Araştırma Makalesi / Research Article

Turkey's Recent Inflation Experience: Main Causes of Inflation According to Demand-pull and Cost-push Inflationary Effects and An Evaluation in Terms of Economy Policy

Türkiye'nin Yakın Dönem Enflasyon Deneyimi: Talep Çekişli ve Maliyet İtişli Enflasyonist Etkilere Göre Enflasyonun Temel Sebepleri ve Ekonomi Politikası Açısından Bir Değerlendirme

ÖMER FARUK BİÇEN [a, *]

[a] *Doç. Dr., Balıkesir Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İktisat Bölümü, Balıkesir, Türkiye*

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ABSTRACT Turkish economy managed to break the long-term inflation inertia and to maintain price stability, thanks to the new policies implemented after the crisis in 2001. However, developments since the mid-2010s have reversed this process. The Turkish economy has not been able to sustain its single-digit inflation experience since 2004 and has entered a double-digit inflationary period since 2017. In this study, Turkey's recent inflation experience and the reasons for this process are investigated. As a result of the Gregory-Hansen structural break cointegration and Hsiao causality analyses applied in this study, which covers the process from January 2016 to February 2022, no causality relationship was found between the main indices of Consumer and Domestic Producer Prices. However, based on sub-indices, a unidirectional causality relationship has been reached from Consumer Prices to Electricity, Gas, Steam, and Air Conditioning Production and Distribution products; and from Domestic Producer Prices to Housing prices; and bidirectional causality between Domestic Producer Prices and the prices of Food and Non-Alcoholic Beverages group products. In short, both cost-push and demand-pull inflationary structures were effective in this period.

Keywords: Inflation, Turkish economy, economy policy, monetary policy, causality analysis

JEL Classification: C22, E31, E52

ÖZ Türkiye ekonomisi 2001 yılında yaşadığı krizin ardından uygulanan yeni politikalar sayesinde uzun dönemli enflasyon ataletini kırmayı ve fiyat istikrarını sağlamayı başarmıştır. Fakat 2010'lu yılların ortalarından itibaren yaşanan gelişmeler bu süreci tersine çevirmiştir. Türkiye ekonomisi 2004 yılından itibaren yaşadığı tek haneli enflasyon deneyimini sürdürememiş ve 2017 yılından itibaren çift haneli enflasyonist sürece girmiştir. Bu çalışmada da Türkiye'nin yakın dönem enflasyon deneyimi ve bu sürecin nedenleri araştırılmaktadır. 2016 yılı Ocak ayından başlayarak 2022 yılı Şubat ayına kadar geçen sürecin ele alındığı bu çalışmada uygulanan Gregory-Hansen yapısal kırılmalı koentegrasyon ve Hsiao nedensellik analizleri neticesinde, Tüketici ve Yurtiçi Üretici Fiyatlarına ait ana endeksler arasında herhangi bir nedensellik ilişkisine rastlanılamamıştır. Fakat alt endeksler bazında bakıldığında, Tüketici Fiyatlarından Elektrik, Gaz, Buhar ve İklimlendirme Üretimi ve Dağıtımı kapsamındaki ürünlere doğru ve Yurtiçi Üretici Fiyatlarından Konut fiyatlarına doğru tek yönlü, Yurtiçi Üretici Fiyatları ile Gıda ve Alkolsüz İçecekler grubuna ait ürünlerin fiyatları arasında ise çift yönlü nedensellik ilişkisine ulaşılmıştır. Kısaca bu dönemde hem maliyet itişli hem de talep çekişli enflasyonist yapılar etkili olmuştur.

Anahtar Kelimeler: Enflasyon, Türkiye ekonomisi, ekonomi politikası, para politikası, nedensellik analizi

JEL Sınıflandırması: C22, E31, E52

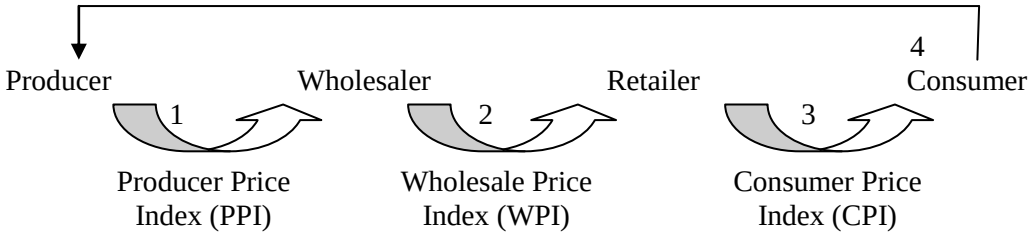
* Sorumlu yazar / Corresponding author.
E-posta adresi / E-mail address: ofbicen@balikesir.edu.tr (Ö. F. BİÇEN)

1. INTRODUCTION

Turkey, which had to struggle against the inflation problem for many years, transitioned to the single-digit inflation process based on consumer prices in February 2004, thanks to the tight monetary and fiscal policies implemented after the 2001 crisis. In previous periods, many issues like supply-side structural problems, external deficits, and financing of public deficits by resorting to central bank resources made it difficult for Turkey to control inflation. Aside from being an important problem, inflation is a reflection of the demand-side and supply-side problems in the economy. In short, if there is an inflation problem in a country or for a period of time, then there are demand-side and supply-side problems. In terms of economic policies, identifying these problems initially and then eliminating them in order to find a solution for the inflation problem are very important. In Turkey, which transitioned to the inflation targeting regime in 2002, price stability was ensured, and single-digit inflation figures became a common practice, except for some incidental situations. However, in 2017, Turkey had to face the inflation problem again. As a result of this process, which could not hbe brought under control, inflation has exceeded 60% based on the Consumer Price Index and 100% based on the Producer Price Index in 2022.

Figure 1

Pass-through between Consumer Prices and Producer Prices



As stated before, it is very important to determine the source of inflation to overcome the inflation problem. Theoretically, this process is briefly described in Figure 1. The raw materials and intermediate goods obtained as a result of the production process are made available to other manufacturers, and manufactured goods are produced. Manufactured goods are first offered to wholesalers by manufacturers, and then to retailers by wholesalers. On the other hand, consumers largely demand goods and services from retailers to meet their needs. As can be seen in Figure 1, the tax-free prices of raw materials, intermediate goods or manufactured goods that are calculated as soon as they are produced by the producers form the producer price index (PPI). In the second stage, the product is offered to the service retailers from wholesalers, and in this stage, wholesale prices (WPI) are formed. At the last link in the chain, there are prices calculated by including the taxes when the products are released from the retailers. Thus, the consumer price index (CPI) is formed.

The relationship or pass-through between the indices is very critical with regard to determining whether the inflationary pressure in an economy is demand-side or supply-side (Erdem & Yamak, 2014: 2). Bringing the inflationary process under control is a critical objective for central banks. The primary objective of the Central Bank of the Republic of Turkey (CBRT), which is also responsible for the execution of monetary policy in our country, is to ensure and maintain price stability. The CBRT made this target concrete with the 5% inflation target. Determining the pass-through between indices is not only necessary for central banks, but also concerns many segments of society, such as households, governments, private sector firms, and unions.

The direction of the arrows in Figure 1 is extremely important in terms of understanding and making sense of the relationships and pass-through between the indices. Two different approaches have been developed to explain the relationships between price indices. The first approach is the supply-side approach, or in other words, the cost-push approach or the New Keynesian perspective. The second approach is the demand-side approach, or in other words, the demand-pull approach or the Classical perspective (Jones, 1986: 42; Akçay, 2011: 227; Alemu, 2012: 13; Belton & Nair-Reichart, 2007: 1295). According to the supply-side approach, the increases in the prices of production factors, raw materials, and intermediate goods increase the production costs and affect the price of the manufactured goods produced by the producers upwards. Arrows 1, 2, and 3 in Figure 1 show that the increase in producer prices will initially increase wholesale prices and consequently affect consumer prices. This process summarizes the basic operation of a cost-push inflationary process. In short, the PPI can be accepted as a leading indicator for the increase in consumer prices in the future. According to the demand-side approach, an increase in the demand for manufactured goods will also increase the demand for raw materials, intermediate goods, and other inputs. However, increasing production costs will affect producer prices in an upward direction. Similarly, arrow number 4 in Figure 1 shows this process. According to Cushing & McGarvey (1990), while demand in the current period affects consumer prices, expected demand for manufactured goods in the future affects producer prices.

The study aims to investigate the main causes of Turkey's recent inflation problem. Merely in this way, the necessary monetary policy practices will become evident to control the inflationary process. In this context, the relations between the consumer and producer price indices and the sub-indices that make up the consumer and producer price indices in the period from January 2016 to February 2022 were examined. The study consists of four main sections, including the introduction. In the second section following the introduction, the brief historical development of the inflation in Turkey is emphasized. The third section is devoted to the literature review, which includes previous studies on the subject. In this section, important information about the main sources of inflation in Turkey and other countries are presented. In the fourth and last part, Turkey's recent inflation experience in the above mentioned date range and the main reasons for this process have been tried to reach through the empirical model.

2. A BRIEF HISTORY OF INFLATION IN TURKEY

In general, Turkey has started to experience an inflation problem permanently since the end of the 1960s. Even though inflation rates went up to double digits from time to time before this period, this effect was seasonal, and then inflation rates returned to single digits again. However, single-digit inflation figures from the late 1960s to February 2004 became a difficult target for Turkey. Inflation figures in 1980 and 1994 climbed to triple digits. When we look at the 99-year history of the Republic of Turkey, some developments that led to the inflation problem can be summarized as follows: Budget deficits and financing of these deficits with central bank resources; devaluation decisions as a result of external deficits; administrative, political and cyclical reasons such as loans provided to the private sector by the banking sector; difficulties in increasing the supply; troubles in supplying domestic or imported raw materials and intermediates; for new companies, barriers to entry to the market and rigidities in the direction of price decline (Kılıçbay, 1999: 342). In different periods, one or more of these effects have formed the main causes of the inflation problem in Turkey.

Table 1

Development of Inflation in Turkey by Sub-periods between 1923-1976

Periods	Average Annual Inflation Rate of Increase (%)	Periods	Average Annual Inflation Rate of Increase (%)
1923-1929	3.1	1954-1958	13.3
1929-1935	-12.0	1959-1961	8.6
1935-1939	5.1	1963-1967	5.2
1939-1948	19.0	1968-1972	10.2
1950-1953	4.0	1973-1976	19.0

Note. The data in Table 1 were taken from Table 2 and Table 3 in Kazgan (2006: 75 and 93). Inflation rates represent the increase in Wholesale Prices (WPI).

From the founding of the Republic to 1939, when the Second World War began, the increase in the general level of prices did not pose a problem for the Turkish economy. In fact, with the emergence of the World Economic Depression, a 12% deflationary process was experienced between 1929 and 1935, as seen in Table 1. This deflationary process also had negative effects on private sector investments in Turkey and statist industrial plans were put into effect in 1933. One of the most important reasons why inflationary pressures did not arise in Turkey in the 1920s and 1930s was the implementation of a fiscal policy in a way that would yield a budget surplus. Except for 1925, 1931, and 1933, attention was paid to the budget surplus in this period (Kepenek, 2012: 39-65; Eroğlu & Kangal, 2019: 278; Eroğlu et al., 2021: 153).

Although attention was paid to running a budget surplus during and after the Second World War, the increases in the money supply and total loans constituted the main source of inflation in the 1939-1948 period. With the end of the Second World War, Turkey's proximity to the Western Bloc brought relatively liberal policies to the agenda as opposed to statist policies. With this process, policies toward budget surplus have been replaced by a new political understanding based on constant budget deficits. In the early 1950s, with the increasing demand for food goods in the conjuncture that arose due to the Korean War, the economic revival in Turkey increased, and between 1950 and 1953, agricultural production increased by 12.2% on average and real gross national product by 11.3% (Kazgan, 2006: 93). Inflation also remained at a stable level of 4% in the same period. However, as a result of the reversal of the conjuncture in 1954, the price of agricultural products decreased, but the state applied to support purchases at high prices through short-term loans extended to the Turkish Grain Board (*Toprak Mahsülleri Ofisi*) by the Central Bank of the Republic of Turkey as a source of financing for products such as wheat and tobacco in order to prevent these price decreases (Pamuk, 2014: 231-241). The increase in money supply as a result of this practice caused inflation rates to rise to an annual average of 13.3% for the 1954-1958 period.

The 1960s were years when relative price stability could be maintained. The most important factor in the emergence of this situation is the preservation of the budget balance. By this way, high inflation was avoided as the need for additional monetary expansion did not arise. However, in the 1970s, with the effect of both domestic and foreign developments, inflation became a fundamental problem that would remain on Turkey's agenda for a long time. During this period, increasing budget deficits,

increasing domestic demand thanks to workers' remittances, and oil prices, which increased significantly due to the oil crisis experienced towards the end of 1973, raised the inflation to an annual average of 19% in 1973-1976 period (Pamuk, 2014: 243). As a result of the decrease in workers' remittances, the instability caused by short-term coalitions and the social and political conflict environment, short-term foreign borrowings with high-interest rates to finance growth during the oil crisis and the government's exchange rate guarantee for these borrowings, along with the stagflation phenomenon in European countries after the oil crisis. Due to the resulting budget deficits, the WPI index jumped to 63.9% in 1979. The economy shrank by 0.3% in the same period (Kazgan, 2006: 106; Eroğlu et al., 2019: 341). Another factor that led to this process was the import substitution policies implemented in 1963. When imported input and foreign dependency on technology were caused by these policies combined with an overvalued exchange rate, foreign currency bottlenecks became inevitable. Thanks to the cost increases stemming from the exchange rate, inflation rates have also increased. In addition, the oligopolistic structures created by the import substitution policies and the constant deficits of the state to provide cheap inputs to these structures have led to monetary expansion (Orhan & Erdoğan, 2018: 325-326). The heavy economic crisis, which hit Turkey in the late 1970s, was tried to overcome by the new economic measures taken on January 24, 1980. Since then, Turkey has abandoned import substitution and protectionist practices and has focused on reducing the weight of the state in the economy, liberalizing foreign trade, and making the market more functional.

Table 2

Development of Inflation in Turkey Between 1980-1999

Years	Annual Inflation Rate (%)	Years	Annual Inflation Rate (%)
1980	107.6	1990	52.3
1981	37.6	1991	55.3
1982	29.2	1992	52.1
1983	30.4	1993	58.4
1984	50.4	1994	120.7
1985	43.2	1995	66.0
1986	29.6	1996	75.9
1987	32.5	1997	81.8
1988	70.5	1998	71.8
1989	64.0	1999	53.1

Note. The data in Table 2 were taken from Graph 6 in Kazgan (2006: 202). Inflation rates represent the increase in Wholesale Prices (WPI).

One of the goals of the January 24 Decisions is to ensure price stability by reducing inflation. As can be seen in Table 2, partial success was achieved in price stability in the early 1980s. Except for 1984 and 1985, inflation remained around 30% in the 1981-1988 period. The most important factor in partially controlling inflation is the budget deficits that were brought under control (Kazgan, 2006: 200). Thanks to the budget deficits that were brought under control, the government's demand for central bank advances was also limited. In the pre-1980s and 1990s, the CBRT had an important place as the main source of public finance (Kepenek, 2012: 221). After the 2001 crisis, until a regulation is made in the Central Bank Law, the CBRT is legally obliged to provide short-term loans to the Treasury up to 15% of the budget. However, these limits have been exceeded in some periods. In addition, all debts of the public sector to the CBRT were written off in 1993.

In addition to the advance facilities of the CBRT, the amount limit on the Treasury's ability to borrow by selling bonds and bills in the domestic market has been lifted since 1986 (Pamuk, 2014: 278; Orhan & Erdoğan, 2018: 328). This situation provided an additional opportunity to finance the budget deficits. As a result of the central bank advance facility and the bonds and bills issued by the Treasury, serious increases have occurred in the budget deficits since 1987. While the share of budget deficits in the gross domestic product was 4% in 1986, this ratio gradually increased until 1993 and reached 12% (Kazgan, 2006: 200). Increasing budget deficits also had an impact on inflation, and in 1987 the inflation rate exceeded 70%. As a result of the exchange rate anchor application in 1989, the inflationary effects of the exchange rate increases were tried to be prevented, and this policy was supported by the foreign capital inflows with the high real interest rate application (Kazgan, 2006: 274-275). The most important cost of this process has been the increasing external deficits. The convertibility decision of the Turkish Lira and the liberalization of capital movements in 1989 made Turkey more open to external economic factors.

As a result of the economic crisis that emerged in 1994 due to short-term capital flight, inflation rates reached the highest level in the history of the Republic, reaching 120.7%. The terrorist incidents in 1993 and the political and, therefore, economic uncertainty caused by the short-term coalitions between 1993-1999 caused the continuation of the budget deficit, high real interest rate, and high budget deficit spiral in Turkey (Pamuk, 2014: 276). In the 1990s, apart from the exchange rate anchor, monetary aggregates such as reserve money and net domestic assets were also used as intermediate targets in the fight against inflation, but inflation rates could not be reduced below 50% due to unavoidable budget deficits and partially experienced monetary expansions.

In this period, short-term coalition governments could not implement policies that could produce a permanent solution to the inflation problem. In December 1999, the close monitoring agreement with the IMF that expressed a determined stance in the fight against inflation and the "Inflation Reduction Program" were put into practice. However, due to the increasing oil prices and the ongoing deficits in the public sector, the desired success could not be achieved in the fight against inflation (Külünk, 2020: 37). At the same time, due to the Currency Board system, the CBRT's ability to increase its Turkish Lira emission volume was made dependent on foreign exchange reserves. The liquidity crunch occurred consecutively in November 2000 and February 2001, and the CBRT's inability to respond to this led to the start of one of the biggest crises in the history of the Republic of Turkey on February 19, 2001.

Table 3

Development of Inflation in Turkey Between 2000-2015

Years	CPI Annual Inflation Rate (%)	Years	PPI Annual Inflation Rate (%)
2000	54.6**	2000*	51.4
2001	54.4**	2001*	88.6
2002	44.8**	2002*	30.8
2003	25.3**	2003	13.9
2004	9.3	2004	13.8
2005	7.7	2005	4.5
2006	9.6	2006	11.6
2007	8.4	2007	5.9
2008	10.1	2008	8.1
2009	6.5	2009	5.9
2010	6.4	2010	8.9
2011	10.4	2011	13.3
2012	6.2	2012	2.4
2013	7.4	2013	6.9
2014	8.2	2014	6.3
2015	8.8	2015	5.7

*Source.*Turkish Statistical Institute (2022a), Consumer Price Index Data (2003=100), Accessed: 16.04.2022, www.tuik.gov.tr. Turkish Statistical Institute (2022b), Domestic Producer Price Index (2003=100), Accessed: 16.04.2022, www.tuik.gov.tr. Figures footnoted * and show wholesale prices, were taken from Kazgan (2006: 443). Figures footnoted ** were taken from Kepenek (2012: 237).

"Transition to a Strong Economy Program" was put into practice after the 2001 crisis, and a new era began in the fight against inflation in Turkey. According to Article 4 of Law No. 1211, amended by Law No. 4651, the independence of the central bank is ensured by legally guaranteeing that the CBRT's main purpose is to ensure price stability and that it chooses the policy to be implemented and the tools to be used for this purpose. Inflation targeting has been implemented instead of the exchange rate anchor and monetary size targeting applied in previous periods. Short-term interest rates are used within the framework of the operational target.

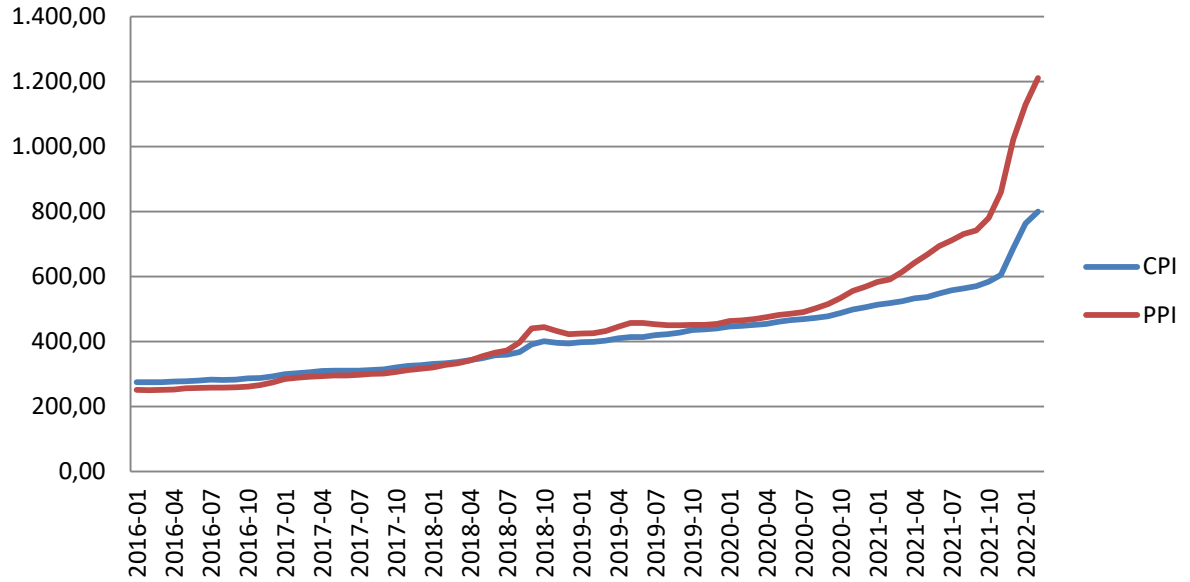
It is not possible for the inflation targeting regime to be successful on its own and to be considered sufficient to prevent inflation. These policies should be supported by fiscal policies, and inflationary expectations should be broken (Murat & Atakişi, 2018: 479; Kayıkçı & Kaplan, 2019). In parallel with these targets and policies, the practice of financing budget deficits, one of the main causes of inflation, by using advances from the CBRT's resources, came to an end. In the same way, tight monetary and fiscal discipline was implemented to support the implementation of inflation targeting. Since 2002, the depreciation of the Turkish Lira has been prevented and stability has been achieved in the exchange rate (Kepenek, 2012: 237).

Thanks to these policies, as can be seen in Table 3, the fight against inflation started to give results in 2002, and Turkey got rid of the double-digit inflation inertia, which it had irreversibly entered at the

end of 1960s, in 2004. Although the annual rate of increase in consumer and producer price indices exceeded 10% in some periods until 2015, this situation was not permanent. In particular, Turkey has been affected by the capital flight in developing countries due to global economic developments, and the depreciation of the Turkish Lira has reached 7%. In addition, as a result of the increase in commodity prices, especially food and oil, producer prices were realized as 11.6% (Kepenek, 2012: 237; Külünk, 2020: 40-41). With the 2008 global financial crisis, this trend came to an end, and in 2012, the lowest inflation rate in the history of the republic was achieved on an annual basis. However, despite all these developments, inflation rates could not be reduced to 5%, which is the long-term target of the CBRT.

Figure 2

Development of CPI and PPI Indices in Turkey (January 2016-February 2022)



Source. Turkish Statistical Institute (2022a), Consumer Price Index Data (2003=100), Accessed: 16.04.2022, www.tuik.gov.tr. Turkish Statistical Institute (2022b), Domestic Producer Price Index (2003=100), Accessed:16.04.2022, www.tuik.gov.tr.

With the domestic political developments, terrorist incidents, foreign political developments and foreign economic developments that have been experienced in Turkey since 2013, especially the exchange This can be seen more clearly in Figure 2. After the coup attempt in 2016, the exchange rate rose above 3.50 TL at the end of the year, and inflation rates saw double digits in 2017 rate and budget deficit, which can have a direct impact on inflation, Turkey has started to step into a process where the inflationary process is experienced and accelerated.

As seen in Table 4, the CPI and PPI indices, which were 8.53% and 9.94%, respectively, in 2016, were realized as 20.3% and 33.64%, respectively, in 2018. When Table 4 is examined within the framework of this situation, it is seen that budget deficits and consumer loans accompany this situation, as well as the serious depreciation of the Turkish Lira. In short, after 2016, Turkey entered the monetary and financial expansion process in order to prevent the negative effects of exchange rate increases, production costs, and the real economy.

Table 4

Developments in Inflation, Exchange Rate, Consumer Loans and Public Sector Borrowing Requirements in Turkey in the 2016-2021 Period

Years	CPI (%)	Domestic PPI (%)	Dollar Exchange Rate*	Consumer Loans (Million TL)	Public Sector Borrowing Requirements (% GDP)
2016	8.53	9.94	3.54	337.8	1.05
2017	11.92	15.47	3.82	397.6	1.79
2018	20.3	33.64	5.27	399.6	2.44
2019	11.84	7.36	5.95	464.5	3.24
2020	14.6	25.15	7.35	675.8	3.92
2021	36.8	79.89	13.00	776.7	3.60

Source. Turkish Statistical Institute (2022a), Consumer Price Index Data (2003=100), Accessed:16.04.2022, www.tuik.gov.tr. Turkish Statistical Institute (2022b), Domestic Producer Price Index (2003=100), Accessed: 16.04.2022, www.tuik.gov.tr. CBRT (2022a), USD Currency Sales, Accessed:17.04.2022, https://evds2.tcmb.gov.tr. CBRT (2022b), Total Consumer Loans, Accessed:17.04.2022, https://evds2.tcmb.gov.tr. CBRT (2022c), Total Public Sector Borrowing Requirement, Accessed: 17.04.2022, https://evds2.tcmb.gov.tr. CBRT (2022d), Gross Domestic Product (at buyer's prices), Accessed: 17.04.2022, https://evds2.tcmb.gov.tr. * The closing value of the dollar rate on the last business day of the year has been taken into account.

The inflation problem, which was partially overcome in 2019, continued the momentum that emerged in 2016 with the pandemic process in 2020. To prevent the negative effects of the pandemic on the economy in 2020, expansionary tendencies have emerged in the economy due to the budget deficits that emerged within the framework of keeping interest rates low, expansion in consumer loans, and announced support packages. Capital outflows due to the low-interest rate environment increased the exchange rate, which increased Turkey's imported production goods and energy costs and increased the upward pressure on producer prices. On the other hand, the increase in imported final goods prices also affected consumer prices (Emek et al., 2021: 167). At the same time, with increasing inflationary pressures, households and companies residing in Turkey increased their foreign exchange demands to avoid the depreciation of the Turkish Lira, and exchange rates increased even more.

It is observed that similar trends continue in 2021 as well. Although budget deficits were partially reduced during this period, they remained high, and consumer loans increased even more. The depreciation of the Turkish Lira continued due to low-interest rates, high inflation and foreign exchange demand. The dollar exchange rate, which saw its historical peak in December 2021, was realized as 18.35 TL during the day and, due to the measures taken, especially the currency-protected deposit system, it completed the year at the level of 13 TL. In 2022, the CPI and PPI exceeded the level of 60% and 110%.

It can be said that many factors are effective in the background of Turkey's recent inflation experience. In Turkey, which is an economy with a high foreign dependency, increases in the exchange rate increase the costs of imported raw materials, intermediate goods and energy, and this creates serious pressure on production costs and prices. In particular, the uncertainty in exchange rates also affects the pricing strategies of manufacturers. This kind of uncertainty leads to frequent increases

in prices (Orhan & Erdoğan, 2018: 334). However, it can also trigger behaviors toward stocking goods. Apart from these, the more than double increase in consumer loans and the increase in budget deficits in the last six years show that monetary and fiscal discipline has been compromised.

In addition, the competitive nature of the real sector is of great importance. In Turkey, especially between 1980 and 2000, prices rose rapidly due to demand and cost increases, while the decreases in prices were very limited in the face of an increase in supply or a decrease in demand (Kılıçbay, 1999: 191). In the last two years, similar trends have emerged in Turkey again. While the increases in the exchange rate are directly reflected in the prices, the effects of the decreases in the exchange rate remain limited. This indicates that there are still oligopolistic structures in the real sector.

3. LITERATURE REVIEW

Numerous studies have been conducted in Turkey and around the world on the main sources of inflation. In these studies, focusing on different countries, periods, and methods, it was concluded that while cost-side inflation was more dominant in some of them, demand-side inflation was more dominant in others. Again, in some countries, demand and cost-side inflationary effects coexist. The results of the studies are summarized in Table 5.

Table 5

Literature Review

Author/ Authors	Period	Method	Country/ Countries	Results
Jones (1986)	1947m1 – 1971m6 / 1974m5 – 1983m12	Causality Analysis	USA	Bidirectional causality between CPI and PPI.
Clark (1995)	1959q2 – 1994q4	Regression Analysis	USA	Increases in PPI are not a higher inflation indicator in terms of CPI.
Belton & Nair-Reichert (2007)	1959m1 – 2000m1	GARCH-M	USA	Food and energy prices are important in transmitting changes in input prices to output prices. No relationship between PPI and CPI when food and energy prices are eliminated.
Sidaoui, Capistrán, Chiquiar & Ramos-Francia (2009)	1994m2 – 2008m10	VAR, Vector Error Correction, Cointegration, Causality	Mexico	The change in PPI will be able to create a prediction 68cur68he changes that may 68cur in the CPI in the following periods.

Table 5 (Continued)

Author/ Authors	Period	Method	Country/ Countries	Results
Gang, Liping & Jiani (2009)	2001m1 – 2008m8	Causality Analysis	China	Unidirectional causality running from CPI to PPI. PPI responds to CPI with a time lag of 1-3 months.
Saraç & Karagöz (2010)	1994m1 – 2009m12	ARDL	Turkey	Unidirectional causality relationship from PPI to CPI in the short and long run
Akçay (2011)	1995m8 – 2007m12	Cointegration and Causality Analysis	Finland, France, Germany, Netherlands and Sweden	Unidirectional causality from PPI to CPI in Finland and France, Bidirectional causality between PPI and CPI in Germany and no causal relationship in the Netherlands and Sweden
Tarı, Abasız & Pehlivanoğlu (2012)	1987q1 – 2008q4	Frequency Domain Approach	Turkey	Unidirectional causality from PPI to CPI in the 1987-1993 period, Unidirectional causality from CPI to PPI in the long run.
Abdioğlu & Korkmaz (2012)	2003m1 – 2012m2	Cointegration and Causality Analysis	Turkey	Bidirectional causality for main indices and health index and Unidirectional causality from CPI to PPI for clothing and housing
Alemu (2012)	1970m1 – 2008m12	Threshold Autoregressive Model, Momentum Threshold Autoregressive Model, Momentum Consistent Threshold Autoregressive Model and Causality	South Africa	Unidirectional causality relationship from PPI to CPI in the short and long run
Tiwari (2012)	1969q3 – 2010q4	Frequency Domain Approach	Australia	In the medium run, Unidirectional causality from CPI to PPI. No causality in any period from PPI to CPI
Tiwari, Suresh, Arouri & Teulon (2014)	1981m1 – 2009m3	Continuous Wavelet Transform Approach	Mexico	Bidirectional causality between CPI and PPI. While CPI is leading between 1-7 months (short run), PPI is leading between 8-32 months (long run).
Ülke & Ergün (2014)	2003m1 – 2013m12	Cointegration, Vector Error Correction, Causality Analysis	Turkey	Unidirectional causality from CPI to PPI in the long run, No causal relationship in the short run.

Table 5 (Continued)

Author/ Authors	Period	Method	Country/ Countries	Results
Erdem & Yamak (2014)	1987q1 – 2012q1	Kalman Filter Analysis	Turkey	After 2003, the degree of pass-through from PPI to CPI decreased.
Yıldırım (2015)	1987m1 – 2013m12 / 1987m1-2001m12 / 2002m1-2013m12	Cointegration and Causality Analysis	Turkey	In the period when inflation is high and volatile (before 2002), the pass-through from PPI to CPI is complete. In the period when inflation is low and stable (between 2002 and 2013), the pass-through from PPI to CPI is low.
Saatçioğlu & Karaca (2017)	2005m1 – 2016m12	Causality Analysis	Turkey	Unidirectional causality from PPI to CPI
Terzi & Tütüncü (2017)	2010m5 – 2016m4	ARDL	Turkey	CPI affects PPI positively in the short and long run. PPI affects CPI negatively in the short run and positively in the long run.
Meyer & Habanabakize (2018)	2000q1 – 2017q4	ARDL Cointegration, Error Correction, Causality Analysis	South Africa	No causality between PPI and CPI
Öner (2018)	2004m1 – 2016m12	Causality Analysis	Turkey	Unidirectional causality from CPI to PPI. CPI increase raises worker wages, which in turn increases PPI.
Topuz, Yazdifar & Sahadev (2018)	1996m1 – 2011m8	Causality Analysis, Impulse-Response, Variance Decomposition	Turkey and United Kingdom	Bidirectional causality between CPI and PPI in Turkey and UK.
Kara & Keskin (2021)	1996m1 – 2020m9	Cointegration and Causality Analysis	Turkey	Bidirectional causality between PPI and CPI in the short and long run. In the short run, the effect of CPI on PPI is more dominant.

Note. m: month, q: quarter.

As seen in Table 5, there are some studies focusing on Turkey, and these are conducted by Saraç & Karagöz (2010), Tarı, Abasız & Pehlivanoğlu (2012), Abdioğlu & Korkmaz (2012), Ülke & Ergün (2014), Erdem & Yamak (2014), Yıldırım (2015), Saatçioğlu & Karaca (2017), Terzi & Tütüncü (2017), Öner (2018), Topuz, Yazdifar & Sahadev (2018), and Kara & Keskin (2021). When considered the common inferences made from these studies, the results of which are given in detail, it is seen that the studies, which include the dataset before 2002, generally conclude that the cost-side inflation is more dominant in Turkey while the studies that use the dataset after 2002 have concluded that the demand inflation is more dominant in Turkey. Some studies reach a bidirectional causality.

4. DATASETS, MODEL AND EMPIRICAL ANALYSIS

In this study, the main reasons for the recent inflation problem in Turkey are investigated, and monthly data belonged to the series covering the period 2016:01-2022:02 were used. The data set was created by the Central Bank of the Republic of Turkey (CBRT) Electronic Data Distribution System (TCMB-EVDS) (CBRT, 2022e). Information on the variables used in the study and the explanations of these variables are given in Table 6.

Table 6

Variables Used in the Study

Variables	Explanation
Main Indices	
CPI	Consumer Price Index
PPI	Domestic Producer Price Index
Consumer Price Index – Sub-Indices	
FOOD	Food and Non-Alcoholic Beverages
HOUSING	Housing, Water, Electricity, Gas and Other Fuels
TRANSPORTATION	Transportation
Domestic Producer Price Index – Sub-Indices	
MINING	Mining and Quarrying
PRODUCTION	Production
WATER	Water Supply, Sewage Waste Management and Improvement Activities
ELECTRICITY	Electricity, Gas, Steam and Air Conditioning Production and Distribution

As can be seen in Table 6, in addition to the main indices regarding consumer prices and domestic producer prices, the three indices with the highest weight in the consumer price index[1], namely Food and Non-Alcoholic Beverages, Housing, Water, Electricity, Gas and Other Fuels, and Transportation sub-indices and All sub-indices included in the domestic producer price index[2] have been taken into account in the analysis of the recent inflationary effects on the Turkish economy. The relationships between the series were converted into a linear form by taking the logarithm (LN) of all data. In the investigation of the main causes of inflation, in addition to the relationships between LNCPI and LNPPI, the effects of the sub-indexes of the consumer price index LNFOOD, LNHOUSING and LNTRANSPORTATION on LNPPI and the sub-indexes of the domestic producer price index

[1] The three indices that have the highest weight in the CPI Index, which consists of 12 sub-groups, are Food and Non-Alcoholic Beverages (25.32%), Transportation (16.80%) and Housing (14.12%) (Turkish Statistical Institute (2022c), Consumer Price Index, March 2022, Accessed: 20.04.2022, https://data.tuik.gov.tr/Bulten/Index?p=T%C3%BCketici-Fiyat-Endeksi-Mart-2022-45792&dil=1).

[2] In the Domestic PPI Index, which consists of 4 main categories, Mining and Quarrying has a share of 3.23%, Manufacturing has a share of 89.22%, Electricity, Gas, Steam and Air Conditioning Production and Distribution has a share of 6.61% and Water Supply, Sewage Waste Management and Improvement Activities have a share of 0.95%. (Turkish Statistical Institute (2020), Domestic Producer Price Index Product Basket Update, Accessed: 20.04.2022, https://www.tuik.gov.tr/).

LNMINING, LNPRODUCTION, LNWATER and LNELECTRICITY on the LNCPI will also be examined. The scope of empirical analysis consists of determining the long-term relationship (cointegration) and causality between the relevant variables. EViews 9 and Stata 14 package programs were used in econometric analysis.

Before analyzing the cointegration and causality relationship between the variables, it is necessary to examine whether the series are stationary or not. The stationarity of the series is examined with the help of both conventional and structural break unit root tests.

4.1. Stationarity Analysis

In this study, which examines the main causes of inflation in Turkey, the stationarity of the time series is an important condition in order to accurately determine the long-term relationships between the variables in Table 6. In case the time series are not stationary, the relationships between the variables will not reflect a correct relationship (Spurious Regression Problem). For this reason, the interpretations of the estimates are also meaningless from an economic point of view (Granger & Newbold, 1974: 117).

Unit root tests are widely used to determine the stationarity of time series. Among the most used unit root tests in the literature to determine stationarity; Dickey-Fuller (DF), Extended Dickey-Fuller (ADF), KPSS (Kwiatkowski-Phillips-Schmidt-Shin) and Phillips-Perron (PP) unit root tests can be used. Although the related unit root tests are important in determining the stationarity of the time series, such unit root tests do not take into account the structural breaks that may occur in the series. Even when structural breaks are not taken into account, the economic reliability of the obtained results decreases. Structural breaks in the time series generally occur as a result of changes in economic policies and structural changes (Sevüktekin & Nargeleçekenler, 2010: 399).

Structural Break Unit Root tests are also divided into tests in which the break time is known and the break time is not known. While the Perron's (1989) test is a test in which only one break is found and the break time is known (the break time is determined exogenously), the tests developed by Zivot & Andrews (1992) and Perron (1997) indicate that the break time is not known beforehand (the break time is determined internally) and are tests that allow only one structural break. Likewise, the single refractive test developed by Lee & Strazicich (2013) and the double refractive test developed by Lee & Strazicich (2003) and Narayan & Popp (2010) are tests in which the breaking time is not known beforehand.

In this study, in order to determine the stationarity of the time series, Phillips-Perron (PP) and KPSS unit root tests, in which the structural break is not taken into account, and the Lee & Strazicich (2003) unit root test, which considers the double structural break and the break time is not known beforehand, were used.

In the PP unit root test, the null hypothesis is that there is a unit root, and the alternative hypothesis is that there is no unit root. If the calculated t statistical value is significant, the null hypothesis is rejected and the series is stationary (contains no cumulative root). Whether the t statistical value is significant or not is determined by comparing it with the critical values of MacKinnon (1996) (Biçen & Çoban, 2018: 36). In the KPSS test, unlike the PP unit root test, the null hypothesis is that there is no unit root, and the alternative hypothesis is that there is a unit root. Calculated LM test statistic Kwiatkowski et al. (1992: 166) is compared with the critical values to determine whether it is significant or not.

Table 7

PP and KPSS Unit Root Test Result

Variables	PP Test (*t* statistic)		KPSS Test (LM statistic)	
	c	c+t	c	c+t
lncpi	2.820084 (3)	2.026803 (2)	1.163938 (6)	0.157672* (5)
lnppi	3.317166 (3)	2.350472 (1)	1.126570 (6)	0.149757* (6)
lnfood	2.461559 (4)	-0.054144(4)	1.152630 (6)	0.150796* (5)
lnhousing	2.754055 (2)	0.747793 (2)	1.158844 (6)	0.167496* (5)
lntransportation	2.106720 (1)	0.566343 (1)	1.146523 (6)	0.143535* (5)
lnmining	3.001302 (3)	2.789190 (1)	1.144657 (6)	0.158663* (5)
lnproduction	3.128638 (3)	2.068751 (1)	1.125970 (6)	0.154145* (6)
lnwater	2.799485 (3)	1.053937 (3)	0.961826 (6)	0.204910* (6)
lnelectricity	2.463062 (3)	-0.171090 (3)	1.064444 (6)	0.100594*** (6)
Δlncpi	-3.830619* (2)	-4.286006* (2)	0.488605* (4)	0.140486* (4)
Δlnppi	-3.115017** (7)	-3.588284** (7)	0.559179* (4)	0.175114* (4)
Δlnfood	-4.248683* (3)	-4.752420* (2)	0.459294** (4)	0.110350** (4)
Δlnhousing	-6.212078* (2)	-6.742654* (1)	0.475537* (4)	0.122100** (3)
Δlntransportation	-4.828326* (4)	-4.997513* (5)	0.368883** (2)	0.140429* (2)
Δlnmining	-3.982433* (2)	-4.389472* (3)	0.507373* (4)	0.170467* (4)
Δlnproduction	-3.199712** (6)	-3.548865** (7)	0.540293* (4)	0.174923* (4)
Δlnwater	-6.371072* (1)	-6.883565* (3)	0.607228* (2)	0.197315* (1)
Δlnelectricity	-6.621266* (3)	-7.229223* (2)	0.485356** (4)	0.141988* (3)

Note. c: constant, c+t: constant and trend model. Values in parentheses show the Bartlett Kernel lag length in PP and KPSS Unit Root Tests. Δ represents the first difference of the series. Critical Values: Model with PP constant -3.52 for 1%, -2.90 for 5%, -2.58 for 10%. Model with PP constant and trend -4.08 for 1%, -3.47 for 5%, -3.16 for 10%. KPSS fixed model 0.73 for 1%, 0.46 for 5%, 0.34 for 10%. Model with KPSS constant and trend 0.21 for 1%, 0.14 for 5%, 0.11 for 10%. * Significant at 1%, ** Significant at 5%, *** Significant at 10%.

The results obtained according to Table 7 show that all series become stationary when the first difference is taken for constant (c) and constant-trend model (c+t) in the PP test. When the KPSS test results are examined, it is seen that while all series are stationary at the first difference for the fixed model (c), the series are also stationary at the level for the fixed-trend model (c+t).

By taking into account the structural break situations of the series at the same time, it will be possible to reach definite information about the stationarity. And in this context, as stated before, Lee & Strazicich's (2003) unit root test will be used. Lee & Strazicich's (2003) unit root test, which takes into account the double structural break and whose break time is not known beforehand, is carried out within the framework of the LM principle, based on the following model:

$$\Delta y_t = \hat{\delta}\,\Delta Z_t + \phi\,\hat{S}_{t-1} + \varepsilon_t \quad (1)$$

Here $\tilde{S}t = yt - \tilde{\psi}x - Zt\tilde{\delta}$, =2, … , T. $\tilde{\delta}$; They are the coefficients obtained from the regression of Δyt with respect to ΔZt. $\tilde{\psi}x$ is denoted by $y1 - Z1\tilde{\delta}$. $y1$ and $Z1$ are the first observations of yt and Zt. The null hypothesis is defined as $\phi = 0$ and the LM test statistic is the t statistic that tests the hypothesis $\tilde{\tau}= \phi = 0$. It is expressed as $LMt = inf\lambda\ \tilde{\tau}(\lambda)$ (Lee & Strazicich, 2003: 1083; Mert & Çağlar, 2019: 138; Pata, 2018: 173). In order to test the break at the level in Model A and the break in the level and trend in Model C, the structural break unit root null hypothesis is rejected when the calculated t statistic is greater than the critical value. In this case, the series is stationary under the presence of a structural break. The opposite situation indicates the existence of a unit root. In short, in such a case, the series is not stationary.

Table 8

Lee & Strazicich (2003) Structural Break Unit Root Test Result

Variables	Model A		Model C	
	t	Break Dates	*t*	Break Dates
lncpi	-2.301310 (4)	2018M10 2018M12	-6.500778** (1)	2018M05 2021M05
lnppi	-1.820322 (1)	2019M01 2021M03	-4.720949 (1)	2018M11 2021M02
lnfood	-2.262456 (1)	2018M10 2021M07	-5.497229 (3)	2018M09 2021M03
lnhousing	-2.243274 (1)	2020M12 2021M06	-6.953705* (6)	2018M07 2021M02
lntransportation	-2.232091 (1)	2018M10 2019M07	-6.023241*** (1)	2018M11 2021M05
lnmining	-1.939459 (1)	2020M08 2021M03	-5.242369 (1)	2018M07 2021M02
lnproduction	-1.986051 (1)	2018M10 2021M03	-5.225422 (1)	2018M06 2020M04
lnwater	-1.583138 (6)	2020M01 2021M01	-6.041922*** (6)	2018M11 2020M02
lnelectricity	-2.442877 (7)	2021M04 2021M07	-5.123353 (6)	2018M08 2020M11

Note. The values in parentheses indicate the appropriate lag length. t represents the calculated test statistic. Critical Values: Model A -4.07 for 1%, -3.56 for 5%, -3.29 for 10%. Model C -6.69 for 1%, -6.15 for 5%, -5.79 for 10%.

Table 8 shows the results of the Lee & Strazicich (2003) unit root test with a double break. The t statistical values calculated according to Model A, which expresses the breaking at the level, did not exceed the critical values below Table 8 for any series. It is seen that these series contain unit roots under structural breaks. According to the results obtained for Model C, which expresses breaks in level and trend, it is seen that LNCPI is stable at 5%, LNHOUSING is at 1%, LNTRANSPORTATION and LNWATER are stable under structural breaks at 10%. Break dates for LNCPI are May 2018 and May 2021, break dates for LNHOUSING are July 2018 and February 2021,

break dates for LNTRANSPORTATION are November 2018 and May 2021, and break dates for LNWATER are November 2018 and February 2020. Other series contain unit root under structural breaks.

4.2. Cointegration Analysis

Although there are various methods in the literature that examine the long-term relationships between series, each has its strengths and weaknesses over other methods. In practice, there are cointegration methods developed by Engle & Granger (1987), Johansen (1988), Johansen & Juselius (1990), and Pesaran, Smith & Shin (2001). However, these methods do not take into account long-term parameter changes or structural breaks in the cointegration equation. For this reason, Gregory & Hansen's (1996) cointegration method, which takes into account parameter changes and structural breaks, was used in the study.

In their study, Gregory & Hansen (1996) found that the break time in the cointegrated vector is determined internally in the model and allows a single structural break and includes a break at the constant (C) and break at the trended constant (C/T) and regime change (C/S). They developed a cointegration method in which the model is included. In Gregory & Hansen's (1996) cointegration analysis, the existence of cointegration can be tested by comparing the Za, Zt, and ADF test statistics determined for the appropriate model with the table critical values. While the null hypothesis states that there is no long-term relationship between the variables, the alternative hypothesis states that there is a cointegration relationship between the variables with a structural break.

Table 9

Gregory and Hansen (1996) Structural Break Cointegration Test Result

Relationship	Model	ADF Test Statistic	Zt Test Statistic	Za Test Statistic
lncpi & lnppi	C	-3.54 (1) [April 2019]	-3.60 (1) [April 2019]	-18.00 (1) [April 2019]
	C/T	-4.78 (1) [November 2019]	-4.48 (1) [October 2019]	-32.09 (1) [October 2019]
	C/S	-4.39 (1) [September 2019]	-3.90 (1) [August 2019]	-27.93 (1) [August 2019]
lncpi & lnmining	C	-3.51 (0) [July 2019]	-3.74 (0) [April 2019]	-22.13 (0) [April 2019]
	C/T	-4.47 (0) [September 2019]	-4.89 (0) [September 2019]	-34.47 (0) [September 2019]
	C/S	-4.57 (0) [September 2019]	-5.07** (0) [October 2019]	-36.70 (0) [October 2019]
lncpi & lnproduction	C	-3.74 (1) [March 2019]	-3.68 (1) [April 2019]	-19.26 (1) [April 2019]
	C/T	-4.56 (1) [November 2019]	-4.24 (1) [August 2019]	-30.23 (1) [August 2019]
	C/S	-4.09 (1) [September 2019]	-3.68 (1) [August 2019]	-25.21 (1) [August 2019]

Table 9 (Continued)

Relationship	Model	ADF Test Statistic	Zt Test Statistic	Za Test Statistic
lncpi & lnwater	C	-3.38 (1) [September 2018]	-2.84 (1) [November 2018]	-16.79 (1) [November 2018]
	C/T	-4.75 (1) [December 2020]	-4.26 (1) [November 2020]	-28.11 (1) [November 2020]
	C/S	-3.88 (0) [January 2019]	-3.98 (0) [January 2019]	-27.93 (0) [January 2019]
lncpi & lnelectricity	C	-3.15 (0) [May 2020]	-2.98 (0) [May 2020]	-12.92 (0) [May 2020]
	C/T	-6.45* (3) [April 2019]	-6.48* (3) [February 2021]	-53.96* (3) [February 2021]
	C/S	-3.49 (0) [August 2020]	-3.31 (0) [September 2020]	-15.29 (0) [September 2020]
lnppi & lnfood	C	-4.93** (3) [July 2019]	-4.36*** (3) [January 2019]	-24.12 (3) [January 2019]
	C/T	-5.17 (1) [September 2019]	-4.65 (1) [November 2019]	-29.62 (1) [November 2019]
	C/S	-5.66* (3) [July 2019]	-4.61 (3) [September 2019]	-27.41 (3) [September 2019]
lnppi & lnhousing	C	-4.97** (0) [July 2019]	-4.97** (0) [July 2019]	-37.61*** (0) [July 2019]
	C/T	-6.81* (0) [August 2019]	-6.85* (0) [August 2019]	-57.84*** (0) [August 2019]
	C/S	-5.77* (0) [August 2019]	-5.81* (0) [August 2019]	-48.58** (0) [August 2019]
lnppi & lntransportation	C	-3.94 (1) [November 2016]	-3.97 (1) [December 2016]	-21.80 (1) [December 2016]
	C/T	-3.48 (1) [July 2018]	-3.61 (1) [November 2018]	-18.91 (1) [November 2018]
	C/S	-4.21 (1) [July 2018]	-4.21 (1) [June 2018]	-24.48 (1) [June 2018]

Note. The values in parentheses indicate the BIC appropriate delay length. The values in square brackets indicate the breakout period. Critical Values in Gregory & Hansen (1996: 109) were taken into account for the evaluation of the results. * Significant at 1%, ** Significant at 5%, *** Significant at 10%.

Table 9 shows the results of Gregory & Hansen's (1996) structural break cointegration test. When the results are examined, considering the Zt statistics for the regime change (C/S) model between the lncpi and lnmining series, there is cointegration, but other test statistics indicate the opposite situation. In short, it was decided that there was no cointegration between these two variables. When considering the relationship between lncpi and lnelectricity variables, it is seen that there is cointegration in terms of all test statistics for the model that includes a break in trend constant (C/T). At the same time, cointegration was found between lnppi and lnfood variables for models including a break in constant (C) and regime change (C/S), and between lnppi and lnhousing variables for all model and test statistics. Therefore, although a relationship between lncpi and lnppi cannot be determined depending

on periodic developments, the causality relations between lncpi and lnelectricity, lnppi and lnfood and lnppi and lnhousing variables will provide important information about the basic causes of inflation in Turkey in terms of examining the causality relationship between them.

4.3. Causality Analysis

The most commonly used test in the literature to determine the causal relationship between variables is the causality test developed by Granger (1969). For the causality to be analyzed correctly in the Granger test, it is important to determine the appropriate lag lengths for these variables while including the dependent and independent variables in the model. When the lag length is not taken correctly, the results regarding the causality between the variables may also change. However, Hsiao's (1979) Causality Test, which is based on the Final Prediction Error (FPE) criterion, produces more reliable results (Terzi, 2004: 66). While the causality test based on Hsiao's (1979) Final Prediction Error (FPE) Criterion is based on the equations used in the Granger causality test, it uses Akaike's Final Prediction Error (FPE) Criterion to determine the lag length (Bağdigen & Beşer, 2009: 12; Yang, 2000: 312).

$$Y_t = \alpha + \sum_{i=1}^{m} \beta_i Y_{t-i} + u_t \tag{2}$$

$$FPE(m) = \frac{T+m+1}{T-m-1} \cdot \frac{ESS(m)}{T} \tag{3}$$

$$Y_t = \alpha + \sum_{i=1}^{m} \beta_i Y_{t-i} + \sum_{j=1}^{n} \delta_j X_{t-j} + v_t \tag{4}$$

$$FPE(m,n) = \frac{T+m+n+1}{T-m-n-1} \cdot \frac{ESS(m,n)}{T} \tag{5}$$

In the above equations, T is the sample size; m and n are delay numbers; ESS represents the sum of squares of error. Hsiao's (1979) Causality test is a two-stage test. In the first stage, the lagged values of the dependent variable in Equation 2 are included in the equation as independent variables, and the appropriate lag number is tried to be determined. The appropriate delay number (m) is the number of delays that minimizes the Final Prediction Error (FPE) in Equation 3. In the second stage, as seen in Equation 4, the appropriate delay number (n) of the other variable is tried to be determined. The number of delays (n), which also minimizes the Final Prediction Error (FPE) criterion in Equation 5, is the appropriate delay number. After determining the appropriate lag numbers, FPE(m) and FPE(m,n) are compared as follows to test whether there is a causal relationship. According to this;

If FPE(m) < FPE(m,n), Xt is not the cause of Yt.

If FPE(m) > FPE(m,n), Xt is the cause of Yt.

Table 9

Results of Hsiao's (1979) Causality Test Based on FPE Criteria

Aspect of Causality	FPE (m)	FPE(m, n)	Results
lncpi → lnelectricity	0.000859 (1)	0.000836 (1,2)	There Is Causality
lnelectricity → lncpi	0.0000462 (3)	0.0000485 (3,1)	No causality
lnppi → lnfood	0.0001115 (2)	0.0000861 (2,6)	There Is Causality
lnfood → lppi	0.0000826 (3)	0.0000764 (3,3)	There Is Causality
lnppi → lnhousing	0.0000914 (1)	0.0000416 (1,5)	There Is Causality
lnhousing → lnppi	0.0000826 (3)	0.0000868 (3,1)	No causality

Note. The numbers in parentheses indicate the appropriate lag length.

The results of the Hsiao (1979) Causality Test are summarized in Table 10. The results show that there is no causality relationship from lnelectricity variable to lncpi variable and from lnhouse variable to lnppi variable. On the other hand, there is a unidirectional causality relationship from lncpi variable to lnelectricity variable and from lnppi variable to lnhousing variable, and bidirectional causality relationship between lnppi and lnfood variables. According to these results, although no information can be provided about the effects of inflation within the framework of the main indices, important information has been obtained about how the inflationary process develops within the framework of the sub-indices.

5. CONCLUSION

The socioeconomic and/or sociopolitical developments experienced in Turkey and the world in 2016 and later resulted in the inflation problem again taking the first place on Turkey's agenda after inflation fell to single digits in 2004. From the end of the 1960s, there were supply-side structural problems, budget deficits, financing of budget deficits with central bank resources, external deficits, etc. The inflationary process, which gained inertia in Turkey due to many reasons, was tried to be overcome with the "Transition to a Strong Economy Program", which was put into practice after the 2001 crisis. Policies supported by tight monetary and fiscal discipline policies and based on structural transformation, stability in the exchange rate and breaking inflationary expectations have led to results in the fight against inflation since 2004. Since 2016, including the previous years, domestic and foreign political developments and increasing terrorist activities have also shown themselves to economic stability. After the coup attempt in 2016, together with the policies aimed at preventing the economic recession, the process of fighting inflation was adversely affected. Foreign exchange outflow, increased budget deficits, and increases in consumer loans, coupled with the low-interest rate environment, triggered the inflationary process. In 2017, the double-digit inflationary process returned, and in 2022, inflation figures reached triple-digit figures based on the Domestic PPI.

This study, which the reasons for this situation are investigated, aimed to determine the main causes of inflation in the period starting from January 2016 until February 2022. As a result of the cointegration and causality analyses conducted, no causality relationship was found between the main indices, while one-way direction from Consumer Prices (lncpi) to products within the scope of Electricity, Gas, Steam and Air Conditioning Production and Distribution (lnelectricity) and from Domestic Producer Prices (lnppi) to Housing (lnhousing) prices. A bidirectional causality relationship was found between Domestic Producer Prices (lnppi) and the prices of products belonging to the Food and Non-Alcoholic Beverages (lnfood) group. In short, both cost-push and demand-pull inflationary structures were effective in this period. In addition, one of the most important issues to be considered is that the increases in the domestic PPI affect the food and non-alcoholic beverages and housing prices, which have a total weight of approximately 40% in the consumer price index. The price increases in the products in these two sub-categories, which have an important place in the budgets of consumers, will reveal serious negativities and welfare losses in terms of providing the basic needs of consumers.

The increase in the prices of raw materials, intermediate goods, energy costs, and consumption goods due to the increases in the exchange rate in general in this process, the decrease in the level of economic activity during the pandemic process, and the rapid increase in demand afterward have significant effects on inflation. The more dominant factor for Turkey is undoubtedly serious depreciation of the Turkish Lira. After the 2001 crisis, Turkey implemented inflation targeting as a monetary policy regime and managed to control inflation as a result of demand-side tightening policies and fiscal discipline followed over the short-term policy rate. However, the same policies have begun to be ineffective in controlling the inflationary process experienced in the recent past. Because although monetary and fiscal disciplines are more effective in resolving demand-side inflation, they have been ineffective in alleviating the supply-side inflationary pressures Turkey has been experiencing in recent years. As long as Turkey doesn't attach importance to capacity increase through new investments, foreign direct investments, technological progress, research and development, human capital, and institutional development in solving supply-side inflation and ensuring a long-term stable production structure, it may encounter these problems frequently. The most rational way for Turkey is to produce policies that suppress and control the inflationary effects in the short-term, and eliminate inflation in the medium and long-term, depending on the increases in the capacity and production level, to ensure price stability, thanks to supply-side policies.

Beyan ve Açıklama / Disclosure Statement

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