: ARDL Bounds Test Results for Cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.045476	10%	Asymptotic: n=1000	3
k	5	5%	2.08	3.38
		2.5%	2.39	3.73
		1%	2.7	4.15
			3.06	

Source: prepared by researchers based on the EViews 12 program

○ **Estimating the study model using autoregressive distributed lag (ARDL) models:**

Broad Money Supply Growth (M2): The coefficient is positive at 0.844444 with a highly significant p-value (P-value = 0.0000), indicating that a 1% increase in money supply growth leads to a 0.84% rise in inflation in the long term. This reflects the strong inflationary effect of excess liquidity in the economy.

Import Growth (IMP): The coefficient is negative at -0.809317 with strong statistical significance (P-value = 0.0000), meaning that a 1% increase in import growth reduces inflation by 0.81% in the long term. This suggests that imports help ease inflationary pressures by providing goods at competitive prices.

GDP Growth (GDP): The coefficient is negative at -1.488511 with significance at the 5% level (P-value = 0.0263). This implies that a 1% increase in GDP growth lowers inflation by 1.49% in the long term, reflecting the deflationary impact of productive economic growth.

Export Growth (EXP): The coefficient is positive at 0.948674 with significance at the 5% level (P-value = 0.0288). This indicates that a 1% increase in export growth raises inflation by 0.95%, which may result from higher external demand driving up domestic prices.

Foreign Direct Investment Growth (FDI): The coefficient is positive but small at 0.011812 and statistically insignificant (P-value = 0.6519), suggesting that foreign direct investment has a negligible and statistically insignificant effect on inflation in the long term according to this model.

Constant (C): The coefficient is 1.447168 and statistically insignificant (P-value = 0.6276), indicating that the model primarily explains inflation through the independent variables, with no significant influence from the constant term.

$$INF = 0.84444 * M2 - 0.8093 * IMP - 1.4885 * GDP + 0.9486 * EXP + 0.0118 * FDI + 1.4471$$

Table 4: Estimated Long-Run Coefficients of the ARDL Model

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
M2_	0.844444	0.041398	20.39815	0.0000
IMP_	-0.809317	0.144103	-5.616217	0.0000
GDP_	-1.488511	0.611943	-2.432433	0.0263
EXP_	0.948674	0.397255	2.388072	0.0288
FDI_	0.011812	0.025719	0.459256	0.6519
C	1.447168	2.929563	0.493988	0.6276
EC = INF_ - (0.8444*M2_ -0.8093*IMP_ -1.4885*GDP_ + 0.9487*EXP_ + 0.0118*FDI_ + 1.4472)				

Source: prepared by researchers based on the EViews 12 program

○ **The short-term relationship and error correction model:**

The short-term relationship analysis through the Error Correction Model (ECM) shows that approximately 108.8% of short-term imbalances between inflation and the independent variables are corrected in the following period, indicating a very high speed of adjustment toward long-term equilibrium. The adjustment process takes about **11 months and 27 days** to return to full equilibrium. In the short term, inflation is strongly and positively affected by broad money supply growth (0.53%) and export growth (0.64%), while imports (-0.43%) and foreign direct investment (-0.05%) help alleviate inflationary pressures. GDP growth is not statistically significant in the current period but shows a positive impact when lagged by one period (0.65%). Additionally, previous inflation has a slight positive effect on current inflation. The model demonstrates high accuracy, explaining 91.8% of the variation in inflation.

Table 5: Short-Run Dynamics and Error Correction Model (ECM) Results

ARDL Error Correction Regression Dependent Variable: D(INF_) Selected Model: ARDL(2, 1, 2, 2, 2, 2) Case 2: Restricted Constant and No Trend Date: 01/20/25 Time: 17:53 Sample: 1988 2023 Included observations: 34				
ECM Regression Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF_(-1))	0.185013	0.082139	2.252441	0.0378
D(M2_)	0.533898	0.053817	9.920602	0.0000
D(IMP_)	-0.433634	0.085545	-5.069058	0.0001
D(IMP_(-1))	0.159328	0.070193	2.269858	0.0365
D(GDP_)	-0.390962	0.225661	-1.732518	0.1013
D(GDP_(-1))	0.646360	0.248212	2.604064	0.0185
D(EXP_)	0.641002	0.104172	6.153283	0.0000
D(EXP_(-1))	0.208563	0.122363	1.704453	0.1065
D(FDI_)	-0.050934	0.013990	-3.640810	0.0020
D(FDI_(-1))	-0.046202	0.012004	-3.849039	0.0013
CointEq(-1)*	-1.088030	0.117554	-9.255592	0.0000
R-squared	0.918272	Mean dependent var	-0.276857	
Adjusted R-squared	0.882738	S.D. dependent var	14.06058	
S.E. of regression	4.814835	Akaike info criterion	6.237473	
Sum squared resid	533.2006	Schwarz criterion	6.731296	
Log likelihood	-95.03704	Hannan-Quinn criter.	6.405881	
Durbin-Watson stat	2.123760			

Source: prepared by researchers based on the EViews 12 program

○ **Model diagnostic tests:**

✓ **The autocorrelation test for errors:**

The results of the Breusch-Godfrey test for serial correlation indicate the absence of serial correlation in the model's residuals. The **F-statistic** value is **0.766391** with a probability (P-value) of **0.3943**, which is greater than the significance level (0.05), indicating insufficient evidence to reject the null hypothesis. Additionally, the **Obs*R-squared** value is **1.554138** with a probability (P-value) of **0.2125**, also greater than 0.05, confirming the same conclusion. Based on these results, it can be concluded that the model satisfies the assumption of residual independence.

Table 6: Results of the Breusch–Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 1 lag			
F-statistic	0.766391	Prob. F(1,16)	0.3943
Obs*R-squared	1.554138	Prob. Chi-Square(1)	0.2125

Source: prepared by researchers based on the EViews 12 program

✓ Homogeneity of variance test:

The results of the Heteroskedasticity Test (ARCH) indicate that the residuals in the model do not suffer from heteroskedasticity. The **F-statistic** value is **0.295482** with a probability (P-value) of **0.5906**, which is greater than the significance level (0.05), suggesting insufficient evidence to reject the null hypothesis. Additionally, the **Obs*R-squared** value is **0.311576** with a probability (P-value) of **0.5767**, supporting the same conclusion. Based on these results, it can be concluded that the variance of the residuals is constant over time (Homoscedasticity), which enhances the reliability of the model.

Table 7: Results of the ARCH Heteroskedasticity Test

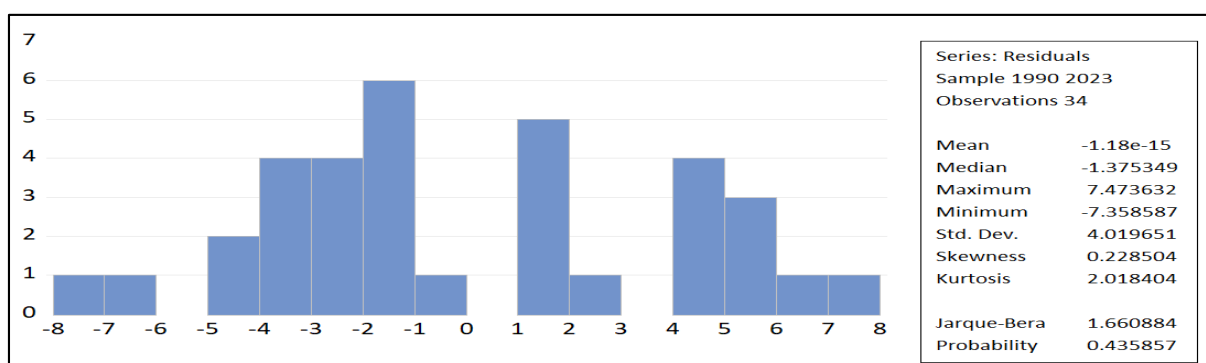
Heteroskedasticity Test: ARCH			
F-statistic	0.295482	Prob. F(1,31)	0.5906
Obs*R-squared	0.311576	Prob. Chi-Square(1)	0.5767

Source: prepared by researchers based on the EViews 12 program

✓ Test for normal distribution of residuals:

The results of the Jarque-Bera test indicate that the residuals follow a reasonably normal distribution. The Jarque-Bera statistic is **1.660884**, and the probability (P-value) is **0.435857**, which is greater than the significance level (0.05). This suggests there is insufficient evidence to reject the null hypothesis. Additionally, the skewness value is slightly positive at **0.228504**, indicating a slight tilt of the residuals toward positive values, while the kurtosis value is **2.018404**, which is less than 3, reflecting a distribution that is less peaked (flat) compared to the normal distribution. Based on these findings, it can be concluded that the residuals exhibit a good degree of normality, supporting the validity of the model used and confirming its alignment with the required statistical assumptions.

Figure 8: Normality Test of Model Residuals



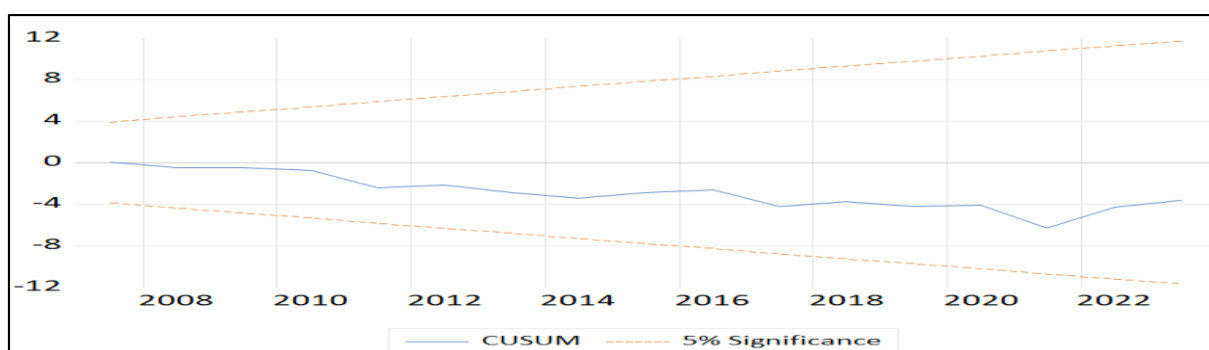
Source: prepared by researchers based on the EViews 12 program

✓ Structural stability testing:

To assess the stability of the model over the period 1988–2023, the CUSUM test and CUSUM of squares test were applied. The results indicate that the cumulative sum of residuals remained within the 5% critical bounds throughout the study period, confirming the absence of structural breaks.

This demonstrates that the model parameters are statistically stable and reliable, allowing for consistent interpretation of the results and supporting the model's suitability for forecasting without the need for re-specification.

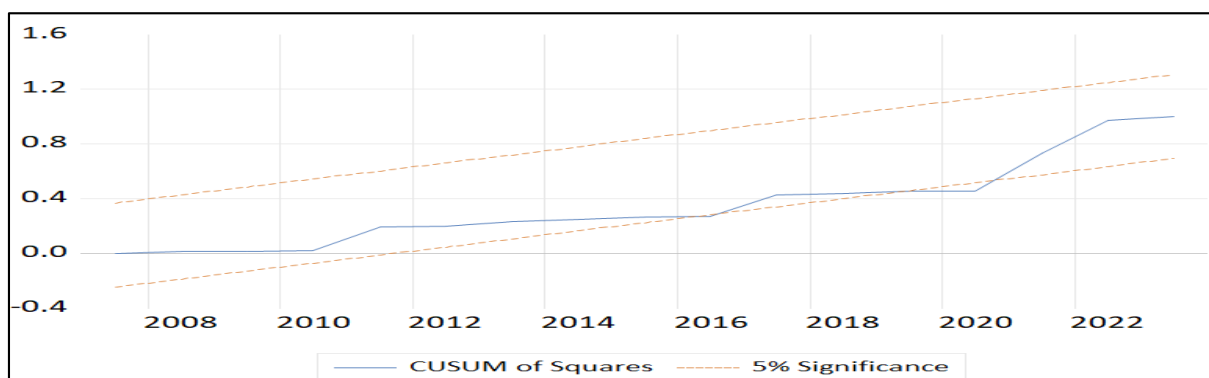
Figure 9: CUSUM Stability Test Results



Source: prepared by researchers based on the EViews 12 program

The results of the CUSUM of Squares test indicate that the blue line, representing the cumulative sum of squared residuals, remains entirely within the 5% confidence boundaries represented by the dashed orange lines throughout the period from 2008 to 2023. This clearly suggests that the estimated model parameters are stable over time, with no structural changes or inconsistencies affecting its performance. Based on these results, it can be concluded that the statistical model is stable.

Figure 10: CUSUM of Squares (CUSUMSQ) Stability Test Results



Source: prepared by researchers based on the EViews 12 program

Discussion:

The findings of this study confirm that inflation in Turkey is driven by a combination of monetary, structural, and external factors in both the short and long run. More specifically, the results demonstrate that money supply and exports exert positive inflationary effects, while imports and GDP growth contribute to reducing inflationary pressures. These findings directly answer the main research question by identifying the key macroeconomic determinants shaping inflation dynamics in Turkey during the period 1988–2023.

The positive and statistically significant effect of money supply is consistent with the monetarist perspective, which argues that excessive monetary expansion constitutes a major source of inflation. This result supports the findings of (YÜRÜK & Akgül, 2024) who concluded that domestic monetary factors, particularly money supply, play a central role in explaining persistent inflation in Turkey. Similarly, the results align with (YILMAZKUDAY, 2022) which emphasizes the importance of exchange rate and external shocks in amplifying inflationary dynamics.

The negative impact of imports on inflation suggests that imports help alleviate domestic supply shortages and reduce cost pressures by increasing the availability of goods in the Turkish market. This finding partially differs from the conclusions of (Gezer, 2024) and (Akusta, 2026) who found that imports, particularly energy imports, contribute to inflationary pressures through exchange rate depreciation and imported inflation. However, the difference may be explained by the broader definition of imports used in the present study, which captures the stabilizing role of imported consumer and intermediate goods in mitigating supply constraints.

The negative long-run effect of GDP growth indicates that productive economic expansion may improve supply capacity and reduce structural inflationary pressures. This result is compatible with supply-side interpretations of inflation and supports the findings of (Akarsu & Aktuğ, 2025) who argued that inflation in Turkey is increasingly driven by supply-side disruptions rather than demand-side expansion.

The positive coefficient of exports may primarily be explained by exchange rate pass-through effects. Periods of currency depreciation tend to increase the competitiveness of Turkish exports, stimulating external demand while simultaneously increasing domestic production costs and imported input prices. This mechanism contributes to higher domestic inflation through cost-push channels. These findings are consistent with the conclusions of (YILMAZKUDAY, 2022), (MAKALESİ, 2024) and (Gezer, 2024) all of which emphasize the dominant role of exchange rate pass-through in explaining inflation dynamics in Turkey.

The error correction coefficient indicates a very rapid adjustment toward long-run equilibrium, as approximately 108.8% of short-run disequilibria are corrected within one period. Although a coefficient exceeding 100% may suggest temporary overshooting around the equilibrium path, the stability and diagnostic tests confirm that the estimated model remains statistically

stable and properly specified. This rapid adjustment likely reflects the strong sensitivity of inflation dynamics in Turkey to monetary and exchange rate shocks particularly during periods of macroeconomic instability and financial crises.

The insignificant effect of foreign direct investment (FDI) may be attributed to the sectoral composition of foreign investments in Turkey, which are often concentrated in production-oriented or financial sectors with limited immediate impact on consumer prices. In addition, the transmission of FDI flows to inflation may require longer adjustment periods that are not fully captured within short-run dynamics. Similar conclusions regarding the weak inflationary role of FDI have been reported in several empirical studies on emerging economies, where inflation is primarily driven by monetary and exchange rate factors rather than capital inflows.

Likewise, the insignificance of the constant term suggests that inflation dynamics are mainly explained by the macroeconomic variables included in the model rather than by autonomous inflationary effects outside the explanatory framework. This reinforces the explanatory power of the selected variables in capturing inflation behavior in Turkey.

The empirical findings generally support the main hypothesis of the study, confirming the existence of a statistically significant relationship between inflation and its selected macroeconomic determinants in Turkey over the period 1988–2023. More specifically, the results validate the sub-hypotheses related to money supply growth, GDP growth, imports and exports, as these variables exhibit statistically significant effects on inflation within the estimated ARDL framework. In contrast, the sub-hypothesis concerning foreign direct investment (FDI) is rejected, given the absence of a statistically significant relationship between FDI and inflation during the study period. These outcomes suggest that inflation dynamics in Turkey are primarily driven by monetary conditions, trade-related factors, and broader macroeconomic interactions rather than by foreign capital inflows.

Despite its contributions, this study has certain limitations that may provide directions for future research. The analysis focuses on a selected set of macroeconomic variables other while potentially relevant factors—such as interest rates, fiscal policy indicators, expectations, or institutional variables—were not incorporated due to the scope of the study. In addition future studies could extend the time horizon or employ more disaggregated measures of exports and foreign direct investment to better capture their transmission mechanisms and sectoral effects on inflation. Further research may also explore nonlinear relationships and asymmetric effects in inflation dynamics, particularly during periods of economic crises and exchange rate volatility. Nevertheless, the study offers important theoretical and practical contributions by providing updated empirical evidence on inflation determinants in Turkey and supporting the design of more effective macroeconomic stabilization policies.

II. Conclusion:

This study examined the main determinants of inflation in Turkey during the period 1988–2023 using the ARDL approach to analyze both short-run and long-run relationships. The findings

demonstrate that inflation in Turkey is mainly influenced by monetary expansion, external trade dynamics, and macroeconomic conditions. In particular, money supply and exports were found to increase inflationary pressures, whereas imports and economic growth contributed to mitigating inflation over the long run. The results also confirmed the existence of a stable long-run equilibrium relationship between inflation and its determinants, thereby providing a direct answer to the main research question of the study.

The study contributes to the empirical literature by offering updated evidence on inflation dynamics in Turkey within a unified econometric framework that captures both structural and policy-related dimensions of inflation. From a policy perspective, the findings highlight the importance of maintaining coordinated monetary, fiscal, and trade policies aimed at controlling liquidity growth, strengthening domestic productive capacity, and reducing the economy's vulnerability to external shocks and exchange rate fluctuations.

Future research may further investigate inflation dynamics by incorporating additional macroeconomic and institutional variables, applying nonlinear models, or using sectoral indicators to better capture the transmission channels affecting inflation in emerging economies such as Turkey.

○ **Recommendations:**

Based on the findings of this study, the following policy measures are recommended to enhance price stability and mitigate inflationary pressures in Turkey:

1. **Control money supply growth** in accordance with real output to prevent excessive monetary-driven inflation.
2. **Promote domestic production and diversify the industrial base** to reduce supply-side constraints and narrow the output gap.
3. **Encourage targeted imports** that support productive activities while minimizing adverse effects on domestic industries.
4. **Regulate the composition of exports** to avoid domestic shortages of essential goods and ensure balanced internal supply.
5. **Direct foreign investment toward productive sectors** that contribute directly to output expansion and price stability.
6. **Enhance coordination between monetary and fiscal policies** to maintain long-term macroeconomic and price stability.
7. **Adopt modern inflation forecasting tools** to improve policy responsiveness and effectiveness.
8. **Regularly monitor structural stability indicators** to detect and prevent sudden price distortions and economic imbalances.

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