

-RESEARCH ARTICLE-

AN APPLICATION ON THE SOURCE OF INFLATION IN TURKEY

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**Abstract**

*High inflation is among the undesirable conditions for the economies of countries in terms of macroeconomics. Inflation is generally seen in economies for two different reasons. These can be listed as demand-pull inflation and cost-push inflation. The objective of the study is to investigate the source of inflation in Turkey. For this purpose, the monthly producer price index and consumer price index series for the period of January 2006 and July 2021 were used. First, the stationarity of the variables was analyzed with the Generalized Dickey Fuller Unit Root Test. Then, the Granger Causality Test was applied to the variables. As a result of the analysis, a one-way causality relationship from producer price index to consumer price index was determined. This shows that inflation in Turkey is generally caused by costs. For this reason, the implementation of cost-oriented policies to combat inflation will contribute more to the decrease in inflation.*

**Keywords:** Turkey, Inflation, Producer Price Index, Consumer Price Index, Causality Testing.

**JEL Codes:** E3, E4, E5.

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## TÜRKİYE'DE ENFLASYONUN KAYNAĞINA YÖNELİK BİR UYGULAMA<sup>2</sup>

### Öz

*Enflasyonun yüksek olması makroekonomik olarak ülkelerin ekonomileri açısından istenmeyen durumlar arasındadır. Enflasyon ekonomilerde genellikle iki farklı sebep ile görülmektedir. Bunlar talebin çektiği ve maliyetin ittiği enflasyon olarak sıralanabilir. Çalışmanın amacı Türkiye'deki enflasyonun kaynağını araştırmaktır. Bu amaçla çalışmada Ocak 2006 ve Temmuz 2021 dönemine ait aylık üretici fiyat endeksi ve tüketici fiyat endeksi serileri kullanılmıştır. Değişkenlerin öncelikle Genelleştirilmiş Dickey Fuller Birim Kök Testi ile durağanlık durumları analiz edilmiştir. Ardından değişkenlere Granger Nedensellik Testi uygulanmıştır. Analiz sonucunda üretici fiyat endeksinden tüketici fiyat endeksine doğru tek yönlü nedensellik ilişkisi tespit edilmiştir. Bu durum Türkiye'de enflasyonun genellikle maliyetlerden kaynaklandığını göstermektedir. Bu sebeple enflasyonla mücadele için maliyet eksenli politikaların uygulanması, enflasyonun düşmesine daha fazla katkı sağlayacaktır..*

**Anahtar Kelimeler:** *Türkiye, Enflasyon, Üretici Fiyat Endeksi, Tüketici Fiyat Endeksi, Nedensellik Testi.*

**JEL Kodları:** *E3, E4, E5*

“Bu çalışma Araştırma ve Yayın Etiğine uygun olarak hazırlanmıştır.”

### 1. INTRODUCTION

The concept of development is the instrument of the economy of underdeveloped and developing countries. In this context, the economies of countries with development goals try to reach the level of developing countries. There are chronic macro-economic problems of underdeveloped countries, some of which are inflation, unemployment, inequality in income distribution and poverty. One of the most important chronic problems listed is the problem of inflation. Inflation is one of the obstacles to economic growth, which includes quantitative variables, and therefore to the process of development, which includes qualitative variables. In addition, deflation also affects economic growth and development. What is important here is to provide price stability both in terms of demand and supply.

Within the scope of the fight against inflation, countries develop economic policies in order to ensure price stability and maintain the value of the national currency against the foreign currency. Inflation is a dynamic concept and the factors of influence can be different parameters.

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<sup>2</sup> Genişletilmiş Türkçe Özet, makalenin sonunda yer almaktadır.

Central Banks and policy practitioners are the most important institutions in the fight against inflation in national economies. At this point, in order to be protected from the effects of the Great Crisis of 1929 centered in the USA, a central bank was established under the name of the Central Bank of the Republic of Turkey in 1930 for the first time in the history of the Republic of Turkey and started its activities in 1931.

Until the global crises, the monetary policies of the central banks and their policies to combat inflation were effective. Although it is thought that this situation leaves the fiscal policies in the background in the fight against inflation with the transformation of inflation into deflation in developing countries, these countries' economies have started to implement fiscal policies to create inflation. However, it can be stated that policies to reduce inflation are already being implemented in developing country groups. Inflation causes problems such as depreciations of the national currency, low purchasing power, and increased production costs.

While different studies in the literature focus on inflation in terms of resources, the issue is discussed in terms of demand or supply. In their study, Saatçioğlu and Korap (2006) concluded that inflation was not demand-side in the 1989-2004 period, but cost-driven shocks were the main determinant of inflation. Detailed studies are included in the literature section of the study. It is important to address this issue in a stable economy; however, it is also important and essential to deal with the Pandemic process, which has pushed economies to a significant recession for the last two years. It is known that the economies of countries that have not completed their structural transformation, such as the Turkish economy, follow an import-dependent production-export policy and a growth policy. As a result of the exchange rate shocks that follows, it is seen that destructive effects are experienced in the markets which are already stagnant.

Although it has been discussed many times in the literature, the interest rate decisions taken by the Central Bank and policy makers, especially in the last 6 quarters in the Turkish economy, have been criticized, which is a phenomenon that finds support and is theoretically reinforced in the literature. This situation has brought along many discussions, and the issue has been reduced to the cause-effect relationship between interest rate and inflation variables. Although there are theories of interest-, foreign exchange shock-, and Central Bank policy-induced inflation in the literature, the low interest rate strategies in the country's economy have triggered high inflation with high exchange rates, which has been frequently mentioned. Considering the historical process in the Turkish Economy, it can be said that the inflation problem is not up-to-date, and that it is one of the main reasons for the transition to the planned period in the 1960s, together with the foreign dependency and employment problem.

The results were consistent with those in the literature. When considered in terms of inflation source, it is considered as demand- or supply-based inflation, and theoretical information will be given in the next section. In addition, the study also deals with the titles of inflation and inflation theories according to their causes. Following the theoretical titles given, the literature supporting the theory is included, and the empirical model established with the following titles is presented.

## **1.1. Theoretical Background**

### *1.1.1. Concept of Inflation*

Although inflation is defined as a continuous increase in the general level of prices, the conditions mentioned in the definition should be realized simultaneously in order for the phenomenon of inflation to be mentioned. Inflation, which helps to reveal the rate of increase in the general level of prices, is also one of the means of obtaining information about the purchasing power level of the national currency. Decreases in inflation rates may be observed in economic structures; however, this should not be interpreted as a decrease in the general price level, but should be interpreted as a slowdown in the rate of increase in the general price level (Dawood, 2010: 161; Samulson and William, 2001: 337).

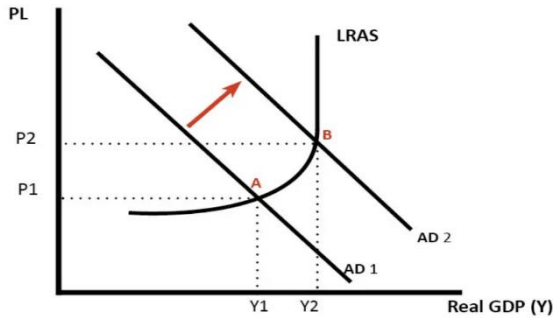
### *1.1.2. Causes of Inflation*

In addition to being mentioned in current economic platforms and included in the analysis results of the study, the type of inflation on which the study is based is cost inflation. However, it is not possible to theoretically explain the causes of inflation with a single variable. In this case, the explanation of variables such as money supply and external factors that may cause inflation may theoretically strengthen the theoretical aspect of the study. However, in the next section of the study, inflation theories will be explained and then associated with the causes of inflation.

The similarity rate of the articles sent to the journal, excluding references, should not exceed 20%. Ethics committee approval should be obtained and documented for research that requires ethics committee approval. Ethics committee approval document should be uploaded to the system as an additional file.

**Demand-Pull Factors:** It is the type of inflation that occurs when the total production amount of imports and production items in an economy cannot meet the total of expenditures and exports; in other words, the current demand cannot meet the current demand. In order for such a conjuncture to take place, the demand side needs monetary support to be able to consume. Consumers can borrow more cheaply as a result of the central bank's implementation of the money supply policy. In such a case, consumption trends will increase (Barro, 1995: 409; Hinaea, 2000: 94).

**Figure 1. Demand-Pull Factors**

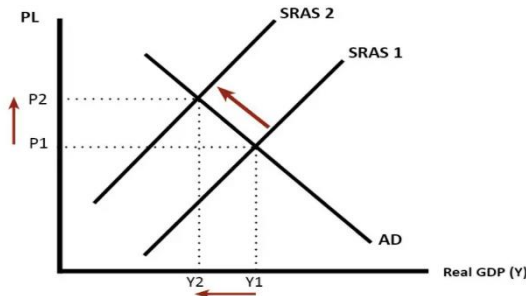


**Source:** <https://www.economicshelp.org/macroeconomics/inflation/causes-inflation/>

If the economy is at or near full employment, an increase in aggregate demand (AD) leads to an increase in the price level (PL). As firms reach full capacity, they respond by raising prices, which leads to inflation. Furthermore, workers close to full employment with a labor shortage may earn higher wages, which increases their spending power.

**Cost-Push Factors:** Cost Inflation means an increase in input prices subject to production, in other words, an increase in production costs. In this case, contractions occur at a level where the production supply cannot meet the consumption demand (Yıldırım et al., 2014: 373). Cost inflation components are energy prices, which are the main input of the manufacturing industry, an increase in employee wages, and an increase in the exchange rate. In this case, it can be pointed out that components such as input inflation and wage inflation are effective in cost inflation (Humphrey, 1976: 87; Jalol and Amin, 2008: 106).

**Figure 2. Cost-Push Factors**



**Source:** <https://www.economicshelp.org/macroeconomics/inflation/causes-inflation/>

If there is an increase in the costs of firms, businesses will then pass this on to consumers. There will be a shift to the left in the SRAS.

Fees constitute a significant part of the costs. For this reason, the effects of wage levels on inflation levels are also observed. The increase in production will trigger an increase in other input costs as well as increase wage costs. Increases in wages will affect unit labor costs, prices and wage increases again. This situation is explained as inflation wage spiral. This situation can be prevented by limiting the aggregate demand. With the restriction of aggregate demand, unemployment will increase and price-wage increases will decrease (Abdioğlu, 2014: 246-248).

Considering the differentiation between demand and cost inflation, it can be said that while employment remains high in demand inflation, unemployment increases in an economy with cost inflation. In fact; considering the differentiation between demand and cost inflation; While employment is at a high level in a demand-side inflation environment, it can be said that the unemployment phenomenon increases in an economy with cost inflation. Whether inflation is caused by demand or cost, it has a negative impact on the welfare level of individuals because it causes a decrease in purchasing power. It is known that inflation also has a distributive effect on the investment resource. However, inflation affects investments negatively by reducing savings. Today, inequality in income distribution will increase as a result of cost-oriented inflation in the Turkish economy (Parasız, 2009: 275-277; Dinler, 2013: 484-485; Seyidoğlu, 2006: 687).

Changes in money supply or borrowing costs, in other words, in interest rates, are effective on inflation. Decreases in real interest rates will trigger inflation by increasing consumption-oriented tendencies by borrowing instead of saving. In addition, some monetary theoretical approaches explain inflation as a monetary phenomenon, and in such a case, the amount of money is explained as an effective factor on inflation (Narayan et al. 2011: 924; Calderon and Hebbel, 2009: 3-7).

Considering external effects, foreign currency and exchange rate can be determined as the focal point. In this case, the effect of foreign exchange on inflation in the country's economy is explained by the changes (increase or decrease) in the prices of imported goods. The appreciation of the exchange rate will cause imports to increase and exports to be restricted and lead the aggregate demand curve to shift to the left. Considering the total supply in the aforementioned relationship, it will be effective in decreasing the price level (Narayan et al. 2011: 924; Calderon and Hebbel, 2009: 3-7).

### *1.1.3. Theories of inflation*

**The Classical Theory of Inflation:** According to the classical theory of inflation, the general level of prices is simply an increasing function of the money supply, which is called the quantity theory of money. In this case, fighting inflation will be possible by reducing the money supply. According to the classical theory of inflation, an increase in the amount of money will cause inflation, and when this increase stops, inflation will naturally stop (Şahin, 2002: 25-26; Kibritçioğlu, 2002: 48).

**The Keynesian Theory of Inflation:** In the Keynesian theory of inflation, inflation is explained by excess demand. The main factor triggering this situation is the short-term inadequacies that occur on the supply side, according to the Keynesian perspective. When considered from a Keynesian point of view, changes in money supply cause changes in interest rates and investment expenditures and consequently affect production (Kibritçioğlu, 2002: 48; Şahin, 2002: 26; Cinel, 2020: 53).

**Monetarist Theory of Inflation:** According to the approach put forward by the members of the Monetarist School, money is the most important factor in terms of determining the general level of prices. According to the monetarist approach, the most important factor in the fight against inflation is the reduction of the money supply; otherwise, its inflation would not be prevented. This inflation theory is supported by the Phillips curve based on adaptive expectations. In this approach, the fact that expectations are adaptive causes the actual inflation and expected inflation rates to differ from each other. In this approach, there is only a negative relationship between inflation and unemployment in the short run. This part of the explanation is represented by the negatively sloped Phillips curve. In the monetarist approach, the view that the Phillips curve will be a straight line in the long run is dominant. At this point, since it is assumed that unemployment has reached the natural unemployment limit, there will be no cost to fight inflation after that point. Monetary policies will not be effective on real production and employment in the long run, but only on the general level of prices (Özcan, 2014: 36; Cinel, 2020: 54; Kibritçioğlu, 2002: 48).

**The New Classical Theory of Inflation:** According to this approach, supply shocks cause the current rise in the economy to decrease. These negative shocks in the market will have an impact on the real sector. In this case, while there are no changes in the money supply and the circulation rate of money, an increase in prices can be observed.

Again, according to this approach, the unemployment Phillips curve is in a steep position; in other words, there will be no unemployment problem for a short time in the natural unemployment limit and in the fight against inflation. Monetary expansions affect prices. The announcements to be made by authorities in advance will create an expectation of an increase in prices (Kibritçioğlu, 2002: 48-49; Özcan, 2014: 36; Cinel, 2020: 54).

**Structuralist Theory of Inflation:** The 1960s welcome is as an expression of Monetarism. The problems created by the expectations in the economy constitute the point where monetarism and the new classical economics diverge (Büyükkakin, 1995: 59-60). The rational expectations hypothesis argues that economic agents will use all the information they have, that is, information from both the past and the current period, when estimating the future value of a variable (Felderer and Homburg, 2017: 259-260).

**The New Keynesian Theory of Inflation:** New Keynesians argue that monetary policy, which does not affect real variables in the long run, can affect real variables in the short run. New Keynesians explain inflation with the Phillips curve. The subject

of the new Phillips curve is how the past and expected inflation rate is determined and, accordingly, how the current inflation rate will be explained. According to the New Keynesian view; While the marginal cost is fixed, the decrease in inflation expectation will result in a decrease in inflation (Korkmaz, 2010: 142).

#### 1.1.4. Literature Review

Demir (2022) aimed to investigate the international determinants of inflation in the Turkish economy. For this purpose, using the data of the period 2006:Q1-2020:Q3, VAR block Granger and time-varying causality method were applied. he study concluded that there is a long-run relationship between inflation and global commodity prices, global food prices, exchange rates, per capita income and money supply.

In their study, Chiang et al. (2021) aimed to investigate the relationship of local inflation with national factor, structural stickiness and a localized pricing power effect in order to better understand inflation dynamics. In their study for China, they concluded that the most important factor explaining inflation in China was sectoral differences in inflation.

In the study conducted by Koçak (2021), it was aimed to investigate the pass-through relationship between consumer and producer prices. In the study, the data for the period between 2005 February and 2020 March were analyzed by VAR-DCC-GARCH, K-Means clustering, and ARDL method, and it was concluded that there was a pass-through between these two variables and that the dollar exchange rate had a positive relationship on the variables.

Erdogan et al. (2020) aimed to explain the determinants of inflation in their study. In the study, the spatial panel data analysis method was applied with the data belonging to the period between 2020:01- 2020-07 and to 28 EU countries. In the study, it was concluded that the changes in the exchange rate and money supply were the most obvious reasons for the increase in inflation.

In their study, Sharif et al. (2020) aimed to explain the relationship between COVID-19 and oil price shocks, geopolitical risk, stock market, and economic uncertainty. They used the Granger causality test in their research for the USA. In the study, it was concluded that the effects of COVID-19 on the geopolitical risk for the USA were greater than the economic uncertainties and that the pandemic risk was perceived differently in the short and long term.

In his study, Akcan (2019) investigated the causality relationship between inflation and unemployment before and after the mortgage crisis, and the validity of the Fisher Hypothesis. According to the results of the study, the Fisher Hypothesis was found to be valid before and after the Mortgage Crisis and between 2000-2018. However, the bidirectional causality relationship between the variables before the mortgage crisis



disappeared after the crisis. Between the years 2000-2018, a causal relationship was found from interest rates to inflation.

Topuz et al. (2018) examined the relationship between producer and consumer price indices comparatively for Turkey and England. In this context, VAR action-response and Granger causality analyzes were performed with the data of the variables, and it was concluded that there was a bidirectional relationship between producer and consumer prices in both countries.

Taban and Şengür (2016) aimed to reveal the causes of inflation in Turkey with an econometric analysis. They used nominal interest rates, and PPI and CPI variables in their studies. In their study, they used the data of the variables for the period 2003 February and 2014 December, and employed the VAR model, the Granger causality test, the impulse response method, and the variance decomposition method. According to the results of the research, there was no relationship from interest to inflation. In this case, according to the study, they concluded that inflation in Turkey was not demand-side, but supply-side.

In the study conducted by Özcan (2014), it was aimed to explain the source of inflation. In the study, the dynamic panel data estimation method was applied by using the data from 44 developing countries for the period between 2000-2009. In the study, it was concluded that excessive money supply, current account deficit, increases in the level of trade openness and nominal exchange rate caused inflation to accelerate. However, it was also seen in the study that economic growth led to a decrease in inflation rates.

Selim and Güven (2014) aimed to reveal the relationship between exchange rate, inflation, and unemployment for Turkey. In the econometric analysis, they used the data of the variables for the period between 1990 and 2012. As a result of the analysis, they concluded that the exchange rate affected inflation.

In the study by Agayev (2012), it was aimed to explain the determinants of inflation in transition economies. In the study, the static panel method was used with the data belonging to the 1998-2008 period and to 23 transition economy countries. It was concluded that wage increases and exchange rate increases had an inflationary effect and caused inflation.

Abidoğlu and Korkmaz (2012) aimed to examine the relationship between consumer and producer price indices in terms of causality. In the method applied in their study, they discussed the CPI and PPI sub-sector indices for the period between 2003:01-2012:02. The study showed that there was a bidirectional causality relationship between CPI and PPI. In the study, they concluded that the demand factor was the source of inflation.

Oktar and Dalyancı (2011) attempted to explain the relationship between the interest policies of the Central Bank of the Republic of Turkey and inflation. As a result of the

Granger causality analysis, which they conducted using the data of the period between 2003:01-2011:6, they concluded that interest policies did not affect inflation and that inflation, however, affected interest policies.

Narayan et al. (2011) aimed to examine the determinants of inflation for developing countries. In the study, the dynamic panel data analysis method was used to analyze the data belonging to the period between 1995-2004 and to 54 developing countries. In the study, it was concluded that short-term US debts, workers' incomes, agricultural sector, current account deficit, and government debts had an increasing effect on inflation and that democratization had a reducing effect on inflation.

In their study, Çubuk and Önder (2010) aimed to examine the distribution of inflation items. In their studies, the data for the period of 1996-2007 for Turkey were used. In their study, they concluded that inflation components were right skewed and fat tailed, as documented by previous studies.

Oktayer (2010) examined the relationship between inflation, budget deficits, and money supply increase variables. Oktayer applied the cointegration test for Turkey using the data belonging to the years 1987-2009, and reached the conclusion that the price level supported the financial theory approach in the analyzes of the current periods for Turkey.

Saraç and Karagöz (2010) aimed to examine the relationship between producer price index and consumer price index variables. In the study, the data for the period between 1994:01-2009:12 were analyzed with the ARDL bounds test method, and they concluded that the inflation variable was cost-supported, considering the results of those periods for Turkey.

Andersson et al. (2009) aimed to analyze the determinants of inflation differences and price levels in their study. In their study, they applied Panel analysis with the 1999-2006 data for the European region. Their study concluded that the price level of each Eurozone country was governed by GDP per capita levels.

In their study, Calderon and Hebbel (2009) aimed to investigate the non-monetary determinants of inflation. In the study, it was concluded that credibility and financial discipline had the effect of reducing inflation in the model established with the data of 97 countries between 1975 and 2005.

Onur (2008) aimed to examine the relationship between inflation and interest rate variables. According to the results of the autoregressive analysis created using the data of the period between 1980-2005, it was found that there was a significant relationship between interest rates and inflation, and that interest had an effect on inflation.

Barnichon and Peiris (2008) aimed to explain the relationship between real money deficit, inflation, and output gap. In the study, heterogeneous panel cointegration estimation methods were used with the data belonging to the period between 1960-

2003 and to Sub-Saharan African countries. In the study, it was concluded that the monetary deficit variable was more effective on inflation.

Zortuk (2008) aimed to investigate the relationship between WPI and CPI for Turkey. In the study, the data belonging to the period between 1986: 01-2004: 12 for Turkey were analyzed with the Granger test method and as a result of the study, it was concluded that there was a one-way causal relationship from CPI to WPI for Turkey in the mentioned years.

Volkan et al (2007) aimed to investigate the causality between the exchange rate and the domestic inflation rate in their study. In the study, VAR analysis was performed for Turkey through the data of the periods covering 1994-2002 and 2003-2006. In the study, they concluded that exchange rate changes had an important role in terms of determining domestic inflation.

Saatçioğlu and Korap (2006) aimed to examine the determinants of the inflation process in Turkey through an empirical modeling they created. The causality method was used in the model by using the data of the period between 1989 and 2004, and it was concluded that inflation was not demand-side, and that cost-based shocks were the main determinant of inflation.

Inoue's (2005) study aimed to explain the determinants of inflation for transition economies. The issue was examined using panel data analysis with the data covering the period between 1995-2003 and belonging to 20 transition economies. In the study, it was concluded that the increase in the money supply caused an increase in the inflation rate and that the budget deficits that consequently occurred affected the inflation negatively.

Catao and Terrones (2003) aimed to examine the relationship between inflation and budget deficit in their study. In the study, panel data analysis was applied with the data covering the period of 1960-2001 and belonging to 107 countries. In the study, a high correlation was found between the budget deficit and inflation at the level of developing countries. However, it was concluded that such a relationship could not be detected for developing countries with low inflation levels.

The study by Hernandez-Cata (1999) aimed to explain the effects of economic liberalization and monetary growth on inflation. In this study, which is the first study to examine the issue with panel data analysis, the least squares method was used with the data covering the period between 1990-1996 and belonging to 26 countries. In the study, it was concluded that monetary freedom had a one-time, non-continuous, but significant effect on the price level.

## 2. METHODOLOGY

The econometric application is used to test a hypothesis based on numerical data. In order to serve this purpose, it is necessary to make sure of some situations first. For this reason, unit root tests are used in order to analyze the stationarity of the series. If the series are stationary, there may be spurious relationships. The Dickey Fuller Unit Root Test, which was first introduced to the literature in 1979, was used to ensure that the series were stationary and that they did not contain unit roots. With the elimination of the deficiencies of the test, the Generalized Dickey Fuller Unit Root Test was introduced to the literature in 1981 and was widely used. Dickey Fuller Unit Root Test models using three different models are as follows (Taş et al., 2017: 270-271):

$$\Delta Y_t = \lambda Y_{t-1} + \mu_t \tag{1}$$

$$\Delta Y_t = \alpha_0 + \lambda Y_{t-1} + \mu_t \tag{2}$$

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \lambda Y_{t-1} + \mu_t \tag{3}$$

Model 1 is generally used when the trend constant term and equality constant term effect is not included among the variables. In cases where a fixed effect is observed, there is a condition for both the fixed term and the trend effect to be used for the use of Model 2 and Model 3.

In addition, P. Phillips and P. Perron developed a different unit root test in 1988 which was sensitive to correlation and variable variance in error terms. In this context, Equation 4 is established as follows (Çiçek et al., 2010: 148).

$$T\hat{\delta} = \frac{\int \hat{\delta}_t \hat{\delta}_t'}{\int \hat{\delta}_t^2} \left[ \frac{(\gamma_0/f_0)^{(1/2)}}{T} - \frac{(T(f_0 - \gamma_0) \text{se}(\hat{S}))}{(2\sqrt{f} s)} \right] \tag{4}$$

In this equation,  $\hat{S}$  is the coefficient estimate and  $\text{se}(\hat{S})$  represents the standard error of  $\delta$ .

Generalized Dickey Fuller Unit Root Test is applied by testing two different hypotheses for three different models. These models can be listed as the model with constant term and trend effect, the model with only constant term effect, and the model where both constant term and trend effect are absent. Generalized Dickey Fuller Unit Root Test hypotheses are

H0:  $\lambda = 0$  The series has a unit root.

H1:  $\lambda < 0$  There is no unit root in the series.

One of these two hypotheses needs to be chosen. The selection is made through the consideration of the probability value. If the probability value is less than 0.05, the H0

hypothesis is rejected and the alternative hypothesis is chosen, and it is concluded that the series do not contain a unit root. If the probability value is greater than 0.05, H0 is accepted and the hypotheses are applied again by taking the difference of the series. This situation continues until the alternative hypothesis is selected.

In order to determine the causal relationships of dependent and independent variables, the primary test created in time series was developed by R. Engle and C. Granger in their study in 1987. This test, in which different equations are used, is known as the Engle Granger Causality Test. Equations 5 and 6 are shown below (Engle and Granger, 1987: 251-276):

$$Y_t = \sum_{i=1}^m \alpha_i Y_{t-i} + \sum_{i=1}^m \beta_i Y_{t-i} + \epsilon_{1t} \tag{5}$$

$$X_t = \sum_{i=1}^m \theta_i X_{t-i} + \sum_{i=1}^m \gamma_i Y_{t-i} + \epsilon_{2t} \tag{6}$$

After making sure that the series are stationary, other tests that are planned to be applied are applied sequentially. In our study, after making sure that the series did not contain unit roots, the Granger Causality Test was applied to investigate the causal dimension of the relationship between the variables. The Granger Causality Test works with two hypotheses. These are:

While looking at the causal aspect of the relationship between the variables, two different hypotheses are tested.

H0: The dependent variable is not the cause of the independent variable

H1: The dependent variable is the cause of the independent variable

If the probability value calculated within the scope of the Granger Causality Test is less than 0.05, the H0 hypothesis is rejected and it is decided that there is a causal relationship between the variables.

In the light of this information, first of all, Generalized Dickey Fuller Unit Root Test was performed in the study, and then the causal relationship between the variables was determined with the Granger Causality Test. In this context, the information about the variables and the test values applied are as follows.

**Table 1: Information on Series**

Variable	Notation	Source
Producer price index	PPI	Turkish Statistical Institute
Consumer price index	CPI	Turkish Statistical Institute

Since the producer price index and consumer price indices are index values as of the base years, the logarithm of the series was taken to see the results more easily, and the

logarithms were taken and tested. The question of the study is whether the source of inflation is demand-side or cost-side. In this case, consumer price index and producer price index data were included in the study. When the study is considered in Turkey; the common base year of producer and consumer price index data is seen as 2006.

The objective of the research is to examine the Consumer Price Index (CPI) and Producer Price Index (PPI) variables and to interpret these variables with the analyzes carried out in the light of the data. The producer index and consumer index data since 2006 were included in the study. The main reason for the data to start with the year 2006 is that although the consumer price index data started with the year 2003, the consumer price index values started with the year 2006. In this case, since both variables would be subject to the model, 2006 was taken as the base year. The model of the study is as follows;

$$PPI = \beta_0 + \beta_1 CPI + \epsilon_t \tag{7}$$

### 3. RESULTS

The unit root test values of the series, whose logarithms were taken and which, then, became logarithmic, are as follows.

**Table 2:** Augmented Dickey Fuller Unit Root Test Results Of The Level Values Of The Variables

Variable	PPI	CPI
Model		
Model with constant term		
%1 Critical Value	-3,465977	-3,466377
%5 Critical Value	-2,877099	-2,877274
%10 Critical Value	-2,575143	-2,575236
Test Statistics Value	2,621509	3,249149
Probability Value	1,0000	1,0000
Model with constant term and trend effect		
%1 Critical Value	-4,008706	-4,009271
%5 Critical Value	-3,434433	-3,434706
%10 Critical Value	-3,141157	-3,141318
Test Statistics Value	0,868038	0,953797
Probability Value	0,9998	0,9999

Model Without Trend and Constant Term		
%1 Critical Value	-2,577590	-2,577730
%5 Critical Value	-1,942564	-1,942584
%10 Critical Value	-1,615553	-1,615541
Test Statistics Value	4,723739	6,896070
Probability Value	1,0000	1,0000

When the level values of the producer price index and consumer price index variables are examined, it is seen that there is a unit root in all three models. Therefore, the unit root test should be applied again to the series whose difference is taken by taking the first-order differences of the series.

**Table 3:** Unit Root Test Results of the First Difference Values of the Variables

Variable \ Model	PPI	CPI
Model with constant term		
%1 Critical Value	-3,465780	-3,466580
%5 Critical Value	-2,877012	-2,877363
%10 Critical Value	-2,575097	-2,575284
Test Statistics Value	-7,219387	-5,547099
Probability Value	0,0000	0,0000
Model with constant term and trend effect		
%1 Critical Value	-4,008706	-4,009271
%5 Critical Value	-3,434433	-3,434706
%10 Critical Value	-3,141157	-3,141318
Test Statistics Value	-8,091479	-8,340192
Probability Value	0,0000	0,0000
Model Without Trend and Constant Term		
%1 Critical Value	-2,577522	-2,577801

%5 Critical Value	-1,942555	-1,942594
% 10 Critical Value	-1,615559	-1,615534
Test Statistics Value	-5,845358	-2,340653
Probability Value	0,0000	0,0190

The Generalized Dickey Fuller Unit Root Test values of the first-order differences of the producer price and consumer price indices indicate that the series were stationary in all three models. Since the series are unrooted from the unit root, the Granger Causality Test can be applied in order to test the causal relationship between them. Before applying the Granger Causality Test, it is necessary to select the appropriate lag length for the series. Since the granger causality test analyzes the causal relationship of the lagged values, it was subjected to VAR analysis by taking the difference of the variables. The appropriate lag length was analyzed for up to six periods, and the values of three different information criteria are given in Table 4.

**Table 4:** Appropriate Lag Length

Lag	AKAIKE Information Criterion	SCHWARTZ Information Criterion	HANNAN-QUINN Information Criterion
0	-2,004264	-1,968921	-1,989935
1	-12,74495	-12,63892	-12,70196
2	-13,03120	-12,85448*	-12,95955
3	-13,08669	-12,83929	-12,98639
4	-13,06076	-12,74268	-12,93180
5	-13,17097*	-12,78220	-13,01336*
6	-13,16895	-12,70950	-12,98268

When Table 4 is examined, it is seen that the fifth lag is the most appropriate lag according to the Akaike information criterion and the Hannan Quinn information criterion. However, according to the Schwartz information criterion, the second lag is the most appropriate lag. When the values are examined, since the smallest value was in the Akaike information criterion, the appropriate lag length was chosen as the fifth lag. The results of the Granger Causality Test according to the VAR model re-estimated according to the appropriate lag length are given in Table 5.



**Table 5: Granger Causality Test Results**

Aspect of Causality	Chi Square	Lag	Probability Value
PPI > CPI	44,64718	5	0,0000
CPI > PPI	9,611749	5	0,0870

According to the Granger Causality Test results, it is seen that there was a causal relationship from the producer price index to the consumer price index. In the study, analyzes were made at the 5% level. For this reason, it was concluded that there is no causality relationship from cpi to ppi. According to these hypotheses, the causal relationship was decided. Granger causality hypotheses;

H0: The dependent variable is not the cause of the independent variable.

H1: The dependent variable is the cause of the independent variable.

#### 4. DISCUSSION

In the last two years, there has been a serious recession in the economies of different countries. In the new process, even the economies of developing countries, where the concept of inflation has not been mentioned properly before, have included the problem of inflation on their agenda. This situation has prepared the ground for examining the source of the inflation phenomenon in Turkey as well. Along with the pandemic process, increases have been observed especially in cost-oriented inflation rates.

When the source of inflation is considered in the context of theoretical discussions, the issue is taken into account from different perspectives as Classical and Keynesian economics. According to the classical economics point of view, the amount of money supply in the market is effective on the general level of prices. At this point, the amount of disposable money that can be withdrawn from banks will increase as a result of an increase in the money supply, in other words, a decrease in interest rates. This, in turn, will affect the general level of prices.

According to the Keynesian perspective, inflation is driven by demand. It is assumed that consumers are at a level of income to be able to consume and that the mentioned income level can be achieved with high employment rates. According to the Keynesian point of view, the money supply introduced to the market through expansionary monetary policies assumes the mission of triggering the current inflation, but is not the only source of inflation.

In this study, the source of inflation, which is one of the dynamic obstacles to economic growth, in the context of Turkey was emphasized, and the results supporting

the literature were found. It was concluded that the inflation developed due to the increasing cost with the pandemic process.

## **CONCLUSION**

Consumer and Producer Price Index interaction is a concept that causes differentiation in the literature, but is used interrelatedly in the market. While some studies focus on the pass-through between the two variables, some focus on causality studies specific to the two variables. The most fundamental problem of the recession in the Turkish economy in recent years is the problem of inflation. It is observed that production costs increase in the face of increasing exchange rate.

In this study, an econometric analysis was carried out for Turkey by using the monthly producer price index and consumer price index series for the period between 2006:01 and 2021:07.

The producer index and consumer index data since 2006 were included in the study. The main reason for the data to start with the year 2006 is that although the consumer price index data started with the year 2003, the consumer price index values started with the year 2006. In this case, since both variables will be the subject of the Granger Causality analysis created in the study, 2006 was taken as the base year.

The question of the study is whether the source of inflation is demand-side or cost-side. In this case, consumer price index and producer price index data were included in the study. When the study is considered in Turkey; the common base year of producer and consumer price index data is seen as 2006. According to the Granger Causality Test results, it is seen that there was a causal relationship from the producer price index to the consumer price index; however, the causality relationship from the consumer price index to the producer price index could not be determined. The results showed that inflation was caused by costs.

High inflation rates are one of the biggest obstacles to the development of the country's economy. At this point, policies to combat the inflation problem should be created and implemented. There is an inflation problem in the Turkish economy as well, and solution policies should be developed to eliminate its source, which emerged as a result of different studies.

Since cost-driven inflation will occur when input prices increase as a result of foreign exchange shocks or economic recession in economies that are hypersensitive to exchange rate volatility, the policies to be implemented should be implemented in a way that will encourage the reduction of the cost of expenditure. In order not to trigger an inflationary spiral, that is, not to fuel demand inflation in any inflationary environment, expansionary monetary policies can also be avoided. Currency shocks are highly effective on the current spiral, and in order to prevent exchange rate shocks, the country's economy will need to focus on export-oriented investments by producing in a way that is dependent on imports and reduces the production process. Since the

national currency, whose value is declining in an inflationary environment, will make investments increasingly impossible, investment costs can be reduced by attracting foreign capital investments to the country.

In order to solve the problem of cost inflation arising from the import of intermediate and capital goods, it is necessary to resolve the dependency structure based on imports. In addition, it is important to prevent excessive depreciation of the domestic currency with effective exchange rate and monetary policy implementations, and to implement policies to increase economic growth targets.

In the future studies, the interest-inflation relationship can be taken into account more specifically, and the policies implemented by policy practitioners can shed light on the current Turkish economy in a scientific way.

Another suggestion for further studies is; The subject will be to deal with the reflections of the inflation source with different dimensions by considering the real sector and consumer confidence indices.

## **TÜRKİYE'DE ENFLASYONUN KAYNAĞINA YÖNELİK BİR UYGULAMA**

### **1. GİRİŞ**

Literatürde yer alan çalışmalar genelinde konu, enflasyona kaynak olarak yaklaşmaktadır. Buna bağlı olarak konu talep ya da arz yönünden ele alınmaktadır. Bu konunun stabil bir ekonomide de ele alınması önemlidir. Ancak; özellikle son iki senedir ekonomileri önemli derecede durgunluğa iten pandemi sürecinde ele alınması ayrıca önemli ve elzemdir. Türkiye Ekonomisi' nin de aralarında bulunduğu yapısal dönüşümünü tamamlayamamış ülke ekonomilerinin, ithalata bağımlı üretim ihracat ve büyüme politika izledikleri bilinmektedir. Meydana gelen kur şokları ile beraber bu ülke ekonomilerinin zaten durağan piyasalarında da yıkıcı etkilerin yaşandığı görülmektedir.

Literatürde defalarca ele alınmasına rağmen özellikle ülke ekonomisinde son 6 çeyrekte Merkez Bankası ve politika yürütücülerin aldığı faiz kararları eleştirilmektedir. Bu durum pek çok tartışmayı beraberinde getirmiş ve konu faiz ile enflasyon değişkenlerinin sebep-sonuç ilişkisine kadar indirgenmiştir. Literatürde faiz, döviz şoku ve Merkez Bankası politikası kaynaklı enflasyon teorileri yer almasına karşın ülke ekonomisinde düşük faiz stratejilerinin izlenmesi, ülkede yüksek döviz kuru ile yüksek enflasyonu tetiklemiş ve bu konu sıklıkla telaffuz edilir hale gelmiştir. Türkiye Ekonomisi tarihsel süreç göz önünde bulundurulduğunda enflasyon sorununun güncel olmadığı; hatta dışa bağımlılık ve istihdam sorunu ile beraber 1960 planlı döneme geçişin temel nedenlerinden biri olduğu da söylenebilir.

## 2. YÖNTEM

Veriler kısaltmaları ve kaynakları aşağıdaki gibi olup serilerin durağan olduklarından emin olunduktan sonra uygulanması planlanan diğer testler sırasıyla uygulanmıştır. Üretici Fiyat Endeksi UFE Türkiye İstatistik Kurumu

Tüketici Fiyat Endeksi TUFİ Türkiye İstatistik Kurumu

Serilerin durağan olduklarından emin olunduktan sonra uygulanması planlanan diğer testler sırasıyla uygulanır. Çalışmada, serilerin birim kök içermediğinden emin olunduktan sonra değişkenler arasındaki ilişkinin nedensel boyutunu araştırmak için Granger Nedensellik Testi uygulanmıştır. Granger Nedensellik Testi’de iki hipotez ile çalışmaktadır. Bunlar;

Değişkenler arasındaki ilişkinin nedensel yönüne bakılırken iki farklı hipotez test edilmektedir.

H0: Bağımlı değişken, bağımsız değişkenin nedeni değildir

H1: Bağımlı değişken, bağımsız değişkenin nedenidir

## 3. BULGULAR

Üretici fiyat endeksi ve tüketici fiyat endeksi değişkenleri düzey değerlerine bakıldığında her üç modelde de birim kök içerdiği görülmektedir. Dolayısıyla serilerin birinci dereceden farkları alınarak, farkı alınmış serilere tekrar birim kök testi uygulanmıştır. Granger Nedensellik Testi sonuçlarına göre üretici fiyat endeksinden tüketici fiyat endekisine doğru nedensellik ilişkisinin olduğu görülmektedir. Tüketici fiyat endeksinden, üretici fiyat endeksine doğru ise nedensellik ilişkisi tespit edilememiştir.

## 4. TARTIŞMA

Klasik iktisat bakış açısında göre; piyasadaki para arzı miktarı fiyatlar genel düzeyi üzerinde etkilidir. Enflasyon, Keynesyen bakış açısına göre talep kaynaklı gerçekleşmektedir. Tüketicilerin tüketim yapabilecek seviyede bir gelir düzeyinde olduğunun varsayıldığı ve bahsi geçen gelir düzeyinin yüksek istihdam oranları ile sağlanabileceği savunulmaktadır. Keynesyen bakış açısına göre piyasaya genişletici para politikaları aracılığıyla sürülen para arzı, mevcut enflasyonu tetikleyici misyon üstlenirken enflasyonun salt kaynağı durumunda değildir.

## SONUÇ

Bu çalışmada Türkiye için [2006:01-2021:07] dönemine ait aylık üretici fiyat endeksi ve tüketici fiyat endeksi serileri kullanılarak ekonometrik bir analiz gerçekleştirilmiştir. Granger Nedensellik Testi sonuçlarına göre üretici fiyat

endeksinden tüketici fiyat endeksinde doğru nedensellik ilişkisinin olduğu görülmektedir. Tüketici fiyat endeksinden, üretici fiyat endeksinde doğru ise nedensellik ilişkisi tespit edilememiştir. Sonuçlar enflasyonun maliyet kaynaklı olduğunu göstermiştir.

Maliyet kaynaklı enflasyon, döviz kuru oynaklığına aşırı duyarlılık gösteren ekonomilerde girdi fiyatlarının döviz şokları ya da ekonomik durgunluk sonucu artmasıyla gerçekleşeceğinden, uygulanacak politikaların girdi maliyetini azaltmayı özendirerek yönde uygulanması gerekmektedir. Enflasyon sarmalı tetiklenmemesi adına yani herhangi bir enflasyonist ortamda talep enflasyonunu körüklememek adına genişletici para politikalarının da uygulanmaması sağlanabilir. Döviz şoklarının mevcut sarmal üzerinde son derece etkili olduğu ve kur şoklarının önüne geçilebilmesi için ülke ekonomisinin ithalatı kısarak ihracat odaklı yatırımlara ağırlık vermesi gerekecektir. Enflasyonist ortamda gittikçe eriyen ulusal para birimi, yatırımları gittikçe imkansız kılacağından yabancı sermaye yatırımları ülkeye çekilerek yatırım maliyetleri daha aza indirilebilir.

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Tasarım / <i>Design</i>	Yöntemi, ölçeği ve deseni tasarlamak / <i>Designing method, scale and pattern</i>	Hasan AZAZİ
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