



# COMMODITY PRICES AND INFLATION NEXUS: CASE OF TÜRKİYE

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# INTRODUCTION

Achieving and maintaining price stability is the most fundamental goal of modern central banks. Consequently, rising inflation has always been one of the key macroeconomic problems that central banks closely monitor. In this context, it is crucial for policymakers to identify the factors influencing inflation and to assess the magnitude of their impact.

Although certain factors, such as exchange rates and labor costs, are well-established in the literature as causes of inflation, the effect of commodity prices remains a subject of debate. These debates started following the inflationary pressures caused by energy price increases in the 1970s. Since the early 2000s, fluctuations in commodity prices have significantly impacted both developed and developing economies.

# INTRODUCTION

Since the beginning of the 2000s, the fluctuations in commodity prices have affected the economies of developed and developing countries. Commodities play a crucial role in the economy, serving both as consumer goods and essential inputs for production processes.

In this context, numerous studies in the literature have empirically demonstrated the adverse effects of various basic commodity prices, particularly in the energy and industrial sectors, on key macroeconomic indicators such as inflation, industrial production, and employment, which are of significant importance to policymakers.

# INTRODUCTION

Researchers have conducted studies on the impact of the Oil Crisis in the 1970s, the increase in food prices in mid-2006, the rising food inflation in China after 2007 and the role of commodity prices in the 2008 Global Economic Crisis. Especially in recent periods, they have also shown the effect of commodity prices on the prices of various basic goods and services, especially food, with empirical findings (Chen & Li, 2020; Chen, 2009).

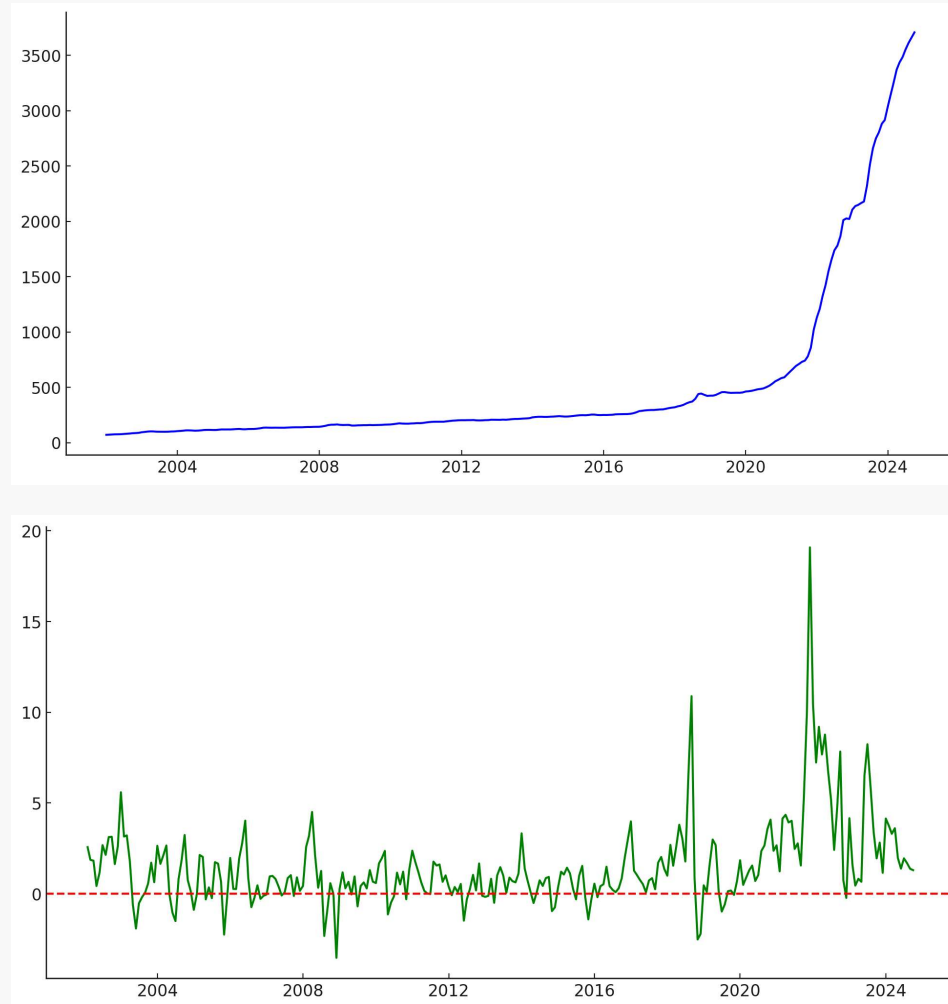
Although these studies have presented findings on the impact of fluctuations in various commodity prices on the consumer and producer price indices, understanding the temporal changes in these effects will yield valuable insights for policymakers (Chen & Yang, 2021).

# AIM OF THE STUDY

The aim of the study is to examine the time-based effect of the two commodity groups and exchange rate for the domestic production of Türkiye, namely industrial inputs and energy prices, and the USD exchange rate, on the domestic producer price index.

For this purpose, the Bayesian TVC-VAR model was employed due to its ability to capture time-varying relationships among variables, making it well-suited for analyzing the dynamic impacts of commodity prices and exchange rates on PPI.

# PRODUCER PRICE INDEX - TÜRKİYE



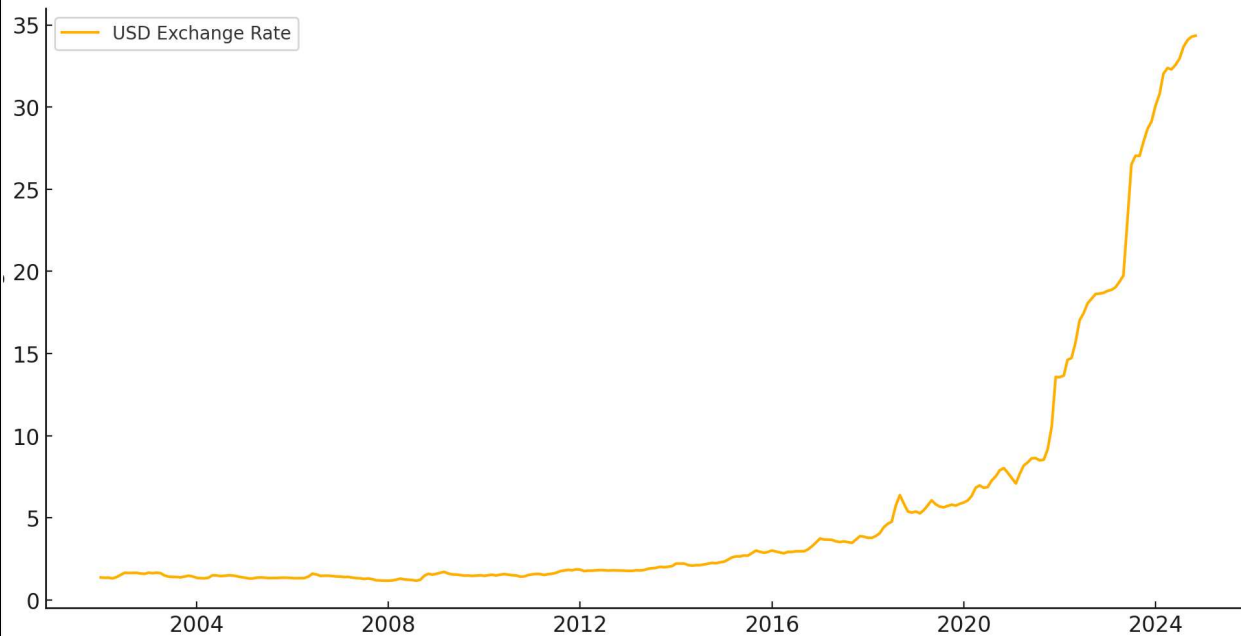
In the aftermath of the 2001 crisis, policy maker implemented comprehensive reforms to foster economic stability. Consequently, as the central bank adopted the 'Inflation Targeting' strategy, the inflation rate began to decline, reaching 8% by 2005. The financial crisis that started in the US in 2008 had a global impact and also had an impact on producer inflation in Turkey. However, after maintaining a level of approximately 5-7% until 2014, inflation has started to rise once again. In 2018, the exchange rate crisis increased import costs, causing a sharp increase in producer inflation. The inflation rate rose to 25% in 2018, causing inflation to enter the agenda of policy makers. The COVID-19 pandemic had created significant pressure on producer inflation.

# COMMODITY PRICES



Geopolitical risks and events have led to increases in energy prices as well as non-energy commodity prices. However, the growth of the world economy, increased demand and climatic events have also been effective in these price increases. The development of non-energy commodity prices between 2000 and today has been affected by many different factors. Commodity prices, which entered a strong upward trend in the early 2000s, were shaped by events such as the 2008 global financial crisis, China's rapid growth, and the COVID-19 pandemic, and increased again after 2020 due to factors such as inflation, supply constraints, and wars.

# EXCHANGE RATE - USD



Since 2000, the course of the US dollar (USD) exchange rate in Turkey has been affected by many factors, including structural problems in the Turkish economy, global economic crises, Turkey's external debt, inflation rates, political uncertainties and international developments. Among the reasons for the increase in the exchange rate are economic and political uncertainties, as well as the increase in foreign exchange demand, the decrease in foreign exchange supply, inflationary pressures and the burden of external debt.



# THEORETICAL BACKGROUND

Commodity prices can cause inflation through various channels.

- **Cost-Push Inflation:** When commodity prices rise, the cost of producing many goods and services will also increase. This is called as cost inflation.
- **Demand-Pull Inflation:** Demand shocks in the economy have an effect on commodity prices and can cause the general price level to increase. For instance, a surge in global oil demand can lead to increased transportation costs, thereby driving up the general price level.
- **Exchange Rate Pass-Through:** Commodity prices are denominated in major currencies like the USD. If the local currency depreciates against the USD, the cost of importing commodities increases. This can lead to higher domestic prices, contributing to inflation.
- **Expectations and Wage-Price Spiral:** Rising commodity prices can shape inflation expectations.

# LITERATURE REVIEW

Various empirical studies show that energy industrial input and food prices have a strong impact on inflation. Especially in developing countries, since energy and food expenditures account for a large share of the consumer basket, these price increases have a more pronounced impact on inflation. For example, the oil crisis in the 1970s and supply chain disruptions during the COVID-19 pandemic caused sharp increases in prices.

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# LITERATURE REVIEW

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# DATA AND METHOD

The literature often assumes that the estimated model parameters remain constant over time; however, this assumption is insufficient to capture the dynamic effects of variables (Lubik & Matthes, 2015). While structural changes in the economy are frequently highlighted in studies utilizing long-term data, few studies address the direction of these changes. In this context, the present study examines how the effects of commodity prices and exchange rates on the Producer Price Index (PPI) vary by employing the BTVC-VAR model (Lucey et al., 2017). The findings are expected to contribute to the literature by providing a clearer perspective on the inflationary impact of shifts in market dynamics (Wen & Hu, 2019; Zhong et al., 2019).

The industrial input price index and energy price index were obtained from the International Monetary Fund Commodity Data Portal. The USD Exchange rate and Domestic Producer Price Index (D-PPI) data obtained from the Electronic Data Distribution System of the Central Bank of the Republic of Turkey. The industrial input price index (IIP) includes agricultural raw material and base metal price indices. The energy price index (EPI) includes crude oil, natural gas, coal and propane prices. In addition, since approximately 70% of Türkiye's imports are made in USD, the USD was used to represent the exchange rate.

# DATA AND METHOD

For this purpose, the impact of industrial inputs, energy prices and USD Exchange Rate on Domestic Producer Price Index is estimated by using cointegration methods and Bayesian TVC-VAR method. First, ADF unit root test was used to check the stationarity of the data. In the second step, ARDL cointegration tests were used to check whether the variables were related in the long run. In the third step, FMOLS (fully modified ordinary least squares), DOLS (dynamic ordinary least squares) and CCR (Canonical Cointegration Regression) methods were used to estimate the impact of IIP, EPI and ER on PPI. Finally, time-varying coefficients were estimated using Bayesian TVC-VAR method.

The model used in the study is as follows:

$$PPI = \beta_0 + \beta_1 IIP + \beta_2 EPI + \beta_3 ER + u_t$$

# RESULTS – ADF UNIT ROOT TEST – ARDL BOUND TEST

<i>At First Difference</i>		<i>PPI</i>	<i>USD</i>	<i>EPI</i>	<i>IIP</i>
<i>With Constant</i>	t-Stat	-4.5696	-8.2405	-11.4091	-11.2648
	<i>P.</i>	0.0002	0.0000	0.0000	0.0000
<i>With Constant &amp; Trend</i>	t-Stat	-5.8620	-9.1530	-11.4399	-11.3242
	<i>P.</i>	0.0000	0.0000	0.0000	0.0000
<i>Without Constant &amp; Trend</i>	t-Stat	-2.7508	-4.3776	-11.4063	-11.2048
	<i>P.</i>	0.0060	0.0000	0.0000	0.0000

The results of the ADF unit root test, displayed in table indicate that all variables are integrated of order  $I(1)$ .

<i>ARDL (2,3,1,1)</i>	<i>F-Stat</i>	<i>I(0)</i>	<i>I(1)</i>
<i>k=3</i>	5.8545	3.23	4.35

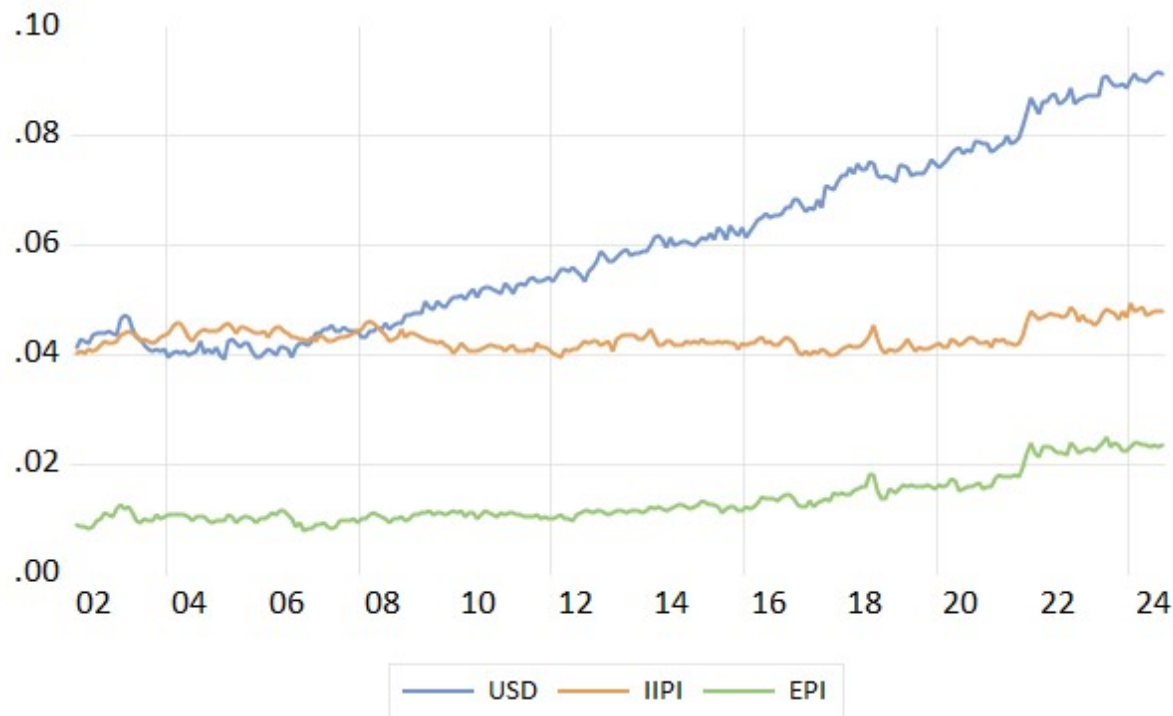
Since the F-Statistic (5.8545) shown in table is higher than the upper limit value, it is concluded that the variables are cointegrated.

# RESULTS – FMOLS, DOLS AND CCR ESTIMATIONS

<i>Variable</i>	<b>FMOLS Coefficient (Std. Error) (P.)</b>	<b>DOLS Coefficient (Std. Error) (P.)</b>	<b>CCR Coefficient (Std. Error) (P.)</b>
<i>USD</i>	0.92 (0.021) (0.00)	0.96 (0.014) (0.00)	0.91 (0.022) (0.00)
<i>IIP</i>	0.24 (0.09) (0.01)	0.15 (0.06) (0.01)	0.25 (0.100) (0.01)
<i>EPI</i>	0.30 (0.078) (0.00)	0.37 (0.05) (0.00)	0.26 (0.08) (0.00)
<i>JB Normality (P.)</i>	3.317 (0.19)	1.857 (0.40)	0.122 (0.94)

According to the results obtained from the models estimated with FMOLS, DOLS and CCR methods, the effect of all three variables on PPI is positive. These findings support the long-term relationship between the variables in the estimated model. These results provide important information for the policies or strategies by taking into account the positive effect of the commodity prices on the PPI.

# RESULTS – BAYESIAN TVC-VAR ESTIMATION



According to the empirical findings, all three variables have a positive effect on PPI.

The effect of energy prices on PPI remained constant until 2012 and increased from the second quarter of 2012.

The effect of industrial input prices on PPI remained constant until the last quarter of 2021 and then increased.

The effect of the USD which is used as a proxy for the exchange rate, on PPI has continuously increased throughout the analysis period.



# CONCLUSION AND POLICY IMPLICATIONS

According to the empirical findings, all three variables have positive effect on PPI. The effect of the USD, which is used as a proxy for the exchange rate, on PPI has continuously increased. Although the effect of industrial input and energy prices on PPI fluctuated over time, their impact increased in the last quarter of 2021. The findings indicate two important results.

Firstly, it was concluded that industrial input prices and energy prices contribute to inflation. While the effects of industrial input and energy prices on PPI were relatively stable in earlier periods, a notable increase has been observed since the last quarter of 2021, likely due to global supply chain disruptions and rising inflationary pressures.

Secondly, the influence of the exchange rate on inflation has intensified over time. Due to the significant reliance of the Turkish manufacturing industry on imports, economic growth can increase inflationary pressures through escalating commodity prices and exchange rate fluctuations. Therefore, it is vital to implement policies aimed at cushioning the impact of exchange rate volatility on inflation. To mitigate the adverse effects of exchange rate volatility on inflation, it is recommended to enhance foreign exchange reserves and incentivize domestic production through targeted industrial policies.