PRODUCER PRICE INDEX, CONSUMER PRICE INDEX AND FISCAL POLICY: 1996-2020 PERIOD AND TURKEY[1]

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ABSTRACT| Knowing the relationship between the Producer Price Index (PPI) and the Consumer Price Index (CPI) is crucial for deciding the fiscal policies which will be implemented within the scope of combating inflation. This relationship has been examined econometrically in this study. Engle-Granger cointegration and Granger causation methods were used in this study, in which monthly data of 1996-1 and 2020-9 periods obtained from the Central Bank and TURKSTAT were used. The stationarity of the series was measured using Augmented Dickey-Fuller and Phillips-Perron unit root methods. Consequently, a 1% increase in CPI for the short term increases PPI by 1.41% and this situation stabilizes within 3.5 months in the long-term, while a 1% increase in PPI increases the CPI by about 00.9%. and this situation stabilized within 20 months in the long-term. And same mutual relationship results found for long-term as well.

Keywords: *PPI, CPI, fiscal policy*
Jel codes: *A12, E62, H30*

Scope: *Economics*
Type: *Research*

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[1] It is confirmed that the relevant ethical rules are followed in the study.

ÜRETİCİ FİYAT ENDEKSİ, TÜKETİCİ FİYAT ENDEKSİ VE MALİYE POLİTİKASI: 1996-2020 DÖNEMİ VE TÜRKİYE

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ÖZ | Üretici Fiyat Endeksi (ÜFE) ve Tüketici Fiyat Endeksi (TÜFE) arasındaki ilişkinin bilinmesi, enflasyonla mücadele kapsamında uygulanacak olan maliye politikalarının belirlenmesi açısından oldukça önem arz etmektedir. Nitekim bu çalışmada söz konusu ilişki ekonometrik olarak incelenmiştir. Merkez Bankası ve TÜİK'den edinilen 1996-1 ve 2020-9 dönemlerinin aylık verilerinin kullanıldığı bu çalışmada, Engle-Granger eş-bütünleşme ve Granger nedensellik yöntemleri kullanılmıştır. Serilerin durağanlığı ise Augmented Dickey-Fuller ve Phillips-Perron birim kök testi yöntemleri ile ölçülmüştür. Analizler neticesinde kısa dönem için TÜFE'deki %1 birimlik bir artışın ÜFE'yi yaklaşık %1.41 artırdığı ve bu durumun uzun dönemde 3.5 ay içerisinde dengeye geldiği, ÜFE'deki %1 birimlik bir artışın ise TÜFE'yi yaklaşık %0.09 artırdığı ve bu durumun uzun dönemde 20 ay içerisinde dengeye geldiği tespit edilmiştir. Uzun dönem için bakıldığında da ÜFE ve TÜFE arasında karşılıklı ve anlamlı bir ilişkinin bulunduğu tespit edilmiştir.

Anahtar Kelimeler: *ÜFE, TÜFE, maliye politikası.*
JEL Kodu*: A12, E62, H30*

Alan: *İktisat*
Türü: *Araştırma*

1. INTRODUCTION

Inflation can be defined as the continuous increase in the general level of prices. There are two main indicators in the measurement of inflation; the Producer Price Index (PPI) and the Consumer Price Index (CPI) (Ertek, 2011, s. 301). The PPI shows the price changes in the markets of the goods used in production activities, while the CPI shows the changes in the prices of the goods and services used by the consumers. Until 2004, the Wholesale Price Index (WPI) was calculated instead of PPI in Turkey. There is a difference between WPI and PPI. Unlike PPI, matters such as VAT are also included in the calculation while calculating the WPI (TÜİK, 2008, s. 38).

In the literature, it is accepted that there is a mutual relationship between PPI and CPI[2]. Namely; the increase in costs such as raw materials used in the production of goods, intermediate goods, and labor force causes firms to increase the prices of the goods they produce. This situation causes a transition from PPI to CPI. Besides, the increase in demand due to various reasons, especially the increase in the income levels of consumers, increases the prices of these goods. This situation causes a transition from CPI to PPI (Abdioğlu and Korkmaz, 2012, s. 66). The occurrence of this situation is possible if the input costs have a considerable share in the production of the product. Also, the relationship between producer and consumer inflation is not only dependent on input costs but can also be shaped by competition and technological developments (Saatçioğlu and Karaca, 2017, s. 3).

Although this relationship is generally accepted in the literature, it is very important to analyze and reveal it econometrically. This is very useful in determining whether the current inflation in the economy is demand-side or cost-side. In this way, the anti-inflationary policies to be applied can be determined according to the situation between the two indices (Erdem and Yamak, 2014, s. 2).

The continuous rising in general level of prices creates various costs for society. The loss of properties that money should have and the emergence of money substitution can be given as example for these costs (Tarı, Abasız, and Pehlivanoğlu, 2012, s. 2). For these reasons, countries try to keep inflation under control. And for taking inflation under control, the success of anti-inflationary policy to be determined is of vital importance (Saraç and Karagöz, 2010, s. 221).

Considering all these factors, it is thought that the studies conducted within the scope of inflation are important. Indeed, especially comprehensive studies on inflation in many countries, including Turkey and United States took

[2] In the next part of the study, only "the relationship" expression will be used.

place. These studies will be shown in literature review. The common goal of almost all of these studies is to define the main reason of inflation is demand or supply in the aforementioned countries, and thus to reveal which policies should be followed to ensure price stability.

2. PPI, CPI AND THE IMPORTANCE OF THE RELATIONSHIP BETWEEN IT IN TERMS OF FISCAL POLICY

Analyzing the relationship is of great importance in terms of fiscal policy. One of the main reasons why inflation is very important for fiscal policy is that states experience a real depreciation in tax revenues due to the "Olivera-Tanzi Effect". In particular, the difference between the accrual and collection periods of certain taxes, such as the income tax in which it is accrued in the year in which the income is obtained but is collected in the following years or installments, causes real value loss for these taxes in economies experiencing inflation (Yılmaz, 2018, s. 393). While this situation provides income through inflation to the governments that finance their budget deficits with monetization, it causes erosion in the real value of tax revenues (Susam, 2020: 332). For this reason, in economies struggling with high inflation, taxes are also affected by this situation, and the efficiency of taxes that can be used as a fiscal policy tool decrease.

Similarly, the emergence of the "Fiscal Drag" phenomenon as a result of inflation is also important for fiscal policy. This problem arises in the form of taxation of individuals from the upper tax brackets because of the progressive nature of income tax. The reason for this situation is the nominal increase in incomes of individuals as a result of inflation. This situation negatively affects investments and savings during the expansion periods. And it also postpones the recovery of the economy from instabilities in periods of low conjuncture (Şen and Sağbaş, 2017, s. 196; Yılmaz, 2018, s. 366). Although this situation automatically causes an increase in tax revenues, it causes the growth rate to decrease and the economy to evolve into recession which is called slumpflation (Susam, 2020: 333).

In addition, inflation causes a decrease in real money balances of individuals, and tax revenues begin to erode due to inflation, and this situation, which is called "Inflation Tax", melts tax revenues of the state (Yılmaz, 2018, s. 418). This situation, which creates negative results in the income distribution among the segments of the society, causes the effects of inflation on the economy to increase, especially in fixed-income societies that have insufficient ability and capacity to adapt to inflation (Akdoğan, 2020: 202).

Knowing the source of inflation and the transitivity between PPI and CPI is also decidedly important for some goods and services groups. An example of such groups of goods is electrical energy. Electric energy is the final consumer

goods for some, while for others it is the final output of production. This kind of goods and services may cause an increase in inflation (Saatçi and Dumrul, 2013; Kara and Keskin, 2021; Mallick, 2007). It does not matter if the inflation observed in such goods is caused by supply or demand, both sources will feed each other. However, in order to combat inflation specific to these goods, it is essential to know which is the source.

Therefore, having information about inflation is of great importance for the effective use of fiscal policy tools. For example, knowing whether inflation is supply-side or demand-side will also determine the fiscal policy to be implemented. It is necessary to know the relationship so that tax policies to be implemented within the scope of combating inflation do not adversely affect the capital accumulation and income distribution.

3. LITERATURE

In the literature review conducted on the relationship, it is seen that the studies generally focus on the USA. For this reason, to maintain the integrity of the study, the results of the literature review have complied separately for the USA and Turkey.

3.1. Studies in the USA

One of the oldest studies carried out in the USA belongs to Silver and Wallace (1980). Within the scope of the study, by applying Pearson and Hatanaka-Wallace methods, the unidirectional causality relationship from PPI to CPI was determined in the USA between 1952-1977.

In another study conducted for the USA, Guthrie (1981) demonstrated that there is a short-run relationship from PPI to CPI by using the least-squares method and the distributed lag regression model.

Colclough and Lange (1982) analyzed the period of 1945-1979 for the USA with Sims and Granger causality methods and found that there was unidirectional causality from CPI to PPI.

Jones (1986), in his analysis performed Granger causality method for the period 1947-1983 in the USA, found a bidirectional relationship for the short-term.

Gordon (1988) could not detect any causality relationship in his regression analysis for the period 1954–1987 within the USA.

Cushing and McGarvey (1990) examined the relationship in the USA for the period 1954-1987 using Geweke's linear dependence feedback and Granger causality method. As a consequence, it was determined that there is a two-way relationship between the variables, but the causality from PPI to CPI is two times stronger than the causality from CPI to PPI.

Similaly, Mehra (1993) concluded that there is a long-term causality relationship from PPI to CPI in the analysis performed by Geweke linear dependence feedback and Granger causality method within the scope of the USA.

Clark (1995) analyzed the relationship in the United States using the VAR analysis method within the scope of the 1959-1994 period and found that the two variables are independent and unrelated to each other.

Emery and Chang (1996) concluded that there is causality from PPI to CPI in the study they conducted for the USA with the correlation and Granger causality method, covering the period 1957-1980.

Lown and Rich (1997), in their study for the USA, determined that the direction of causality is from PPI to CPI, valid for the period 1965-1996.

Dorestani and Arjomand (2006) analyzed the relationship in the USA using Engle-Granger cointegration methods. As a result of the analysis covering the period 1960-2005, it has been determined that there is no long-term relationship.

Hamid, Thirunnavukkarasu, and Rejamanickam (2006) analyzed the period 1926-2003 for the USA. As a result of the study using VAR and Granger causality method, they concluded that PPI is explained by the delays of CPI and that CPI is the cause of PPI.

Belton and Reichert (2007) concluded that the relationship is related to food and energy prices as a result of their study within the GARCH-M structure for the period 1950-2000 in the USA.

Finally, Kwon and Koo (2009) analyzed the relationship for the period 1985-2008 using the Toda-Yamamoto method. As a consequence, it was determined that there is a unidirectional relationship as of 1985-2001, and a one-way causality relationship from PPI to CPI for the period of 2002-2008.

3.2. Studies in Turkey

The first study about Turkey belongs to Akdi et al. (2006). Akdi et al. (2006) have examined the relationship in Turkey for the period of 1987-2004 by using Engle-Granger and Johansen co-integration methods. As a result of the analysis, a mutual causality relationship was determined in the short run.

In another study, Akdi and Şahin (2007) determined the existence of convergence between CPI and PPI according to the results of the unit root tests they carried out for the period 1988-2007.

As a result of the Granger causality analysis performed by Zortuk (2008) for the period 1986-2004, a bidirectional causality relationship from PPI to CPI was determined.

As a result of the analysis performed by Yamak and Topbaş (2009) for the period 1982-2005 with the Enders-Ludlow cointegration technique, it was determined that PPI had a significant effect on CPI.

As a result of the analysis performed by Saraç and Karagöz (2010) for the period 1994-2009 with the ARDL boundary test method, one-way causality from PPI to CPI was determined in both the short and long-term.

Abdioğlu and Korkmaz (2012), as a result of their analysis using Engle-Granger and Johansen cointegration and Granger causality methods, found that there was a bidirectional causality relationship for the period 2003-2012.

Tarı et al. (2012) determined the existence of causality relationship in the short term from PPI to CPI and from CPI to PPI in the long run as a result of their analysis with the frequency domain approach for the 1987-2008 period.

As a result of the study conducted by Erdem and Yamak (2013) within the scope of the 1987-2012 period, a dynamic relationship was found from PPI to CPI for the 1987-2002 period, and it was found that this relationship tended to decrease since 2003.

As a result of the Granger causality test and Johansen cointegration analysis, Ülke and Ergün (2014) have determined that there is one-way causality from CPI to PPI in the long run.

Yıldırım (2015) found a two-way causality relationship rates between 1987-2002 as a result of his study examining inflation regimes for the period 1987-2013 and inflation pass-through between CPI and PPI rates. At the same time, it was found that the causality from CPI to PPI ended after 2002, and the causality from PPI to CPI decreased partially.

Yamaçlı and Saatçi (2016), as a result of the ARDL analysis they applied between 2004 and 2015, concluded that the main variable that explains the CPI is PPI rates.

As a result of the Granger causality analysis conducted by Taban and Şengür (2016) for the period 2003-2014, they found a significant relationship from PPI to CPI, but it is not very strong.

As a result of the Toda-Yamamoto analysis conducted by Saatçioğlu and Karaca (2017) within the scope of the period 2005-2016, a two-way causality from PPI to CPI was determined.

Öner (2018) determined a unidirectional causality relationship from CPI to PPI as a result of the Granger causality analysis conducted for the period 2004-2016.

Finally, Terzi and Tütüncü (2017) have determined that for both short and long-term there is bidirectional causality between PPI and CPI for the period 2010-2016 by using the ARDL bounds test analysis method.

3.3. Literature Review

As can be seen, there is no consensus in the analyzes on the relationship. While this situation seems normal in studies conducted at different periods or using different methods, it is not normal to find different results from studies using the same method for the same period. After the studies are scanned, it is understood the comprehensive information about the studies performed is not included in some studies. This situation makes it impossible to understand the reason for these different results.

4. METHODOLOGY AND DATA SET

In this study, the relationship analyzed with monthly inflation rates in the period from 1996-1 to 2020-9 in Turkey. The series analyzed are monthly series and have 292 observations in total. The data used in the analysis were compiled from the Central Bank and TURKSTAT databases. Turkey's PPI and CPI under the said data are shown in the chart below.

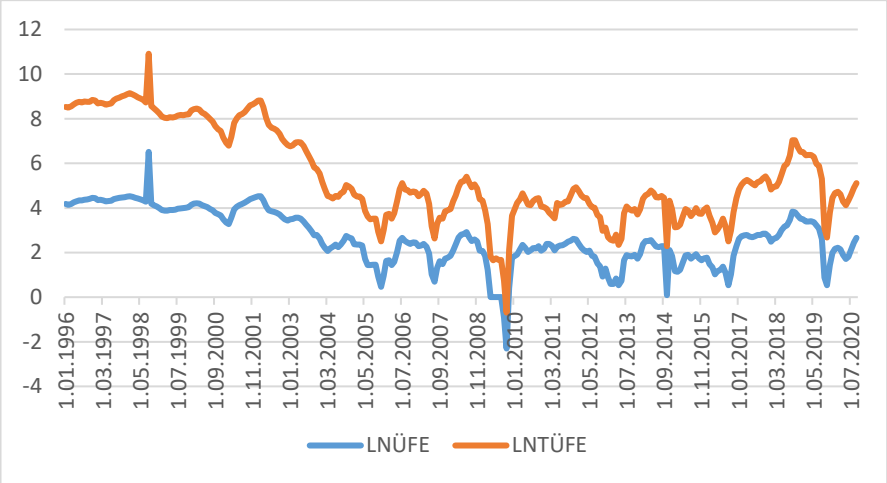

Figure 1: PPI and CPI in Turkey
Source: Central Bank, TURKSTAT.

Considering the PPI and CPI series over time, it can be said that the increases and decreases occur simultaneously in both the long-term and short-term. In this study, Engle-Granger cointegration analysis was used to reveal the long-term equilibrium relationship. Besides, the Granger causality method was used to reveal the causality between variables in the short term. Results of the analyzes are included under the following headings.

4.1. Descriptive Statistics

Before looking at the causality relationship, the series were subjected to logarithmic transformation to make the analysis more understandable and to reduce the effect of the extreme values in the series. Descriptive statistics of the series subjected to logarithmic transformation are illustrated in the table below.

Table 1. Descriptive Statistics

	LNPPI	**LNCPI**
Average	2.700302	2.825432
Median	2.513648	2.360854
Maximum Value	6.513230	4.621044
Minimum Value	-2.302585	1.360977
Standard Deviation	1.173968	0.928909
Jarque-Bera	3.507209	3.817071
Probability	0.173149	0.0000
Observation	292	292

As can be seen from the Table 1, according to Jarque-Bera statistics, LNPPI series shows normal distribution at 5% significance level (P = 0.173149> 0.05), while LNCPI series (P = 0.0000 <0.05) does not show normal distribution.

4.2. Unit Root Tests

Engle-Granger Cointegration analysis and Granger causality analysis were used to test the long and short-term relationship. However, to make both analyzes, it is necessary to check whether the series have unit root or not (Diks and Panchenko, 2006, s. 1). Stationarity can be defined as time-series data fluctuate around a fixed average and the variance of fluctuation remains constant over time. In regression models with non-stationary series, value of R^2 is high due to the spurious regression phenomenon (Keskin, 2020, ss. 25-38). This situation includes the possibility of misleading researchers (Brooks, 2019, s. 353; Sevüktekin and Çınar, 2014, s. 239). For this reason, Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979, ss. 427-431; Dickey and Fuller, 1981, ss. 1057-1072) and Phillips-Perron (PP) (Phillips and Perron, 1988, ss. 335-346) unit root tests were used.

4.2.1. Augmented Dickey-Fuller (ADF) unit root test

ADF unit root test is performed by taking into account the lag values of the dependent variable in the model created in addition to the Dickey-Fuller test. The regression equations developed for the ADF test used to analyze the stationarities of the series are as follows:

$$\Delta Y_t = \alpha_1 Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + \varepsilon \quad (1)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + \varepsilon \quad (2)$$

$$\Delta Y_t = \alpha_0 + \alpha_2 trend \;\; \alpha_1 Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-1} + \varepsilon \quad (3)$$

$H0 : \gamma < 0$ There is a unit root.

$H1 : \gamma \geq 0$ There is not a unit root.

The hypotheses reached as a result of the ADF unit root test are compared with the Mackinnon critical values (MacKinnon, 1996, ss. 601-618). The null (H0) hypothesis states that the series is not stationary, which means, it has a unit root. The alternative hypothesis (H1) states that the series is stationary.

4.2.2. Phillips Perron (PP) unit root test

Phillips and Perron have developed a new non-parametric test for unit root. In this test, Phillips-Perron expands the stationarity model developed by Dickey-Fuller and makes a new assumption about the distribution of random shocks (Sevüktekin and Çınar, 2014, s. 278). In the PP test, heterogenicity is allowed between the error terms of the Dickey-Fuller test, its autocorrelation is removed and the lagged value of enough dependent variables is added to the regression equation. PP test offers a simple approach to determine the presence of unit root in stationary and trend-effect time series and univariate time series. The regression equations developed for the PP test used to examine the stationarities of series are as follows:

$$Y_t = \theta Y_{(t-1)} + u_t \quad (4)$$

$$Y_t = \beta_1 + \theta Y_{(t-1)} + u_t \quad [With\ Constant] \quad (5)$$

$$Y_t = \beta 1 + \theta Y_{(t-1)} + \beta_2 (t - T/2) + u_t \quad [With\ Constand\ \&\ Trend] \quad (6)$$

$H0 : \gamma < 0$ There is a unit root.

$H1 : \gamma \geq 0$ There is not a unit root.

The null (H0) hypothesis states that the series is not stationary, which means, it has a unit root. The alternative hypothesis (H1) states that the series has no unit root which means that it is stationary.

4.2.3. Unit root tests results

PP and ADF unit root test results are summarized in Table 2.

Table 2: Unit Root Tests Results

		(PP) RESULTS		(ADF) RESULTS	
LEVEL					
		LNPPI	LNCPI	LNPPI	LNCPI
With Constant	t-statistics	-3.7085***	-16.791	-3.8153***	-17.600
	Probability	0.0044	0.4409	0.0031	0.40000
With Constant & Trend	t-statistics	-4.5448***	-13.171	-4.5727***	-0.4751
	Probability	0.0015	0.8817	0.0014	0.9842
Without Constant & Trend	t-statistics	-13.682	-14.507	-14.039	-20.726**
	Probability	0.1589	0.1371	0.1492	0.0369
First Difference					
		d(LNPPI)	d(LNCPI)	d(LNPPI)	d(LNCPI)
With Constant	t-statistics	-18.6376***	-12.4565***	-18.6804***	-6.8406***
	Probability	0.0000	0.0000	0.0000	0.0000
With Constant & Trend	t-statistics	-18.6207***	-12.4606***	-18.6626***	-9.6304***
	Probability	0.0000	0.0000	0.0000	0.0000
Without Constant & Trend	t-statistics	-18.6648***	-12.4525***	-18.7077***	-6.6333***
	Probability	0.0000	0.0000	0.0000	0.0000
Notes: (**) Significant at the 5%; (***) Significant at the 1%.					
***MacKinnon (1996) one-sided p-values.**					

As can be seen, although the PPI is stationary in the first level model with constant and trend, the CPI is not stationary in models. Then, the first difference operation of the series was performed and unit root tests were performed again. In the first differences, the H0 hypothesis can be rejected at the 5% significance level since the tail statistics of all three models are less than 0.05 ($P < 0.05$). In other words, both series are stationary on the first difference. The series stationary in the first difference provides the prerequisite for Engle-Granger cointegration and Granger causality analysis.

4.3. Engle-Granger Cointegration Test and Error Correction Model

Engle and Granger (1987) estimated the long-term equilibrium relationship (cointegration relationship) between the series and error correction model in their studies. In this cointegration estimation method, the long-term equilibrium relation is considered as one-sided rather than a vector. In this study,

the long-term relationship is tried to be explained with error correction models. To apply the Engle-Granger Cointegration method, the series must be stationary to the same degree. If the series are not cointegrated to the same degree, the estimates obtained by traditional methods (eg with EKK) will not be consistent.

First, the stationarity of the series is examined. If the series is I (0), the model is estimated by EKK. If the series are equally stationary, for example, I (1) residues are obtained to calculate deviations from equilibrium.

$$\varepsilon_t = y_t - \beta_0 - \beta_1 X_t \qquad 7$$

If there is cointegration between series, ε_t residues will be stationary. The unit root test statistics obtained are made according to the critical values table of Engle-Granger (1987) or MacKinnon (1991).

$H0: \gamma = 0$

$H1: \gamma < 0$

If the null hypothesis is accepted, the estimated residues are not stable. In other words, there is no long-term relationship between the series. If the null hypothesis is rejected, it is concluded that the residues are stationary, which means, the series are cointegrated.

Engle and Granger (1987) introduced the error correction model in their study. According to this theorem, if the series are cointegrated, there is a long-term relationship between the series. However, imbalances that occur in the short term can be corrected by the error correction mechanism. The error correction model shows the long-term and short-term relationships. The model is generally shown as follows.

$$\Delta\Sigma Y_t = \varphi_0 + \Sigma_{(j=1)}\varphi_j \Delta Y_{(t-j)} + \Sigma_{(h=0)}\varphi_h \Delta Y_{(t-h)} + \lambda(Y_{(t-1)} - \beta_0 - \beta_1 X_{(t-1)}) + \nu_t \qquad 8$$

In equation 2, the error correction model λ represents the error correction coefficient. The error correction coefficient should be negative $(\lambda < 0)$ and statistically significant. The negative and statistically significant coefficient obtained indicates that it will stabilize in the long run. Besides, the obtained coefficient shows how many periods the imbalances will come to equilibrium in the long-term.

4.3.1. Engle-Granger cointegration test results

The null hypothesis is established as the series are not co-integrated in Table 3. For the long-term equilibrium equation, a fixed model is preferred. In the model, two separate long-term equations, PPI and CPI are taken as dependent

variables, respectively. Long-term equations with constant for PPI and CPI are shown in equations 9 and 10.

$$LNÜFE_t = \beta_0 + \beta_1 LNTÜFE_t + \varepsilon \quad (9)$$

$$LNTÜFE_t = \beta_0 + \beta_1 LNÜFE_t + \varepsilon \quad (10)$$

Table 3: Engle-Granger Cointegration Analaysıs Results

Dependent	tau-statistic	Probability	z-statistic	Probability
LNPPI	-7.365509*	0.0000	-8.222783	0.0000
LNCPI	-6.277230*	0.0000	-6.363406	0.0000
***MacKinnon (1996) p-values.**				

In Table 3 the tau value is -7.365509 (P = 0.000 <0.05) and the z value is -8.222783 (P = 0.000 <0.05) for the long-term. With these results, it was seen that the null hypothesis established as "no cointegration" was rejected at the 0.05 significance level.

In Table 3, for the model in which the CPI is the dependent variable in its long-term relationship, the tau value is -6.277230 (P = 0.000 <0.05) and the z value is -6.363406 (P = 0.000 <0.05). With these results, it was seen that the null hypothesis established as "there is no cointegration" was rejected at the 0.05 significance level.

According to the findings obtained, even if the dependent variable is PPI or CPI, it is seen that the series have a long-term relationship in both cases, in other words, they are cointegrated.

4.3.2. Error correction models forecast results

The existence of a long-term relationship between series is calculated with cointegration models. Error Correction Model (ECM) is used to determine the short-term relationship that occurs between series. With error correction models, it is calculated to what extent the deviations that occur in the series that stabilize in the long run can be corrected in the short term. The results of the calculations are given in the table below.

Table 4: Error Correction Models Forecast Results

Dependent Variable (model 1) PPI				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.009816	0.020521	0.478344	0.6328
D(LNCPI)	1.441097	0.206825	6.967707	0.0000
ECT	**-0.286736**	0.03852	-7.443794	**0.0000**
Dependent Variable (model 2) CPI				
C	-0.00535	0.005388	-0.992669	0.3217

D(LNPPI)	0.097982	0.013998	6.999506	0.0000
ECT	**-0.05029**	0.013346	-3.768324	**0.0002**

According to the results in Table 4, it is understood that CPI also has a significant effect on PPI in the short term (coefficient = 1.441097, P = 0.000 <0.05). A 1% unit increase in the CPI increases the PPI by approximately 1.41% in the short term. The error correction coefficient is statistically significant and negative as expected (ect = -0.286736, P <0.00 <0.05). Error correction rate was obtained 1 / 0.28≅ 3.5 periods. The imbalances that will occur in the short term will recover in about 3.5 months and reach the long-term balance.

Likewise, according to the results in Table 4, it is understood that PPI has a significant effect on the CPI in the short term (coefficient = 0.097982, P = 0.00 <0.05). An increase of 1% in PPI increases the CPI by approximately 0.09% in the short run. Error correction coefficient is statistically significant and negative (ect = -0.05029, P <0.00 <0.05). Error correction rate was obtained 1 / 0.05 = 20 periods. The imbalances that will occur in the short term will recover in about 20 months and reach the long-term balance.

4.4. Granger Causality Results

Long-term cointegration between PPI and CPI has been determined with the results of Engel-Granger cointegration. For the short-term relationship, Granger causality analysis was performed and the results are given in Table 5.

Table 5. Granger Causality Results

Pairwise Granger Causality Tests			
Lags: (2)			
Null Hypothesis:	Observation	F-Statistic	Prob.
LNCPI does not Granger Cause LNPPI	288	309.988	0.0000
LNPPI does not Granger Cause LNCPI		149.403	0.2262

In Table 5, "PPI is not the Granger cause of CPI." Constructed in the form of null hypothesis is rejected at the 0.005 significance level (F = 30.9988, P <0.05). Therefore, PPI is the short-term Granger cause of CPI. Likewise, the null hypothesis established as "CPI is not Granger cause of PPI" cannot be rejected at 0.005 significance level (F = 1.49403, P> 0.05). Therefore, CPI is not short-term Granger cause of PPI.

5. CONCLUSION

Analyzing the relationship is very important in many aspects. In this study, the importance of the relationship between them in terms of fiscal policy has been mentioned and this relationship has been revealed with the econometric

analysis performed to serve this purpose. As a result of the analysis, the direction of the expected relationship was stated in detail. Besides, the analysis of the relationship between them has been done separately for the short-term and long-term. In this direction, their evaluation will also be carried out separately.

As can be seen from the analysis results, there is a bidirectional, reciprocal relationship in the long run. This situation shows that both PPI and CPI affect the other variable in the long run. In other words, whether inflationary movements emerge from the supply side or demand side, ultimately affect each other in the long run. Therefore, to combat inflation in the long run, policies that prevent inflationary movements in both directions are needed.

Looking at the results of the short-term analysis, it is seen there is a mutual relationship. As a result of the analysis, it is understood that the effect of CPI on PPI is much more dominant in this relationship. That is, a 1% unit increase in CPI in the short term causes an increase of approximately 1.41% in PPI. The error correction period is calculated as 3.5 terms. Since the study is carried out on monthly data, this result shows that the inflationary problems that will occur in the short term from CPI to PPI will return to their previous state and balance within 3.5 months.

When looking at the movement from PPI to CPI, it is seen there is a serious relation. In this relationship, it is understood that a 1% unit increase in PPI causes an increase of 0.09% in CPI in the short term. The error correction period is 20 months this time. As stated, since the study is prepared with monthly data, this result shows that the inflationary results that will occur in the short term from PPI to CPI will disappear within 20 months.

As can be seen, there is a mutual and significant relation in the short-term. While deciding on anti-inflationary policies to be applied in this relationship, it should be taken into account that the transition from CPI to PPI is more effective. However, from another point of view, it is seen that the effects from CPI to PPI are eliminated in 3.5 months, but the removal of the effects from PPI to CPI takes much longer, and a period of approximately 20 months is required. It is thought that the reason for this situation is that the rate of reflection of a possible increase in demand (due to seasonal effects, advertisements, etc.) to the prices is faster than the rate of reflection of the problems experienced in the production part to the prices. Similarly, it is believed that the reason why demand-driven inflation returns to normal in a much shorter time compared to supply-driven inflation is that it is not possible to increase supply in a short time, but demand can change in a short time. For this reason, this issue should also be taken into account when deciding on fiscal policies to be implemented.

As a result, there is no correlation stemming from inflationary problems with a single solution. Especially, as stated in the title of the literature review, this relationship is not a relationship that occurs in a single direction or a single period but is seen as a much more comprehensive and complex relationship than expected. For this reason, while deciding on fiscal policies to combat inflationary movements, comprehensive studies and analyzes are required, as in this study. Again, along with these policies, other policies outside the scope of fiscal policy should be chosen carefully. No other inflationary action should be caused, except for the struggle due to wrong policies.

6. CONFLICT OF INTEREST STATEMENT

There is a common interest between authors.

7. FINANCIAL SUPPORT

For this work, the authors received no specific funding or support.

8. AUTHOR CONTRİBUTIONS

The authors contributed equally.

9. ETHICS COMMITTEE STATEMENT AND INTELLECTUAL PROPERTY COPYRIGHTS

Ethics committee principles were followed in the study. No permission was required within the scope of intellectual property and copyrights.

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