A TIME SERIES ANALYSIS OF THE EFFECTS OF MONETARY POLICY ON SELECTED MACROECONOMIC VARIABLES IN TURKEY

Master's Thesis

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MASTER'S THESIS

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JÜRİ VE ENSTİTÜ ONAYI

Hanife KADIOĞLU' nun '' Para Politikasının Türkiye'de Seçilmiş Makroiktisadi Değişkenler Üzerindeki Etkilerinin Zaman Serisi Analizi '' başlıklı tezi .../.../2023 tarihinde aşağıdaki jüri tarafından değerlendirilerek "Anadolu Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliği"nin ilgili maddeleri uyarınca, İktisat (İngilizce) Anabilim/Anasanat dalında Yüksek Lisans/Doktora/Sanatta Yeterlik tezi olarak kabul edilmiştir.

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ÖZET

PARA POLİTİKASININ TÜRKİYE'DE SEÇİLMİŞ MAKROİKTİSADİ DEĞİŞKENLER ÜZERİNDEKİ ETKİLERİNİN ZAMAN SERİSİ ANALİZİ

Hanife KADIOĞLU

İktisat Anabilim Dalı

Anadolu Üniversitesi, Lisansüstü Eğitim Enstitüsü, Ekim 2023

Danışman: Prof. Dr. Mustafa Özer

Bu çalışmada para politikasının Türkiye'deki iktisadi hayatın nabzını tutan makroekonomik göstergeler ile ilişkinin ve nedenselliğin saptanması amaçlanmıştır. Çalışmada yapılan analizin bağımsız değişkeni politika faizi olarak belirlenmiştir. Konut, üretici, tüketici, hisse senedi, motorlu taşıt ve petrol fiyatları; perakende satışlar, döviz kuru, kredi genişlemesi, sanayi üretimi, uzun vadeli hükümet tahvilleri, para arzı tanımları ve bileşik öncü göstergeler analizin bağımlı değişkenlerini oluşturmaktadır. Ampirik analizlerde ARDL sınır ve Toda-Yamamoto nedensellik testleri kullanılmıştır. Yapılan sınır testi sonuçlarında; para politikasının üretici, tüketici ve motorlu taşıt fiyatları, perakende satışlar, döviz kuru, özel sektör kredi genişlemesi, uzun vadeli hükümet tahvilleri, para arzı ve bileşik öncü göstergeler ile uzun dönemde anlamlı bir ilişki saptanmıştır. Politika faizi konut fiyatları ile yalnızca kısa dönemde anlamlı bir ilişkiye sahipken; M2, M3, tüketici ve motorlu taşıt (üretici) fiyatları, kredi genişlemesi ve perakende satışlar ile kısa dönemde anlamlı bir ilişki oluşturmamaktadır. Nedensellik testi sonuçları politika faizi ile M2, M3, üretici ve motorlu taşıt (tüketici) fiyatları, kredi genişlemesi ve döviz kuru arasında çift yönlü; politika faizinden M1'e, tüketici, konut ve motorlu taşıt (üretici) fiyatlarına, perakende satışlara, hükümet tahvillerine ve bileşik öncü göstergelere doğru tek yönlü bir ilişki saptamıştır. Sanayi üretimi, hisse senetleri ve petrol fiyatları ile politika faizi arasında herhangi bir ilişki saptanmamıştır.

Anahtar Sözcükler: Para politikası, Politika faizi, ARDL, Toda-Yamamoto.

ABSTRACT

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In this study, it is aimed to detect the relationship and the causality between monetary policy and the macroeconomic indicators that keep the pulse of the economic life in Turkey. The independent variable of the analysis was determined as the policy rate. Housing, producer, consumer, stock, motor vehicles and oil prices; retail sales, exchange rate, credit expansion, industrial production, long-term government bonds, money supply and compound leading indicators are also the dependent variables. ARDL limit and Toda-Yamamoto causality tests were used in the empirical analysis. In the results of the bound test; In the long run, a significant relationship was found between producer, consumer and motor vehicle prices, retail sales, exchange rate, private sector credit expansion, long-term bonds, money supply and leading indicators with monetary policy. While the policy rate has a significant relationship with house prices only in the short run; it has not a significant relationship with M2, M3, consumer and producer-based motor vehicles prices, credit extension, retail sales in the short run. The causality test results has detected the bi-directional causality between policy rate and M2, M3, consumer-based motor vehicles and producer prices, credit expansion and exchange rate; uni-directional causality from policy rate to M1, consumer prices, house and producer-based motor vehicles prices, retail sales, long-term bonds and leading indicators. Any relationship was found between industrial production, stocks and oil prices and the policy rate.

Keywords: Monetary policy, Policy rate, ARDL, Toda-Yamamo.

20/11/2023

ETİK İLKE VE KURALLARA UYGUNLUK BEYANNAMESİ

Bu tezin bana ait, özgün bir çalışma olduğunu; çalışmamın hazırlık, veri toplama, analiz ve bilgilerin sunumu olmak üzere tüm aşamalarında bilimsel etik ilke ve kurallara uygun davrandığımı; bu çalışma kapsamında elde edilen tüm veri ve bilgiler için kaynak gösterdiğimi ve bu kaynaklara kaynakçada yer verdiğimi; bu çalışmanın Anadolu Üniversitesi tarafından kullanılan "bilimsel intihal tespit programı"yla tarandığını ve hiçbir şekilde "intihal içermediğini" beyan ederim. Herhangi bir zamanda, çalışmamla ilgili yaptığım bu beyana aykırı bir durumun saptanması durumunda, ortaya çıkacak tüm ahlaki ve hukuki sonuçları kabul ettiğimi bildiririm.

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LIST OF SYMBOLS AND ABBREVIATIONS

ADF : Augmented Dickey Fuller

ARDL : Autoregression Distributed Lag

BIST : Istanbul Stock Exchange and BIST100 Index

BP : Breakpoint

CB : Central Bank

CBRT : Central Bank of The Republic Of Turkey

CLI : Compound Leading Indicators Index

CLIT : Compound Leading Indicators Index (including trend)

COVIDDUM: The Dummy of Covid-19

CPI : Consumer Price Index

DF : Dickey Fuller

DF-GLS : Dickey Fuller GLS

D-PPI : Domestic Producer Price Index

ECB : Europian Central Bank

ECM : Error correction model

ER : Free Reserve

ERS P-O : Eliott Rothenberg and Stock Point Optimal

EU : Europian Union

FOB : Free On Boards

F-PPI : Foreign Producer Price Index

GDS : 10 year government debt securities

GDP : Gross Domestic Product

HPI : House Prise Index

IMF : International Monetary Fund

IPI : Industrial Price Index

IR : Policy Rate

ISODUM : The Dummy of Full Isolation Period in Covid-19

J&B : Jaque-Bera

KPSS : Kwiatkowski-Phillips-Schmidt-Shin

MTM : Monetary Transmission Mechanism

MVPI : Motor Vehicles Price Index

MVPIC : Consumer-based Motor Vehicles Prices Index

MVPIDUM : The Dummy for End of the SCT Reductions

MVPIP : Producer-based Motor Vehicles Price Index

MTV : Motor Vehicles Tax

NG-P : NG-Perron

OMO : Open Market Operations

PP : Phillips Perron

PPI : Producer Price Index

PSCE : Private sector credit extension

RR : Required Reserve

RSVI : Retail Sales Volume Index

ROM : Reserve Option Mechanism

ROC : Reserve Option Coefficient

SCT : Special Consumption Tax

sl. : Significant level

TIGHTDUM : The Dummy of Monetary Tighting in 2018

TURKSTAT : Turkish Statistical Institute

T&Y : Toda-Yamamoto

USD : Exchange Rate (American Dollar)

INTRODUCTION

Macroeconomic indicators are the economic compass that take the pulse of the economy in a country and direct the expectations and decisions of the economic decision-making units. It is very important for the governments and central banks (CB) carrying the compass to set the appropriate ground with the policy tools applied, so that the decision-making units can have accurate expectations and take the right decisions. Many economic, political, geographical and social situations can cause economic indicators to disorientate. The UK's departure from the European Union (EU) in 2018, the fluctuations in global financial markets, the election atmosphere in Turkey and the Covid-19 epidemic, which emerged at the end of 2019, has seriously disrupted the economic compass in our country. This study seeks to answer the questions of whether the policy instrument implemented by the CB in Turkey affects the selected macroeconomic compasses, and in which direction and to what extent.

The Central Bank of the Republic of Turkey (CBRT) uses the short-term borrowing interest rate (policy rate) as a policy tool to clear the economic ground from unevenness. For this reason, in the study, the policy rate was determined as an independent variable to measure the effect of monetary policy. The selected macroeconomic variables are the variables that most affect the expectations and decisions of the decision-making units and that have the more power to reflect the economic situation in the country. Housing prices, motor vehicle prices, producer and consumer prices, exchange rates, oil prices are indices that reflect the costs that producers and consumers in the country have to bear and the loss of welfare. While the credit expansion of the private sector is an indicator of the investments of the private sector, retail sales reflect the dynamism of the commercial life in the country. While the industrial production index keeps the pulse of the industrial sector in the country, GDS show the government cost burden. Stock prices are an indicator that affects the decisions of investors in the financial system. The money supply is a variable controlled by the CB. However, the CB carries out this control by using various tools instead of providing it directly as it creates inflation risk. For this reason, the relationship between the policy rate instrument and the money supply is also included in the study. In addition, the composite leading indicators index is an important indicator for shaping economic expectations, as it forecasts the direction of fluctuations in the economy. In the study, the

relationship of monetary policy with the specified variables was analyzed and the direction of the existing relationships was investigated.

Many studies in the literature use money supply definitions and other interest rates such as deposit rates and overnight interest rates as a measure of monetary policy. In addition, the studies used data before the recent epidemic period. This study; contributes to the literature in terms of using the policy rate which is the policy tool officially announced by the CB as a monetary policy criterion, carrying the time period to a more recent date, gathering the relation and the causality between monetary policy and many macroeconomic indicators under the single study. In addition, this study examined for the first time the relationship that the retail sales and the motor vehicle prices with the policy rate, which the official monetary policy instrument of the CB in Turkey, and added it to the literature.

In the first part of the study, which consists of three parts, the theoretical framework of monetary policy is discussed and monetary policy practices in Turkey in the sample period are mentioned. In the second part, the purpose and how the selected macroeconomic indicators are created, what they are affected by and how they should be interpreted are mentioned. At the end of the chapter, the literature on these economic indicators is given. In the last part, the theoretical framework of the unit root tests, ARDL bounds test and Toda-Yamamoto causality test, which constitute the empirical part of the study, was mentioned, and then the results of the empirical analyzes were presented, and the findings were evaluated.

CHAPTER 1: MONETARY POLICY

In the first part of the study, the theory of monetary policy, which is the main subject of the research, is discussed in detail. In this context, first monetary policy was defined, and then the objectives and tools of monetary policy were explained. Then, monetary policy strategies and the mechanism for transferring monetary policy to the real sector are explained. Finally, the monetary policy practices implemented in Turkey since 2006 have been tried to be explained comprehensively.

1.3.Definition of Monetary Policy

The concept of "monetary policy" is the name given to the actions of the CBs that aim to influence certain macroeconomic indicators such as money supply, short-term interest rates or nominal exchange rates through some financial instruments (Rasche and Williams, 2005).

1.4. Objectives of Monetary Policy

While the ultimate goals of monetary policy applications are generally price stability and financial stability today, these goals are full employment and economic growth before the 1970s, and inflation control and economic growth as a result of the inflationary expansionary monetary policies implemented to eliminate the negative consequences of the oil crisis in the 1970s. emerged as monetary stability. CBs can set one or more of the following monetary policy targets as targets, as well as specify one as the final target to be achieved and the others as the secondary target (Pınar and Erdal, 2016, 42-45).

1.4.1. Price stability

In fact, the concept of price stability, which has a wide range of meanings, also means a stable price that offers a highly predictable expected inflation rate as well as moving around a fixed price. While examining inflation data to question the existence of price stability in an economy, the magnitude and depth of shocks targeting inflation determine the predictability of the price level, in other words, the predictability of the expected inflation rate (Bordo, Dittmar and Gavin, 2007). Ensuring price stability plays

a pioneering role in achieving other policy objectives. For this reason, CBs generally agree on price stability as the ultimate goal (Orphanides and Williams, 2004).

Although the CB of the Republic of Turkey (CBRT) mainly targets price stability, the concept of price stability; people's consumption, investment and savings, etc. defines it as a low level of inflation that does not affect the decisions they make in their economic activities. Price stability in the range of 1% to 3% inflation rate for developed countries is not only a target to be achieved, but also a target to be sustained. The unpredictability of the future of the economy in case of price instability undermines public opinion confidence in the economy. In the case of price stability, economic growth and the level of economic welfare increase along with it (CBRT, 2013(a)). In addition, the continuous increase in public debt makes it difficult to reach a stable price level by rendering monetary policy ineffective due to the monetary concerns arising from its financing through CBs. On the other hand, the reliable and independent stance of the CB activates the monetary policy on price stability (Eroğlu, 2004, 150).

1.4.2. Financial stability

While targeting financial stability is explicitly stated in some CB laws and implicitly in others, ensuring financial stability actually means the stability of financial markets and institutions that make up the financial system (Pınar and Erdal, 2016, 43-44). If the financial system in a country increases the efficiency of the economic performance of that country and can eliminate the imbalances in the financial system against unforeseen significant negativities, the existence of financial stability in that country can be mentioned (Schinasi, 2004, 8). In order to ensure financial stability, the financial system can effectively provide the right flow of resources from savers to investors; be able to accurately assess and price current and anticipated financial risks; It should have the ability to easily eliminate adverse economic conditions, economic and financial shocks that may arise (Europin Central Bank (ECB), 2022). Contrary to the full employment target, price stability acts in the same direction as the financial stability target. In other words, while ensuring price stability is an important component of ensuring financial stability, ensuring financial stability is an important component in ensuring price stability (Pınar and Erdal, 2016, 44).

1.4.3. Full employment

Providing output at full employment and full employment level, which is the second most widespread objective of monetary policy implementations, creates a conflict between price stability and, in other words, creates a trade-off between full employment and inflation (Walsh, 2017). If it is necessary to define the concepts of output at full employment and full employment level; While the concept of full employment is possible for everyone who wishes to work in a country to participate in business life at current wages and normal working hours, the output at full employment level is obtained by multiplying the number of labor with the output per labor in a country where full employment is achieved based on the labor factor. (Curtis and Irvine, 2017, 20). Although full employment does not mean that there is no unemployment in the economy, it does not mean that working men or women always work efficiently. Being unemployed due to changing seasonal and structural factors as well as a job change or job search causes a certain level of unemployment in every economy. (Beveridge, 2014, 18).

1.4.4. Economic growth

In general, the increase in the amount of goods and services produced in a country over time, or in other words, the continuous increase in the real Gross Domestic Product (GDP) over time is defined as economic growth. The only way to continuously raise the living standards of households in a country is to achieve steady economic growth. (Ünsal, 2017, 14). The fact that economic growth moves in the opposite direction with price stability makes it difficult to reach both targets if these two targets are chosen together. The reason for this is that if price stability is targeted, it causes a decrease in the growth rate and employment rate in the short term, or it becomes difficult to achieve price stability in the long term if economic growth is targeted in the short term.

1.4.5. Interest rate stability

Maintaining stability in interest rates is actually important in terms of ensuring financial stability. The constant fluctuation of interest rates creates an uncertain and therefore unsafe environment in terms of the elements of the financial system, negatively affecting the investments to be made. This situation prevents the financial system mechanism from working effectively (Pınar and Erdal, 2016, 45).

1.4.6. Exchange rate stability

Exchange rate stability, which is considered as the inactivity in exchange rates or the absence of fluctuations; Since money supply is a function of the basic indicators of the economy such as interest rates, it is affected by the volatility in the basic dynamics of the market (Bonser-Neal, 1996). Ensuring exchange rate stability in an economy produces a result similar to price stability. In other words, while exchange rate stability is an important component in ensuring stability in the economy, the unstable situation in the economy leads to instability in the exchange rate (Friedman, 1953, 158). The fluctuations in the exchange rate can create instability in prices by affecting the costs in countries an be dependent on outside financial sources dependent industrial sector, and since the instability in prices will enlarge the balance of payments deficit, it can cause the fluctuations in exchange rates to grow more (Özmucur and Öniş, 1989, 55).

1.4.7. Ensuring the balance of payments

The economic activities of a country's economy with the outside world markets are calculated under a balance sheet called the balance of payments. Balance; current account is formed under four accounts as capital, net errors and omissions and official reserves account and the sum of these accounts is accepted as zero (Yeldan, 2005). The balance of payments, on the other hand, is a basic mathematical balance based on the equality of current account and capital account (Schlesinger, 2012). When the balance of payments is achieved , the supply and demand for foreign currency is also balanced (Ünsal, 2017, 441). Therefore, since any fluctuation in exchange rates will deteriorate the current account balance and thus create an environment of uncertainty in investments, the objectives of ensuring exchange rate stability and balance of payments interact with each other (Pınar and Erdal, 2016, 41). In case of current account deficit, capital mobility surplus is expected as a requirement of the balance. How the current account deficit is financed is important. Because foreign currency inflows, which provide financial capital other than foreign direct investments, such as portfolio flows that constitute the capital account or short-term foreign loans, can cause negative results that are debt-increasing by nature. For this reason, it is considered more reasonable to finance the current account deficit with foreign exchange inflows spread over time, such as foreign direct investments and long-term foreign loans. If the sum of net errors and omissions showing unregistered foreign currency entry and exit transactions and capital and current account items is

greater than zero, the numerical difference is transferred to the official reserves account. Net errors and omissions surplus recorded as negative in the balance of payments shows an increase in official reserves (Yeldan, 2005). While the foreign exchange surplus originating from the current account and net capital exports is absorbed by the CB in fixed exchange rate systems; In flexible exchange rate systems, this task is automatically defined the local banking system, which is an important component of foreign financial transactions (Schlesinger, 2012).

1.5.Tools of Monetary Policy

Monetary policy tools are used by CBs to control the money supply in the economy; Depending on whether CBs or commercial banks are in the implementing position, they are divided into direct and indirect monetary policy instruments. While direct policy instruments find application for economies dominated by the CB, in indirect policy instruments, the CB is only responsible for supplying money to the financial system and does not play a role in the relationship between commercial banks and depositors (Allen, 2004).

1.5.1. Direct monetary policy tools

Direct monetary policy instruments are generally applied by CBs on commercial banks, and the existing deposits and loans of these banks are controlled in terms of quantity (money supply), price (interest rate) or currency. Therefore, while these monetary policy instruments affect the balance sheets of commercial banks, the balance sheet of the CB is not affected by the use of these policy instruments. The advantage of this instruments; In the event of a possible crisis in an economy where there is an underdeveloped financial system or where indirect policy tools cannot be used adequately, CBs can quickly and effectively control the prices and amounts of bank loans by using these tools. The gaps and obstacles created by direct monetary policy instruments regarding the development of financial markets have caused these instruments to become unusable over time and have encouraged CBs to use more indirect policy instruments (Gray and Talbot, 2006, 32).

1.6.1.1. Interest rate control

While the interest policies applied by the CBs are very important in terms of financial markets, controlling the limits of the interest rates to be applied to the deposits and loans of the banks is one of the monetary policy practices of the CB. When the CB lowers the deposit interest rate of the banks, the deposits of the banks decrease and the CB's power to control the money supply weakens. When the deposit interest rates increase, while the deposit amount increases, the loan demand (investments) of the investors decreases as the loan interests will also increase. The CB intervenes with the borrowing/lending interest rates and the interest rates in the market.

1.6.1.2. Selective credit controls

In selective credit controls, it is expressed that the CBs impose some restrictions on the loans opened by commercial banks in order to develop certain sectors. tax exemptions, rediscount quotas, differentiated interest rates, subsidies and differentiated reserve requirements can be used as tools (Pınar and Erdal, 2016, 60). However, these differentiated credit controls applied to some banks to create sectoral incentives create imbalances in the markets and create a very serious cost burden in the economy (Gray and Talbot, 2006, 32).

1.6.1.3. Determining import deposit rates and durations

In this practice, which was abolished in Turkey in 1990, companies had to temporarily deposit an amount in TL of the goods they would import to the CB in order to obtain an import license. Reducing this amount and time determined by the CB created an expansion in the money supply, while the opposite situation increased the money supply.

1.6.1.4. Foreign currency surrender ratio

This tool, which was used occasionally from 1996 to 1998 and is not a traditional monetary policy instrument, is the CB's purchase of a part of its foreign exchange income from the institutions that provide foreign exchange income, in the foreign currency determined. As this ratio increased, so did the money supply, and in 1999, the CB stopped using this policy tool due to excess money supply and foreign exchange reserves.

1.6.1.5. Cash ratio

The amount of cash that banks have to keep ratios to their current deposits in the CB is called the "cash ratio". When this ratio, which was abolished in 2005 in Turkey, is observed (decreased), the amount of loans that banks will give will decrease (increase) due to the increase (decrease) in the amount of cash that banks have to keep, and the subsequent money supply will decrease (increase) (Pınar and Erdal, 2016, 61-67). CBs implement this monetary policy tool by obliging banks to buy GDS and treasury bills with a certain percentage of their deposits. Due to this necessity, the application of this tool; If it covers all the banks' liabilities, it becomes a direct monetary policy tool, if it covers a part of the banks' liabilities, it becomes an indirect monetary policy tool.

1.6.1.6. Reorganization of portfolios of financial intermediaries

The CB has the authority to intervene in the portfolios of banks and institutions in the financial system, in terms of type and amount, in order to transfer these assets to areas where these assets will create efficiency in economic growth.

1.6.1.7. Moral suasion

Also known as moral intimidation, this monetary policy tool can be used by CBs to persuade banks to make decisions in the interests of the country. This vehicle, which has no legal basis, has been used in Asian regions during crisis periods.

1.6.1.8. Press releases and recommendations of the CB

CBs can influence the expectations of commercial banks and related commercial institutions by expressing their views and giving various recommendations through the press and media (Önder, 2005, 64-80).

1.6.2. Indirect monetary policy tools

The financial system that developed along with financial liberalization has put the direct policy practices of CBs into the background and left commercial banks alone with their customers. Although commercial banks are involuntarily affected by the decisions of the CB, which is the monetary authority, they decide on their own what interest rate and how much loan they will give to whom and the interest rates they will pay to the depositors (Allen, 2004).

1.6.2.1. Open market operations

While open market operations (OMO) are used by the CBRT to control the money supply and to keep the policy rate (one-week repo auction rate) in balance with the short-term interest rates in the financial markets; as the name suggests, it consists of several processes. In the "warehouse" transaction, which is the first of these transactions; The CB provides commercial banks with deposits under maturity, collateral and limit constraints through the interbank money market, enabling banks to perform their TL-denominated borrowing and lending transactions on the same day at the interest rate announced by the CBRT. While repo and reverse repo transactions are used to control liquidity tightness or abundance in the market, the purchase of valuable paper from financial markets by CBs to relieve liquidity tightness is called ‘repo’, and the sale of valuable paper to financial markets to control liquidity abundance is called ‘reverse repo’. In the direct purchase-sell transaction, which is another open market operation; liquidity shortage/abundance situation is permanent, that is, it has continuity. In this case, the CB's purchase of securities(valuable paper) in circulation to eliminate permanent illiquidity is called "direct purchase", and when the opposite occurs, it is called "direct sales". Another APİ transaction is the “liquidity bond issuance”, which is used to create a more effective monetary policy to absorb excess liquidity in financial markets. It must be traded in secondary financial markets, with a maturity of less than ninety-one days and for its own account in order to be issued. Finally, the CBRT holds a "TRY Warehouse Purchase Auction" to make the monetary policy more effective, which is used to control the excess liquidity in TL in the market (CBRT (b)).

1.6.2.2. Standing facilities

Contrary to APİ, support facilities (SF) are used at the banks' own initiative and are used to balance the liquidity in the market. Although it is usually the last tool used by banks to solve the liquidity problem, it is used at the end of the day and includes a deterrent interest rate to prevent banks from being overly tied to the CB in solving the liquidity problem (Gray and Talbot, 2006, 46-48). This interest rate is called the “overnight lending rate” and is set higher than the interbank overnight rate because it acts as a deterrent. Banks can borrow from the CB as well as lend overnight, in which case the "overnight borrowing rate" interest accrues for the CB. Banks generally prefer this transaction to evaluate their current excess liquidity. However, the overnight borrowing

interest rate is set lower than the interbank overnight interest rate, on the grounds that the CB is again used by banks as the last resort. The difference between the overnight lending and borrowing rates is called the "interest rate corridor" and the one that fluctuates in this corridor is called the "policy rate (one-week repo auction rate)". While the narrowing of this corridor reduces the uncertainty of the policy rate, the widening of the corridor includes the opposite situation (Pınar and Erdal, 2016, 65).

1.6.2.3.Rediscount ratio

When the commercial banks re-discount the discounted trade review to the CB, the CB determines a rate for the rediscount transaction and this rate is expressed as the "discount rate" (Orhan and Erdoğan, 2007, 75). The CB, which gives rediscount credits as a monetary policy tool, applies a rediscount policy (discount window) in two ways. In the first of these; While the CB is the last source of liquidity for banks, in the second; The CB is the first source of liquidity for banks. While the CB sets the rediscount rate higher than the market rates to implement the first rediscount policy, it sets the rediscount rate below the market interest rates to implement the second policy. When the rediscount rate is high, the tendency of banks to use rediscount credits decreases, and when this rate decreases, banks will want to perform more rediscount transactions. Thus, the rediscount policy will be an effective policy tool on money supply and demand (Balino, 1985).

1.6.2.4. Legal reserve ratios

Like many countries, Turkey also uses official reserve (mandatory reserve) rates as a policy tool when appropriate. While these rates can sometimes be applied as a monetary policy tool to ensure price stability, they can sometimes be used as a macroprudential policy tool to ensure financial stability, and sometimes both can be used together. In an economy, credit expansion can be controlled by using official reserve rates to mitigate or decrease possible financial fluctuations (Mimir, Sunel and Taşkın, 2013). (The effect of official reserve ratios on money supply and money multiplier as a monetary policy tool has been discussed above under the heading of factors affecting money supply.)

1.6.2.5. Currency exchange

In economies using a fixed exchange rate system, CBs can carry out foreign exchange buying and selling transactions in order to prevent exchange rate fluctuations. While this exchange rate policy controls the exchange rates, it also has an impact on the domestic currency supply; While this effect reduces the supply of domestic currency in foreign exchange sales, at the end of the foreign exchange purchase transaction, the shape of the domestic currency over the supply is revealed. However, since CBs do not use this exchange rate policy to control the amount of money in circulation, exchange rate transactions are not accepted as traditional monetary policy instruments (Pınar and Erdal, 2016, 69).

1.6.2.6. Reserve options mechanism (ROM)

The ROM is one of the new monetary policy instruments that allows banks to keep a certain portion of their required reserve ratio in foreign currency or gold at the CB. While the ratio that shows how much of the required reserves of banks should be kept in foreign currency is expressed as the "reserved option ratio (ROR)", the coefficient that shows how much foreign currency is held compared to the required reserve in TL is called the "reserve option coefficient (ROC)" is named. hen the inflow of foreign currency into the country increases, banks increase the tendency to keep their RR as foreign currency because the ROC increases. Thus, by withdrawing some of the foreign currency entering the country from circulation, both the revaluation of the TL is prevented and the amount of foreign currency converted into credit is reduced. In the case of a decrease in the capital entering the country, the opposite situation occurs (Alper, Kara and Yörükoğlu, 2012).

1.6.2.7. Interest rate corridor

The interest rate corridor is another monetary policy tool used in the new systemThe CBRT, which aims to control the interest rates and liquidity in the market; In case of need, it can provide funds to commercial banks with daily/weekly/monthly (short-term) maturity, while it can receive funds from banks with excess funds with overnight maturity. This short-term fund buying/selling transaction is carried out at a certain interest rate, which is expressed as the "overnight borrowing/sending interest rate". The band between these overnight borrowing/issuing rates determined by the CBRT is called the "interest rate corridor".

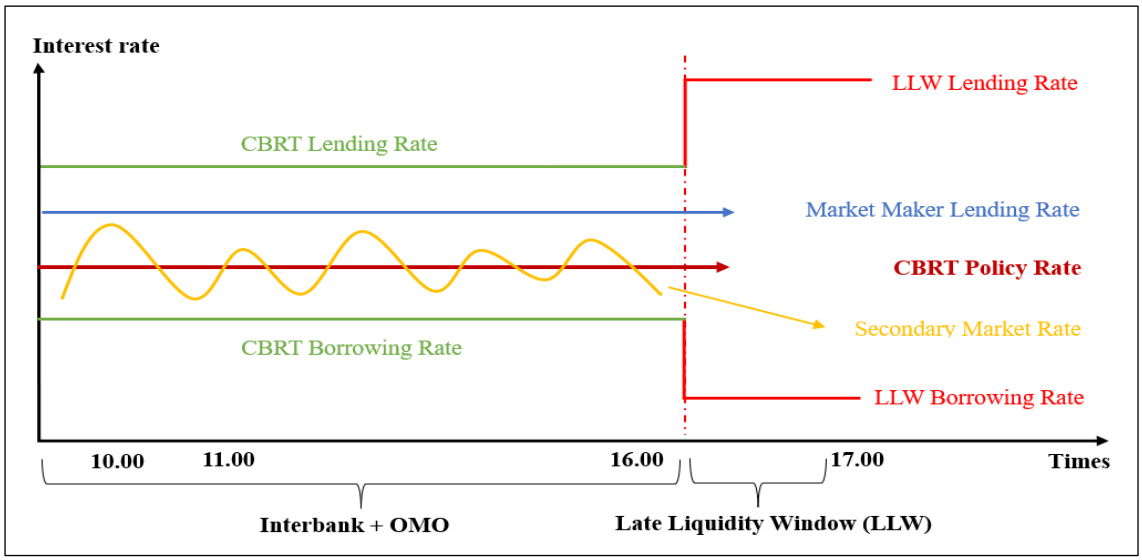


Figure: Interest Rate Corridor, (CBRT, 2013(a)). (Re-edited by the author)

Although the interest rates in the market are determined within this corridor, the one-week repo auction interest rate is determined as the "policy rate" since the CBRT funds the new system through a one-week repo transaction. The interest rate corridor is generally a passive tool used to prevent market interest rates from seriously decoupling from the policy rate. This traditional passive use of the interest rate corridor is in the form of an unchanged narrow band parallel to the policy rate, as shown in the figure above. The CBRT actively uses this tool. In other words, the CB can change the width of the corridor or fluctuate asymmetrically around the policy rate, depending on the current conditions. Such active use of the corridor; while it can respond quickly and flexibly to fluctuations in short-term capital mobility, it can also be effective in the growth of loans when necessary (CBRT, 2012).

1.7. Monetary Transmission Mechanisms on the Real Sector

Monetary transmission mechanism (MTM); It shows how the algorithm, which is formed from the applied monetary policy tools to inflation, works. Mechanism; It differs for each country in terms of its functioning, power and duration. Although the channels of expectations, interest, asset prices and exchange rates that constitute the mechanism are not clearly separated from each other, the channels interact with each other (CBRT, 2007). The basic working principle of MTM is shown in the simplified belove Figure 1.1.

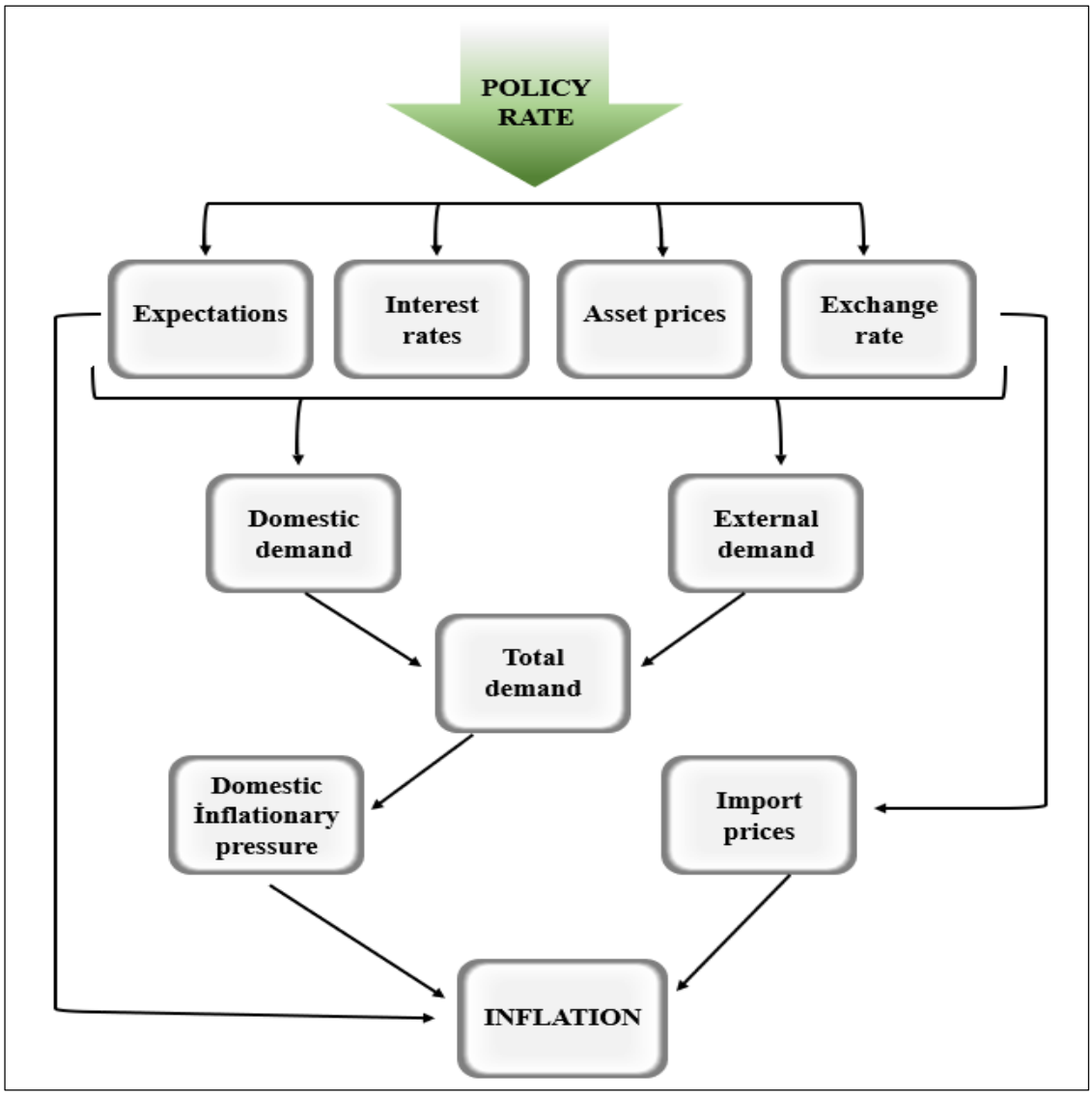


Figure 1.1. : Monetary transmission mechanism, (CBRT, 2007). (Re-edited by the author)

1.7.1. Transmission channels of monetary policy

In this chapter, the four main monetary transmission channels used in the implementation of the targeted monetary policy are discussed.

1.7.1.1. Interest rate channel

The interest channel is also known as the Keynesian monetary transmission channel, since it is the most important policy tool for Keynesians. Therefore, according to this view, an effective monetary policy affects demand by creating a change in interest rates (CBRT, 2013). In the interest channel expressed by the IS-LM model; As the money supply increases, the demand for bonds increases, so bond prices rise and interest rates

fall. Decreasing interest rates will increase investments in the country, increasing aggregate demand and output (Mishkin, 1996). The interest policy approach works under certain assumptions. These assumptions are listed as follows: Money is an asset that cannot be fully exchanged and its supply is controlled by the CB. While CBs have an impact on real and nominal interest rates with their monetary policies, short-term real interest rates have an impact on long-term interest rates. When the interest rate changes, fluctuations in interest-sensitive expenditures and fluctuations in the output should be in harmony with each other (Hubbard, 1995). While it is debatable which of the short and long-term interest rates is more effective on investments and consumption, long-term interest rates work more effectively on long-term investments (housing, machinery) (Taylor, 1995). On the other hand, the idea that monetary policy controls aggregate demand and output only through the interest channel has been criticized by Bernanke and Gertler (1995). While the monetary policy application through the interest channel operates on short-term interests, the application of the interest policy gives results quickly and effectively on investments in which long-term interest rates are effective. In other words, while the monetary policy carried out on short-term interest rates should give faster and more effective results on the stocks and durable goods affected by short-term interest rates, the opposite situation arises (Bernanke and Gertler, 1995).

1.7.1.2. Expectations channel

Monetary policies are implemented in this channel when the actors in the economic system act in line with the expectations of the basic indicators of the economy (especially inflation) regarding the course of the future. Therefore, the CB's high credibility creates a safe environment by providing a more predictable transition rate, which in turn enables monetary policy to easily affect price costs. If the CB fulfills the transparency and reliability principles and follows a path depending on the explanations regarding the monetary policies to be carried out in the future, it will direct the expectations in the economy by using the expectations channel effectively (CBRT, 2013 (b)). The CB's interest rate policies drive the expected inflation value; When an increase in interest rates creates a perception that the fight against inflation will continue in the future, inflation expectations will decrease. Although inflation expectations have an impact on long-term interest rates, pricing and wages, the decline in inflation expectations causes a decrease in these indicators. In addition, high interest rate increases the propensity to save for

economic actors and decreases investments, expenditures and thus aggregate demand (Önder, 2005, 31).

1.7.1.3. Exchange rate channel

The exchange rate channel has started to stand out with global liberalization and the transition to flexible exchange rate regimes, and the effectiveness of the exchange rate channel is increasing in direct proportion to the outward openness of economies (Mishkin, 2001). If the implemented monetary policies are transferred to the economy over the exchange rate and reflected on the economy through net export figures, changes occur in the country's output level. For example; An increase (decrease) in real interest rates will devalue (devalue) the domestic currency by attracting (removing) foreign capital to the country. In this context, while exports will become more expensive (cheaper), imports will become cheaper (expensive) and the amount of production will decrease (increase) (Horvarth and Maino, 2006). The direction of capital movements between the two countries is determined by the interest rate parity calculated over the interest rates of both countries. While the difference between the interest rates of the countries shows the expected exchange rate change in the other country, the capital return remains in the country with the highest return until the returns of both countries are balanced (Taylor, 1995). The new monetary policy of the CBRT, which regulates short-term interest rates on a daily basis, can relatively smooth the fluctuations in exchange rates and capital movements. In the new monetary system; When there is an intense capital flow to the country, fluctuations in interest rates deepen by widening the interest rate corridor, which consists of overnight borrowing/lending interest rates, while the volatility in the exchange rate is softened by expanding the interest rate corridor upwards in case of dilution of capital flow. In addition, the ROM regulation introduced by the CBRT for mandatory reserve amounts also alleviates the fluctuations in the mandatory exchange rates (CBRT, 2013 (b)).

1.7.1.4. Credit channel

The penetration of the policies targeting the money supply change into the economy through bank loans constitutes the essence of the credit channel. Policy practices that increase (reduce) reserves create an effect of increasing bank loans and subsequently investment expenditures (Mishkin, 1996, 9-10). The credit channel is divided into two

complementary channels: the balance sheet channel and the bank loans channel. While the bank credit channel explains how the costs arising from the monetary policy carried out over the high-interest rate have an unexpected effect on the balance sheets of some banks; The balance sheet channel explains how the balance sheet status of borrowers causes investment/spending shocks (Hall, 2001). In the balance sheet channel arising from the asymmetric information problem, the external financing premium determines the creditworthiness of the borrowing banks, while a bank with a low (high) external financing premium has a high (low) value. Therefore, in the event of a shock, the bank's external financing premium will increase, as the high interest rate applied will increase the value of the debt of the borrowing banks. Since the depreciating bank's borrowing costs will increase, its balance sheet will be negatively affected and this will cause fluctuations in investments/ expenditures along with (Gür, 2003, 30). On the other hand, under the assumption that a tightening monetary policy is applied in the credit channel, the amount of loans available to the borrowing banks decreases and the external financing premium increases. In this case, the external financing premium of small firms dependent on bank loans will be affected more than that of large firms. Therefore, fluctuations in the level of output in the economy can occur both through interest rates and external financing premiums (Romer and Romer, 1993). The application of the interest rate corridor established by the CBRT within the scope of the current monetary policy reveals highly effective results on the credit costs of banks. In case of an excessive increase in the credit supply, the upper limit of the interest rate corridor is controlled, and in case of an excessive decrease in the credit supply, the lower limit of the corridor is expanded and the credit supply is controlled. Since the credit channel directly affects all the activities in the economy, it is tapering off as the main transmission channel affecting the determinants of inflation in the medium term. When the credit channel is analyzed within the framework of financial stability; Excessive increases in loans create a higher increase in goods with high import inputs compared to other expenditure items. In addition, excessive credit increases, which deteriorate the current account balance by reducing savings in the short term, make the economy fragile in terms of negative foreign capital movements and give signals of financial instability (CBRT, 2013(b)).

1.7.1.5. Asset prices channel

The Keynesian view's base on interest rates has been criticized by monetarist economists. According to the monetarist view, there are many relative prices in an economy, but interest rates are only one component of these relative prices (Mishkin, 1996). Therefore, relative prices of other financial gains such as bills, bonds, securities and real estate are affected by changes in monetary policies. For example; In the event of a decrease in financial asset prices, asset holders reduce their spending and borrowing tendencies (total demand) by having difficulty repaying their debts or worrying that they will have difficulty repaying their debts (Kamin, Turner and Van't dack, 1998). If the interest rates increase and the expected inflation does not change, it is expected that the prices of financial assets will decrease. While the monetarist view argues that an increase in the money supply will increase expenditures, as it causes an increase in the prices of financial assets and thus in the wealth of the wealthy; The Keynesian view argues that an increase in the money supply will, on the contrary, increase the tendency to the market of other financial assets, as it will cause a decrease in interest rates (Loayza and Hebbel, 2002).

1.7.2. Time inconsistency of monetary policy

The problem of time discrepancy arises when the policies shared with the public by the CB, which acts voluntarily in policy implementation, change in practice, economic units that are in expectation of the announced policies lose their expectations for the operability of these constantly changing policies, and this situation may lead to undesirable consequences such as price instability (Kydland and Prescott, 1977).

1.7.3. Taylor rule

Although the real interest rates and the real production level are not under the influence of monetary policy in the long term, the CB can influence the economic activities of the country by managing short-term interest rates, since the nominal price mechanism is not flexible in the downward direction. This rule, developed by John Taylor (1993), argues that if monetary policies aimed at price stability and growth are implemented, the difference can be closed by managing short-term interest rates if the targeted values of these variables do not match the realized values. When the specified macroeconomic indicators exceed the target value (in the opposite case), the CB can

reduce (increase) the excessive (incomplete) demand generated in the economy by raising (lowering) nominal interest rates. Taylor formulates this rule as follows:

$$i_t = \pi + \varphi + \theta_\pi (\pi_t - \pi_t^*) + \theta_y (y_t - \bar{y}_t) \quad (1.3.)$$

Here; nominal short-term interest rate i_t, equilibrium (target) real interest rate φ, current inflation rate π, targeted inflation rate π_t^*, deviation from the targeted inflation rate $\pi_t - \pi_t^*$, proportional output deficit $y_t - \bar{y}_t$, are symbolized. If the equation is rewritten in terms of small economies that are open to outside, the deviation of the real exchange rate from the target exchange rate $(e_t - e_t^*)$ is included in the equation and formulated as follows:

$$i_t = \pi + \varphi + \theta_\pi (\pi_t - \pi_t^*) + \theta_y (y_t - \bar{y}_t) + \theta_e (e_t - e_t^*) \quad (1.4.)$$

The parameters θ_π, θ_y, θ_e contained in the equations indicate the response coefficients of the variables. For example, while θ_π symbolizes the reaction coefficient of inflation, it refers to the effect of deviation from the targeted inflation rate on the interest rate. In other words, 1 point increase (decrease) in inflation causes an increase (decrease) in short-term interest rates by θ_π.

With the addition of the exchange rate to the equation, the volatility of the short-term interest rate increased; A decrease (increase) in real exchange rates will decrease (increase) inflation. On the other hand, she states that she takes a strict stance in the expectation that the coefficients of θ_y, θ_e in the equations are equal to zero.

On the other hand, the fact that the coefficients are equal to zero in the equation indicates a strict stance in inflation targeting In the studies of Clarida and Gerdler (1998), while developed countries that use short-term interest rates as a policy tool, they observe the validity of Taylor's rule when they implement policies targeting inflation directly; In their studies, Kesriyeli and Yalçın (1998) observed the invalidity of this rule in economies that are pro-inflationary and have a public sector borrowing requirement, such as Turkey. Therefore, when short-term nominal interest rates are used as a policy tool in the mentioned countries, these countries will display an unsuccessful picture in the fight against inflation (Pınar and Erdal, 2016, 79-81).

1.8. Monetary Policy Targeting Strategies Regimes

Developing a targeting strategy for monetary policy does not seek to reduce deviations in target variables such as inflation The targeting strategy is mostly determined in such a way that the applied monetary policy reacts to deviations in the targeted variable (Svensson, 2020). The inability of the targeted monetary policies to respond directly to the final variables such as inflation and growth, through the transmission mechanism, divides the monetary policy targeting into a two-stage system towards the final target through direct control toolsIn the first stage of this system, a main target is determined for the final variable to be responded to, while in the second stage, the other variable that is most effective on the final variable is determined as the intermediate target. The second variable identified is intended to be kept within the targeted policy framework, as if it were the main intended target variable (Telatar, 2002). The final target is comprehensive macroeconomic variables such as the balance of payments balance sheet, real growth, inflation, and the intermediate target is; It includes variables that can be controlled by the CB, such as money supply, exchange rate, and act as a stepping stone to reach the final goal. The operational target, which is a third variable in monetary targeting, is the variables that directly affect the interim target and are also used as policy tools such as reserves and overnight interest rates (Guitian, 1996). However, in open economies with free capital movements, capital mobility, exchange rate and monetary policy cannot be chosen as targets at the same time. In this so-called "impossible trilogy", focusing on two of the three goals is the most likely solution (Hung, 2009). Basically monetary policy; While it implements two types of targeting strategies as interim targeting and direct targeting of inflation, exchange rate targeting and monetary targeting are included in the interim targeting strategy. Nominal anchors are used in these two Decoupling targeting strategies. A "nominal anchor' is a nominal variable that includes the exchange rate and monetary values and is used to reduce the temporal interval between monetary policy and the effects resulting from monetary policy. Decembers of the nominal anchor are used to reduce the time interval between the monetary policy and the monetary policy.

1.8.1. Exchange rate targeting

The targeting strategy based on the exchange rate can be applied to the economy in different ways. The practice, which can be realized by pegging the value of the domestic currency to the currency of the country with low inflation and a strong currency; On the

other hand, it can be applied with the fixed exchange rate method, in which the exchange rate is devalued in a timely and proportional manner (Pınar and Erdal, 2016, 82-84). Since the anchoring of the exchange rate to the strong currency of another country is an easy and clearly understood targeting strategy by the public, the domestic currency will tend to the low inflation conditions of the country where the currency it anchors is located over time. In countries where inflation has become continuous, it is more appropriate to use the exchange rate as an Decoupling targeting strategy, since this strategy will not affect inflation in the country due to the high dollarization trend. In addition, exchange rate targeting also eliminates the problem of 'time discrepancy" that arises in the conduct of monetary policy (Müslümov, Hasanov and Özyıldırım, 2002, 8). On the other hand, since independent monetary policies cannot be implemented in economies using exchange rate anchors, the country is negatively affected by a possible shock in the currency country to which it depends, and the impact of the shock is even deeper if there is a strict price and wage mechanism in the country. Developing countries that use the exchange rate targeting strategy become open to possible financial shocks depending on the degree of financial vulnerability, as they do not have a developed financial system, while in countries where inflation becomes permanent, this strategy can create a temporary expansion in economic activity (Erdoğan, 2005, 38-39).

1.8.2. Monetary targeting

In the monetary targeting strategy, although the money supply is an intermediate target, the money supply that is most effective for ensuring price stability and the supply of which can be controlled most easily (M1, M2, M3) is selected to create a certain expansion in this money supply (Guitian, 1996). This targeting strategy, which has been used to ensure price stability since the collapse of the Brettton Woods System, has caused this strategy to lose its importance due to the uncertainty created in the demand for money by technological developments and innovations in the financial system in the mid-1980s. Although there are some advantages of monetary targeting, the most basic advantage is that the CB, unlike the exchange rate anchor strategy, can adjust monetary policy according to the mobility in the country's economy and differentiate the inflation target. Like exchange rate targeting, in this system, it responds to the expectations of the public about the course of the economy by immediately reporting to the public whether the monetary targeting policy is successful or not, and therefore shows consistency in fighting

inflation by fixing inflation expectations. In addition, it prevents the CB from experiencing time discrepancy (Malatyalı, 1998, 7). There is an important condition on which the achievement of all these advantages depends; which is the condition for the existence of a strong, reliable and stable relationship between the final target total and the target variable inflation or nominal output. The absence of this relationship undermines the transparency and credibility of the CB regarding monetary policy; renders the monetary targeting strategy ineffective (Mishkin, 2004, 501). Moreover, the intermediate target of money supply should be completely controlled by the CB; otherwise, the CB cannot fully dominate the money supply and the monetary targeting strategy may not work effectively if the targeted averse money supply does not match the amount of liquidity in the market or if there is a high degree of currency substitution.

1.8.3. Inflation targeting

In order for direct inflation to be targeted, it is necessary to implement non-fixed exchange rate systems in the country first, the CB should be independent and ultimately aim for price stability, there should be developed financial markets, financial markets should show stability despite not being compatible with inflation targeting (Pınar and Erdal, 2016, 84). The inflation targeting strategy, which is thought to be based on strict rules, actually frames the process of conducting monetary policies rather than rigidity. The scope of the framework drawn in this context is based on the determination of inflation directly as the main objective of monetary policy, commitment and announcement of a numerical expression for inflation to the public, transparency of the CB, introduction of liability mechanisms, inflation forecasting and targeting strategy require a wide information network (Hammond, 2012, 5). Countries that apply inflation targeting usually use consumer price indices (CPI) or core inflation, where parameters that the CB cannot control, such as energy prices, agricultural products, are subtracted as target criteria. Moreover, inflation is usually targeted as a December forecast rather than a point forecast in order for monetary policy to have a partial effect on inflation and for monetary policy to be flexible enough to respond to short-term shocks. While a wide range of estimates arouses public suspicion; a narrow forecast range is perceived as a strong stance as long as the CB maintains stable policies (Mishkin and Posen, 1997,12). Inflation targeting has several advantages when compared to other targeting strategies. First of all, while the inflation targeting strategy increases the credibility of the CBs; It

provides effective and long-term results in the fight against inflation. This situation is based on the limits drawn by the inflation targeting strategy, such as the CB's openly declaring that it aims at price stability, informing the public about the policies carried out, transparency in its policies, and operational flexibility. When the inflation targeting is considered in terms of declaring the intended target and informing the public during the policy execution process, it creates a system that requires the CB to be held accountable as a result of the policies it carries out failing to reach the target. Thus, policies will be implemented to achieve consistency by avoiding the CB time-inconsistency trap. Also, unlike other targeting, direct fire targeting can respond to shocks that occur in the CB country (Mishkin, 2000). Another advantage of this strategy, which directly targets inflation, is that it offers flexibility in the execution of the determined policies, in other words, it ignores short-term deviations. If a good inflation targeting regime has been established, this provides the opportunity for CBs to respond to situations occurring in the medium term without damaging their reputation in the fight against inflation in the long run. Another advantage of the regime is that it can direct the public's interest in the policy implementations of the CB. Thus, the perception of the general view is that instead of the intrusive monetary policies implemented, it is the target that aims to maintain and manage the stability at the macroeconomic level in the country, such as price stability and low inflation level. Regime; It improves monetary and fiscal policies in terms of discipline and accountability, and therefore contributes to the institutionalization of CBs (Schaechter and at al., 2000). Thanks to all these limits that it draws, the inflation targeting regime reduces fluctuations in economic activities in the country compared to other regimes and creates a lower cost in a possible shock wave. For example, when the exchange rate targeting strategy fails, the country faces serious economic problems such as hyperinflation, paid public debt, financial crisis, reserve losses. However, if the inflation targeting regime does not reach the target, inflation will remain above the target value for a while and the volume of economic growth will weaken (Batini and Laxton, 2006). There are also disadvantages and criticisms of the inflation targeting strategy in the literature. The first criticism of the regime; It is stated that the regime severely limits the discretion for policy makers due to its rigidity, and the outcome of the monetary policy implemented in a possible shock wave did not create the expected reaction, since this situation restricts the flexibility of monetary policies (Blanchard, 2003). On the contrary, the regime; There are those who argue that it offers a wide margin of appreciation for

policymakers, therefore, price stability becomes impossible if the expansion policies implemented by policymakers are overdone. Mishkin (2000) and Bernanke et al. (1999); He states that an inflation-targeting regime created by examining the situation of the country will not have an authority problem and that this problem stems from the poor design of the regime. Hammond (2012), on the other hand, expresses the issue of authority as an advantage for the regime to combine rules and discretion, and characterizes this unity as "limited discretion**".** Another criticism of the regime is that the regime neglects exchange rates because it aims at price stability, and this situation will create problems for open small economies; The most serious criticism of the regime is that the effectiveness of the accountability principle in the regime will be less than that of other regimes, since the effect of the monetary policies implemented in the fight against inflation is long-term and delayed. Thus, while developing countries, especially those transitioning to low inflation, may make serious estimation errors and experience deviations in their targeted results; Under these conditions, the reputation of the CBs of the countries is damaged and their credibility suffers. Finally, the regime is criticized for the fact that CBs are under the yoke of financial pressures and fluctuations in exchange rates create financial instability, especially for developing countries (Mishkin, 2000).

1.9. Monetary Policy Practices in Turkey (2006 - 2022)

While the implicit inflation application was used in Turkey until 2006, as a result of developments such as the successful results of the application reducing the country's credit risks and providing serious reductions in public debt, the direct inflation targeting regime was switched on in 2006. In this transition; The CBRT's decision to issue a quarterly inflation report and the MPC's central role in interest rate decisions also play a role. In the new regime, the CB set the inflation target as a range estimate. The decrease in the risk-taking tendency of the global financial markets in mid-2006 was reflected in Turkey as an increase in credit risks and deviations in the targeted inflation rates, and the CBRT increased interest rates in response to this situation.

In the Turkish economy in 2007; negative developments were experienced due to the political election atmosphere, relaxation in fiscal policies, and the global increase in energy and food prices.

When it comes to 2008; The global financial crisis centered in the USA caused deep fluctuations in macroeconomic parameters such as exchange rate, interest rate, credit risk

and inflation and the economy contracted. As a result of all these, the policy rate, which followed a fluctuating course from the transition to the inflation targeting regime until 2008, was reduced from 16.75 to 6.5 from 2008 to the end of 2009; In the past three years, inflation has remained above the targeted band.

The inflation rate, which was below the target value for the first time as of 2009, was re-estimated as 7.5 for the end of 2009 and 6.5 for the end of 2010 (previous target is 4%) (Özatay, 2011, 412-416). The deep fluctuations in financial systems after the global crisis revealed the importance of financial stability for developing countries; In this context, towards the end of 2010, the CBRT made a gradual adjustment in the direct inflation targeting regime, including financial stability. In the new regulation, which aims to narrow the volatility caused by capital flow, credit expansion and possible shocks in the exchange rate; Policy instruments were expanded by targeting financial stability as well as price stability. Policy instrument with formerly policy interest; Liquidity management has been expanded with the addition of the interest rate corridor and ROM (CBRT, 2012).

In September 2011, ROM application started with %10 reserve option ratio (for foreign currency and gold); As of October 5, this rate was reduced to %20 for foreign currency and to %40 for foreign currency as of October 27. As of June 2012, the coefficients in the ROM application were differentiated and the ROC was announced as 1.4. (Alper, Kara and Yörükoğlu, 2012). As can be understood from this, as of the first half of 2012, the CBRT implemented a strict liquidity policy by taking into account price stability, and in the second half of the year, it loosened its liquidity policy and ensured that short-term interest rates moved close to the floor limit of the corridor. As of December, in order to balance a possible financial instability against the increasing capital mobility, the policy interest rate was reduced on a limited basis and a measured tightening was made in the mandatory provisions. In summary, while 2011 was a year in which new policy implementations took shape, 2012 was a year in which these policies bore fruit. Inflation has decreased steadily this year and economic activities have continued to grow (CBRT, 2012).

By 2013, the CBRT applied an interest rate cut in the first quarter, which increased imports and created a current account deficit, causing a depreciation in the TL. Although domestic demand has entered the recovery process this year, uncertain monetary policies in the foreign world have reduced capital mobility. in 2014, with a more rigorous stance

in monetary policy, credit growth slowed down, domestic devaluation and the country risk premium increased. Later in the year, interest rates started to decline due to the improvement in uncertainties in the foreign market and the country's risk premium.

By 2015, due to the positive effect of the fall in oil and commodity prices and the tight stance of the CB on inflation, it was announced that new regulations will be made for banks in terms of their foreign currency reserves (Çetin, 2016, 88). As of the end of the year, policies that will ensure financial stability and exchange rate stability and take a firm stance against inflation have been targeted. In this way, both credit expansion has been fixed at a certain level and commercial loans have been kept higher than consumer loans. Thus, a contribution has been made to achieving the balance of the economy.

In the first quarter of 2016, the CBRT aimed to eliminate the pressure on inflation caused by fluctuations in energy and food prices and the cumulative exchange rate by maintaining its tight stance in monetary policy. In this context, the upper limit of the interest rate corridor has been gradually lowered by a total of 250 basis points until September. During this period, it fulfilled its liquidity needs with one-week repo auctions, but as of the second quarter of the year, it increased its marginal funding share. the inflation target for the period 2017-2019 was set at %5 (CBRT, 2016).

The exchange rate fluctuations that occurred at the beginning of 2017, together with the global and geopolitical shocks in 2016, determined the direction of monetary policy. Due to the exchange rate-based inflation risk, a strong tight monetary policy was implemented throughout the year by increasing the tightening in the second quarter of the year. In order that this stance does not cause negative effects on financial markets and price stability, the CBRT; Increasing overnight and GLP lending rates and closing one-week repo auctions, a gradual decrease was achieved in funding, lowering the reserve requirement ratios and transferring foreign currency to the market (CBRT, 2017).

The tight stance of monetary policy continues in the first months of 2018. The CBRT's tight monetary stance has been strengthened as a result of the continued rise in public inflation expectations due to unhealthy pricing behaviors in the market. Some decisions were taken to reduce the uncertainty of monetary policies and to activate the transmission mechanism. In this context; The one-week repo auction rate was determined as the policy rate and the funding made by the CBRT was carried out entirely through weekly repo auctions. It was decided that the overnight interest rates would follow a +/- 150 basis points difference around the policy rate, thus, the overnight rates and the policy

rate formed a symmetrical band. In August, with the devaluation of TL stemming from the financial market, the CBRT within the scope of ensuring financial stability; It reduced the required reserve ratios in TL and foreign currency, relaxed the bank guarantee conditions, allowed the rediscount loans to be repaid in TL and provided funding only on the overnight lending rate. As the cost pressures caused by the financial fluctuations in this period affected inflation negatively, a strong monetary stance was adopted to ensure price stability as of September. In addition, the policy rate was increased to %24 and the funding process was transferred to weekly repo auctions again. (CBRT, 2018).

In 2019, the tight monetary policy stance was maintained in sync with the trend of inflation in the country. In order to transfer the gold savings of the people under the gold pillow to the financial system; "Gold Swap Market for TL" was opened in May and "Gold Swap Market for Currency" was opened in October. In addition, in August, required reserves were regulated to support financial stability. As this tight stance of the CBRT brought about a significant improvement in inflation, the policy rate was gradually reduced to 14% between July and October. By expanding the monetary policy tools to improve the transmission mechanism and financial markets; In March, the amount of undue transactions in the FX Currency TL Swap Market was increased, and transaction limits were increased to %40 of their current limits, and in June, liquidity disbursement to Primary Dealer (PM) banks through OMO started again (CBRT, 2019).

By 2020, due to the Covid-19 epidemic, it has shown its effect in some sectors such as tourism and foreign trade since the middle of March and spread throughout the economy as of April. The economic and social closure period implemented within the scope of the epidemic affected the service sector and employment the most. In this context, the interest rate cuts in July 2019 continued. In addition, liquidity support was provided to banks in TL and foreign currency in order to prevent banks from experiencing liquidity problems. In this context; increasing the bond portfolios, reducing the required reserves in foreign currency, etc. procedures have been applied. There was an expansion in this period, especially in individual loans, as banks made loans available. Until mid-May, inflation followed a positive course due to commodity prices abroad; Afterwards, core inflation increased due to unit cost increases. The TCBM did not change the policy rate, predicting that inflation would decrease in the other half of the year. After the middle of May, the gradual easing of the Covid-19 restrictions and the contribution of the other measures mentioned above, a positive course was observed in domestic demand and

economic activities. With the increase in exports, GDP exceeded its pre-epidemic value in the second quarter of the year; The rapid credit expansion and the decline in the tourism and service sectors increased inflation and current account deficit indicators. With the worsening of inflation expectations, the deterioration of the current account balance and the increase in dollarization, the exchange rates and risk premium increased and the foreign exchange reserves melted. As the effects of the epidemic did not progress as predicted on macroeconomic parameters such as inflation, policies began to be tightened even more as of August. November September saw a 200 basis point increase in the policy rate; in November, this rate was increased from %10.25 to %15 in order to eliminate inflation risks. This and other liquidity made, along with exchange rate and communication policies, tended to decrease in the risk premium after November, foreign capital inflows increased and TL gained value. In 2020, the main trigger of inflation was the movements in exchange rates; at the end of the year, the TL experienced a 40% depreciation against the basket exchange rate. while the high inflation risk remains important for 2021, it is aimed to maintain the tight stance of monetary policy against the inflation risk and other risks that will occur together (TCBM, 2020).

By 2021, throughout the year, factors such as international food and commodity prices, domestic demand, costs, exchange rate fluctuations, supply-side disruptions and price manipulations adversely affected the course of producer and consumer inflation. In this context; Towards the end of the first quarter of the year, the CBRT strengthened the monetary tightening and increased the policy rate from 17% to 19%. The policy rate, which was kept constant until September, was reduced by 500 basis points in September. Although the monetary tightening slowed down the loan demand in general in the second quarter, the rapid increase in the demand postponed during the quarantine period in the transition to full liberalization greatly increased the expansion of retail loans. On December 21, it launched the "Currency Protected Deposit" application to combat currency-induced price instability. Within the scope of this application; If deposit and participation fund holders keep their assets in TL, they will be supported and assets converted to TL under this application will be exempt from required reserve payment (CBRT, 2021).

Finally, looking at the year 2022, the policy rate was kept constant in the first half of the year. In the second half of the year, in order to ensure the continuation of economic activities in the country against a possible global recession risk due to geopolitical and

global financial problems, the CBRT started to cut interest rates continuously in August and the policy interest rate decreased by 500 basis points to 9% as of November. In December, the policy rate was kept constant and the interest spiral was broken. In addition, the "Liraization Strategy", which aims to ensure permanent price stability by taking into account the structural elements of the country, was presented to the public in January. Within the framework of this strategy; It was decided to use TL as a store of value, to increase the share of TL in balance sheets, to use TL as the only means of exchange in domestic commercial transactions, to present TL assets as collateral in CB funding transactions. Within the framework of all these policies, with the strengthening of national reserves, the inflation trend and the depreciation of TL started to slow down. With these strategies, the ROM causing structural dollarization was removed. In addition, the yields provided by GDS decreased in all maturities due to the effect of the new liquidity strategy, and the difference between GDS and policy interest rates was largely eliminated. This has strengthened the effectiveness of the monetary transmission mechanism. In the framework drawn for the year 2023; Although the main target is price stability, financial stability will continue to be observed. “Liralaşma” strategy will be developed and will continue to be in effect. While the inflation target remains fixed at 5% in the medium term; monetary policies will be formed and implemented in a way that will approach the medium-term inflation target. The one-week repo rate will continue to be the main policy instrument, the floating exchange rate will be maintained, and the foreign exchange reserves will be strengthened (CBRT, 2022).

CHAPTER 2: THE SELECTED MACROECONOMIC INDICATORS

In this part of the study; the variables of money supply, consumer and producer price indexes, exchange rate, industrial production index, long term government bonds, motor vehicles prices index, compound leading indicators, private sector credit extention volume, Brent oil prices, retail sales volume index, house price index, and stock prices whose relationship with monetary policy is examined, are explained respectively. Then, a quantitative literature review of the relevant variables is included. The literature review has been added to the part as a table.

2.1. Money Supply

The money supply is the name given to the amount of money (including instruments used as money) circulating in an economy. money supply; It is defined in three ways as M1 (the narrowest money supply), M2 and M3 (the most comprehensive money supply), and the M3 money supply has been calculated by the CBRT since 2005. While M1 money supply expresses the sum of cash in circulation, demand deposits in domestic and foreign currency and other checkable deposits M2 money supply is calculated by adding domestic and foreign currency time deposits and similarly less liquid assets to the M1 money supply. M3 money supply is also calculated by adding money market funds, repo and short-term (with less than 2 years maturity) securities issued by banks to the M2 money supply (Ünsal, 2017, 601-602).

When it is came to define the monetary base and the money multiplier, which are the direct determinants of the money supply (M), the monetary base consists of liquid assets that make up the M1 money supply. Since CBs are afraid of sharp changes in interest rates, instead of providing full control over the size of the monetary base, they provide control over the size of the monetary base by making purchasing and selling transactions on their existing assets. Therefore, there is a direct relationship between the monetary policy practices of the CB in a country and the fluctuations in economic activities in the country (Fischer, Sahay and Vegh, 2002). The money multiplier, on the other hand, is a proportional parameter coefficient that determines how much the increase or decrease in the money supply will be caused by an expansion or contraction in the monetary base. The monetary base (MB) and money multiplier (m) formulas are as follows, respectively:

$$M = m \times MB \quad (2.1)$$

$$m = (1 + c) \div (r + e + c) \quad (2.2)$$

$$M = [(1 + c) \div (r + e + c)] \times MB \quad (2.3)$$

In the equation; "r" refers to the required reserve ratio determined by the CB, "e" refers to the free reserve ratio determined by the banks, and "c" refers to the cash rate held by depositors. Considering the equation (1.3), it is seen that the variables in the money multiplier equation affect the money supply. In addition to the variables included in the equation, market interest rates and expected deposit outflows are also factors affecting the money multiplier. In case of an increase in the current variables (r, e, c) in the monetary multiplier, while the value of the money multiplier decreases (or vice versa), the money multiplier mechanism has an negative relationship with interest rates and has a positive relationship with the expected deposit outflows (Mishkin, 2004, 375-381).

An increase in the cash preference ratio, which is created by the ratio of the cash amount demanded by households to the demand deposits, affects the money multiplier and thus the money supply negatively. A decrease in market interest rates, an increase in inflation rates, informal and illegal activities that have become widespread in the economy are the factors that increase the cash preference rate. Although the preference for cash is considered as a leak in the banking system, demand deposits have an increasing effect on the formation of fiat money through lending.

The time deposit preference ratio, which is another factor affecting the money multiplier and the money supply, and expresses the ratio of demand for time deposits to demand deposits, is considered a leak in the money supply equation since it is not included in the M1 money supply. When there is an increase in time deposit interest rates or a decrease in the expected return of other financial assets, this situation has an increasing effect on the time deposit preference rate and a decreasing effect on M1, which is the money supply in the narrow sense (Şıklar, 2004, 51-53).

While free reserve (ER) is the fact that banks hold some of their demand deposits in cash; The ratio obtained by dividing ER by demand deposits (ER/D) is expressed as the ER ratio (e). Therefore, the increase (decrease) in the ER ratio decreases (increases) the money supply. This rate, which is determined by the opportunity cost of banks, is in

an inverse relationship with market interest rates. When the market interest rate rises, banks will want to earn more interest income and hence lower their ER rates. In addition, this opposite relationship, which can also be explained by the expected return of financial assets, will decrease the ER ratio as the expected return of financial assets will increase when market interest rates increase. In addition, the presence of irregularities in deposit inflows and outflows will have an increasing effect on the ER ratio due to the uncertain and anxious atmosphere it will create (Mishkin, 2004, 380).

Banks are obliged to keep a certain part of their assets such as deposit etc. in the CB. This part, which banks are obliged to keep in the CB in proportion to their assets, is expressed as "required reserves (RR)" (Önder, 2005, 86). The RR rate, which is an exogenous variable in the denominator of the money multiplier equation and determined by the CB, is a monetary policy tool used by the CB to control the money supply. When the RR ratio, which is usually symbolized by the letter "r", is decreased (increased), the money supply tends to increase (decrease) because it is in the denominator of the money multiplier. Therefore, when the CB wants to implement an expansionary monetary policy, it decreases the RR ratios to increase the money supply, while it increases this ratio when it wants to implement a contractionary monetary policy (Günal, 2006, 279).

Currency substitution, which usually occurs in countries with high inflation, is the replacement of the domestic currency by a foreign currency. The prevalence of the American dollar instead of the domestic currency due to high inflation in many countries such as Latin American countries has led to the emergence of the concept of "dollarization" (Calvo and Végh, 1993). The dollarization process first starts with the loss of the function of the currency as a store of value, and then the domestic currency loses its functions as a unit of account and a medium of exchange, resulting in the "currency substitution". Dollarization is triggered by factors such as disruptions and distortions in the markets, high budget deficits, a fixed exchange rate regime with high inflation, excessive public debt and its fragile structure, financial regulations that do not take into account the exchange rate, weak domestic financial market system, lack of legal regulations protecting domestic creditors, poor quality of political and official institutions etc. (Yılmaz, 2006).

The money supply can be internal or external. The issue of whether the money supply is internal or external, that is, whether economic activities are the cause or the result of the money supply, is important for monetary economists. In the 19th century, it

was common to argue that money supply had an effect on inflation and exchange rate, that is, money was a "cause". The realization of this situation leads to the conclusion that the money supply is determined exogenously. The internality of money, which emerged as a requirement of modern banking, is that changes in money demand create a reaction in the money supply (Arestis ve Howells, 2001). While neoclassical and monetary economists argued that the money supply is external, that is, determined independently of demand, Post-Keynesian economists put forward the idea that the money supply is determined internally. While CBs are the determinants of the external money supply, commercial banks and money demand are the determinants of the internal money supply (Palley, 2002).

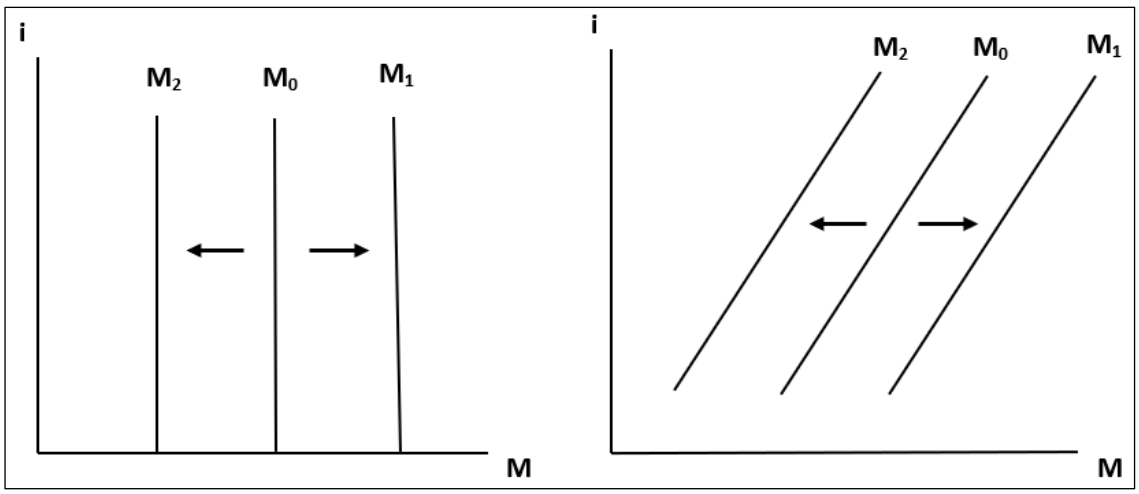


Figure 2.1. : *Exogenous and endogenous money supply (Şıklar, 2004, 60-61). (Re-edited by the author)*

In the exogenous money supply (left), the money supply is insensitive to market interest rates, as the factors determining the money supply are under the control of the CB; In the endogenous money supply, since the increase (decrease) in the interest rates will have an effect on the money demand, the banks will tend to decrease (increase) the free reserve ratio, and that will increase (decrease) the money multiplier value, thus the money supply (Şıklar, 2004, 60-61).

2.2. Consumer Price Index

The CPI is a price index that measures the price change of a basket of goods and services, which shows the average consumption habits of individuals. CPI, which is the index that is frequently used to determine the inflation rate and the price level that

consumers have to meet, is preferred as the main basis for price adjustments in wages and rent increases that affect our daily lives. The service and goods basket in the calculation of this index consists of 12 sub-categories. These categories are:

- Housing, water, electricity, gas and other fuels
- Education
- Health
- Transportation
- Communication
- Entertainment and culture
- Clothing and shoes
- Furniture
- Restaurants and hotels
- Alcoholic beverages and tobacco
- Miscellaneous goods and services
- Food and non-alcoholic beverages

By choosing a certain number of services and goods from each of these categories, it is prevented that any group of goods and services is excluded from the evaluation process in determining the basket. While creating the basket of goods and services, which was taken as a basis in the preparation process of the index; Expenditures made by individuals for their own workplaces, real estate purchases, social security expenses, expenditures made abroad, taxes, donations and second-hand sales are excluded from the scope. Every December, some updates are made, and when the consumption surveys of that year are examined, some goods that gain importance are added to the basket and goods that lose their importance are removed from the basket. Additionally, the weight of seasonal items in the basket is changed. For example, while the weight of vegetables and fruits in the basket increases in the summer months, the weight of fuel expenses increases in the winter months.

Cash sales prices of goods and services within the scope of CPI are obtained from sales points by survey method. Monthly current prices are collected in the weeks covering the 10th and 20th days of the month, and for some products with frequent price changes during the month, price compilation is carried out every week. In this case, it is stated that the index value shows the general average price of each month (Turkish Statistical Institute (TURKSTAT), 2008(a)). Reflecting the changes in the quality of the products to

the price indices is a more complex issue. Although technological developments are taken into account in price determination studies, it has been observed that sometimes the quality increase due to technical developments cannot be reflected in the price indices, that is, price indices tend to overestimate the general price level (Fisher and at al.,1962; Shapiro and Wilcox,1996; Nordhaus,1998).

The final stage for calculating the CPI is the calculation of the index using the compiled prices. During this process, separate indices are created for each region using prices obtained separately for each item in the basket from 26 different regions across the country. Then, CPI is calculated using the "Chain weighting-Laspeyres method" according to the weights of these indices in the basket. It is useful to take some points into consideration to avoid mistakes when interpreting the index. First of all, since the price paid by the consumer, called "market price", is used in calculating the index, changes in the taxes paid by the consumer, such as value added and special consumption taxes, have an impact on the index. On the other hand, the goods and services included in the basket are determined by taking into account the consumer's consumption habits, and the origin of the product is not taken into account. Therefore, customs practices and exchange rates for imported goods have an impact on the CPI. In such a case, when the exchange rate decreases, there will be a price pressure on the domestic producer, so the exchange rate can be determined as an intermediate target in the policies implemented to control inflation. In addition, price indices also contain seasonality, as the prices of some groups of goods and services in the basket fluctuate throughout the year. Therefore, regardless of the frequency at which price indices are evaluated, changes should be interpreted based on the period with the same frequency in previous years (Akyıldız, 2022, 146-151).

Due to the aforementioned seasonality problem and the impact of non-market decisions on the CPI, a search for new indexes has emerged to determine inflation, and in this context, " Customized CPI" or "Core Inflation" indicators have begun to be calculated. These indicators, calculated monthly, are created by eliminating price changes from factors that have temporary and unusual effects in order to determine the main trend of inflation (Atuk ve Özmen, 2009; Wynne, 2008). The purification process can be carried out by removing items that cause price fluctuations from the consumption basket or by using some statistical methods that focus on the distribution of changes in prices. However, TURKSTAT uses the exclusion from the basket method (CBRT, 2011). In the

exclusion method, 6 core inflation indices are calculated from which different groups of goods and services are excluded. These Customized CPI indicators, numbered alphabetically, consist of A, B, C, D, E, F indices:

- A index: seasonal product group such as fruits, vegetables, clothing and shoes,
- B index: goods and services that constitute energy expenditures, alcoholic beverages, tobacco, gold and unprocessed food products (meat, milk, eggs, fish, etc.),
- C index: tobacco products, alcoholic and non-alcoholic beverages, gold, energy and food products,
- D index: tobacco products, alcoholic beverages and unprocessed food products mentioned in the previous title,
- E index: tobacco and alcoholic beverages,
- F index: groups of goods and services whose prices are determined directly by public institutions or whose prices are determined with the approval of public institutions.

The goods and service groups specified in these indices are excluded while creating the Customized indices (Akyıldız, 2022, 152).

Since CPI is an indicator that reflects inflation in the country, it is important to talk about the types of inflation. Although inflation varies in many aspects such as form, source and continuity, it fundamentally diversifies in terms of the sources that pave the way for the formation of inflation. In terms of sources, it is considered as demand, cost and structural inflation. Demand inflation can be defined as an increase in prices when the total demand for goods and services in the country exceeds the total supply. Increases in public expenditures, changes in income, increases in income due to excess balance of payments, and increases in private investment expenditures along with expansions in credit volume can create demand inflation. Cost inflation can be defined as an increase in the prices of goods and services as a result of the increase in the prices of raw materials or factors used in their production. Finally, structural inflation can be defined as an increase in prices due to non-market reasons. In sectors with Monopoly or Oligopoly market structure, those who determine the prices are suppliers the goods and services in these sectors. Therefore, when suppliers determine prices in line with their own goals, first there is an increase in the general level of prices in that sector, and then an artificial price increase occurs that spreads to the entire economy. In addition, to encourage

production, protect the producer, etc., the state sets the prices of some goods and services high for these purposes, causing those who supply these products to make excessive profits. This group, which earns excessive income, causes demand to increase and therefore prices to rise. This price increase is reflected in all sectors over time, creating an increase in the general level of prices (Birinci, 1989).

While low levels of inflation, exchange rate and interest rates in a country indicate high levels of economic performance, high levels of these three indicators indicate low levels of welfare (Özel, 2000, 7-8). Since these indicators are interrelated, these variables must be in balance in order for the country to create a stable internal and external economic performance table (Ekren, 2000, 10). Both exchange rate and inflation can be the triggers of the mentioned process of destabilization of the economic balance. The trigger of inflation is generally public deficits, and borrowing is preferred to cover the deficits (since emissions will create inflation). While borrowing occurs in two ways, from domestic and foreign sources, in developing countries, since savings are insufficient, the borrowing method from domestic sources is generally preferred to cover public deficits, which significantly affects interest rates. In this case, increasing interest rates reduce private investments and reduce the level of production (Sonat, 1996, 123).

2.3.Producer Prices Index

The producer price index (PPI), calculated by TURKSTAT to determine the average price levels of the products produced in the country's economy covering a certain period, reflects the price level at the point where the products are put on the market for sale. In addition, the Producer Price Index is considered as an indicator of the supply-driven inflation pressure of the economy. PPI, which was calculated as a single index until 2013, started to be calculated as domestic (D-PPI) and foreign (F-PPI) as of 2014.

Domestic index shows the price level of products produced and sold domestically in a certain period at the moment they were produced. The foreign index calculates the producer prices of goods produced within the country but sold abroad. While calculating the F-PPI index, a basket is created from products exported from the manufacturing, mining and quarrying sectors and evaluated based on FOB (free on board) sales prices, and the index is published on the 20th day of each month. In this study, the domestic index was used. D-PPI; Since it does not include service and agriculture-oriented sectors such as construction, trade, tourism, communications, agriculture, transportation, fishing,

financial institution activities, forestry, etc. (these sectors constitute a large part of the added value such as 3/4 in the country), it can be described as a price indicator that includes some of the economic activities in the country. While the goods in the basket and their weighting are determined by TURKSTAT while creating the index, the manufacturing industry is the sector with the highest weight in the basket (Akyıldız, 2022, 154). Since data on producer prices are obtained from producers with the help of surveys prepared on the 5th, 15th and 25th days of each month, the index shows the monthly average price change, just like the CPI. The producer price stated here means the cash sales price determined by the manufacturer, excluding taxes reflected on the consumer. Although the same calculation method is used as the CPI, the commodity groups and their weights in the index are updated every year with the changes in the structure of the economy. (TÜİK, 2008(a)).

PPI can move in the same direction with CPI, or it can move in different directions. This transitive situation between the two price indices shows whether inflation is demand-oriented or cost-oriented, and guides policy makers in determining the right policies while controlling inflation (Erdem ve Yamak, 2014). The main idea here is the expectation that producer prices will show the strength of cost pressure on inflation, as an increase in costs will first be reflected in producer prices (Akyıldız, 2022, 155). This pass-through between producer prices and consumer prices has opened two approaches to discussion. The approach that argues that changes in producer prices will be reflected in consumer prices is the supply-oriented approach. In the mechanism of the supply-oriented approach shaped by the New Keynesian view; Since the increase (decrease) in raw material prices will first be reflected in the prices of intermediate goods, then in the prices of inputs, it will be reflected in the prices of the final product and finally in the consumer prices (Belton ve Reichert, 2007). The demand-oriented approach, on the other hand, is shaped by the New Classical view and advocates the view that changes in the demand for already produced goods are primarily reflected in input prices, and this increases (decreases) costs and therefore producer prices (Tiffin ve Dawson, 2002). Saraç and Karagöz (2010), in the paper, revealed that there is a causality relationship from producer prices to consumer prices for Turkey.

2.4.Exchange Rate

The exchange rate, which represents the way foreign currencies are expressed in local currency, determines its own price by the supply and demand conditions in the market, as in other goods, unless there is any restriction or intervention on it. The exchange rate regime, on the other hand, is among the main factors that determine the effectiveness of monetary policy and how open the country is to foreign interventions.

The exchange rate regime is grouped under three subheadings: fixed exchange rate, flexible (floating) exchange rate and semi-flexible exchange rate regimes where these two are used together (Kansu, 2010). The fixed exchange rate regime, in which the foreign exchange price is fixed according to the local currency, refers to the exchange rate regime in which the CB undertakes to buy and sell unlimited foreign currency at this rate, if requested. The flexible exchange rate regime, on the other hand, refers to the exchange rate regime in which the public authority cannot intervene in the market even in periods of fluctuations in the economy, and the foreign exchange prices are determined in the market. It is also rare that the fixed exchange rate regime loses its effectiveness and the exchange rate is completely left to the market conditions. In many countries, semi-flexible exchange rate regimes are preferred, which is a mixture of these two systems, where the exchange rate is determined under market conditions, but in periods when there are excessive price fluctuations that will disrupt the economic balances, these fluctuations are prevented by public authorities (Akyıldız, 2022).

In previous title where the inflation indicator was explained, it was mentioned that inflation generally occurs due to public deficits and that governments resort to domestic borrowing to solve this problem. On the other hand, a large part of the country's income flows into investments to ensure growth, especially in developing countries such as Turkey. While investments are generally financed by domestic savings, developing countries resort to external borrowing because domestic savings are insufficient. If investments are not made in areas that provide productivity with the resources obtained from foreign borrowing, foreign borrowing would be required again for new investments. This cycle would increase the amount of external debt, raise interest rates and gradually increase the country's foreign exchange need (Saleh, 2003, 13). While it is important to maintain the balance between the interest-inflation-foreign exchange trio in order to maintain stability in an economy, the effect of the difference in nominal interest rates

between two countries on the change in the national currencies of those countries is explained by the Fisher equation as follows:

$$i^{DM} - i^{FR} = p^{DM} - p^{FR} = \frac{(E^f - E)}{(E)} \quad (2.4)$$

In above Equation (2.4), it is represented; the domestic interest rate i^{DM}, the interest rate of the other country i^{FR}, the general level of domestic prices p^{DM}, the general level of prices of the other country p^{FR}, Exchange rate E ve expected Exchange rate E^f **(Melvin, 1997, 95).** According to Equation (2.4), the difference between the nominal interest rates of two countries should be equal to the relative difference in the price increases of the countries and the expected change in the exchange rates of the countries. In a country with high inflation, the CB sometimes intervenes in exchange rate increases and evalues to the domestic currency. In this case, based on Equation (2.4), since the expected value of foreign currency will be less than inflation and interest differences, it encourages hot money (short-term funds) to enter the country. However, this situation, which creates a temporary economic recovery for countries, over time upsets the balance in country resources and paves the way for a crisis environment **(Seyidoğlu, 1996, 455).**

2.5.Industrial Production Index

Industrial production index (IPI) is an indicator that enables comparative monitoring of the production capacity of the industrial sector and the increase or decrease in production activities, and is calculated by TURKSTAT on a monthly basis and divided into three sub-sectors. In addition, the industrial production survey applied in 4850 workplaces is used in the calculation of IPI. Sub-sectors in the calculation and their weights in the total production index (index values taking 2010 as reference) is determined; as 81.51% for the manufacturing industry sector, 12.44% for the electricity-gas-steam-air conditioning-production-distribution sub-sector, and 6.05% for the mining and quarrying sector. To measure the increase or decrease in industrial production, a reference year is determined and changed every 5 years. For example, in the 2016 index calculations, 2010 was determined as the reference year. The IPI is published monthly in three different ways: calendar adjusted IPI, seasonal and calendar adjusted IPI, and non-seasonal and calendar adjusted IPI. Among these three indices, the index that expresses

the real situation of the industry is third of them. Calendar-adjusted IPI is obtained by removing the calendar effect from the unadjusted IPI according to the working day and hour. Finally, the IPI adjusted for seasonal and calendar effects is obtained from the IPI adjusted for calendar effects (Koç, Kaya ve Şenel, 2016, 43).

The IPI for the 2015 base year is published monthly by TURKSTAT, based on the most reliable monthly indicators for obtaining information about the general functioning of the economy. The IPI is a quantity index that characterizes the total production obtained from production activities classified under industry, prepared in accordance with the Nace Rev.2 standard. In the Industrial Production Index, mining, quarrying, all of the manufacturing industry and a large part of the energy sub-sector are included in the GDP (TURKSTAT, 2008(b)). This index is calculated by using a basket of materials made up of continuously produced and homogeneous industrial products. Production amount data is also collected through the Monthly Industrial Production Survey, which is organized for the workplaces where the products in the item basket are produced. Information about the index values is also provided by weighting the determined production quantities according to the share of each item in the total industrial value added. In addition, this index is not a monetary expression of production, but an indicator of its physical volume. Therefore, indices reflect real increases in production (Akyıldız, 2022).

2.6.Long Term Government Bonds

Although the bonds are a debt agreement, they can be issued by the government and the private sector and traded in the secondary markets. While the persons or institutions holding the bonds earn interest income, those who issue bonds incur a cost arising from interest. The policy rate also affects the nominal interest rate, which is one of the other interest rates in the market. Nominal interest shows the cost of borrowing. The maturity structure and risk of bonds have an impact on the interest rates of the bond. As the maturity and risk structure of the bond increases, the interest rate of the bond increases. Increasing government investment decisions and budget deficits increase the bond supply. In addition, since the worsening of inflation expectations will create the expectation that interest rates will decrease, the demand for bonds will decrease (Pınar and Erdal, 2016, 213-236).

2.7.Motor Vehicles Price Index

The automotive industry is a sector followed with interest because it reflects industrial production level and total demand in many countries. The sector, production volume is a crucial item for the manufacturing industry as it includes a wide range of sub-industry and intermediate goods. Additionally, since the data collected for the automotive industry was announced before the IPI, it can be an indicator that gives advance notice about the state of the industrial production. Similar to housing purchases, car purchases indicate that the consumer does not expect to have payment difficulties in the future, so car sales reflect consumer confidence, while commercial vehicle sales reflect investor confidence (Akyıldız, 2022, 122).

Market prices for motor vehicles are generally created by adding some taxes as well as production costs. In many countries, motor vehicle tax (MTV) is paid depending on the vehicle's carbon dioxide emissions, the type of fuel used and the amount of fuel consumed. Unlike other countries, Turkey, in addition to MTV, also collects a tax called special consumption tax (SCT), which is calculated on the tax-free sales price of the vehicle and the cylinder volume of its engine (Ömür, 2023). This paper investigates the answer to the question of how motor vehicle prices are affected by the government's monetary policy practices. Therefore, price data compiled for motor vehicles drawn from the sub-items within the CPI and D-PPI indexes were used in the study.

2.8. Compound Leading Indicators

Some indicators that include the dynamics of the future mobility of economic activities are followed as leading indicators. Past experience shows that they can both produce contradictory signals and have poor predictive power individually. At this point, with the idea that an indicator created by using different leading indicators together can make more consistent and meaningful estimations, composite leading indicator (CLI) indices are created in most countries. The CLI created by the CBRT has been published monthly by the CBRT since 2002 in order to predict the transitional processes that determine the periods of economic expansion and contraction in Turkey (Atabek, Coşar and Şahinöz, 2005; Demirhan, 2014).

CLI is an indicator also calculated by the OECD jointly with the relevant units of member countries in order to predict periods of expansion and contraction in economic activity. While creating the indicator, different variables are used that act in coordination

with economic cycles but react earlier, show the early stages of trend reversals, respond quickly to changes in economic activity, and reflect expectations and monetary policy conditions. In the data sets belong to variables are cleared of long-term trends and seasonal effects and focus more on predicting economic cycles. The first stage of the composite leading indicators index is to select the series to be referenced and the variables to be used as indicators of economic activity. When calculating the CLI, GDP and IPI are generally chosen as economic activity indicators, and reference series are selected from both high-frequency and less lagged series. The CLI that represents the economy well should have quick access and a data series in which changes that affect previous results are not made, the series should be published on time, and the cyclical movements in the series should show the movements in the reference series before (Gülhan, Kaya ve Güngör, 2012, 11).

2.9. Private Sector Credit Extention Volume

Monetary policies have significant effects on total demand and other macroeconomic variables in countries with flexible exchange rates and affect economic growth. Interest rates falling through interest rate policy is expected to change total demand by affecting the cash needs and consumption decisions of consumers and the investment and spending decisions of producers. Expansionary monetary policy increases the amount of loanable funds in the financial system by increasing banks' reserves and deposits through assets. From this perspective, the increase in bank reserves and bank deposits increases the amount of loans given by banks. This increase increases the investment amount for investors and consumption expenditures for consumers. As a result, these increases increase the total amount of output and increase growth (Cambazoğlu, 2010:25).

The increase in the amount of credit through expansionary monetary policy will enable companies (especially small and medium-sized companies) to increase their investments. Because most of the time, small and medium-sized companies are highly dependent on bank loans because they do not have the power to find funds directly and easily from the capital market (Örnek, 2009:110).

It is known that approximately 99% of the Turkish economy consists of Small or Medium-Sized Enterprises (SMEs). Therefore, companies mostly prefer banks to meet

their investment expenditure needs due to the underdevelopment of the capital market. Due to the low level of financial development in Turkey and their expertise in solving asymmetric information problems in the credit market, banks play an important role in the effective functioning of the credit channel (Güneş and Yıldırım, 2017, 45). On the other hand, as banks increase the amount of existing deposits by providing loans to the market, this also causes a decrease in loan interest rates. Therefore, while the credit market is expanding, consumption expenditures of households and investment expenditures of businesses are increasing. In other words, banks' reduction in loan interest rates increases the borrowing volume and spending volume of bank-dependent households and investors (Cambazoğlu, 2010:42).

The fact that credit expansions bring along financial vulnerabilities has made it necessary for public authorities and policy makers to focus on this situation. On the other hand, results such as excessive credit expansion triggering balance of payments crises (Kaminsky ve Reinhart, 1999); relationship with economic activities, cyclical movements in private consumption and real asset prices (IMF, 2004); valuation of real exchange rates in relevant periods and faster growth of tradable sectors compared to other sectors (Tornell and Westermann, 2002) emphasize the importance of excessive credit expansion for the real economy. In summary, it is important for financial stability policy to determine the credit expansion periods and their determinants and to predict the said events (Mendoza, 1995).

2.10. Brent Oil Prices

Oil prices, inflation and exchange rate variables are important in determining the economic performance of countries. Changes in oil prices increase production inputs and production costs in developing countries that are dependent on foreign sources for energy supply. The increase in production costs triggers inflation. The increase in production costs causes an increase in the exchange rate. Inflation negatively affects economic growth by reducing purchasing power, real income and competitiveness (Akça, 2023).

Oil prices generally affect the economic structure of a country using six mechanisms, and they are listed as follows:

- According to the classical supply-side economic view, the increase in the price of oil, the main input of production, affects economic activity because it leads to a decrease

in the profit margin in the price of the potential output. Therefore, rising oil prices increase production costs and reduce productivity.

- The rise in oil prices affects the economic structure because it disrupts the foreign trade balance of countries that import oil or, in other words, are dependent on foreign in oil trade. To put it more clearly, the rise in oil prices causes a wealth transfer between the oil-importing country and the exporting country to the oil-exporting country, creating a decrease in the purchasing power of companies and households.
- Another mechanism is that since the rise in oil prices will cause an increase in money demand, if the CB cannot respond to the increase in money demand, it will increase interest rates in the country, causing a decrease in economic activity.
- As it increases the general level of prices, the increase in oil prices in the country can not only cause an excessive increase in inflation, but can also cause a spiral of price-wage increases due to inflation.
- An increase in the price of oil will have a negative impact on investments, consumption and stock prices, causing consumption to fall due to a decrease in disposable income.
- Lastly, If the rise in oil prices is permanent, this would trigger a decrease in production and investments, which would lead to a decrease in employment (İşcan, 2010, 611).

2.11. Retail Sales Volume Index

Consumption-oriented growth policies are a very common method used in many countries, especially in developing countries. Retail sales volume index (RSVI), which is one of the basic indicators when developing policies regarding growth, is also an important tool to provide politicians with data in policy development. Retail sales volume index data in Turkey is included in the Retail Trade Index. More accurately, Retail Trade Index; It consists of RSVI and Retail Turnover Index. The CPI values and the Retail Trade Sector Monthly Question Paper collected by TURKSTAT provide data for retail sales indices. While sectoral Retail Trade Indices are obtained as a result of weighting the index values determined for each subcategory, and Retail Trade Volume Indices are obtained as a result of weighting these indices at a certain rate. In the indices mentioned above to measure retail product sales, the RSVI is obtained with fixed prices, and the Retail Turnover Index is obtained with current prices (Kaya, Şenel ve Koç, 2018, 503).

The retail sales volume ındex RSVI started to be published by TURKSTAT on 23 July 2013. The index is based on the year 2010 and started to be calculated as of this year. The RSVI takes into account the NACE Rev.2 activity grouping so it does not cover motor vehicles and motorcycles and covers sectors that carry out retail trade activities. The index is calculated within the framework of the activity groups NACE Rev.2 (defined by drawing the boundaries in the EU Short-Term Business Statistics Legislation) in order to ensure international comparability (TURKSTAT (a)). This index is an index study to measure monthly sales of enterprises of different sizes and types in the commercial sector. The index is obtained by clearing the price changes of the Retail Turnover Index, which is created with the turnover information obtained from the companies. Although the RSVI is a comprehensive and high-frequency indicator, it cannot be considered as an indicator reflecting the development of national income (Akyıldız, 2022). Since RSVI is calculated at constant prices, it is considered a short-term indicator of consumer confidence and household consumption demand. Within the scope of the index, retail trade consists of sub-activity groups: food, beverages and tobacco, retail trade of non-food products (except automotive fuel) and automotive fuel trade (Kaya, Şenel ve Koç, 2018, 505).

On the other hand, RSVI has an important place among the basic indicators for consumption and is a frequently used tool in correctly interpreting the changes in the retail sector. In this respect, the retail sector plays a dynamic role for the economies of both developed countries and developing countries. In addition, the retail sector; Providing services to many areas such as pharmaceuticals, food, ready-made clothing, petroleum and furniture technological products, etc. shows that it has spread to a very wide area and that the retail sector has undergone a serious global transformation in recent years (Akyol ve Can, 2018, 118).

2.12. House Prices Index

The construction sector, which is called the locomotive of the economy with more than two hundred sectors including its sub-sectors, has a large share in the macroeconomic structure. The housing market, which is one of the sectors within the scope of the construction sector, is an important indicator of consumer expenditures and total welfare. Therefore, it is an inevitable result that housing prices are affected by macroeconomic variables such as interest rate, gross domestic product, money supply, exchange rate etc. and that prices follow a fluctuating course (Badurlar, 2008).

Due to the dependence of the housing market on other sectors, housing prices are affected by changes in current market conditions and cause significant effects on market conditions alone. The housing sector's relationship with other sectors it interacts with is backward-looking, and growth or contraction in the sector causes GNP to grow or shrink. Therefore, a growth in the housing market is considered a tool in the economic growth and monitoring of macroeconomic indicators (Özcan ve Başaran Tormuş, 2018, 506).

It is very possible that a sector that is so influential on macroeconomic indicators can cause crises by affecting the real markets and financial markets in the economy. For example, the mortgage-related crisis that started in the USA in 2008 affected the whole world. This crisis also affected Turkey and the country's growth rate was negatively affected by this crisis. Therefore, the 2008 global economic crisis was deepened by the fear that the deterioration in assets traded in the high-risk housing market would spread to less risky financial assets (Özhan, 2016, 99).

Although the construction sector has many sub-components, it is seen that the sector consists of a significant portion of housing production and sales. Therefore, whether the houses that are built and become ready-for-sale products are priced correctly or the trends in house prices are important indicators for the forecasting of the economy. For this reason, since 2010, the CBRT has started to create the Housing Price Index (HPI), which covers the whole country in order to monitor price movements in the housing market (Adana Karaağaç ve Altınırmak, 2018, 225).

It is calculated by the CBRT as three different indices: Turkey House Price Index (HPI) Turkey New HPI and Non-New HPI. In the calculation of this index, regardless of the year of construction, all the houses subject to sale are included in the scope, while only the houses built in the current year and the previous year are included in the Turkey New HPI (CBRT (c)). Since the increases in housing prices have a positive effect on consumption and investment expenditures with the effect of wealth, the development in this index can be associated with growth performance (Akyıldız, 2022).

Besides it is important for the course of the economy which economic factors and variables are affected by the HPI and the extent of this effect, there are some difficulties in calculating the HPIs. The two main difficulties of the index, which aims to measure sales price movements of houses; the first is that the houses are not homogeneous in terms of location and characteristics, and the second is that not enough houses are sold to provide data (Bollerslev vd., 2016, 1007).

The HPI calculation in Turkey is determined according to the Stratified Median Price Method. While the method aims to create relatively more homogeneous layers by clustering houses with similar characteristics and locations, the general price index is reached by weighting the median unit price calculated for each layer (Adana Karaağaç ve Altınırmak, 2018, 225).

2.13. Stock Prices

Stocks are valuable documents that show that the company's assets and returns are shared in certain shares. Its stocks are traded on Istanbul Stock Exchange (BIST), an organized securities market in Turkey. BIST100 index represents 100 stocks with the highest trading volume traded in the stock market. The return of the stock, unlike the bond, consists of the increase in the market value of the stock and the sum of the profit share. Therefore, those who hold the stock share the company's profit as well as its loss. In addition, stocks which are a certificate of partnership do not have a maturity date and their return is not predetermined (Pınar and Erdal, 2016, 200-216). Stocks is known that macroeconomic factors such as the CPI, interest rates, exchange rates, money supply, and industrial production index have a significant long-term impact on stock prices (Aktaş, M., & Akdağ, S., 2013). Also, Stock prices tend to react negatively to an increase in interest rates and positively to a decrease in interest rates, and the effect of changes in the money supply on stock returns is a subject of debate. While some economists argue that an increase in the money supply will positively affect stock prices, others believe that changes in the money supply will have a negative impact on stock prices, as they suggest that it will disrupt investors' portfolio balances and result in a wealth effect (Altıntaş, H., & Tombak, 2011).

Its stocks are traded on the BIST, an organized securities market in Turkey. BIST100 index represents 100 stocks with the highest trading volume traded in the stock market. A study on the macroeconomic factors influencing stock returns in Istanbul Stock Exchange has been conducted. It was determined that an increase in the industrial production index has a short-term positive effect on stock returns, but it decreases them in the long term. Increases in inflation have been found to positively impact stock returns both in the short and long term, with the short-term effect being higher and statistically significant. Additionally, it was observed that savings deposit accounts are a substitute for Istanbul Stock Exchange, and an increase in the interest rates applied by banks on

savings deposits particularly reduces stock returns in the short term (Sadeghzadeh, K., & Elmas, B., 2018).

When the relationship between interest rates and share earnings is examined, there is an inverse relationship between interest rates and earnings per share. On the other words, while interest rates rise, earnings per share decrease. At some point, the equity line intersects with the debt line, which is the indifference point. Below this point, financing with debt results in higher earnings per share, while above it, equity financing is more profitable due to the higher interest rates. Economic growth has been found to have a positive impact on the average returns of stocks in both the short and long term. (Yener, E., 2023) The return of the stock, unlike the bond, consists of the increase in the market value of the stock and the sum of the profit share. Therefore, those who hold the stock share the company's profit as well as its loss. In addition, stocks which are a certificate of partnership do not have a maturity date and their return is not predetermined (Pınar and Erdal, 2016, 200-216).

2.14. Literature Review

Within the scope of this study, a literature review was conducted on studies based on the relationship between the above-mentioned macroeconomic variables and various monetary policy instruments. The results of the examined literature are tabulated and presented in Table 2.2 below.

Table 2.1: *Literature review for Turkey.*

Author(s)	Periods	Econometric Methods	Results
Büyükakın, at al. (2009)	1990M1-2007M9	Toda-Yamamoto and Granger causality tests	A change in the overnight interest rate affects the price level.
Oktar and Dalyancı (2011)	2003M1-2011M6	VEC, Cointegrassion test and Granger causality test	In the long run, there is a relationship in the same direction between the CBRT policy rate and the CPI.
Kaya and Oz (2016)	1980Q-2014Q	ARDL	An increase by %1 in the money supply raises the price level by %48.

[Table 2.1. (Continue) *Literature review for Turkey*]

Torun and Karanfil (2016)	1980-2013	VAR and Granger causality test	A causality relationship from interest rate to inflation has been determined.
Yıldırım (2016)	1997-2014	FMOLS, DOLS and Granger causality test	There is a bidirectional causality relationship between the interest rate and the CPI.
Taban ve Şengür (2016)	2003M2-2014M12	VAR and Granger causality test	There is no causal relationship between interest rates and CPI.
Yenice ve Yenisu (2019)	2003M1-2018M4	ARDL and Toda-Yamamoto causality test	There is a one-way causality running from the exchange rate to the interest rate. A cointegration relationship was found between the CPI and the interest rate.
Akçalı, at al. (2019)	1999M3-2018M12	ARMA-EGARCH	Overnight interest rate, real effective exchange rate and CPI series are effective on each other's conditional variability.
Kılavuz and Altınöz (2020)	2006Q4-2018Q4	ARDL	There is a statistically significant and positive relationship between M2 money supply and CPI in the long run.
Ergeç, at al. (2008)	2002M1-2007M12	Granger Causality	A bidirectional causality relationship has been identified between construction sector output and M3 money supply.
Badurlar (2008)	1990-2006	VECM	A unidirectional causality relationship from money supply to housing prices, and a bidirectional causality relationship between short-term interest rates and housing prices has been determined.
Darıcı (2018)	2010M-2016M	ARDL	There is a positive relationship between the M2 money supply and the housing price index.
Bayır (2019)	2011M-2017M	S-VAR	No relationship was found between the overnight lending rate and housing prices.
Akpolat (2020)	2010M1-2020M3	Hatemi-J asymmetric causality	A bidirectional causality has been determined between the mortgage loan interest rate and house prices.

[Table 2.1. (Continue) *Literature review for Turkey*]

Türkyılmaz ve Özata (2008)	2001M5-2005M12	VAR and Granger causality test	There is a one-way causality relationship from money supply (M1) to stock prices.
Şahin (2011)	2005-2010	Panel data analysis	Interest rates on GDS bonds, which have one month to maturity, have an impact on stock prices.
Özer vd. (2011)	1999M1-2009M12	Johansen-Juselius cointegration test and Granger causality test	There is a long-run relationship between the interest rate, money supply and stock prices.
Gökalp (2016)	2010M5-2014M11	GMM method	It has been determined that decreasing the lower limit of the interest rate corridor increases stock prices, while increasing the upper limit of the corridor decreases it.
Koyuncu (2018)	1988-2016	FMOLS and DOLS	A 1% increase in the interest rate decreases the BIST-100 index by 4.78%.
Kaya (2018)	1998Q1-2016Q3	DSGE	There is a bidirectional causality relationship between monetary policy shocks and stock prices.
Ojaghlou and Demirkale (2020)	2005Q4-2019Q3	S-VAR	M2 and M3 money supply affects BIST100 negatively in the long run.
Ünal (2020)	2006Q1-2019Q3	ARDL	An increase in the M3 money supply positively affects the BIST-100 index.
Altıntaş and Kassouri (2021)	2002M-2018M	NARDL	It has been determined that positive increases in the M3 money supply increase stock prices.
Tunalı ve Yalçınkaya (2017)	2012M9-2017M12	Johansen cointegration test and Granger causality test	There is a bidirectional causality relationship between the CBRT's weighted average funding cost and the dollar rate.
Akıncı ve Özyılmaz (2016)	1980-2012	DOLS, Johansen-Juselius cointegration test and Granger causality test	There is a one-way causality relationship from the money supply (M2) to the interest rate.
Aklan ve Nargeleçekenler (2008)	1998Q1-2001Q4	Balanced Panel data analysis	The overnight interest rate has a weak effect on banks' credit supply. The impact varies depending on the liquidity levels of banks.

[Table 2.1. (Continue) *Literature review for Turkey*]

Yiğitbaş (2013)	1990Q1-2012Q4	VAR analysis	A unidirectional causality was found from monetary policy to bank loans, and a bidirectional causality was found from bank loans to industrial production.
Yiğitbaş (2015)	2003M1-2012M12	OLS and Granger causality test	There is a one-way causality relationship from loan interest rate to business loans.
Abbasoğlu, at al. (2018)	2002Q4-2015Q1	Panel data analysis	The increase in the policy rate reduces commercial credit expansion at different rates depending on the size of banks.
Sekmen, Topuz (2020)	2006Q1-2019Q4	Toda-Yamamo, Hacker and Hatemi-J causality tests	The causality relationship from money supply to credit expansion is more uncertainty than CB interest rates.
Batırlık, at al. (2023)	2011M1-2022M6	Fourier ADF, Fourier Causality method	Automobile sales have no relationship with the interest rate, but there is a one-way causality relationship with the vehicle loan interest rate.
Yaylalı, Fuat (2012)	1986Q2-2010Q2	VAR analysis	Crude oil prices have a greater impact on monetary policy, especially on the money supply. Oil prices and monetary policy are the source of inflation.
Ünal (2021)	2006M1-2020M1	ARDL bound and Toda-Yamamoto Causality test	Oil prices are a one-way Granger cause of inflation.
Çelik, at al. (2023)	2006M1-2022M6	Wavelet Method	While Oil prices are driven by uncertain global policies, proving the sensitivity of its momentum power on inflation at certain dates.
Arslan, Ergeç (2011)	1992Q1-2006Q4	VAR Analyis	The manufacturing industry sector reacts more strongly to monetary policy than others.
Kaplan (2020)	2008M1-2019M12	Granger Causality and Breitung-Candelon Frequency causality	While industrial production causes changes in total deposits in the short term, there is no causality relationship in the long term.

CHAPTER 3: ECONOMETRIC ANALYSIS OF THE EFFECTS OF MONETARY POLICY ON SELECTED MACROECONOMIC VARIABLES

In the last (econometric analysis) part of the study, explanations about the relevant variables and used dummy variables, the sources from which the data were obtained, are included. Besides, graphs showing the original values, the logarithmic forms and the first difference of the variables are presented. Then, theoretical information about the concept of stationarity and the unit root tests performed are explained and the unit root test results obtained are presented in tables. In the following, theoretical information about the models used in the study and the results obtained for each variable are presented under separate headings, respectively. Finally, the robustness of the results obtained with the causality test was tested and the results of the study were included.

3.1. Dataset

The variables used in the econometric analysis of the relationship between monetary policy and selected some macroeconomic indicators in Turkey, whose the literature was examined in the previous section, and their definitions and sources are shown in the table below. Within the scope of the analysis to be made, the sample period covers the range of 2011;M1- 2021;M9, since some selected variables have recently started to be observed in Turkey.

Table 3.1 : *The variables used in the econometric analysis.*

Variable	Definition	Source
IR	Policy rate (one-week repo rate)	CBRT
USD	Exchange rate (U.S. Dollar, buying)	CBRT
BIST	İstanbul Stock Exchange 100 Index (closing price)	CBRT
CPI	Consumer price index	CBRT
PPI	Producer price index	CBRT
IPI	Industrial production index (seasonal adjusted)	CBRT
M1	M1 Money supply	CBRT
M2	M2 Money supply	CBRT
M3	M3 Money supply	CBRT

[Table 3.1. (Continued) *The variables used in the econometric analysis*]

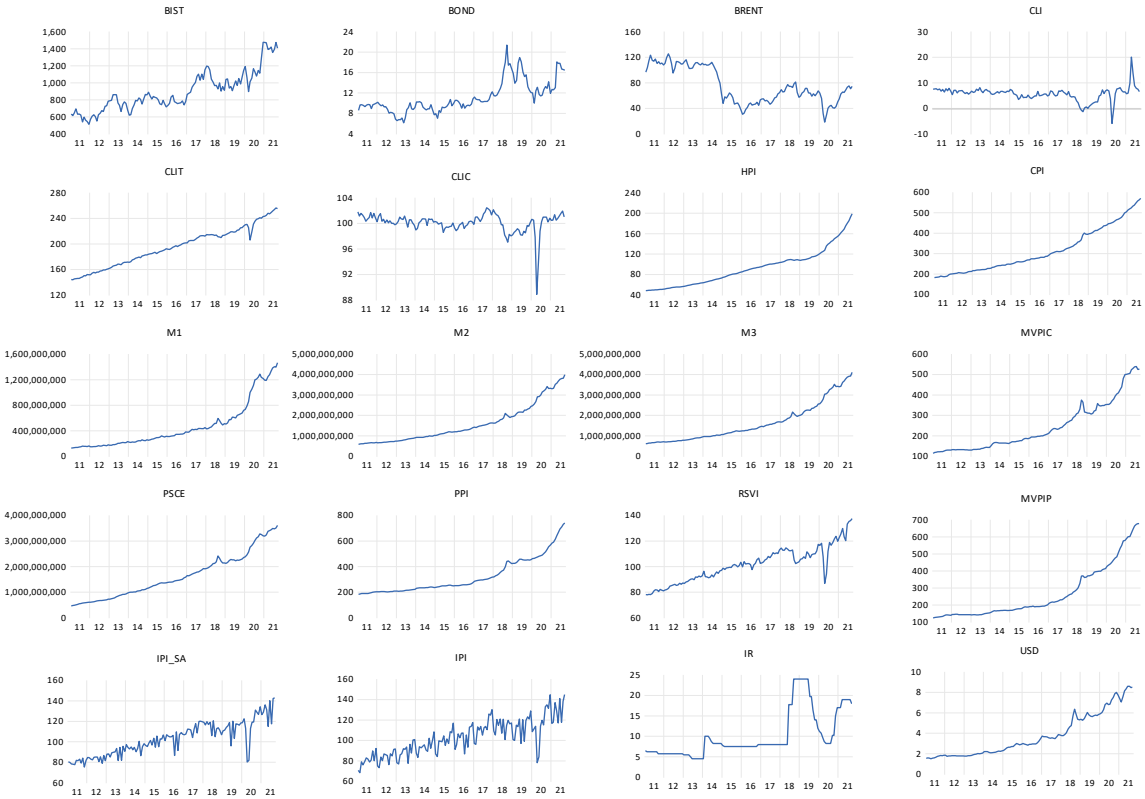
PSCE	Private sector credit volume expansion	CBRT
CLI	Compound leading indicators (12 month rate of change)	CBRT
CLIT	Compound leading indicators (trend restored)	CBRT
GDS	10 year government debt securities rates	BLOOMBERG
MVPIC	Motor vehicle price index (according to cpi)	CBRT
MVPIP	Motor vehicle price index (according to ppi)	CBRT
HPI	House price index	CBRT
BRENT	Europe Brent Spot Price FOB (Dollars per Barrel)	U.S. EIA
RSVI	Retail sales volume index (seasonal and calendar adjusted)	TURKSTAT

In addition, the following dummy variables are added as externalities to the analyzes for some shocks that occurred in the selected sample period. These dummy variables were created by examining the breakpoints in the BP unit root test and graphs of the related variables.

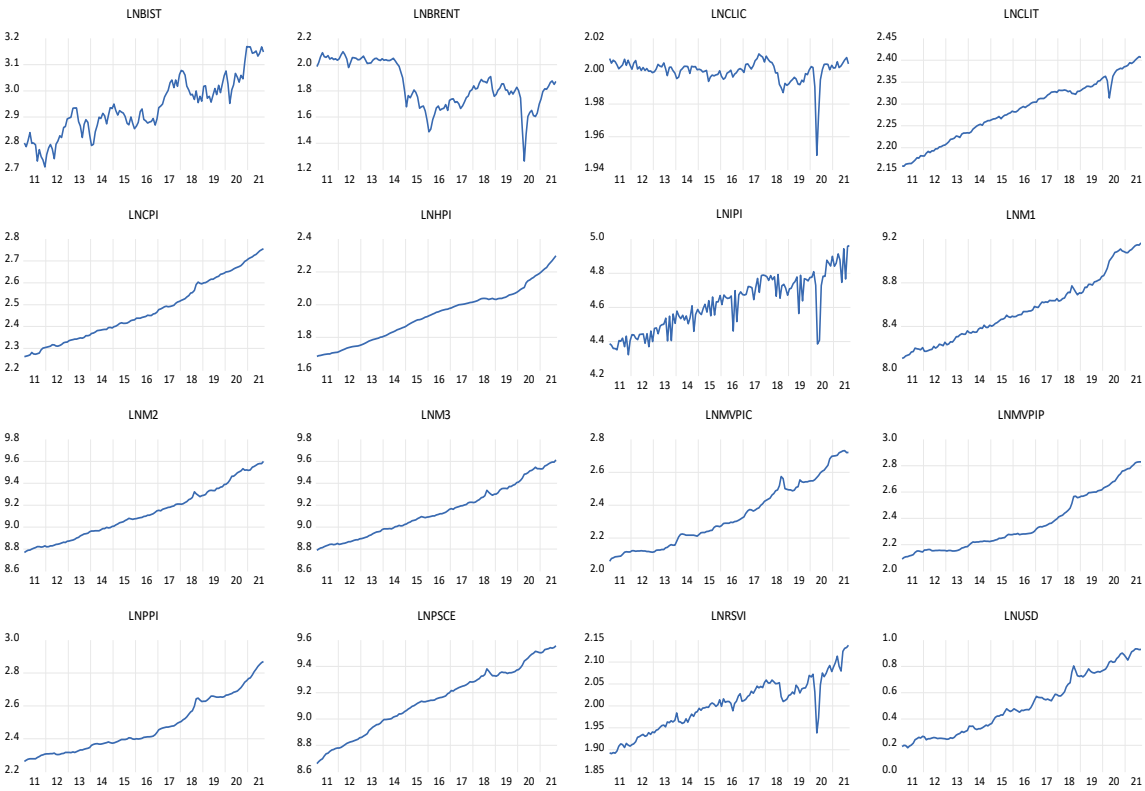
Table 3.2 : *Dummies used in the econometric analysis.*

Dummies	**Definitions**
COVIDDUM	The arrival of the Covid-19 pandemic in Turkey (2020)
ISODUM	Full isolation period due to the pandemic (2020)
MVPIDUM	The end of the Special Consuption Tax (SCT) reductions (2019).
TIGHTDUM	The fluctuations in the exchange rates, and domestic and global financial markets because of the United Kingdom's departure from the European Union and its protectionist policies in trade, President and 27th Term Member of Parliament elections in Turkey (2018) CBRT's strong tightening monetary policy (2018)

The original values of the CLI, GDS and IR are used in the analysis, since they are rate variables; logarithmic forms of all other variables were included in the analyses. The following graphs show the original and logarithmic forms of the variables. Eviews 9 statistical package program was used to obtain the logarithmic forms of the variables and their graphs below.



Graph3.1: *Original values of the all variables used.*



Graph 3.2: *Logarithmic values of the variables used.*

3.2. Stationary

Econometric time series are trend, seasonality, conjuncture etc. contain irregular movements. Therefore, the variables in the time series take various values around a certain trend. In addition to these movements, various external shocks can also create a temporary or permanent trend in time series. While the concept of stationarity is defined as the values forming the time series approaching a certain value over time; When a shock occurs that creates a permanent and new trend, the variables in the series are prevented from approaching the specific value in question. In this way, the series with a permanent trend are not stationary (Tarı, 2011, 374-375). A stationary series has a fixed mean even with a long-term fluctuation:

$$E(Yt) = \mu \tag{3.1}$$

A stationary series must have a time-invariant finite variance:

$$Var(Yt) = E(Yt - \mu)^2 = \sigma^2 \tag{3.2}$$

As the lag of a stationary series gets longer, the correlogram approaches zero and eventually takes the value zero (Kutlar, 2005, 307-308; Tarı, 2011, 387):

$$\gamma k = E((Yt - \mu)(Yt{-}k - \mu)) \tag{3.3}$$

For all t values, k represents the lag distance. Time series variables that do not meet these conditions are not stationary. The stationarity of the variables in a time series can be investigated by correlogram test or unit root tests. In this research, unit root tests were used to test the stationarity and the unit root tests used are explained below.

3.2.1. Preliminary tests (unit root)

Unit root tests are tests developed to test whether a time series is stationary. The long-term values of a time series can be used to see how the value taken in the previous period affects the current period. In order to examine the effect of the previous period values on the current period, the value of the series in each period should be regressed with the values obtained in the previous periods (Tarı, 2011, 387). A regression involving

non-stationary time series results in a spurious or statistically insignificant regression (Gujarati, 2016, 320).

Although various methods have been developed for this purpose, in this study; Extended Dickey-Fuller, Dickey-Fuller Gls, Phillips-Perron, Kwiatkowski-Phillips-Schmidt-Shin, Ers Point- Optimal, Ng – Perron and Breakpoint unit root tests are explained.

3.2.1.1. Augmented Dickey-Fuller Unit Root Test (ADF)

To understand the ADF unit root test, it is first necessary to understand the first unit root test developed by Dickey and Fuller (1979). The relationship between the value of any Y_t variable in the current period and its value in the previous period is shown in Equation (3.4):

$$Y_t = \rho\, Y_{t-1} + \mu_t \qquad (-1 \leq \rho \leq 1) \tag{3.4}$$

In this equation; it is represented The current period value Y_t, the previous period value Y_{t-1}, the white noise error term μ_t. Here, it is actually the ρ term that is investigated in unit root analysis. Equation (3.6) is obtained if this term is equal to 1:

$$Y_t = Y_t - 1 + \mu_t \tag{3.5}$$

In other words, the value of the variable in the current period completely reflects the value of the previous period. In this case, it is concluded that there is a unit root in the related series. If the coefficient of ρ is less than 1, it can be said that the effect of the shock that occurred in the previous period on the series will disappear over time. One of the most common methods used to make a non-stationary series stationary is to take the difference of the series with respect to time. Assuming that the Y_t series given in the above equation is not stationary, that is, the ρ coefficient is equal to 1, Y_{t-1} is subtracted from both sides of Equation (3.5) as in Equation (3.6) to make the series stationary, and Equation (3.7) form can be write:

$$Y_t - Y_{t-1} = \rho\, Y_{t-1} - Y_{t-1} + u_t \tag{3.6}$$

$$\Delta Y_t = \theta\, Y_{t-1} + u_t \tag{3.7}$$

In Equation (3.7), for simplification, it is represented by the term θ instead of the coefficient (ρ-1). In the equation, if the coefficient of ρ is equal to 1, θ will be equal to zero and therefore Equation (3.8) will be obtained:

$$\Delta Y_t = (Y_t - Y_{t-1}) = u_t \quad (3.8)$$

By taking the first difference in Equation (3.8), the Yt series became stationary. In this case, the series Y_t is called a first-order stationary series and is expressed as I(1). An already stationary time series is represented as I(0). Equation (3.7) is an equation created for a no fixed and trendless model. It is created like Equation (3.9) for a fixed model and Equation (3.10) for a fixed-trend model:

$$\Delta Y_t = \beta_1 + \theta Y_{t-1} + \varepsilon_t \quad (3.9)$$

$$\Delta Y_t = \beta_1 + \beta_2 t + \theta Y_{t-1} + \varepsilon_t \quad (3.10)$$

The null hypothesis for the Dickey-Fuller (DF) test ($H_0 : \theta = 0$) states that the time series contains a unit root, it is not stationary or it is probabilistic. The alternative hypothesis ($H_1 : \theta < 0$) states that there is no unit root and that the series is stationary or around a definite trend.

For the case where there is autocorrelation between the error terms, the ADF test was developed in the study. The difference of the ADF test equation from the DF test is that the lagged value of ΔY_t is also added to the equations. Equation (3.11) is given below for the fixed and trend model. The same applies to other models:

$$\Delta Y_t = \beta_1 + \beta_2 t + \theta Y_{t-1} + \sum_{i=1}^{m} a_i \Delta Y_{t-i} + \varepsilon_t \quad (3.11)$$

ADF test is tested on the same hypotheses using the same table critical values as DF. To test the hypotheses, table critical values called "tau" statistics or later developed "MacKinnon" critical values are used.

3.2.1.2. Philips-Perron Unit Root Test (PP)

While the DF unit root test calculates on the assumption that the error terms are independent and identical, the ADF test reconstructs the model by adding the lagged difference variables to the model, and the possible sequential relationship between the error terms. Unlike the ADF test, Phillips and Perron (1988) use non-coefficiental statistical methods to add the sequential relationship between the error terms to the model (Gujerati, 2020, 754-758). Additionaly, in the PP test; Although the independence and homogeneity assumptions of the DF and ADF error terms are invalid, hypothesis testing is constructed in the same way as these tests (Kutlar, 2005, 321).

3.2.1.3. Dickey-Fuller Gls Unit Root Test (DF-GLS)

The DF-GLS unit root test is proposed by Elliott, Rothenberg, Stock (ERS, 1996) and has a high performance in terms of sample size and power. (Baum, Sperling, 2001). This test, which includes an autoregressive model, is more powerful than its predecessor unit root tests. In this test, firstly, the time series to be used is purified from local trends and then the traditional ADF test is applied to the new series created. In this way, parts of the series close to the non-stationary region are freed from linear trends and averages (ERS, 1996).

3.2.1.4. Kwiatkowski-Phillips-Schmidt-Shin Unit Root Test (KPSS)

KPSS unit root test proposed by Kwiatkowski et al. (1992); It was defined as the ratio obtained by dividing the sum of the squares of the partial sums of the series(s) examined with a long-term variance estimator, and was first created to test the H_0 hypothesis that the time series is stationary against the hypothesis that the series is not stationary. When it is examined together the ADF test which uses the H_0 hypothesis which states that the time series contains a unit root, and the KPSS test which uses the H_0 hypothesis which states that the series does not contain a unit root in an any study; In this way, the robustness of the results is proven statistically by cross-checking (Özer, et al., 2018).

3.2.1.5. Ers Point- Optimal Unit Root Test (ERSP-O)

Again, by Elliot et al. (1996), it has been found that this test is more powerful than the currently used stationarity tests when a time series has an unknown mean or a linear

trend. In this test, a semi-differentiating regression equation is used; The H_0 hypothesis is again based on the existence of a unit root and the calculated statistical value is compared with the simulation based critical values of ERS and interpreted. (Cooray, 2007).

3.2.1.6. Ng – Perron Unit Root Test (NG-P)

This unit root test, developed by Ng and Perron (2001) and consisting of four tests (MZa, MZt, MSB and MPT), uses modified (M) information criteria. These tests have a full size and local asymptotic power around the nominal size, even in the case being of a negative moving large mean component. (Perron, Qu, 2007). Among these tests, the H_0 hypothesis for MZa and MZt is based on the presence of a unit root, while the H_0 hypothesis for MSB and MST is based on the absence of a unit root. In this case; while the H_0 hypothesis is rejected when the test statistics for MZa and MZt are greater than the critical values calculated by Ng-Perron, the H_0 hypothesis cannot be rejected when the test statistics for MSB and MST are less than the specified critical values (Göktaş, 2008).

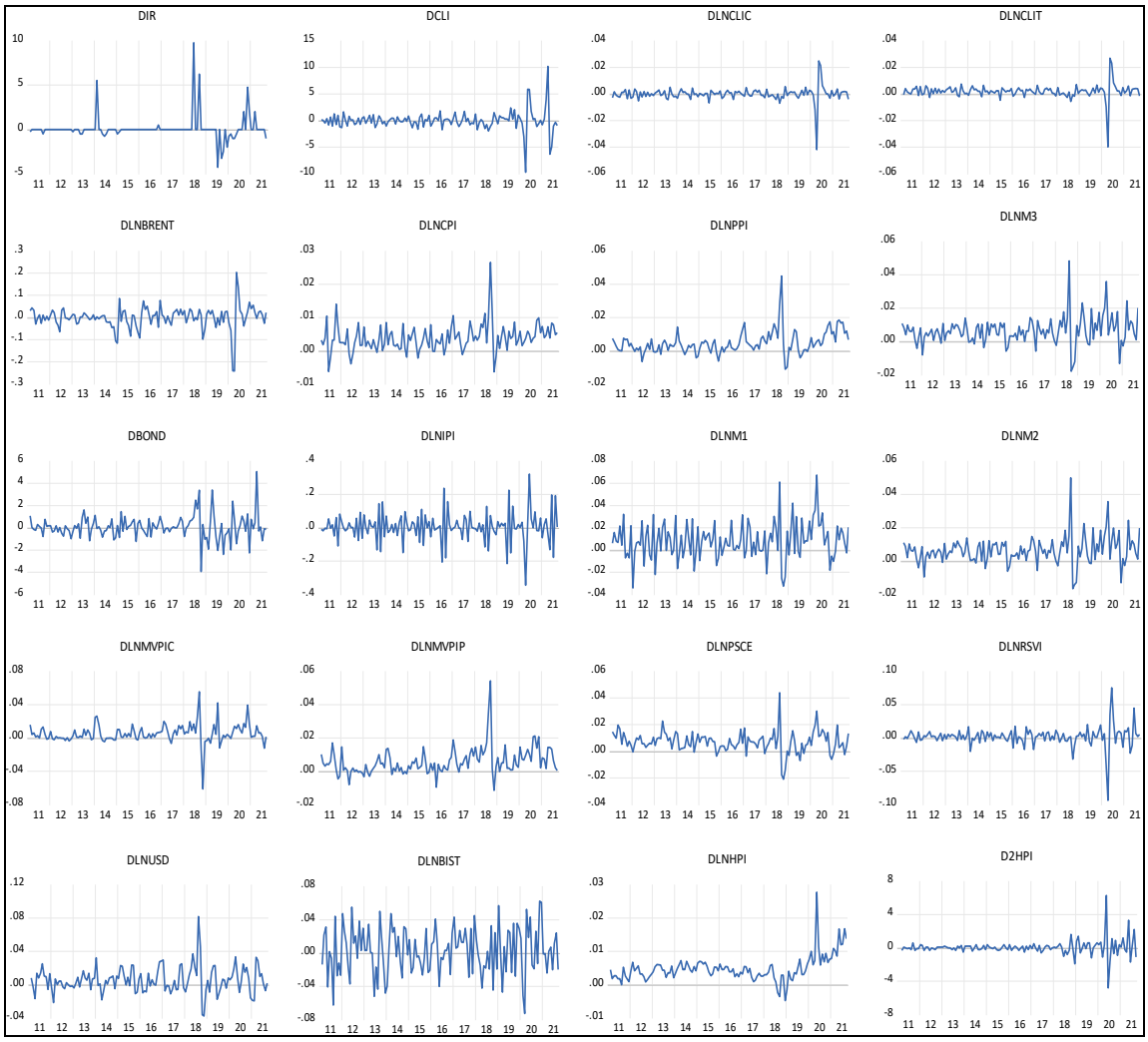
3.2.1.7. Breakpoint Unit Root Test (BP)

As in this study, some factors that affect political, economic or social life by spreading to the masses can cause breaks in the temporal series. In such cases, as Perron (1989) stated in his study, the breakpoint should not be ignored when it comes to affecting the predicted results. Otherwise, results that do not match the facts may be obtained. Since there may be breaks in temporal series, it is useful to perform a breakpoint unit root test after traditional unit root tests (Sun, et al., 2017). The H_0 hypothesis of this test is based on the existence of a unit root. Therefore, as in ADF, PP etc. unit root tests, when the test statistic value is less than the table critical value or the probability value is less than 0.05 at the %10 (sl.), the H0 hypothesis is rejected.

3.2.1.8. Preliminary test results

All the above-mentioned tests have been carried out and the results are given in the tables below. Additionally, all tests have been conducted taking into account the Schwarz Information Criterion (SIC) and the results were evaluated at the 10% sl, and the stationary values at the specified significance level are shown with the symbol (*). Although the test statistic results of some variables differ according to the unit root test used, in general all the variables are not stationary in the fixed model in I(0), but become

stationary in both fixed and trend models in I(1). The house price index does not become stationary in I(1) in the ADF unit root test. However, the ADF results of HPI variable can be ignored since the test is the oldest traditional test and the stated variable is stationary in I(1) in other unit root tests.



Graph 3.3: *First differences of the all variables used.*

The first difference graphs of the variables are given above in order to make a visual comparison of stationarity of the variables whose graphs of the original and logarithmic form were presented before. On the other hand, the unit root test results of the variables are given in the following tables, respectively:

Table 3.3 : *ADF unit root test results.*

AUGMENTED DICKEY-FULLER UNIT ROOT TEST (SIC)				
Variables	**I(0)**		**I(1)**	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
IR	0.1272	0.0283*	0.0025*	0.0144*
CLI	0.4753	0.9161	0.0002*	0.0009*
LNBIST	0.7143	0.0444*	0.0000*	0.0000*
LNBRENT	0.3111	0.6065	0.0000*	0.0000*
LNCLIT	0.8752	0.0528	0.0000*	0.0000*
LNCPI	1.0000	0.9886	0.0006*	0.0000*
LNHPI	0.9996	0.9919	0.3557	0.3681
LNIPI	0.5145	0.0006*	0.0000*	0.0000*
LNM1	0.9983	0.9140	0.0000*	0.0000*
LNM2	0.9998	0.9545	0.0000*	0.0000*
LNM3	0.9999	0.9609	0.0000*	0.0000*
LNMVPIC	0.9972	0.4064	0.0000*	0.0000*
LNMVPIP	0.9999	0.9488	0.0000*	0.0000*
LNPPI	1.0000	0.9964	0.0000*	0.0000*
LNPSCE	0.6939	0.2013	0.0000*	0.0000*
LNRSVI	0.8460	0.0696	0.0000*	0.0000*
LNUSD	0.9833	0.2974	0.0000*	0.0000*
GDS	0.4340	0.1537	0.0000*	0.0000*

Table 3.4 : *PP unit root test results.*

PHILLIPS-PERRON UNIT ROOT TEST (SIC)				
Variables	**I(0)**		**I(1)**	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
IR	0.4192	0.2333	0.0000*	0.0000*
CLI	0.0018*	0.0093*	0.0000*	0.0000*
LNBIST	0.8723	0.0278*	0.0000*	0.0000*
LNBRENT	0.3707	0.5090	0.0000*	0.0000*
LNCLIT	0.8987	0.0914	0.0000*	0.0000*
LNCPI	1.0000	0.9911	0.0000*	0.0000*
LNHPI	1.0000	0.9997	0.0000*	0.0000*
LNIPI	0.1444	0.0000*	0.0001*	0.0001*
LNM1	0.9980	0.8800	0.0000*	0.0000*
LNM2	1.0000	0.9627	0.0000*	0.0000*
LNM3	1.0000	0.9776	0.0000*	0.0000*
LNMVPIC	0.9955	0.6776	0.0000*	0.0000*
LNMVPIP	1.0000	0.9842	0.0000*	0.0000*
LNPPI	1.0000	0.9985	0.0000*	0.0000*
LNPSCE	0.5663	0.2100	0.0000*	0.0000*
LNRSVI	0.8962	0.0232*	0.0000*	0.0000*
LNUSD	0.9884	0.2867	0.0000*	0.0000*
GDS	0.4513	0.1193	0.0000*	0.0000*

Table 3.5 : *DF-GLS unit root test results.*

DICKEY-FULLER GLS UNIT ROOT TEST (SIC)				
Variables	**I(0)**		**I(1)**	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
IR	-2.168722	-3.502233	-3.749238*	-3.896659*
CLI	-1.349479	-1.561941	-4.602735*	-4.064609*
LNBIST	-0.199152	-3.370132*	-3.091573*	-11.24384*
LNBRENT	-1.516191	-2.142677	-7.269613*	-8.255834*
LNCLIT	2.659609	-3.126490*	-10.038664*	-9.597301*
LNCPI	2.140876	-0.408675	-4.198071*	-7.030526*
LNHPI	2.012576	-1.113600	-1.905785*	-2.408986
LNIPI	-0.371808	-4.867526*	-19.75197*	-20.13940*
LNM1	4.654292	-1.100482	-5.743885*	-6.049316*
LNM2	6.914162	-0.668236	-8.908953*	-9.726486*
LNM3	6.953220	-0.634280	-8.789686*	-9.560084*
LNMVPIC	2.643876	-1.829534	-6.584470*	-7.542680*
LNMVPIP	3.450873	-0.562248	-6.262526*	-6.486487*
LNPPI	4.050588	-0.198805	-5.447980*	-6.287097*
LNPSCE	3.087023	-1.668691	-6.383399*	-8.064270*
LNRSVI	1.018423	-3.153856*	-10.58841*	-10.95452*
LNUSD	2.499231	-1.889769	-8.661166*	-8.678612*
GDS	-1.224613	-2.843940*	-5.201982*	-10.01045*
Critical value	%1 → -2.584 %5 → -1.944 %10 → -1.615	%1 → -3.546 %5 → -3.002 %10 → -2.712	%1 → -2.584 %5 → -1.944 %10 → -1.615	%1 → -3.548 %5 → -3.004 %10 → -2.714

Table 3.6 : *KPSS unit root test results.*

KWIATKOWSKI-PHILLIPS-SCHMIDT-SHIN UNIT ROOT TEST (SIC)				
Variables	**I(0)**		**I(1)**	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
IR	0.830368	0.073466*	0.048089*	0.036488*
CLI	0.258394*	0.143188	0.182114*	0.163306
LNBIST	1.221761	0.061919*	0.214416*	0.160288
LNBRENT	0.786962	0.163895	0.112290*	0.080823*
LNCLIT	1.382893	0.232487	0.177482*	0.175751
LNCPI	1.375325	0.336457	0.698600	0.066941*
LNHPI	1.377755	0.099949*	0.474109	0.198266
LNIPI	1.321202	0.135931	0.124675*	0.100234*
LNM1	1.350247	0.245645	0.247599*	0.047683*
LNM2	1.374957	0.289694	0.434879	0.051625*
LNM3	1.373668	0.300285	0.455825	0.060722*
LNMVPIC	1.364878	0.280548	0.202102*	0.029370*
LNMVPIP	1.309246	0.335385	0.713027	0.073312*
LNPPI	1.328719	0.322636	0.695210	0.078516*
LNPSCE	1.385263	0.226276	0.184364*	0.060288*
LNRSVI	1.327178	0.147063	0.192068*	0.161771
LNUSD	1.375453	0.263764	0.137374*	0.038467*
GDS	0.989317	0.123835	0.064000*	0.041085*
Critical value	%1 → 0.739 %5 → 0.463 %10 → 0.347	%1 → 0.216 %5 → 0.146 %10 → 0.119	%1 → 0.739 %5 → 0.463 %10 → 0.347	%1 → 0.216 %5 → 0.146 %10 → 0.119

Table 3.7 : *ERS P-O unit root test results.*

ERS POINT- OPTIMAL UNIT ROOT TEST (SIC)				
Variables	**I(0)**		**I(1)**	
	Intercept	**Trend & Intercept**	**Intercept**	**Trend & Intercept**
IR	2.420439*	2.393290*	1.509649*	5.399641*
CLI	3.157380*	11.03151	30.31079	143.5949
LNBIST	17.89621	4.973276*	0.482971*	1.577653*
LNBRENT	5.943245	9.139559	0.296591*	0.952381*
LNCLIT	283.5480	5.654656*	0.263936*	0.909928*
LNCPI	3089.729	106.7775	0.762273*	0.079237*
LNHPI	294.4713	9.283959	3.897472*	8.751717
LNIPI	14.55132	2.937696*	0.536778*	1.967954*
LNM1	487.3148	24.50767	0.037075*	0.013821*
LNM2	1199.003	35.18407	0.533415*	1.821206*
LNM3	1211.634	36.73202	0.539507*	1.833788*
LNMVPIC	378.8331	14.74380	0.733130*	1.231685*
LNMVPIP	455.8615	70.07305	0.660932*	2.191981*
LNPPI	522.0251	74.70078	0.409369*	1.373146*
LNPSCE	1124.375	19.59402	0.693194*	1.826145*
LNRSVI	52.65582	4.608844*	0.183112*	0.645141*
LNUSD	265.4408	12.82481	0.234724*	0.848833*
GDS	7.015177	6.492036*	0.660511*	1.684872*
Critical value	%1 → 1.9384 %5 → 3.1274 %10 → 4.2164	%1 → 4.1991 %5 → 5.6458 %10 → 6.8103	%1 → 1.9388 %5 → 3.1268 %10 → 4.2148	%1 → 4.2012 %5 → 5.6456 %10 → 6.8096

Table 3.8: *NG-P unit root test results.*

NG – PERRON UNIT ROOT TEST (SIC)								
I(0)								
Variables	**Intercept**				**Trend & Intercept**			
	MZa	**MZt**	**MSB**	**MPT**	**MZa**	**MZt**	**MSB**	**MPT**
IR	-14.216*	-2.5434*	0.1789*	2.1929*	-38.305*	-4.371*	0.1141*	2.4092*
CLI	-4.6328	-1.5206	0.3282	5.2914	-12.194	-2.4503	0.2009	7.5786
LNBIST	-0.4027	-0.1705	0.4233	14.723	-19.593*	-3.0963*	0.1580*	4.8595*
LNBRENT	-4.4813	-1.4865	0.3317	5.4875	-10.367	-2.1949	0.2117	9.1851
LNCLIT	1.7014	2.8319	1.6645	208.19	-16.944*	-2.9082*	0.1716*	5.3936*
LNCPI	2.1929	3.6362	1.6582	225.43	-1.3921	-0.5512	0.3960	36.684
LNHPI	2.2322	2.1807	0.9769	83.301	-61.048*	-5.3155*	0.0871*	2.4513*
LNIPI	-0.9135	-0.3416	0.3739	12.022	-32.841*	-4.0128*	0.1222*	2.9999*
LNM1	2.3219	4.8841	2.1036	366.49	-3.3421	-1.0745	0.3215	23.285
LNM2	2.2959	7.2566	3.1607	815.07	-1.7466	-0.6340	0.3629	31.775
LNM3	2.2990	7.2976	3.1743	822.46	-1.6119	-0.6017	0.3733	33.318
LNMVPIC	2.0587	2.9945	1.4546	171.13	-7.0739	-1.7759	0.2510	13.045
LNMVPIP	2.5739	4.5286	1.7594	269.31	-1.0124	-0.4758	0.4610	48.210
LNPPI	3.0993	5.7607	1.8587	324.98	-0.4026	-0.1643	0.4080	42.803
LNPSCE	1.5880	3.5939	2.2631	370.90	-5.7881	-1.6648	0.2876	15.686
LNRSVI	1.6393	1.1425	0.6969	41.807	-20.310*	-3.1150*	0.1534*	4.9273*
LNUSD	1.8649	2.8326	1.5189	179.76	-7.9031	-1.9414	0.2457	11.662
GDS	-4.2404	-1.1965	0.2822	6.1571	-14.598*	-2.6776*	0.1834*	6.3872*
I(1)								
IR	-15.983*	-2.8122*	0.1760*	1.5891*	-16.927*	-2.8856*	0.1705*	5.5290*
CLI	-0.7871	-0.5781	0.7345	27.479	-2.3412	-1.0645	0.4547	38.137
LNBIST	-9.7588*	-2.2027*	0.2257*	2.5358*	-63.482*	-5.6186*	0.0885*	1.5060*
LNBRENT	-52.857*	-5.1409*	0.0973*	0.4635*	-93.467*	-6.8317*	0.0731*	0.9927*
LNCLIT	-62.712*	-5.5978*	0.0893*	0.3951*	-98.527*	-7.0117*	0.0712*	0.9521*
LNCPI	-29.808*	-3.8528*	0.1293*	0.8465*	-703.88*	-18.760*	0.0267*	0.1295*
LNHPI	-8.7069*	-1.8155*	0.2085*	3.8175*	-11.337	-2.2552	0.1989	8.6903
LNIPI	-46.866*	-4.8405*	0.1033*	0.5235*	-45.933*	-4.7922*	0.1043*	1.9844*
LNM1	-619.63*	-17.597*	0.0284*	0.0431*	-2968.4*	-38.524*	0.0130*	0.0312*
LNM2	-60.347*	-5.4674*	0.0906*	0.4668*	-62.272*	-5.5459*	0.0891*	1.6206*
LNM3	-59.992*	-5.4482*	0.0908*	0.4768*	-61.970*	-5.5299*	0.0892*	1.6392*
LNMVPIC	-48.491*	-4.9069*	0.1012*	0.5498*	-54.373*	-5.2138*	0.0959*	1.6772*
LNMVPIP	-46.197*	-4.7820*	0.1035*	0.5946*	-47.714*	-4.8736*	0.1021*	1.9646*
LNPPI	-39.183*	-4.4263*	0.1130*	0.6253*	-64.954*	-5.6989*	0.0877*	1.4029*
LNPSCE	-46.864*	-4.8405*	0.1033*	0.5232*	-57.148*	-5.3220*	0.0931*	1.7066*
LNRSVI	-131.23*	-8.0982*	0.0617*	0.1903*	-138.03*	-8.3074*	0.0601*	0.6605*
LNUSD	-104.64*	-7.2311*	0.0691*	0.2379*	-104.82*	-7.2385*	0.0691*	0.8730*
GDS	-36.240*	-4.2429*	0.1171*	0.7167*	-62.634*	-5.5960*	0.0893*	1.4557*
%1	-13.8	-2.58	0.174	1.78	-23.8	-3.42	0.143	4.03
%5	-8.1	-1.98	0.233	3.17	-17.3	-2.91	0.168	5.48
%10	-5.7	-1.62	0.275	4.45	-14.2	-2.62	0.185	6.67

Table 3.9: *BP unit root test results.*

BREAKPOINT UNIT ROOT TEST (BP) – SIC						
I(0)						
Variables	**Intercept**			**Trend & Intercept**		
	break date	**t-statistic**	**p-value**	**break date**	**t-statistic**	**p-value**
IR	2018-M5	-5.140420	<0.01*	2018-M5	-10.92447*	< 0.01*
CLI	2021-M4	-4.766740*	0.0195*	2021-M3	-6.416620*	< 0.01*
LNBIST	2016-M11	-2.887668	0.7447	2020-M10	-4.083909	0.4660
LNBRENT	2014-M9	-4.633860*	0.0297*	2014-M10	-4.633036	0.1802
LNCLIT	2020-M4	-3.469788	0.4037	2018-M5	-5.962582*	< 0.01*
LNCPI	2017-M9	0.040744	>0.99	2016-M7	-4.237680	0.3714
LNHPI	2019-M11	-0.670267	>0.99	2018-M7	-2.867073	0.9770
LNIPI	2011-M11	-3.677543	0.2934	2020-M3	-10.13088*	< 0.01*
LNM1	2019-M2	-1.244198	>0.99	2020-M2	-6.304928*	< 0.01*
LNM2	2018-M2	-0.161714	>0.99	2018-M8	-4.975357*	0.0823
LNM3	2018-M2	-0.202160	>0.99	2018-M8	-5.382230*	0.0286*
LNMVPIC	2017-M7	-0.728986	>0.99	2015-M9	-3.981998	0.5340
LNMVPIP	2017-M9	-1.025828	>0.99	2016-M3	-4.234289	0.3736
LNPPI	2017-M9	0.299127	>0.99	2017-M10	-4.340282	0.3257
LNPSCE	2019-M11	-2.465839	0.9112	2018-M8	-5.540830*	0.0184*
LNRSVI	2020-M5	-2.538077	0.8916	2020-M2	-7.381021*	< 0.01*
LNUSD	2017-M9	-1.274256	>0.99	2018-M4	-5.324445*	0.0337*
GDS	2017-M10	-3.582987	0.3409	2018-M3	-3.813614	0.6413
I(1)						
IR	2018-M9	-11.09443*	< 0.01*	2018-M9	-11.37905*	< 0.01*
CLI	2021-M4	-13.35981*	< 0.01*	2021-M4	-11.40461*	< 0.01*
LNBIST	2020-M3	-12.40502*	< 0.01*	2020-M3	-12.39632*	< 0.01*
LNBRENT	2020-M4	-11.22350*	< 0.01*	2020-M4	-11.01202*	< 0.01*
LNCLIT	2020-M4	-13.31525*	< 0.01*	2020-M4	-13.66686*	< 0.01*
LNCPI	2011-M10	-8.859802*	< 0.01*	2011-M10	-9.356434*	< 0.01*
LNHPI	2020-M1	-7.890828*	< 0.01*	2018-M5	-8.833935*	< 0.01*
LNIPI	2020-M4	-23.39275*	< 0.01*	2020-M4	-23.26936*	< 0.01*
LNM1	2019-M3	-12.17532*	< 0.01*	2019-M3	-12.12321*	< 0.01*
LNM2	2018-M8	-12.07105*	< 0.01*	2018-M8	-12.44906*	< 0.01*
LNM3	2018-M8	-11.73246*	< 0.01*	2018-M8	-12.03792*	< 0.01*
LNMVPIC	2018-M11	-10.59354*	< 0.01*	2018-M11	-10.77379*	< 0.01*
LNMVPIP	2018-M9	-9.157727*	< 0.01*	2018-M9	-10.23810*	< 0.01*
LNPPI	2018-M9	-7.642083*	< 0.01*	2018-M9	-10.35470*	< 0.01*
LNPSCE	2018-M8	-9.778242*	< 0.01*	2018-M8	-10.51394*	< 0.01*
LNRSVI	2020-M4	-13.68092*	< 0.01*	2020-M4	-13.13675*	< 0.01*
LNUSD	2018-M8	-10.30610*	< 0.01*	2018-M8	-10.46034*	< 0.01*
GDS	2021-M4	-12.25812*	< 0.01*	2018-M9	-12.70251*	< 0.01*
Critical value	%1 → -4.949133 %5 → -4.443649 %10 → -4.193627			%1 → -5.719131 %5 → -5.175710 %10 → -4.893950		

3.3. Model

Since the variables to be used in this study have different degrees of integration, the Autoregressive Distributed Lag (ARDL) bound test was used. In Turkey, the official monetary policy tool of the CB is the policy interest rate, that is, the one-week repo auction rate. Therefore, policy interest rate (IR), one of the variables below, represents the independent variable of the econometric models created in this part of the study. Other variables constitute the the dependent and the control variables and for each model. Additionally, Eviews 9 statistical package program was used for all econometric procedures carried out in the study.

3.3.1. Cointegration and ARDL bound test

Cointegration, which is an analysis used to examine the long-run relationship between two or more non-stationary variable(s), is a serious requirement to construct an econometric model with non-stationary temporal series. If the variables are not cointegrated, that is, if the series do not have a common trend that binds them together in the long run, then the model becomes meaningless and the spurious regression problem arises. Therefore, I(0) series are needed for a linear relationship between the variables in the long run (Asteriou and Hall, 2021, 384-385). In the cointegration analysis, which was first used by Engle-Granger (1987), in order to make non-stationary time series stationary, the difference of the series is taken, and while the series are made stationary in this difference process, the possible long-term relationship between them is deteriorated. In this case, cointegration analysis is used to estimate the possible long-run relationship between the series, even if they are not stationary (Tarı, 2011: 415).

Since the classical Engle-Granger and Johansen (1988) cointegration tests require that all the examined temporal series be cointegrated to the same degree, this requirement creates significant limitations in practice. For this reason, classical cointegration approaches cannot be used if at least one of the series to be used in the analysis is I(0) or I(1) and the degrees of other variables are different. In such a case, ARDL boundary approach is preferred in order for a long-term cointegration relationship between the variables to yield meaningful results (Akel and Gazel, 2014).

ARDL boundary approach developed by Pesaran and Pesaran (1997), Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran et al. (2001), besides being a new approach to linear cointegration analysis, also has many important advantages. These

advantages can be listed as to be able to predict short and long-term parameters with the same model, to eliminate internality problems, to detect the existence of a possible cointegration between variables with I(0)/ I(1) or fractionally different degrees of integration, to obtain better regression results in small samples (Jebli ve Belloumi, 2017). Below is a general equation with two variables (X,Y) representing the ARDL boundary approach:

$$Y_t = \theta_0 + \sum_{i=1}^{i=m} \theta_i \Delta Y_{t-i} + \sum_{i=0}^{i=m} \theta_{2i} \Delta X_{1t-i} + \omega_i Y_{t-i} + \omega_{2i} X_{1t-i} + u_t \qquad (3.12)$$

In the above ARDL model, while the delayed variable Y_{t-i} is the autoregressive part of the model, the variables X_{1t-i} constitute the distributed part of the model. Also, while θ_0 represents the intercept term and Δ represents first difference, θ_i-θ_{ki} coefficients represents the short term coefficients and ω_1- ω_k represents the long term coefficients above (3.12). Such an ARDL model detects not only the dynamic effects of the lagged variable, but also the dynamic effects of the distributed variables (Gujarati, 2016, 219).

While to estimate the relationship in the long run is used Equation (3.13), to estimate relationship in the short run, the error correction term " μecm_{t-1}" is added to Equation (3.14):

$$Y_t = \theta_0 + \sum_{i=1}^{i=m} \omega_i Y_{t-i} + \sum_{i=0}^{i=m} \omega_{2i} X_{1t-i} + u_t \qquad (3.13)$$

$$Y_t = \theta_0 + \sum_{i=1}^{i=m} \theta_i \Delta Y_{t-i} + \sum_{i=0}^{i=m} \theta_{2i} \Delta X_{1t-i} + \mu ecm_{t-1} + u_t \qquad (3.14)$$

The coefficient statistics of this variable should be in the range of $-1<\mu<0$. This statistical value shows how much of a short-term deviation will be corrected in the long-term. The models used for the series in this study are rearranged below within the framework of the general ARDL equation (3.12) above:

$$LNM1_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNM1_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta LNPSCE_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta LNUSD_{t-i} + \omega_1 LNM1_{t-i} + \omega_2 IR_{t-i} + \omega_3 LNCPI_{t-i} + \omega_4 LNPSCE_{t-i} + \omega_5 LNUSD_{t-i} + \omega_6 COVIDDUM + u_t \qquad (3.15)$$

$$LNM2_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNM2_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNUSD_{t-i} + \omega_1 LNM2_{t-i} + \omega_2 IR_{t-i} + \omega_3 LNUSD_{t-i} + \omega_4 COVIDDUM + u_t$$

(3.16)

$$LNM3_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNM3_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNM2_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta LNCLIT_{t-i} + \omega_1 LNM3_{t-i} + \omega_2 IR_{t-i} + \omega_3 LNM2_{t-i} + \omega_4 LNCPI_{t-i} + \omega_5 LNCLIT_{t-i} + u_t$$

(3.17)

$$LNCPI_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNM2_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta LNM3_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta LNBRENT_{t-i} + \omega_1 LNCPI_{t-i} + \omega_2 IR_{t-i} + \omega_3 LNM2_{t-i} + \omega_4 LNM3_{t-i} + \omega_5 LNBRENT_{t-i} + \omega_6 TIGHTDUM + u_t$$

(3.18)

$$LNPPI_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNPPI_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta LNBRENT_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta LNBIST_{t-i} + \sum_{i=0}^{i=n} \theta_{6i} \Delta CLI_{t-i} + \omega_1 LNPPI_{t-i} + \omega_2 IR + \omega_3 LNUSD_{t-i} + \omega_4 LNBRENT_{t-i} + \omega_5 LNBIST_{t-i} + \omega_6 CLI_{t-i} + \omega_7 COVIDDUM + \omega_8 TIGHTDUM + u_t$$

(3.19)

$$LNPSCE_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNPSCE_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNM3_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta CLI_{t-i} + \omega_1 LNPSCE_{t-i} + \omega_2 IR_{t-i} + \omega_3 LNM3_{t-i} + \omega_4 LNUSD_{t-i} + \omega_5 CLI_{t-i} + u_t$$

(3.20)

$$LNRSVI_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta LNRSVI_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta LNIPI_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta LNMVPIC_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta LNBRENT_{t-i} + \sum_{i=0}^{i=n} \theta_{6i} \Delta LNHPI_{t-i} + \omega_1 LNRSVI_{t-i} + \omega_2 IR + \omega_3 LNIPI_{t-i} + \omega_4 LNMVPIC_{t-i} + \omega_5 LNBRENT_{t-i} + \omega_6 LNHPI_{t-i} + \omega_7 ISODUM + \omega_8 COVIDDUM + u_t$$

(3.21)

$$LNGDS_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNGDS_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNCPI_{t-i} + \omega_1 LNGDS_{t-i} + \omega_2 IR + \omega_3 LNUSD_{t-i} + \omega_4 LNCPI_{t-i} + \omega_5 TIGHTDUM + u_t$$

(3.22)

$$LNIPI_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNIPI_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNPPI_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta\, LNCLIT_{t-i} + \omega_1 LNIPI_{t-i} + \omega_2 IR + \omega_3 LNPPI_{t-i} + \omega_4 LNCPI_{t-i} + \omega_5 LNCLIT_{t-i} + \omega_6 COVIDDUM + u_t$$

(3.23)

$$LNUSD_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNM3_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNCPI_{t-i} + \omega_1 LNUSD_{t-i} + \omega_2 IR + \omega_3 LNM3_{t-i} + \omega_4 LNCPI_{t-i} + \omega_5 TIGHTDUM + u_t$$

(3.24)

$$LNCLIT_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNCLIT_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta\, LNPSCE_{t-i} + \sum_{i=0}^{i=n} \theta_{6i} \Delta\, LNBRENT_{t-i} + \omega_1 LNCLIT_{t-i} + \omega_2 IR + \omega_3 LNUSD_{t-i} + \omega_4 LNCPI_{t-i} + \omega_5 LNPSCE_{t-i} + \omega_6 LNBRENT_{t-i} + \omega_7 ISODUM + u_t$$

(3.25)

$$LNMVPIC_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNMVPIC_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta\, LNM3_{t-i} + \sum_{i=0}^{i=n} \theta_{6i} \Delta\, LNBRENT_{t-i} + \omega_1 LNMVPIC_{t-i} + \omega_2 IR + \omega_3 LNUSD_{t-i} + \omega_4 LNCPI_{t-i} + \omega_5 LNM3_{t-i} + \omega_6 LNBRENT_{t-i} + \omega_7 MVPIDUM + \omega_8 TIGHTDUM + u_t$$

(3.26)

$$LNMVPIP_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNMVPIP_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNBRENT_{t-i} + \omega_1 LNMVPIP_{t-i} + \omega_2 IR + \omega_3 LNUSD_{t-i} + \omega_4 LNBRENT_{t-i} + \omega_5 TIGHTDUM + u_t$$

(3.27)

$$LNBIST_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNBIST_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNM2_{t-i} + \omega_1 LNBIST_{t-i} + \omega_2 IR + \omega_3 LNUSD_{t-i} + \omega_4 LNM2_{t-i} + u_t \quad (3.28)$$

$$LNHPI_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNHPI_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNCPI_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNPPI_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta\, LNRSVI_{t-i} + \omega_1 LNHPI_{t-i} + \omega_2 IR + \omega_3 LNCPI_{t-i} + \omega_4 LNPPI_{t-i} + \omega_5 LNRSVI_{t-i} + \omega_6 ISODUM + \omega_7 COVIDDUM + u_t \quad (3.29)$$

$$LNBRENT_t = \theta_0 + \sum_{i=1}^{i=n} \theta_i \Delta\, LNBRENT_{t-i} + \sum_{i=0}^{i=n} \theta_{2i} \Delta\, IR_{t-i} + \sum_{i=0}^{i=n} \theta_{3i} \Delta\, LNCLIT_{t-i} + \sum_{i=0}^{i=n} \theta_{4i} \Delta\, LNM3_{t-i} + \sum_{i=0}^{i=n} \theta_{5i} \Delta\, LNUSD_{t-i} + \sum_{i=0}^{i=n} \theta_{6i} \Delta\, LNPPI_{t-i} + \sum_{i=0}^{i=n} \theta_{7i} \Delta\, LNMVPIC_{t-i} + \omega_1 LNBRENT_{t-i} + \omega_2 IR + \omega_3 LNCLIT_{t-i} + \omega_4 LNM3_{t-i} + \omega_5 LNUSD_{t-i} + \omega_6 LNPPI_{t-i} + \omega_7 LNMVPIC_{t-i} + \omega_8 ISODUM + u_t \quad (3.30)$$

3.3.2. Toda-Yamamoto causality test (T&Y)

The first step for the causality test developed by Toda-Yamamoto (1995) is to establish the Vector Autoregression (VAR) model and determine the lag length ρ. Then, d_{max}, which represents the highest degree of integration, is added to ρ (the highest dmax value is 1 since the ARDL model was used in this study). Knowing these ρ and d_{max} values increases the accuracy of the model's estimation as it prevents data loss. The T&Y test is modeled as follows:

$$Y_t = \delta + \sum_{i=1}^{i=\rho+d_{max}} \theta_{1i} Y_{t-1} + \sum_{i=1}^{i=\rho+d_{max}} \theta_{2i} X_{t-1} + \mu_{1t} \quad (3.13)$$

$$X_t = \delta + \sum_{i=1}^{i=\rho+d_{max}} \beta_{1i} Y_{t-1} + \sum_{i=1}^{i=\rho+d_{max}} \beta_{2i} X_{t-1} + \mu_{1t} \quad (3.14)$$

For Equation (3.13) the H_0 hypothesis is based on the claim that X is not a Granger cause of Y, while the H_0 hypothesis for Equation (3.14) claims that Y is not a Granger

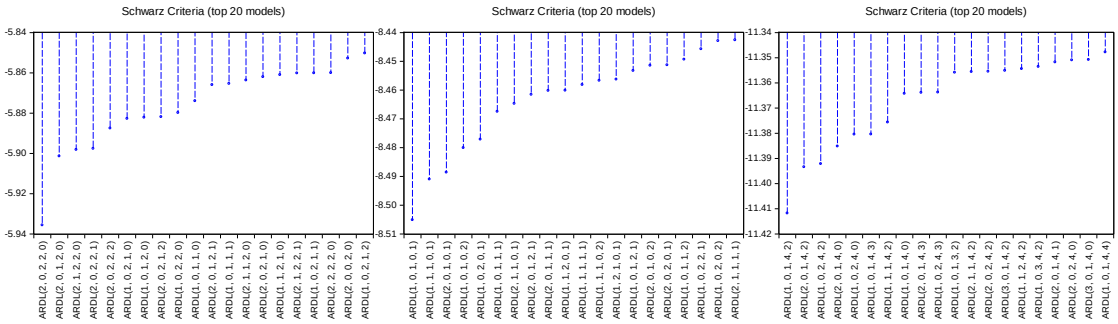
cause of *X*. The test statistical value for T&Y is calculated using the Wald Test which includes the x^2 (chi-square) distribution (Meçik, et al., 2020).

The use of this test provides three main advantages over Granger's (1969) traditional causality test. These can be listed as the fact that the stationarity of the variables is not important, the existence of cointegration between the variables can be neglected, and the long-term information loss is prevented when non-stationary series are subjected to the causality test. (Özer, et al., 2022). The results of the estimated ARDL models, necessary diagnostic tests, robustness tests, short and long term coefficients are given below, respectively.

3.3.3. ARDL bound test results

The test statistics obtained for the ARDL bound test conducted within the scope of the study are given below for each variable as a table under a separate heading. All predicted models were created according to Schwarz Information Criteria (SIC) and the smallest model according to SIC was used to determine the lag length of the model.

3.3.3.1. Test results for money supply



Graph 3.4: *The SIC results for respectively M1, M2, M3.*

In Graph 3.4, the SIC values of estimated 20 different models are shown for the M1, M2, M3 variables, respectively. Among these models, the model with the lowest SIC is ARDL (2, 0, 2, 2, 0) for M1, ARDL (1, 0, 1, 0, 1) for M2, ARDL (1, 0, 1, 4, 2) for M3. Therefore, the lag lengths of the models to be estimated were determined in this way. The results of the models estimated after the lag lengths are determined are presented in Table 3.10, Table 3.11 and Table 3.12 below.

Table 3.10: *The ARDL model for M1.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNM1(-1)	0.482657	0.088307	5.465691	0.0000
LNM1(-2)	0.278878	0.082845	3.366258	0.0010
IR	-0.000765	0.000392	-1.954324	0.0531
LNCPI	-0.515655	0.303414	-1.699509	0.0919
LNCPI(-1)	-0.046510	0.429368	-0.108323	0.9139
LNCPI(-2)	0.785863	0.267469	2.938144	0.0040
LNPSCE	1.118314	0.142374	7.854777	0.0000
LNPSCE(-1)	-0.403841	0.242466	-1.665554	0.0985
LNPSCE(-2)	-0.657330	0.178270	-3.687279	0.0003
LNUSD	0.124170	0.042202	2.942313	0.0039
COVIDDUM	0.020781	0.008440	2.462153	0.0153
C	0.908399	0.252484	3.597851	0.0005

In Table 3.10, the Covid-19 epidemic, which started to spread in Turkey in the first quarter of 2020, was added to the above model, which was estimated to determine the relationship between M1 money supply and monetary policy, as an externality.

Table 3.11: *The ARDL model for M2.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNM1(-1)	0.724055	0.049044	14.76333	0.0000
IR	-0.002330	0.000482	-4.832899	0.0000
LNCPI	0.352791	0.120966	2.916442	0.0042
LNUSD	0.160272	0.075278	2.129082	0.0353
COVIDDUM	0.023132	0.006191	3.736545	0.0003
C	1.432757	0.372752	3.843723	0.0002

Likewise, in Table 3.11, the Covid-19 outbreak was added as an externality to the model estimated to determine the relationship between M2 money supply and monetary policy.

Table 3.12: *The ARDL model for M3. (White heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNM3(-1)	0.770126	0.052025	14.80301	0.0000
IR	-6.80E-05	2.82E-05	-2.412864	0.0175

[Table 3.12. (Continue) *The ARDL model for M3. (White heteroscedasticity)*]

LNM2	0.971241	0.007079	137.2079	0.0000
LNM2(-1)	-0.767554	0.048841	-15.71521	0.0000
LNCPI	0.033983	0.019276	1.763025	0.0806
LNCPI(-1)	-0.054533	0.028653	-1.903224	0.0596
LNCPI(-2)	0.039572	0.027191	1.455369	0.1484
LNCPI(-3)	-0.027478	0.026705	-1.028929	0.3057
LNCPI(-4)	0.059692	0.018764	3.181157	0.0019
LNCLIT	-0.015217	0.009552	-1.593049	0.1140
LNCLIT(-1)	-0.045867	0.020359	-2.252903	0.0262
LNCLIT(-2)	0.043408	0.012751	3.404388	0.0009
C	0.158147	0.028309	5.586411	0.0000

In Table 3.12, the results of the model estimating the relationship between the M3 money supply and the policy rate are given. Since the model contains heteroscedasticity, it was re-estimated by White's test. No dummy variables are used in this model.

Table 3.13: *The Bound test results of ARDL model for M1,M2,M3.*

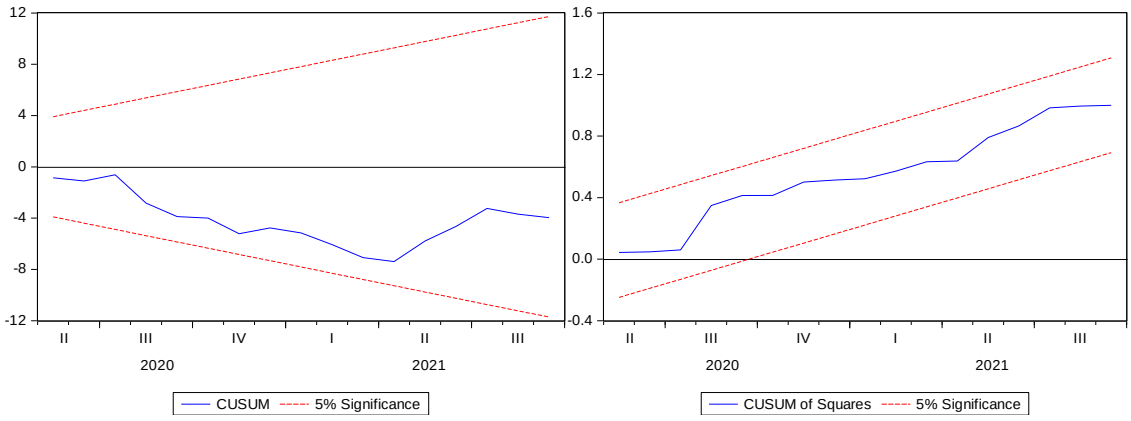
Variable	**k**	**F-statistic**	**%**	**Critical Values**	
				I(0)	**I(1)**
M1	4	24.15027	**%10**	2.2	3.09
			%5	2.56	3.49
			%1	3.29	4.37
M2	4	8.871772	**%10**	2.2	3.09
			%5	2.56	3.49
			%1	3.29	4.37
M3	4	10.15727	**%10**	2.2	3.09
			%5	2.56	3.49
			%1	3.29	4.37

Table 3.13 shows the number of k observations for all money supply definitions, and the lower and upper critical values of cointegration in I(0) Bound and I(1) Bound at 10%, 5%, and 1%, respectively. As stated above, if the calculated F statistical value is greater than the upper critical values, there is a cointegration relationship between the variables included in the model. It is concluded that there is a cointegration relationship between the variables used in the models, since the F statistic for all three predicted models is greater than all critical values at 10%, 5% and 1%.

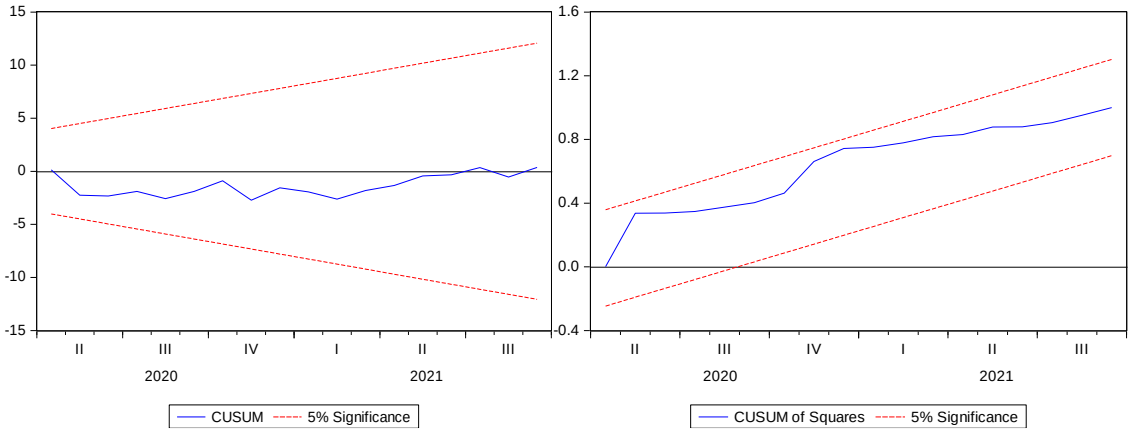
Table 3.14: *The results diagnostic tests of ARDL model for M1, M2, M3.*

Tests	M1		M2		M3	
	Calculated statistics	**Prob.**	**Calculated statistics**	**Prob.**	**Calculated statistics**	**Prob.**
Breusch-Godfrey Autocorrelation	0.431031	0.6509	1.460267	0.2364	0.294715	0.7453
Breusch-Pagan-Godfrey Test	1.235630	0.2717	1.347321	0.2270	2.650514	0.0037
Jargue-Bera Test of Normality	1.564194	0.4575	4.197317	0.1226	0.829654	0.6605
Ramsey RESET Test	0.002446	0.9606	1.863177	0.1749	0.310854	0.5783

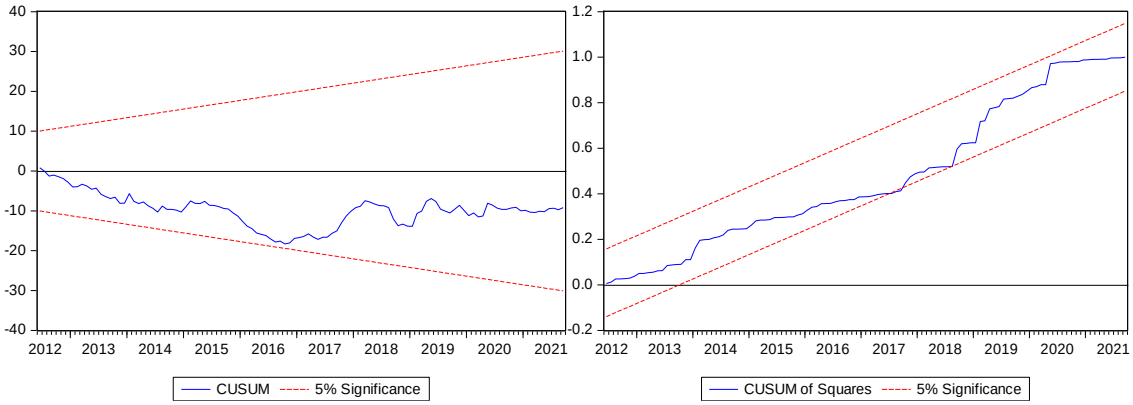
Diagnostic tests are performed to detect the errors of heteroscedasticity, autocorrelation, specification and normal distribution of residual terms of the models estimated by ARDL approach. The results of these tests increase the reliability of the results of the predicted models. The results of the diagnostic tests for all three definitions of money supply are combined in Table 3.14 above. According to the results of the BG-LM test, there is no autocorrelation problem in any of the models. While the models created for M1 and M2, among the models estimated according to the results of the Breusch-Pagan-Godfrey (BPG) test, have constant variance, the problem of heteroscedasticity arose in the model created for M3. To fix this problem, the model was re-estimated using the White test. According to RReset test results, there is no specification error in the models. Finally, according to the results of the Jaque-Bera (J&B) test, the normality assumption condition was also met for all models.



Graph 3.5: *CUSUM and CUSUM of Square tests for M1.*



Graph 3.6: *CUSUM and CUSUM of Square tests for M2.*



Graph 3.7: *CUSUM and CUSUM of Square tests for M3.*

The models estimated above were finally subjected to CUSUM and CUSUM-of-Square robustness tests. These tests are carried out to test whether there is a structural break in the predicted models, in other words, the stability of the model coefficients within the sample period. Chart 3.5, Chart 3.6 and Chart 3.7 above show the results of robustness tests of the models estimated for M1, M2 and M3, respectively. Looking at these CUSUM and CUSUM-of-Square graphs, respectively, it is seen that all three models estimated are in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted models are stable in the long run.

Table 3.15: *The short and long term coefficient estimates of ARDL for M1.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(LNM1(-1))	-0.281589	0.076908	-3.661383	0.0004

[Table 3.15. (continued) *The short and long term coefficient estimates of ARDL for M1*]

D(IR)	-0.000539	0.000752	-0.716574	0.4751
D(LNCPI)	-0.488745	0.274956	-1.777540	0.0781
D(LNCPI(-1))	-0.791505	0.254967	-3.104342	0.0024
D(LNPSCE)	1.122711	0.134882	8.323672	0.0000
D(LNPSCE(-1))	0.644699	0.172104	3.745972	0.0003
D(LNUSD)	0.109588	0.086807	1.262426	0.2093
D(DUMMYCOVID)	0.029170	0.010690	2.728669	0.0074
CointEq(-1)	-0.232697	0.032888	-7.075494	0.0000
Long- Term Coefficients				
IR	-0.003209	0.001342	-2.390668	0.0184
LNCPI	0.938071	0.279584	3.355234	0.0011
LNPSCE	0.239628	0.092419	2.592848	0.0108
LNUSD	0.520706	0.173862	2.994939	0.0034
DUMMYCOVID	0.087143	0.020209	4.312147	0.0000

Table 3.15, shows the short- and long-term coefficients of the ARDL model estimated for M1. Looking at the table, it can be observed that the monetary policy, which is the subject of the research, is related to the most narrowly defined money supply. The policy rate, which is determined as the criterion of monetary policy, is included as an independent variable in the model and has a statistically significant on %5 sl. and negative linear relationship on M1 in the long run. If interpreted this relationship, an 1% increase in IR reduces the M1 money supply by about 0.03%. While the control variables LNCPI, LNPSCE and LNUSD in the model have a statistically significant and positive relationship with M1 in the long run, IR and LNUSD are not significant in the short run. In addition, the COVIDDUM included in the model for the Covid-19 outbreak has a significant and increasing relationship on M1 in both the short and long term. Therefore, the Covid-19 outbreak has brought about a structural change in the M1 money supply.

The short-run error correction model (ECM) coefficient is also included in Table 3.15. It is seen that the error correction coefficient in the table as symbolized with CointEq(-1) is statistically significant. In other words, the coefficient is negative and less than 1 as expected. According to the ECM coefficient, approximately 23% of the deviations caused by the short-term shocks are corrected in the long-term.

Table 3.16: *The short and long term coefficient estimates of ARDL for M2.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.000028	0.000206	-0.135044	0.8928
D(LNM1)	0.216141	0.020954	10.314901	0.0000
D(LNCPI)	0.138654	0.054781	2.531052	0.0127
D(LNPSCE)	0.703490	0.042167	16.683258	0.0000
D(DUMMYCOVID)	-0.002523	0.003027	-0.833411	0.4063
CointEq(-1)	-0.214767	0.025576	-8.397059	0.0000
Long- Term Coefficients				
IR	0.001389	0.000525	2.645503	0.0093
LNM1	0.503134	0.069755	7.212838	0.0000
LNCPI	0.460807	0.106684	4.319349	0.0000
LNPSCE	0.126983	0.040566	3.130254	0.0022
DUMMYCOVID	-0.024918	0.010608	-2.349002	0.0205
C	2.508629	0.184140	13.623488	0.0000

Table 3.16, shows the short- and long-term coefficients of the ARDL model estimated for M2. Looking at the table, it can be observed that the monetary policy, which is the subject of the research, is related to the M2 money supply. The policy rate, which is determined as the criterion of monetary policy, is included as an independent variable in the model and has a statistically significant on 1% sl. and positive linear relationship on M2 in the long run. If interpreted, an 1% increase in IR increases the M2 money supply by about 0.01%. The control variables LNM1, LNPSCE and LNCPI in the model have a statistically significant and positive relationship with M2 in both the long and short term. In addition, the COVIDDUM included in the model for the Covid-19 outbreak has a significant and negative effect on the M2 money supply in both the short and long run.

The short-term ECM coefficient is also included in Table 3.16. It is seen in the table as CointEq(-1) is statistically significant. In other words, the coefficient is negative and less than 1 as expected. According to the ECM coefficient, approximately 22% of the deviations caused by the short-term shocks are corrected in the long-term.

Table 3.17, shows the short and long term coefficients of the ARDL model estimated for M3. Looking at the table, it can be observed that the monetary policy, which is the subject of the research, is related to the most broadly defined money supply. The

policy rate is included as an independent variable in the model and has a statistically significant on %1 sl. and negative linear relationship on M3 in the long run.

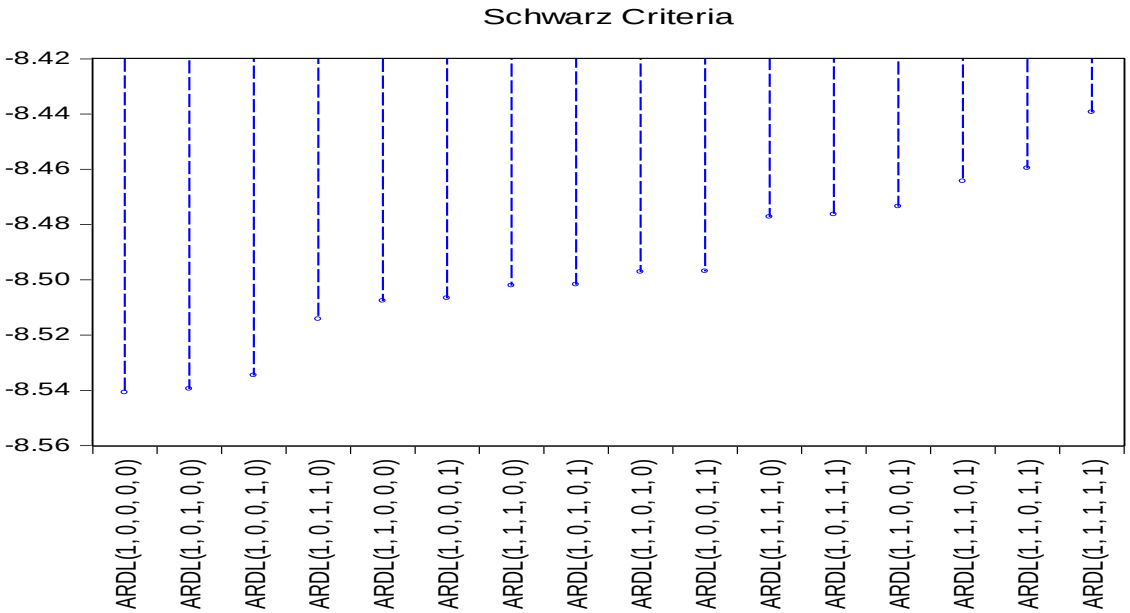
Table 3.17: *The short and long term coefficient estimates of ARDL for M3.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.000046	0.000045	-1.016853	0.3114
D(LNM2)	0.971636	0.006784	143.214535	0.0000
D(LNCPI)	0.032591	0.015496	2.103201	0.0377
D(LNCPI(-1))	-0.073468	0.017332	-4.238866	0.0000
D(LNCPI(-2))	-0.033089	0.016547	-1.999670	0.0480
D(LNCPI(-3))	-0.060816	0.017288	-3.517799	0.0006
D(LNCLIT)	-0.015026	0.010615	-1.415587	0.1597
D(LNCLIT(-1))	-0.043133	0.010638	-4.054698	0.0001
CointEq(-1)	-0.234442	0.030080	-7.794001	0.0000
Long- Term Coefficients				
IR	-0.000296	0.000101	-2.939990	0.0040
LNM2	0.886080	0.019610	45.185566	0.0000
LNCPI	0.222893	0.032124	6.938613	0.0000
LNCLIT	-0.076890	0.016252	-4.730975	0.0000
C	0.687971	0.086740	7.931385	0.0000

An 1% increase in IR reduces the M3 money supply by about 0.003%. Control variables LNCPI, LNM2 and LNCLIT in the model have a statistically significant on %1 sl. relationship with M1 in the short and long term. M3 has a negative linear relationship with LNCLIT in the long run and with LNCPI and LNCLIT in the short run. In addition, the COVIDDUM dummy does not reveal a significant relationship in this model. Therefore, it can be said that the Covid-19 epidemic did not cause a serious structural change for the M3 money supply.

The short-term ECM coefficient is also included in Table 3.17. It is seen that CointEq(-1) is statistically significant. According to the ECM coefficient, approximately 23% of the deviations caused by the short-term shocks are corrected in the long-term.

3.3.3.2. Test Results for CPI



Graph 3.8: *The SIC results for CPI.*

The SIC values of 16 different models are shown in Graph 3.8. The model with the lowest SIC among these models is the ARDL (1, 0, 0, 0) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.18.

Table 3.18: *The ARDL model for CPI.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNCPI(-1)	0.832450	0.029837	27.89977	0.0000
IR	0.000223	0.000101	2.201988	0.0296
LNM2	-0.258772	0.127496	-2.029643	0.0446
LNM3	0.364120	0.135639	2.684482	0.0083
LNBRENT	0.005301	0.002430	2.181611	0.0311
TIGHTDUM	0.014553	0.002383	6.107902	0.0000
C	-0.562703	0.089023	-6.320837	0.0000

The dummy variable (tightdum) of the monetary tightening period in 2018 is added to the above estimated model as an externality. The Covid-19 epidemic, which started to spread in Turkey in the first quarter of 2020, was excluded from the model because it did not give a meaningful result in this model created for the CPI. Bound test results of the model are given in Table 3.19 below.

Table 3.19: *The Bound test results of ARDL model for CPI.*

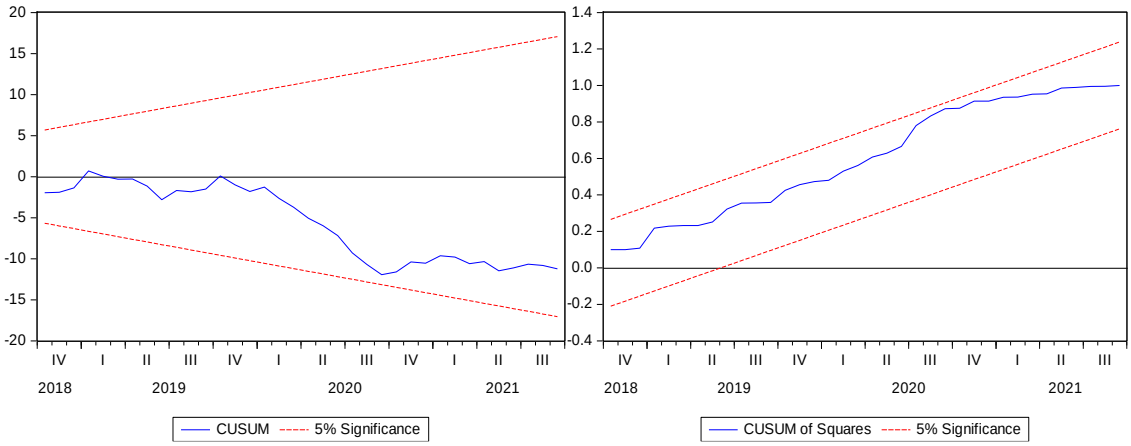
k	F-statistic	%	Critical Values	
			I(0)	I(1)
4	36.36910	**%10**	2.2	3.09
		%5	2.56	3.49
		%1	3.29	4.37

In Table 3.19, I(0) Bound and I(1) Bound cointegration lower and upper critical values at 10%, 5% and 1%, respectively. As stated above, if the calculated F statistical value is greater than the upper critical values, there is a cointegration relationship between the variables included in the model. Since F statistic value the estimated model is greater than all critical values in 10%, 5% and 1%, it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.20: *The results diagnostic tests of ARDL model for CPI.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	2.040020	0.1345
Breusch-Pagan-Godfrey Test	1.783786	0.1079
Jargue-Bera Test of Normality	2.855501	0.2398
Ramsey RESET Test	0.768624	0.3824

Diagnostic tests were performed to detect the errors of heteroscedasticity, autocorrelation, specification and normal distribution of residual terms of the model estimated by ARDL approach. The test results are shown in Table 3.20 above. According to the results of the BG-LM test, there is no autocorrelation problem in the model. The model estimated according to the results of the BPG test has constant variance. In other words, there is no problem of heteroscedasticity. According to RReset test results, there is no specification error in the model. According to the results of the J&B test, the normality assumption condition was also met. These results increase the reliability of the predicted results.



Graph 3.9: *CUSUM and CUSUM of Square tests for CPI.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. These tests were carried out in order to test the stability of the coefficients in the model in the sample period. Graph 3.9 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

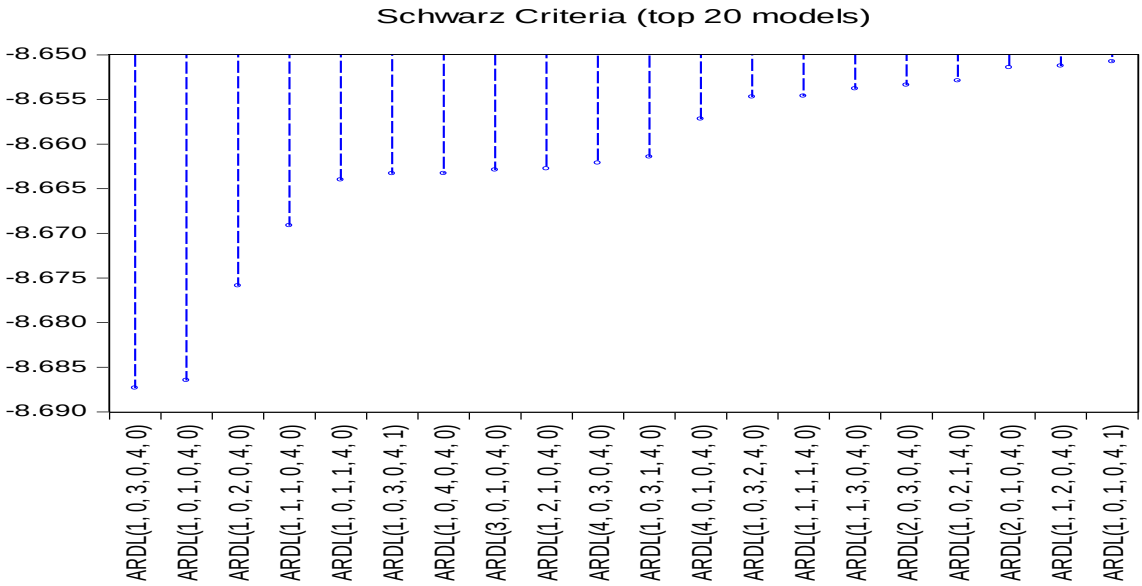
Table 3.21: *The short and long term coefficient estimates of ARDL for CPI.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	0.000237	0.000204	1.161623	0.2477
D(LNM2)	-0.820606	0.314209	-2.611655	0.0102
D(LNM3)	0.899069	0.316916	2.836936	0.0053
D(LNBRENT)	0.005460	0.005253	1.039357	0.3007
D(TIGHTDUM)	0.019270	0.002242	8.595373	0.0000
CointEq(-1)	-0.169781	0.012620	-13.453162	0.0000
Long- Term Coefficients				
IR	0.001330	0.000483	2.751335	0.0068
LNM2	-1.544451	0.702785	-2.197616	0.0299
LNM3	2.173207	0.706515	3.075952	0.0026
LNBRENT	0.031637	0.015424	2.051166	0.0424
TIGHTDUM	0.086859	0.021886	3.968627	0.0001
C	-3.358425	0.165189	-20.330771	0.0000

Table 3.21 shows the short- and long-term coefficients for the model with the lag length (1, 0, 0, 0) estimated by the ARDL approach and the least squares method. The policy rate (ir), which is among the independent variables in the model and is the monetary policy tool of the CBRT, is statistically significant at 1% sl. in the long run. An 1% increase in the policy rate, which has a positive coefficient, increases the CPI, which is a measure of the inflation rate, by about 0.01%. From the control variables in the model; M1 and M2 money supply are significant both in the short and long run, and brent oil prices are statistically significant at 1% sl. in the long run. In addition, since the money supply can be used as a monetary policy tool by the CB, the statistical significance of these variables also shows the effect of monetary policy on the CPI.

Finally, when the short-term ECM results are examined in Table 3.21, it is seen that the error correction coefficient (CointEq(-1)) is statistically significant. The ECM coefficient expresses that 16% of the imbalances occurring in the short run are corrected in the long run, so it can be said that the model returns to its long run equilibrium slowly.

3.3.3.3. Test Results for PPI



Graph 3.10: *The SIC results for PPI.*

The SIC values of 20 different models are shown in Graph 3.10. The model with the lowest SIC among these models is the ARDL (1, 0, 3, 0, 4, 0) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.22.

Table 3.22: *The ARDL model for PPI.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNPPI(-1)	0.831001	0.017609	47.19215	0.0000
IR	0.000383	9.62E-05	3.978700	0.0001
LNUSD	0.274597	0.016746	16.39758	0.0000
LNUSD(-1)	-0.110237	0.031078	-3.547050	0.0006
LNUSD(-2)	-0.087526	0.029541	-2.962899	0.0037
LNUSD(-3)	0.043242	0.018275	2.366200	0.0197
LNBRENT	0.024956	0.002919	8.549611	0.0000
CLI	-5.06E-06	0.000146	-0.034600	0.9725
CLI(-1)	0.000276	0.000181	1.531024	0.1287
CLI(-2)	0.000171	0.000183	0.935179	0.3518
CLI(-3)	0.000125	0.000177	0.707090	0.4810
CLI(-4)	0.000457	0.000140	3.268603	0.0014
LNBIST	0.016974	0.004809	3.529655	0.0006
COVIDDUM	0.008482	0.001217	6.969992	0.0000
TIGHTDUM	0.009333	0.002354	3.965443	0.0001
C	0.252750	0.035074	7.206105	0.0000

In Table 3.22, in order to determine the relationship between PPI and monetary policy, the dummy variable belonging to the monetary tightening period in 2018 was added as externality to the model. In addition, the dummy variable created for the Covid-19 outbreak was added to the model as an externality, as it gave a significant result. Bound test results of the model are given in Table 3.23 below.

Table 3.23: *The Bound test results of ARDL model for PPI.*

k	F-statistic	%	Critical Values	
			I(0)	I(1)
5	14.30404	**%10**	2.08	3
		%5	2.39	3.38
		%1	3.06	4.15

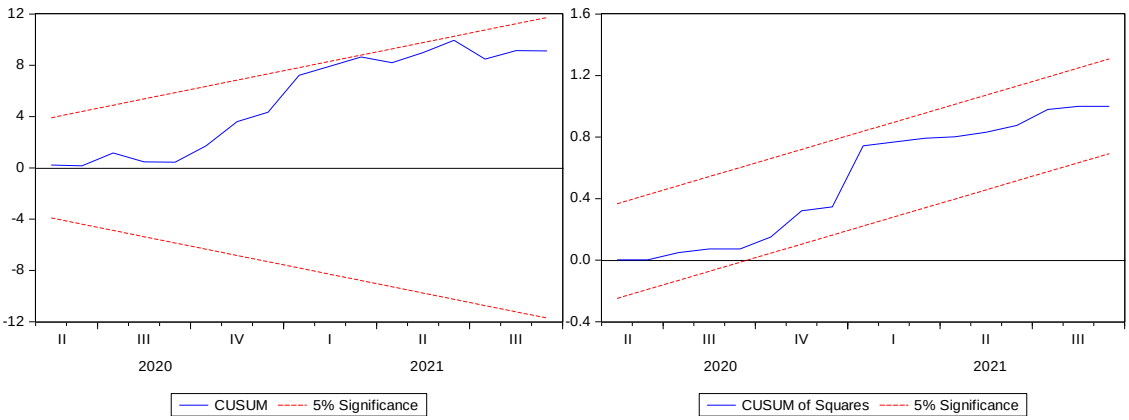
In Table 3.23, I(0) Bound and I(1) Bound cointegration lower and upper critical values at 10%, 5% and 1%, respectively. As stated above, if the calculated F statistical value is greater than the upper critical values, there is a cointegration relationship between

the variables included in the model. Since F statistic value the estimated model is greater than all critical values in 10%, 5% and 1%, it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.24: *The results diagnostic tests of ARDL model for PPI.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	1.589541	0.2088
Breusch-Pagan-Godfrey Test	1.370631	0.1747
Jargue-Bera Test of Normality	3.194108	0.2025
Ramsey RESET Test	2.305032	0.1319

The results of the diagnostic tests of the model estimated by the ARDL approach are shown in Table 3.24 above. According to the results of the BG-LM, BPG, J&B and RReset tests there is no autocorrelation, heteroscedasticity, distribution of normality and specification problems in the model. Therefore, the reliability of the predicted model is high.



Graph 3.11: *CUSUM and CUSUM of Square tests for PPI.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. These tests were carried out in order to test whether there is a structural break in the model, in other words, the stability of the model coefficients within the sample period. Graph 3.11 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.25: *The short and long term coefficient estimates of ARDL for PPI.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	0.000472	0.000174	2.717629	0.0077
D(LNUSD)	0.270956	0.015796	17.153427	0.0000
D(LNUSD(-1))	0.029094	0.020409	1.425521	0.1569
D(LNUSD(-2))	-0.028845	0.018925	-1.524227	0.1303
D(LNBRENT)	0.027792	0.005028	5.527144	0.0000
D(CLI)	-0.000024	0.000149	-0.162258	0.8714
D(CLI(-1))	-0.000730	0.000131	-5.586176	0.0000
D(CLI(-2))	-0.000568	0.000131	-4.323125	0.0000
D(CLI(-3))	-0.000425	0.000125	-3.405195	0.0009
D(LNBIST)	0.008297	0.008302	0.999392	0.3198
D(COVIDDUM)	0.007513	0.003158	2.378615	0.0191
D(TIGHTDUM)	0.012712	0.002174	5.846311	0.0000
CointEq(-1)	-0.164518	0.009334	-17.626115	0.0000
Long- Term Coefficients				
IR	0.002264	0.000514	4.401400	0.0000
LNUSD	0.710513	0.023443	30.307948	0.0000
LNBRENT	0.147672	0.014485	10.194615	0.0000
CLI	0.006064	0.000982	6.173721	0.0000
LNBIST	0.100441	0.029780	3.372811	0.0010
COVIDDUM	0.050189	0.006442	7.790547	0.0000
TIGHTDUM	0.055224	0.015917	3.469408	0.0007
C	1.495572	0.085746	17.441892	0.0000

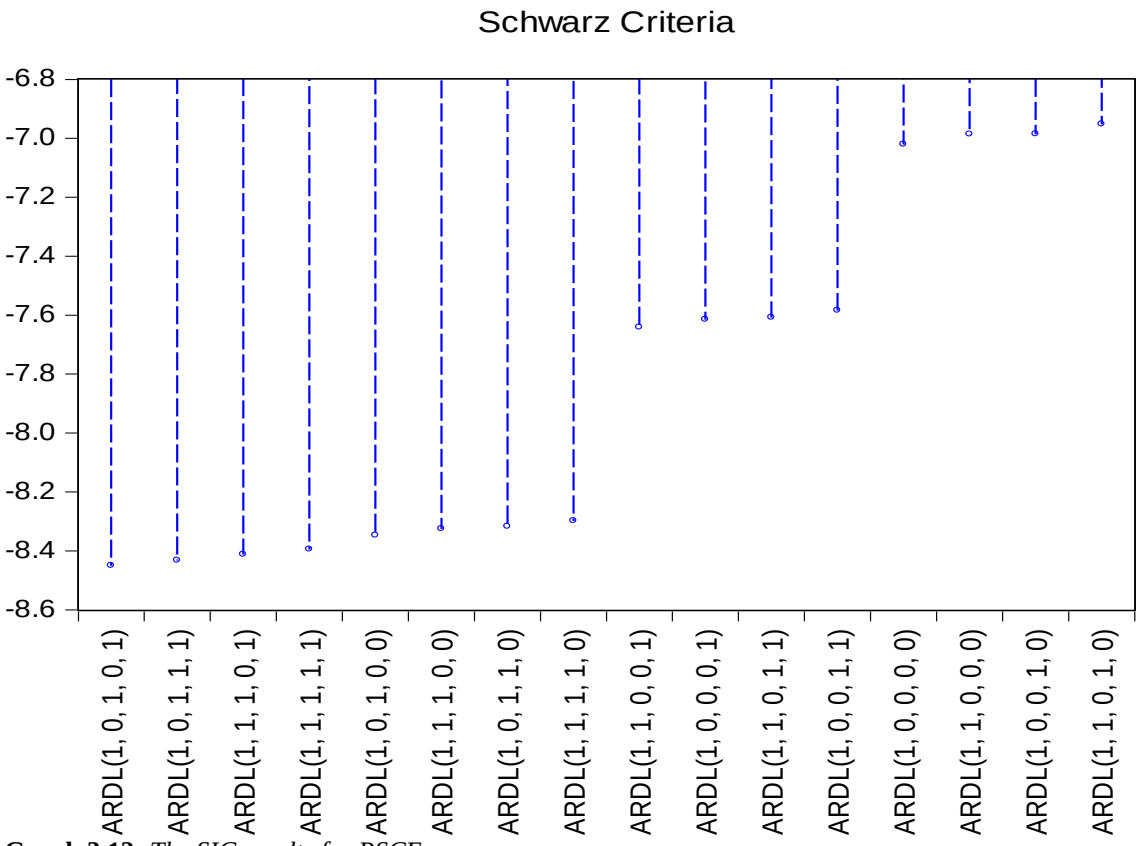
Table 3.25 shows the short and long term coefficients of the model estimated by the ARDL approach and the least squares method. Looking at the table, the effect of monetary policy, which is the main subject of the research, on producer prices can be observed. The IR variable, which is determined as the criterion of monetary policy, is statistically significant at 1% sl. both in the short term and in the long term. An 1% increase in IR causes an increase of 0.02% in the long term and 0.004% in the short term on PPI. All of the LNUSD, LNBRENT, LNBIST, CLI variables added to the model as control variables have a statistically significant and positive effect in the long run. The CLI variable has a

negative effect on PPI in the short run. The dummy variables added externally to the model show that the tight monetary stance in 2018 and the Covid-19 outbreak had a statistically significant effect on PPI both in the short and long term. Therefore, structural breaks occurred in these periods.

When the short-term ECM results are analyzed in Table 3.25, it is seen that the error correction coefficient is statistically significant. The coefficient indicates that approximately 16% of the imbalances caused by the short-term shocks will be corrected in the long-term.

3.3.3.4. Test Results for PSCE

The SIC values of 16 different models are shown in Graph 3.12. Among these models, the model with the lowest SIC is ARDL (1, 0, 1, 0, 1). Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.26.



Graph 3.12: *The SIC results for PSCE.*

Table 3.26: *The ARDL model for PSCE.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNPSCE(-1)	0.969436	0.006817	142.2131	0.0000
IR	-0.000353	8.99E-05	-3.929567	0.0001
LNM3	0.685875	0.042151	16.27183	0.0000
LNM3(-1)	-0.625797	0.048388	-12.93284	0.0000
CLI	-0.000280	0.000136	-2.058453	0.0417
LNUSD	0.070648	0.022538	3.134569	0.0022
LNUSD(-1)	-0.102214	0.023987	-4.261226	0.0000
C	-0.246420	0.117818	-2.091532	0.0386

In Table 3.26, no dummy variable was needed to estimate the above model, in which PSCE was determined as the dependent variable. Limit test results of this model are given in Table 3.27 below.

Table 3.27: *The Bound test results of ARDL model for PSCE.*

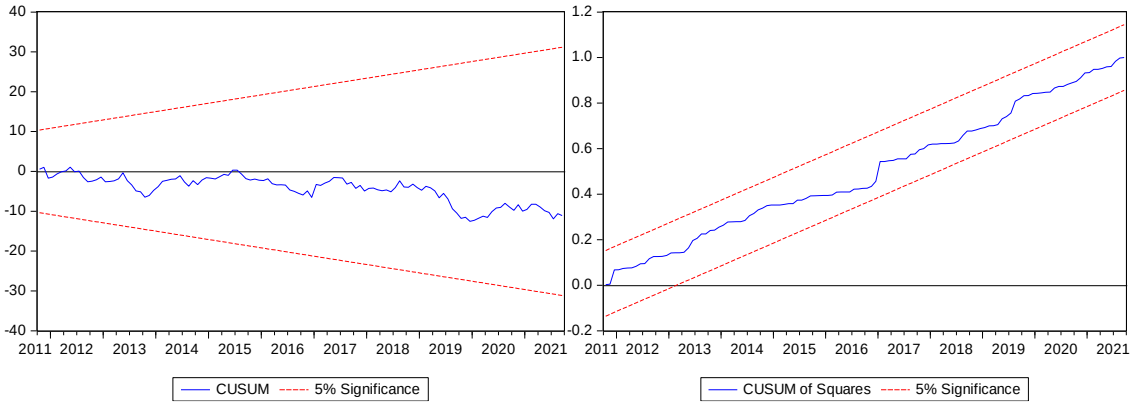
k	F-statistic	%	Critical Values	
			I(0)	I(1)
4	24.15027	**%10**	2.2	3.09
		%5	2.56	3.49
		%1	3.29	4.37

In Table 3.27, shows k, the number of observations, I(0) Bound and I(1) Bound cointegration lower and upper critical values at 10%, 5% and 1%, respectively. Since the F statistic is greater than all critical values in the estimated model, 10%, 5% and 1%, it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.28: *The results diagnostic tests of ARDL model for PSCE.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	0.694115	0.5015
Breusch-Pagan-Godfrey Test	0.846158	0.5514
Jargue-Bera Test of Normality	3.238937	0.1980
Ramsey RESET Test	0.564111	0.4541

The results of the diagnostic tests required to detect the errors of heteroscedasticity, autocorrelation, specification, and normal distribution of residual terms of the estimated model are given in Table 3.24 above. According to the above results of these tests, which increase the reliability of the estimated model, there are no errors specified in the model.



Graph 3.13: *CUSUM and CUSUM of Square tests for PSCE.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. Graph 3.13 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

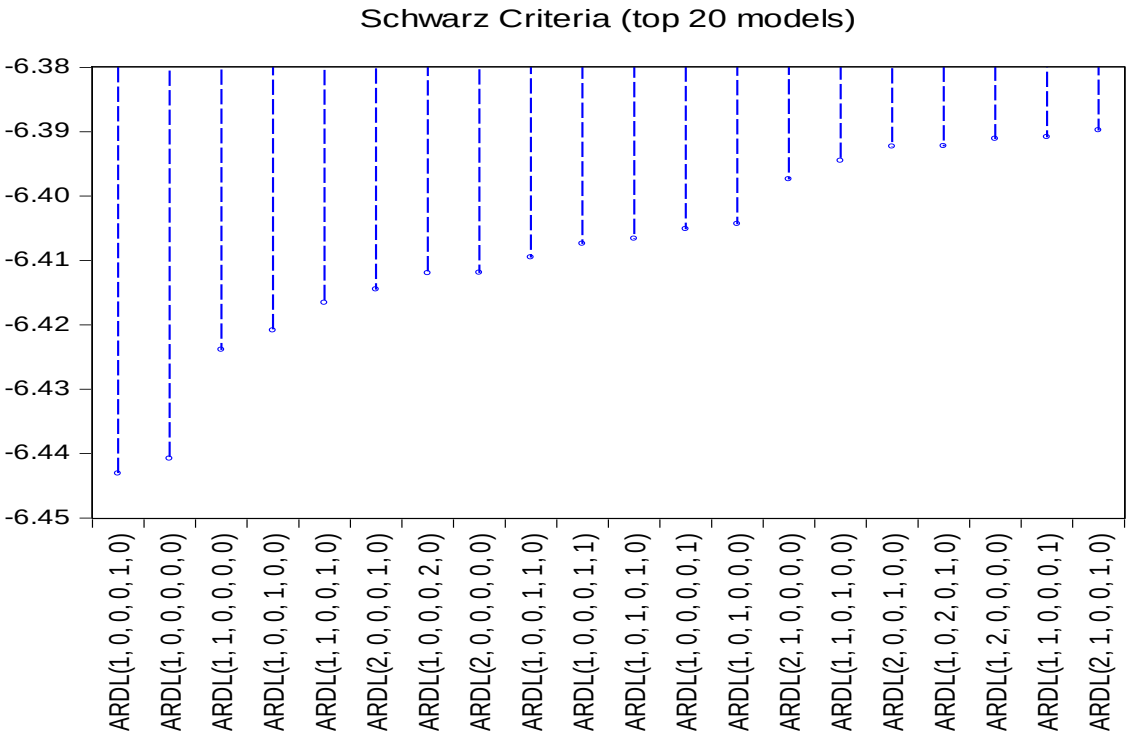
Table 3.29 *The short and long term coefficient estimates of ARDL for PSCE.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.000331	0.000210	-1.574867	0.1179
D(LNM3)	0.690291	0.036894	18.710113	0.0000
D(CLI)	-0.000064	0.000149	-0.431523	0.6669
D(LNUSD)	0.071957	0.022488	3.199758	0.0018
CointEq(-1)	-0.030639	0.002491	-12.298173	0.0000
Long- Term Coefficients				
IR	-0.011562	0.003982	-2.903402	0.0044
LNM3	1.965632	0.430414	4.566843	0.0000
CLI	-0.009145	0.003951	-2.314647	0.0223
LNUSD	-1.032752	0.467173	-2.210640	0.0290
C	-8.062301	3.695675	-2.181550	0.0311

Table 3.29 shows the short and long term coefficients of the model estimated by the ARDL approach and the least squares method. Looking at the table, the effect of monetary policy, which is the main subject of the research, on the credit expansion of the private sector can be observed. The IR variable, which is determined as the criterion of monetary policy, has a statistically significant and negative linear relationship at 1% sl. in the long run. An 1% increase in IR causes a decrease of approximately 1% on PSCE in the long-term. All of the LNUSD, LNM3, CLI variables added to the model as control variables have a statistically significant effect in the long run. While CLI and LNUSD variables have a negative linear relationship in the long run, only the CLI variable has a negative effect in the short run.

When the short-term ECM results in Table 3.29 are examined, it is seen that the error correction coefficient is statistically significant. The coefficient indicates that approximately 3% of the imbalances arising from the short-term shocks will be corrected in the long-term. Therefore, in the long run, the model slowly stabilizes.

3.3.3.5. Test results for RSVI



Graph 3.14: *The SIC results for RSVI.*

The SIC values of 20 different models are shown in Graph 3.14. The model with the lowest SIC among these models is the ARDL (1, 0, 0, 0, 1, 0) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.30 below.

Table 3.30: *The ARDL model for RSVI. (White Heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNRSVI(-1)	0.285967	0.064467	4.435879	0.0000
IR	-0.000752	0.000278	-2.701515	0.0079
LNIPI	0.051493	0.021603	2.383635	0.0187
LNMVPIC	-0.096418	0.029748	-3.241216	0.0015
LNBRENT	0.071519	0.025301	2.826701	0.0055
LNBRENT(-1)	-0.036817	0.024543	-1.500129	0.1363
LNHPI	0.380729	0.053099	7.170225	0.0000
ISODUM	-0.053013	0.013368	-3.965606	0.0001
COVIDDUM	-0.009918	0.004591	-2.160081	0.0328
C	0.625862	0.075085	8.335382	0.0000

In Table 3.30, the dummy variables created for the Covid-19 epidemic and for the full isolation period applied during the period when this epidemic first appeared in Turkey were added as externalities to the above model estimated to examine the relationship between retail sales volume and monetary policy. The boundary test results of the model are given in the table 3.31 below.

Table 3.31: *The Bound test results of ARDL model for RSVI.*

k	F-statistic	%	Critical Values	
			I(0)	I(1)
5	18.33784	**%10**	2.08	3
		%5	2.39	3.38
		%1	3.06	4.15

If the calculated F statistical value is greater than the upper critical values, there is a cointegration relationship between the variables included in the model. In the model estimated in Table 3.31, it is concluded that there is a cointegration relationship between

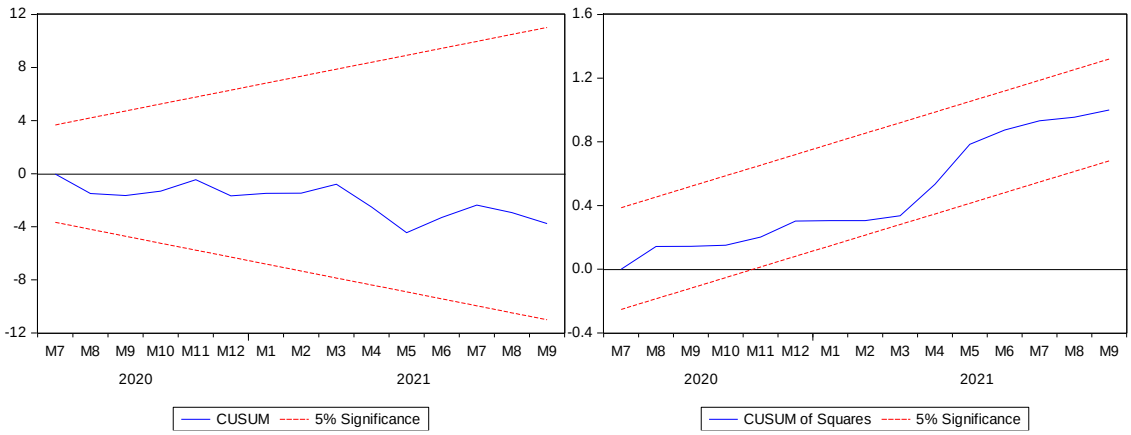
the variables used in the model, since the F statistic is greater than all critical values at 10%, 5% and 1%.

Table 3.32: *The results diagnostic tests of ARDL model for RSVI.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	2.182028	0.1174
Breusch-Pagan-Godfrey Test	3.485877	0.0008
Jargue-Bera Test of Normality	0.424935	0.8086
Ramsey RESET Test	2.695956	0.1033

The results of the diagnostic tests performed to increase the reliability of the model are shown in Table 3.32 above. According to the results of the tests, in the model; autocorrelation problem, normal distribution problem of error terms and specification problems are not exist. However, there is a heteroscedasticity problem in the model according to the results of the BPG test. This problem was tried to be solved by reconstructing the model with the White test.

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. These tests were carried out in order to test whether there is a structural break in the model, in other words, the stability of the model coefficients within the sample period. Graph 3.15 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.



Graph 3.15: *CUSUM and CUSUM of Square tests for RSVI.*

Table 3.33: *The short and long term coefficient estimates of ARDL for RSVI.*

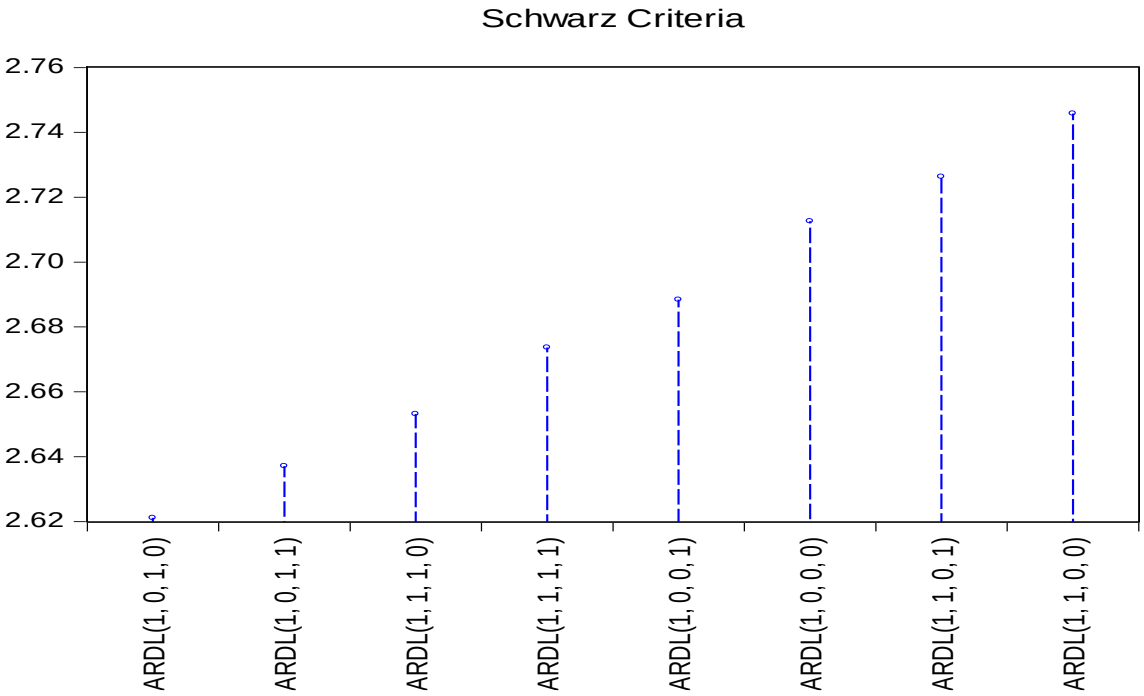
Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.000359	0.000556	-0.644973	0.5202
D(LNIPI)	0.041172	0.009356	4.400461	0.0000
D(LNMVPIC)	-0.080983	0.067808	-1.194296	0.2348
D(LNBRENT)	0.054405	0.016373	3.322886	0.0012
D(LNHPI)	0.441124	0.126024	3.500320	0.0007
D(ISODUM)	-0.060261	0.008801	-6.846868	0.0000
D(COVIDDUM)	-0.021984	0.011873	-1.851581	0.0666
CointEq(-1)	-0.610712	0.085583	-7.135879	0.0000
Long- Term Coefficients				
IR	-0.001053	0.000369	-2.851530	0.0051
LNIPI	0.072115	0.029426	2.450762	0.0157
LNMVPIC	-0.135034	0.040898	-3.301736	0.0013
LNBRENT	0.048599	0.012047	4.034225	0.0001
LNHPI	0.533210	0.058621	9.095833	0.0000
ISODUM	-0.074245	0.019396	-3.827768	0.0002
COVIDDUM	-0.013889	0.005957	-2.331648	0.0214
C	0.876518	0.077216	11.351469	0.0000

In the table 3.33 above, the estimated short- and long-term coefficients for the model in which retail sales are included as the dependent variable are given. Looking at the table, the relationship between IR and RSVI, which is the one of the main question of the research, can be evaluated. In the model, the policy rate is statistically significant at 1% sl. in the long run. If that relationship is interpreted, the 1% increase in the IR reduces the RSVI by about 0.01% in the long run. Other variables in the model have a statistically significant effect in the long term at approximately 1%. In addition, the dummy variables included in the model also have a significant and reducing effect on retail sales in the long run. In the short run, IR and MVPIC do not have a significant effect on retail sales volume.

On the other hand, the Coefficient of CointEq(-1), which represents the short-term ECM, is between -1 and 0 and is therefore statistically significant. This coefficient indicates that approximately 61% of the deviations caused by the short-term shocks will

be corrected in the long-term and the model will return to its long-term equilibrium to a large extent.

3.3.3.6. Test Results for GDS



Graph 3.16: *The SIC results for GDS.*

SIC values of 8 different models are shown in Graph 3.16. The model with the lowest SIC among these models is the ARDL (1, 0, 1, 0) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.34 below.

Table 3.34: *The ARDL model for GDS. (White Heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDS(-1)	0.662072	0.080448	8.229797	0.0000
IR	0.134118	0.043478	3.084710	0.0025
LNUSD	33.97479	5.552715	6.118591	0.0000
LNUSD(-1)	-22.92727	6.430658	-3.565307	0.0005
LNCPI	-16.16322	5.178303	-3.121336	0.0023
TIGHTDUM	-2.143278	0.501723	-4.271838	0.0000
C	36.64025	11.29057	3.245208	0.0015

In this model, in which GDS was determined as the dependent variable, the monetary tightening period in 2018 was added as a dummy again. Boundary test results of this model are given in Table 3.35 below.

Table 3.35: *The Bound test results of ARDL model for GDS.*

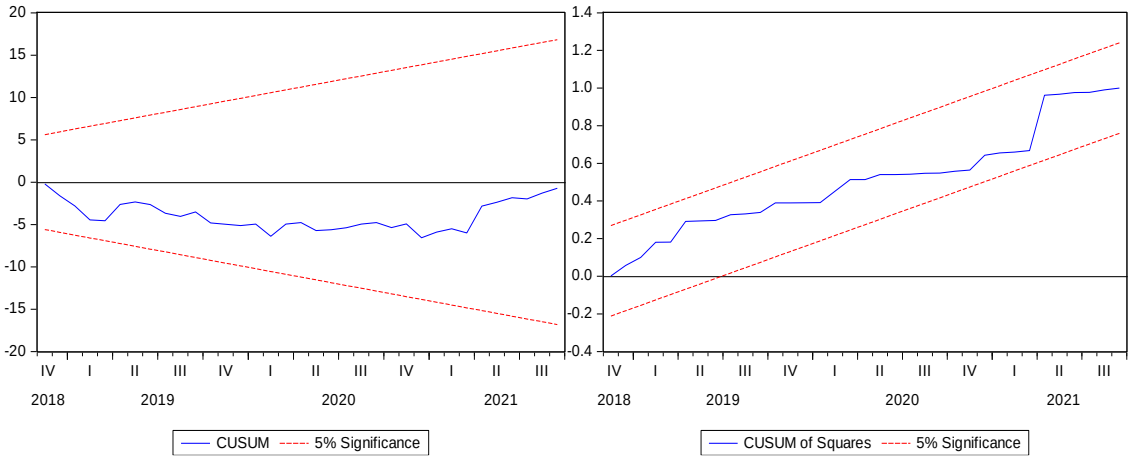
k	F-statistic	%	Critical Values	
			I(0)	I(1)
3	4.85075	**%10**	2.37	3.2
		%5	2.79	3.67
		%1	3.65	4.66

Since the statistical value of F calculated for the model estimated in Table 3.35 is greater than all critical values at 10%, 5% and 1% sl., it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.36: *The results diagnostic tests of ARDL model for GDS.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	1.829631	0.1650
Breusch-Pagan-Godfrey Test	4.725249	0.0002
Jargue-Bera Test of Normality	56.22457	0.0000
Ramsey RESET Test	1.196825	0.2761

In the Table 3.36, according to the above diagnostic tests of the model, estimated by using ARDL approach, the problem of autocorrelation and specification is not exist in the model. According to the results of the BPG test, there is a problem of heteroscedasticity in the model, and according to the results of the J&B test, the normal distribution condition is not provide in the model. However, due to the large number of observations in the model as per the Central Limit Theorem (CLT), the normal distribution condition of the error terms can be neglected. In addition, the White test was applied to the model for the heteroscedasticity problem.



Graph 3.17: *CUSUM and CUSUM of Square tests for GDS.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. Graph 3.17 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.37: *The short and long term coefficient estimates of ARDL for GDS.*

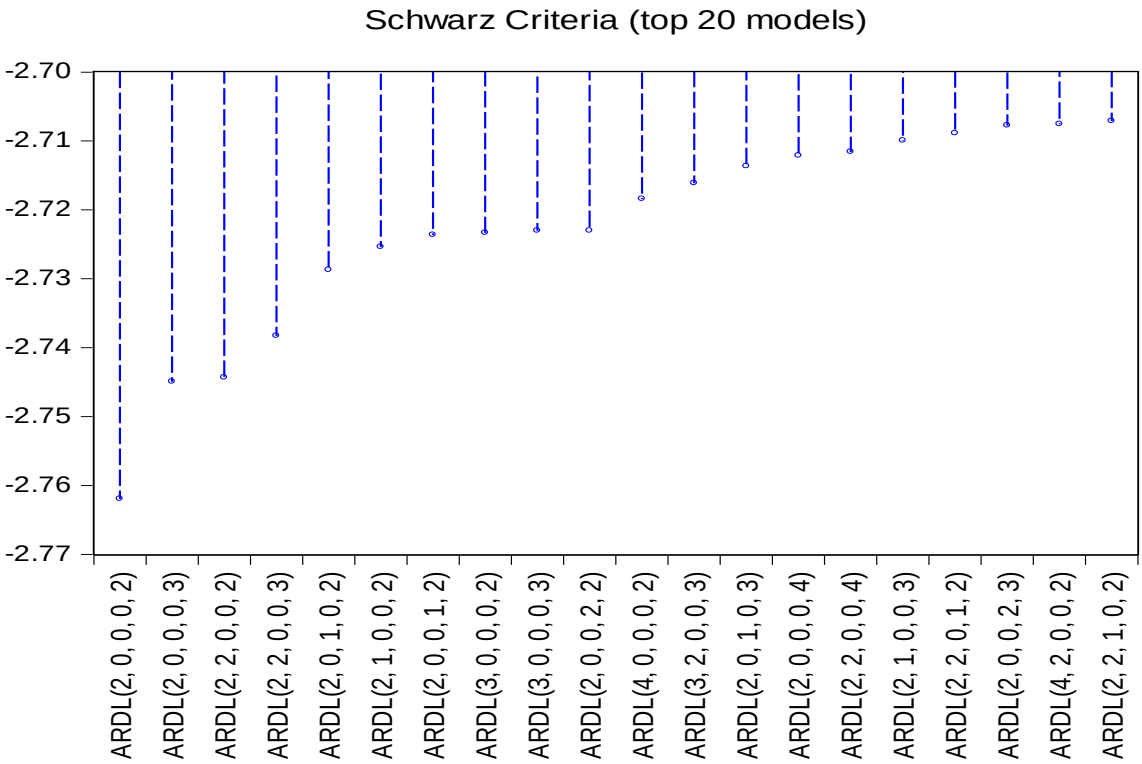
Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	0.158872	0.052803	3.008769	0.0032
D(LNUSD)	30.652698	4.900642	6.254833	0.0000
D(LNCPI)	2.477622	15.274313	0.162208	0.8714
D(TIGHTDUM)	-2.812407	0.592689	-4.745168	0.0000
CointEq(-1)	-0.318320	0.060878	-5.228811	0.0000
Long- Term Coefficients				
IR	0.396884	0.071777	5.529415	0.0000
LNUSD	32.691985	10.362057	3.154970	0.0020
LNCPI	-47.830434	17.411184	-2.747110	0.0069
TIGHTDUM	-6.342419	2.537492	-2.499483	0.0138
C	108.426361	37.735688	2.873311	0.0048

The short and long term coefficients of the estimated model are shown in Table 3.37. Looking at the table, it is seen that the policy rate has a significant relationship with the GDS. The policy rate is statistically significant at 1% sl. in both the long run and the

short run. A % increase in the policy rate creates an increase in GDS variable by approximately 16% in the short term and by approximately 40% in the long term. While the other independent variables in the model LNUSD and LNCPI are significant at 1% sl. in the long run, the probability value of LNCPI is not significant in the short run. In addition, the dummy variable added to the model for the monetary tightening in 2018 has a significant effect on GDS in both the long and short run.

On the other hand, in Table 3.37, it is seen that the short-term ECM is statistically significant. The ECM coefficient indicates that approximately 32% of the deviations caused by the short-term shocks will be corrected in the long-term.

3.3.3.7. Test Results for IPI



Graph 3.18: *The SIC results for IPI.*

The SIC values of 20 different models are shown in Graph 3.18. Among these models, the model with the lowest SIC is ARDL (2, 0, 0, 2) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.38 below.

Table 3.38: *The ARDL model for IPI.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNIPI(-1)	-0.063832	0.087756	-0.727382	0.4684
LNIPI(-2)	0.336000	0.089297	3.762734	0.0003
IR	-0.002279	0.001844	-1.236187	0.2189
LNPPI	1.371956	0.401138	3.420165	0.0009
LNCPI	-2.274839	0.600530	-3.788051	0.0002
LNCLIT	4.929334	0.930904	5.295214	0.0000
LNCLIT(-1)	3.320435	1.346239	2.466452	0.0151
LNCLIT(-2)	-4.940794	1.050072	-4.705194	0.0000
COVIDDUM	-0.056517	0.027917	-2.024448	0.0452
C	-1.946507	0.474650	-4.100927	0.0001

In Table 3.38 , the model examined whether there is a relationship between monetary policy and industrial production. Again, the dummy variable created for the Covid-19 outbreak was added to this model as an externality. Bound test results of the model are given in Table 3.39 below.

Table 3.39: *The Bound test results of ARDL model for IPI.*

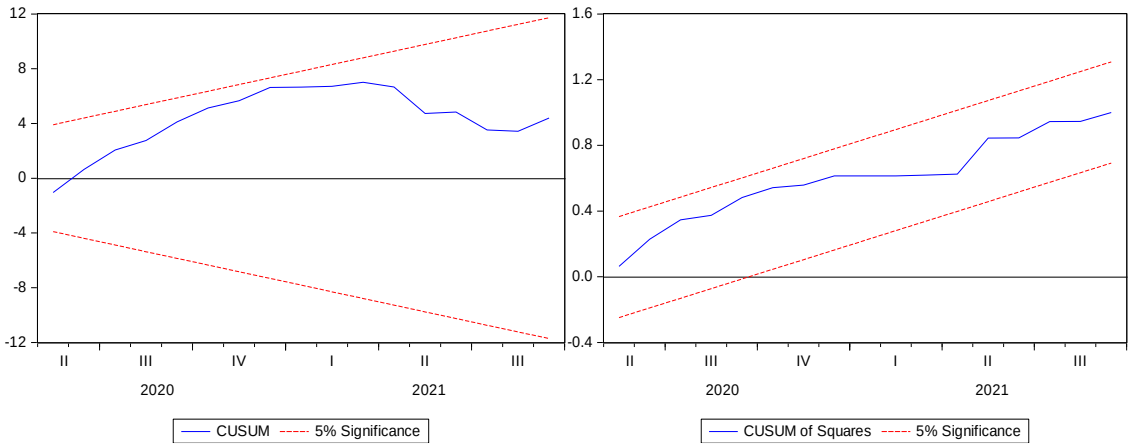
k	F-statistic	%	Critical Values	
			I(0)	I(1)
4	6.348026	**%10**	2.2	3.09
		%5	2.56	3.49
		%1	3.29	4.37

Since the statistical value of F calculated for the model estimated in Table 3.39 is greater than all critical values at 10%, 5% and 1% sl., it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.40: *The results diagnostic tests of ARDL model for IPI.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	1.112166	0.3324
Breusch-Pagan-Godfrey Test	1.808757	0.0737
Jargue-Bera Test of Normality	25.53029	0.0003
Ramsey RESET Test	2.348483	0.1281

The necessary diagnostic tests were performed to detect the errors of heteroscedasticity, autocorrelation, specification, and normal distribution of residual terms of the estimated model, and the results are given in Table 3.40 above. According to the table, among these tests, which increase the reliability of the model, only the normal distribution of residual terms is not met. However, due to the large number of observations as per CLT, the normality distribution condition of the error terms can be neglected.



Graph 3.19: *CUSUM and CUSUM of Square tests for IPI.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. Graph 3.19 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.41: *The short and long term coefficient estimates of ARDL for IPI.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(LNIPI(-1))	-0.363512	0.079343	-4.581556	0.0000
D(IR)	-0.002737	0.003596	-0.761184	0.4481
D(LNPPI)	2.326107	0.955774	2.433740	0.0165
D(LNCPI)	-3.188336	1.402942	-2.272606	0.0249
D(LNCLIT)	3.760253	1.037099	3.625743	0.0004
D(LNCLIT(-1))	4.933917	0.936274	5.269739	0.0000

[Table 3.41. (Continued) *The short and long term coefficient estimates of ARDL for IPI*]

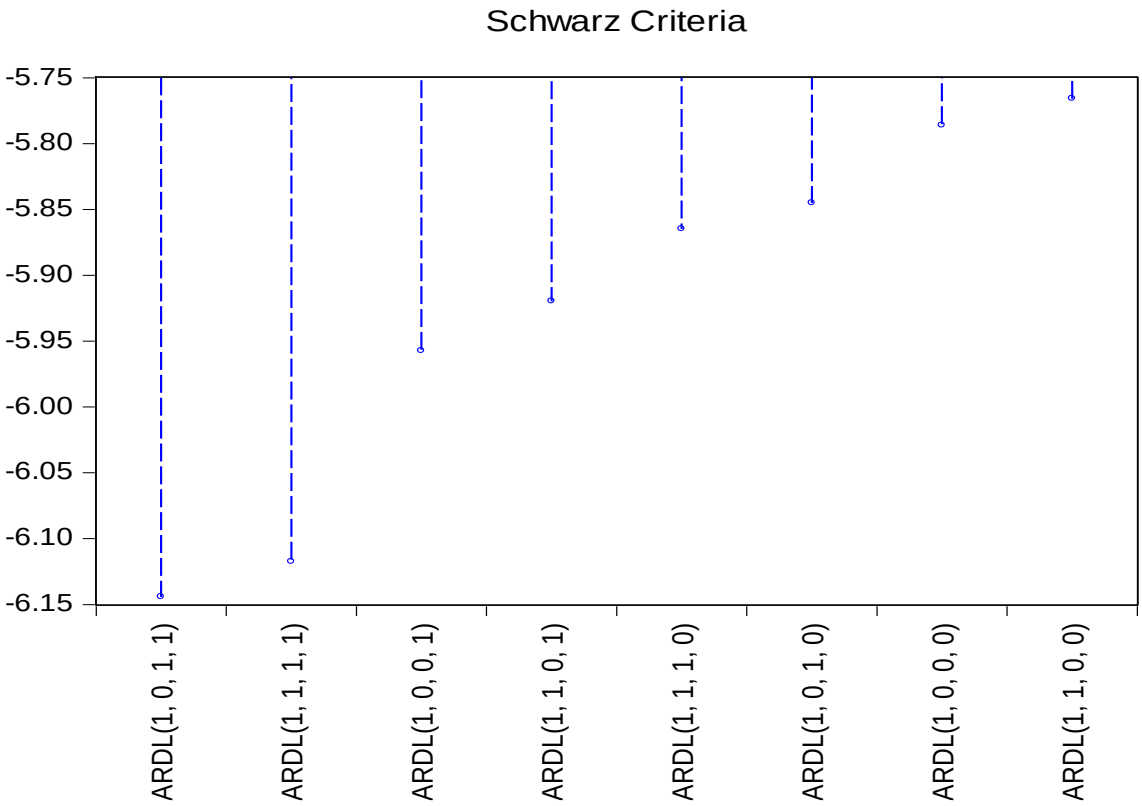
D(COVIDDUM)	-0.181904	0.067143	-2.709194	0.0078
CointEq(-1)	-0.689967	0.114566	-6.022439	0.0000
Long- Term Coefficients				
IR	-0.003132	0.002600	-1.204374	0.2309
LNPPI	1.884989	0.515119	3.659324	0.0004
LNCPI	-3.125496	0.720576	-4.337498	0.0000
LNCLIT	4.546339	0.570841	7.964282	0.0000
COVIDDUM	-0.077651	0.038450	-2.019515	0.0457
C	-2.674387	0.569040	-4.699822	0.0000

According to the short- and long-term coefficients of the model in Table 3.41, the policy rate does not have a significant relationship with industrial production either in the short run or in the long run. Other independent variables in the model are statistically significant in both the short and long run. In addition, the dummy variable added to the model for the Covid-19 epidemic has created a significant and negative effect in both the short and long term.

When the short-term ECM results are examined, it is seen that the error correction coefficient is statistically significant. Its coefficient is negative and less than 1 as expected. The coefficient indicates that the short-term deviations will be corrected by approximately 69% in the long-term. Therefore, the model largely returns to its long-run equilibrium.

3.3.3.8. Test Results for USD

The SIC values of 8 different models are shown in Graph 3.20. Among these models, the model with the lowest SIC is ARDL (1, 0, 1, 1) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.42 below.



Graph 3.20: *The SIC results for USD.*

Table 3.42: *The ARDL model for USD. (White Heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNUSD(-1)	0.892200	0.039835	22.39765	0.0000
IR	0.000993	0.000366	2.709924	0.0077
LNM3	1.091693	0.131572	8.297310	0.0000
LNM3(-1)	-0.787990	0.142902	-5.514206	0.0000
LNCPI	1.273909	0.340017	3.746603	0.0003
LNCPI(-1)	-1.643922	0.350214	-4.694054	0.0000
TIGHTDUM	0.020447	0.006047	3.381042	0.0010
C	-1.823706	0.375135	-4.861464	0.0000

Table 3.42 presents the ARDL model statistics created to examine the relationship between exchange rate and monetary policy, which is one of the main research questions of this study. In the model, a dummy was used again for the monetary tightening in 2018 . The boundary test results of the model are given in the table 3.43 below.

Table 3.43: *The Bound test results of ARDL model for USD.*

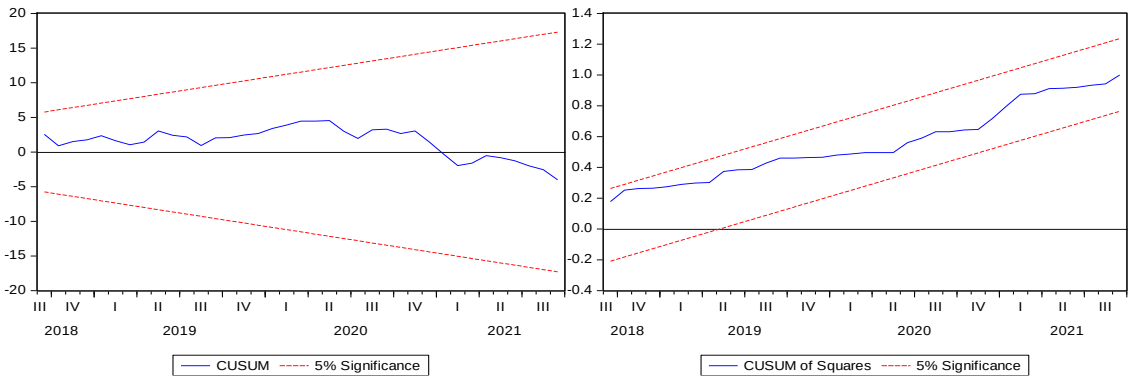
k	F-statistic	%	Critical Values	
			I(0)	I(1)
3	9.225417	**%10**	2.37	3.2
		%5	2.79	3.67
		%1	3.65	4.66

Since the statistical value of F calculated for the model estimated in Table 3.43 is greater than all critical values at 10%, 5% and 1% sl., it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.44: *The results diagnostic tests of ARDL model for USD.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	0.678317	0.5094
Breusch-Pagan-Godfrey Test	3.530141	0.0018
Jargue-Bera Test of Normality	0.136252	0.9341
Ramsey RESET Test	1.236195	0.2684

The results of the diagnostic tests performed to detect the errors of heteroscedasticity, autocorrelation, specification and normal distribution of residual terms of the model estimated by the ARDL approach are given in Table 3.44. According to the results of the BG-LM test, there is no autocorrelation problem in the model. There is a problem of heteroscedasticity in the model estimated according to the results of the BPG test. Therefore, the model are re-estimated using the White test. According to RReset test results, there is no specification error in the model. According to the results of the J&B test, the normal distribution condition was met.



Graph 3.21: *CUSUM and CUSUM of Square tests for USD.*

The predicted ARDL model for USD was finally subjected to CUSUM and CUSUM-of-Square robustness tests. Graph 3.21 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.45: *The short and long term coefficient estimates of ARDL for USD.*

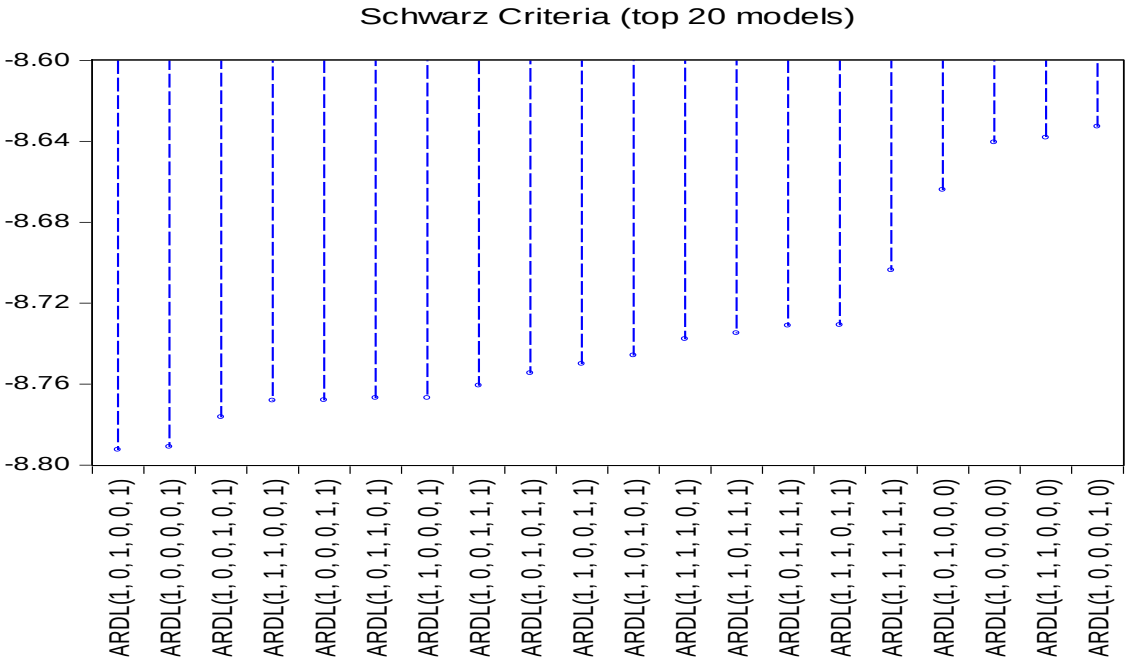
Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	0.001469	0.000669	2.196713	0.0300
D(LNM3)	1.239196	0.110433	11.221268	0.0000
D(LNCPI)	1.089976	0.192307	5.667899	0.0000
D(TIGHTDUM)	0.002501	0.008097	0.308890	0.7579
CointEq(-1)	-0.112769	0.013790	-8.177302	0.0000
Long- Term Coefficients				
IR	0.009209	0.003937	2.339097	0.0210
LNM3	2.817292	0.947388	2.973746	0.0036
LNCPI	-3.432406	1.709994	-2.007263	0.0470
TIGHTDUM	0.189673	0.079993	2.371116	0.0193
C	-16.917514	4.499757	-3.759651	0.0003

In Table 3.45, it is seen that there is a statistically significant at %5 sl. and positive relationship between the policy rate and the exchange rate according to the short- and long-term coefficients obtained using the ARDL model. In the long run, an increase by %1 in IR increases LNUSD by about %1. In the short run, an increase by %1 in IR increases LNUSD by about 0.02%. While other variables LNM3 and LNCPI included in the model have a significant relationship with the exchange rate in both the long and short run, the dummy variable in the model has a significant and positive relationship with the exchange rate in the long run. Therefore, the monetary tightening policy in 2018 had an increasing effect on the exchange rate.

When the CointEq(-1) coefficient is examined, it is seen that the coefficient is statistically significant. The coefficient indicates that approximately 11% of the deviations occurring in the short term will be corrected in the long term.

3.3.3.9. Test Results for CLI

The SIC values of 20 different models are shown in Graph 3.22. Among these models, the model with the lowest SIC is ARDL (1, 0, 1, 0, 0, 1) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.46 below.



Graph 3.22: *The SIC results for CLIT.*

Table 3.46: *The ARDL model for CLIT. (White Heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNCLIT(-1)	0.697390	0.036932	18.88291	0.0000
IR	-0.000183	6.90E-05	-2.646420	0.0092
LNUSD	-0.082858	0.019897	-4.164433	0.0001
LNUSD(-1)	0.038814	0.024473	1.585992	0.1154
LNCPI	0.095891	0.024867	3.856211	0.0002
LNPSCE	0.071304	0.012332	5.782073	0.0000
LNBRENT	0.019854	0.008940	2.220851	0.0283
LNBRENT(-1)	-0.025614	0.008379	-3.056843	0.0028
ISODUM	-0.041633	0.003074	-13.54336	0.0000
C	-0.160940	0.049713	-3.237395	0.0016

In this model, which analyzes the relationship between leading indicators and monetary policy, which is one of the research questions of the study, LNCLIT was determined as the dependent variable because it became stationary at the I(1) level. In the model, again ISODUM are created for the full isolation period at the beginning of the Covid-19 process was used. The boundary test results of the model are given in the table 3.47 below.

Table 3.47: *The Bound test results of ARDL model for CLIT.*

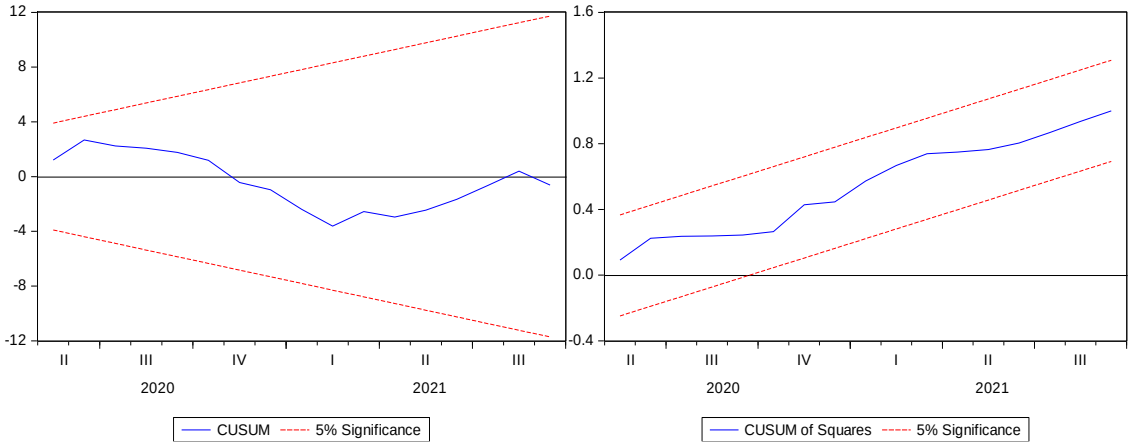
k	F-statistic	%	Critical Values	
			I(0)	I(1)
5	27.94463	**%10**	2.08	3
		%5	2.39	3.38
		%1	3.06	4.15

Since the F statistical value calculated in Table 3.47 is greater than all critical values at 10%, 5% and 1% sl., it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.48: *The results diagnostic tests of ARDL model for CLIT.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	0.317419	0.7287
Breusch-Pagan-Godfrey Test	2.165306	0.0292
Jargue-Bera Test of Normality	1.242346	0.5373
Ramsey RESET Test	1.236195	0.2684

The results of the diagnostic tests that increase the reliability of this estimated model are given in Table 3.48 above. According to the results of the BG-LM test, there is no autocorrelation problem in the model. There is a problem of heteroscedasticity in the model estimated according to the results of the BPG test so the model was re-estimated using the White test. According to RReset test results, there is no specification error in the model and according to the J&B test results, the normal distribution of error terms is provided.



Graph 3.23: *CUSUM and CUSUM of Square tests for CLIT.*

The predicted ARDL model for CLIT was finally subjected to CUSUM and CUSUM-of-Square robustness tests. Graph 3.21 above shows the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

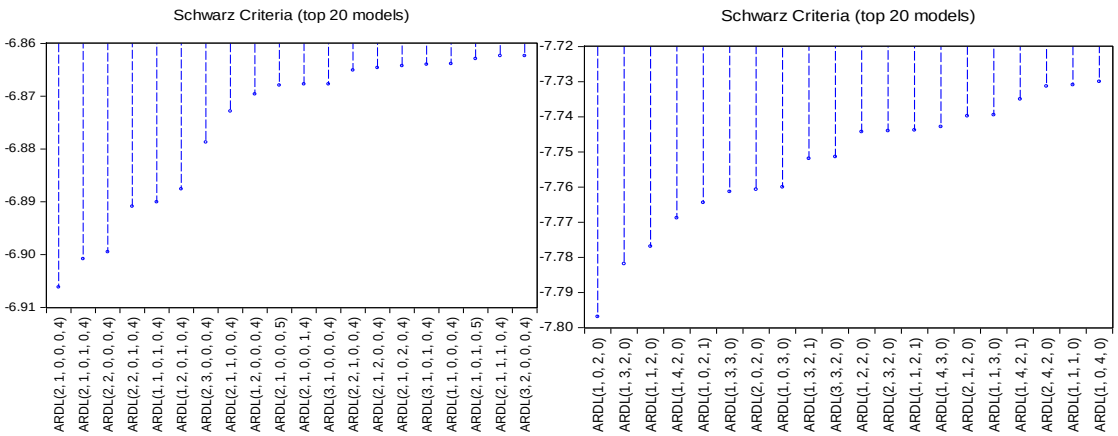
Table 3.49: *The short and long term coefficient estimates of ARDL for CLIT.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.000376	0.000180	-2.093193	0.0385
D(LNUSD)	-0.072133	0.019529	-3.693659	0.0003
D(LNCPI)	0.064945	0.050125	1.295647	0.1976
D(LNPSCE)	0.063309	0.031138	2.033166	0.0443
D(LNBRENT)	0.020028	0.005382	3.721531	0.0003
D(ISODUM)	-0.042428	0.002609	-16.264606	0.0000
CointEq(-1)	-0.310316	0.031095	-9.979531	0.0000
Long- Term Coefficients				
IR	-0.000603	0.000224	-2.689129	0.0082
LNUSD	-0.145545	0.043472	-3.348056	0.0011
LNCPI	0.316880	0.085031	3.726635	0.0003
LNPSCE	0.235631	0.021316	11.054129	0.0000
LNBRENT	-0.019034	0.010460	-1.819650	0.0713
ISODUM	-0.137580	0.016589	-8.293614	0.0000
C	-0.531838	0.146396	-3.632882	0.0004

Table 3.49 shows the short and long term coefficients of the model estimated by the ARDL approach and the least squares method. Looking at the table, it can be mentioned that exists the relationship between leading indicators and monetary policy, which is one of the research questions, both in the short term and in the long term. In the model, an increase by %1 in IR produces a decrease in LNCLIT by about 0.006% in the long run and a decrease by about 0.004% in the short run. While LNUSD, LNCPI and LNPSCE among other variables in the model have a significant relationship with LNCLIT in the long run, only LNCPI does not have a significant relationship with IR in the short run. Oil prices with together other variables, except LNCPI, have a significant relationship with the CLIT in the short run. The ISODUM dummy has a significant and negative relationship with the leading indicators in both periods.

The short-term ECM coefficient is negative and less than 1, as expected. The coefficient indicates that 31% of the imbalances caused by shocks will be corrected in the long term.

3.3.3.10. Test Results for MVPI



Graph 3.24: *The SIC results for MVPIC, MVPIP respectively.*

In Graph 3.24, the SIC values of 20 different ARDL models estimated separately for MVPIC and MVPIP, respectively, are shown. According to the graphs, the model with the lowest SIC for MVPIC is the ARDL (2, 1, 0, 0, 0.4) model, while the model with the lowest SIC for MVPIP is the ARDL (1, 0, 2, 0) model. Therefore, the lag length of the models to be estimated was determined in this way. The results of the models estimated after the lag length is determined are presented in Table 3.50 and Table 3.51 below.

Table 3.50: *The ARDL model for MVPIC. (White Heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNMVPIC(-1)	1.022043	0.092494	11.04986	0.0000
LNMVPIC(-2)	-0.194987	0.103917	-1.876372	0.0633
IR	0.001417	0.000435	3.259761	0.0015
IR(-1)	-0.002001	0.000449	-4.455289	0.0000
LNUSD	0.138886	0.034635	4.009961	0.0001
LNCPI	-0.270975	0.080857	-3.351297	0.0011
LNBRENT	0.028282	0.007617	3.713194	0.0003
LNM3	0.134067	0.114888	1.166937	0.2458
LNM3(-1)	0.175976	0.145166	1.212237	0.2280
LNM3(-2)	-0.116428	0.110325	-1.055319	0.2936
LNM3(-3)	-0.474965	0.165672	-2.866891	0.0050
LNM3(-4)	0.481767	0.136512	3.529117	0.0006
MVPIDUM	0.053885	0.003545	15.19904	0.0000
TIGHTDUM	0.024389	0.005632	4.330504	0.0000
C	-0.870804	0.290150	-3.001219	0.0033

in Table 3.50, the model which was re-estimated by the White test due to the heteroscedasticity issue also includes MVPIDUM which was created for the adjustments in SCT taxes in 2019, besides TIGHTDUM. While MVPI for consumers is used as a dependent variable in the model, its relationship with the policy interest, which is one of the main questions of the research, is discussed.

Table 3.51: *The ARDL model for MVPIP.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNMVPIP(-1)	0.954286	0.013458	70.90827	0.0000
IR	-0.000412	0.000125	-3.302377	0.0013
LNUSD	0.210244	0.027552	7.630822	0.0000
LNUSD(-1)	-0.024173	0.044922	-0.538095	0.5915
LNUSD(-2)	-0.117731	0.030866	-3.814260	0.0002
LNBRENT	0.018125	0.004320	4.195447	0.0001
TIGHTDUM	0.026169	0.005150	5.081336	0.0000
C	0.047478	0.020813	2.281186	0.0243

The results of the ARDL model, which was created to examine the relationship of the MVPI in terms of producers with the policy rate, are presented in Table 3.51. Again, TIGHTDUM is used in this model as an externality for the monetary tightening in 2018.

Since the F statistical values calculated in Table 3.52 are greater than all critical values at 10%, 5% and 1% sl., respectively, it is concluded that there is a cointegration relationship between the variables used in both models.

Table 3.52: *The Bound test results of ARDL model for MVPI.*

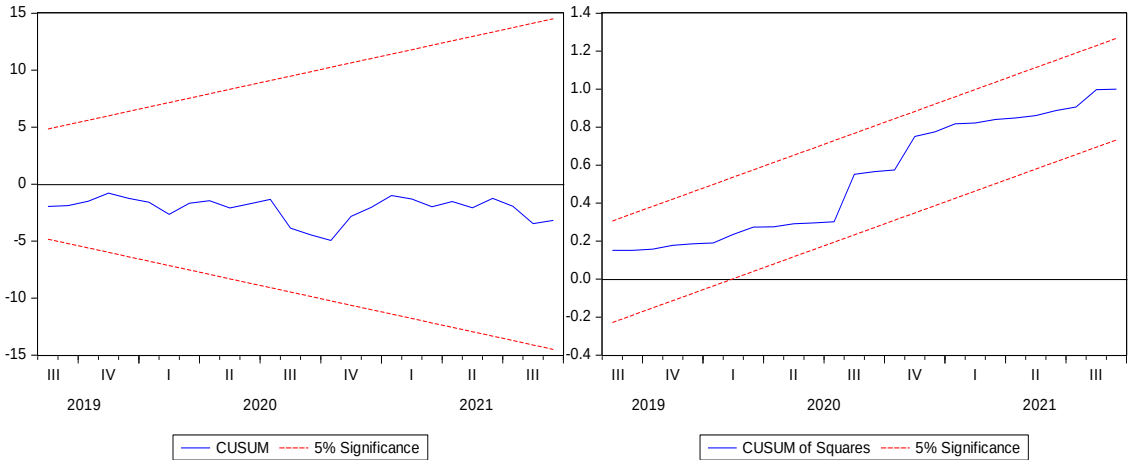
Model	k	F-statistic	%	Critical Values	
				I(0)	I(1)
MVPIC	5	8.541104	**%10**	2.08	3
			%5	2.39	3.38
			%1	3.06	4.15
MVPIP	3	20.79762	**%10**	2.37	3.20
			%5	2.79	3.67
			%1	3.65	4.66

Table 3.53: *The results diagnostic tests of ARDL model for MVPI.*

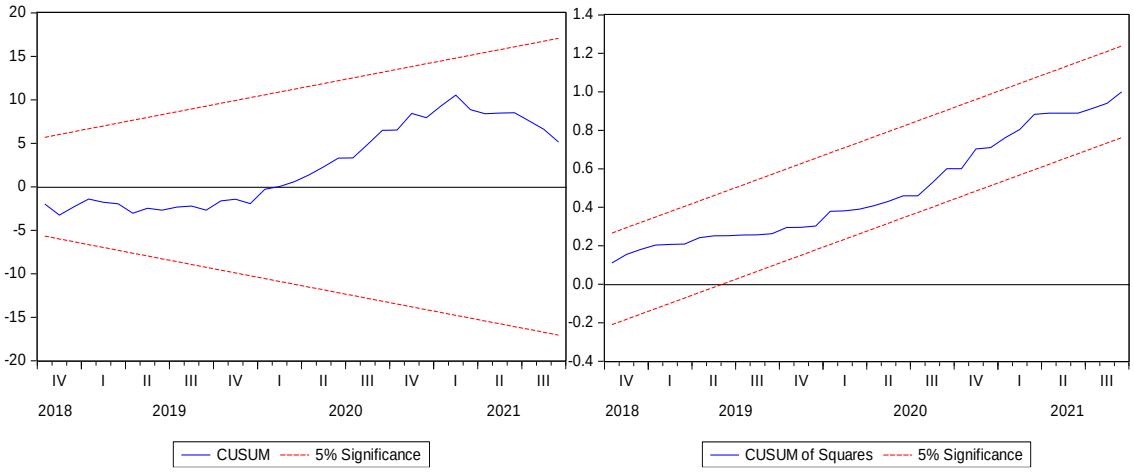
Tests	MVPIC		MVPIP	
	Calculated statistics	Probability	Calculated statistics	Probability
Breusch-Godfrey Autocorrelation	1.710254	0.1857	3.234996	0.1984
Breusch-Pagan-Godfrey Test	2.531393	0.0036	7.535981	0.3753
Jargue-Bera Test of Normality	4.737799	0.0936	3.186194	0.2033
Ramsey RESET Test	0.205764	0.6510	1.587704	0.2101

The diagnostic tests were performed to detect the errors of heteroscedasticity, autocorrelation, specification and normal distribution of residual terms of the models in Table 3.51 and Table 3.52, which were estimated by ARDL approach. According to the diagnostic test results in Table 3.53, there is no autocorrelation problem in both models according to the BG-LM test results. According to the results of the BPG test, the model estimated for MVPIP has homoscedasticity, but the model estimated for MVPIC has the

heteroscedasticity problem. For this reason, the ARDL model for MVPIC was re-estimated with the White test and the problem was tried to be resolved. According to RReset test results, there is no specification error in both models. Finally, according to the J&B test results, both models satisfy the normal distribution condition.



Graph 3.25: *CUSUM and CUSUM of Square tests for MVPIC.*



Graph 3.26: *CUSUM and CUSUM of Square tests for MVPIP.*

The predicted models were finally subjected to CUSUM and CUSUM-of-Square robustness tests. Graph 3.25 and Graph 3.26 above show the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that both models estimated are in the 95% confidence interval. Therefore, it is concluded that the coefficients of both estimated models are stable in the long run.

Table 3.54: *The short and long term coefficient estimates of ARDL for MVPIC.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(LNMVPIC(-1))	0.236032	0.065974	3.577628	0.0005
D(IR)	0.001369	0.000437	3.135190	0.0022
D(LNUSD)	0.142987	0.054476	2.624752	0.0099
D(LNCPI)	0.018881	0.152216	0.124043	0.9015
D(LNBRENT)	0.024399	0.011021	2.213823	0.0289
D(LNM3)	0.142206	0.078361	1.814747	0.0723
D(LNM3(-1))	0.056654	0.089155	0.635460	0.5264
D(LNM3(-2))	0.019418	0.079922	0.242961	0.8085
D(LNM3(-3))	-0.459949	0.067112	-6.853466	0.0000
D(DUMMYMVPI)	0.055829	0.005184	10.768711	0.0000
D(TIGHTDUM)	0.026713	0.005299	5.040973	0.0000
CointEq(-1)	-0.134312	0.018985	-7.074672	0.0000
Long- Term Coefficients				
IR	-0.003374	0.001643	-2.053605	0.0424
LNUSD	0.803072	0.212933	3.771478	0.0003
LNCPI	-1.566845	0.624516	-2.508893	0.0136
LNBRENT	0.163534	0.035672	4.584318	0.0000
LNM3	1.158857	0.287735	4.027507	0.0001
MVPIDUM	0.311579	0.094501	3.297111	0.0013
TIGHTDUM	0.141023	0.053405	2.640616	0.0095
C	-5.035201	1.462191	-3.443600	0.0008

Table 3.54 shows the short- and long-term coefficients of the ARDL model estimated for MVPIC. Looking at the table, it can be observed that the monetary policy, which is the subject of the research, is related to consumer-based MVPI. While the IR, which is determined as the criterion of monetary policy, has a statistically significant relationship with MVPIC in both the long and short run; this relationship is significant and positive at %5 sl. in the short term, and significant and negative at %1 sl. in the long term. An increase by %1 in IR decreases MVPIC by approximately 0.03% in the long term and increases it by approximately 0.01% in the short term. While the control variables LNCPI, LNUSD, LNBRENT, LNM3 in the model have a statistically significant relationship with MVPIC in the long term; only CPI does not have a significant relationship in the short run. In addition, TIGHTDUM and MVPIDUM included in the

model have a significant and positive relationship on MVPIC both in the short and long term.

CointEq(-1), which is the short-term ECM coefficient in Table 3.54, is also seen to be statistically significant. According to the ECM coefficient, approximately 13% of the deviations caused by the short-term shocks are corrected in the long-term.

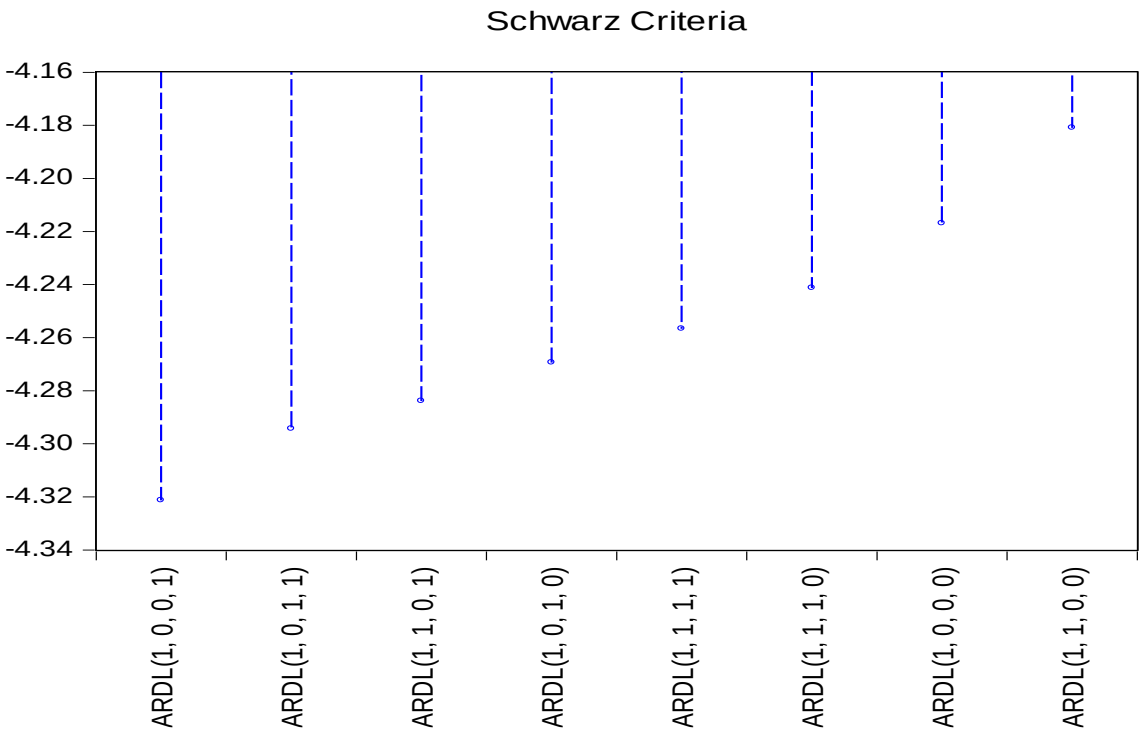
Table 3.55: *The short and long term coefficient estimates of ARDL for MVPIP.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.000032	0.000314	-0.100474	0.9201
D(LNUSD)	0.210807	0.027214	7.746394	0.0000
D(LNUSD(-1))	0.106123	0.031024	3.420696	0.0009
D(LNBRENT)	0.024825	0.007643	3.247919	0.0015
D(TIGHTDUM)	0.027596	0.003647	7.566834	0.0000
CointEq(-1)	-0.044289	0.003909	-11.330991	0.0000
Long- Term Coefficients				
IR	-0.009003	0.003375	-2.667728	0.0087
LNUSD	1.494942	0.150393	9.940230	0.0000
LNBRENT	0.396486	0.091160	4.349316	0.0000
TIGHTDUM	0.572446	0.215973	2.650544	0.0091
C	1.038587	0.195117	5.322888	0.0000

Table 3.55 shows the short- and long-term coefficients of the ARDL model estimated for MVPIP. Looking at the table, it can be observed that the monetary policy, which is the subject of the research, is related to MVPIP. The IR, which is determined as the criterion of monetary policy has a statistically significant and negative linear relationship at %1 sl. with MVPIP in the long run. An increase by %1 in IR reduces MVPIP by approximately %0.09 in the long run. The control variables LNUSD and LNBRENT in the model have a statistically significant and positive relationship at %1 sl. with MVPIP in both the long and short term. In addition, TIGHTDUM included in the model has a significant and up-ward relationship with MVPIP both in the short and long term.

ın Table 3.55, CointEq(-1), which is the short-term ECM coefficient, is also seen to be statistically significant. According to the CointEq(-1) coefficient approximately 4% of the deviations caused by the short-term shocks are corrected in the long-term.

3.3.3.11. Test Results for BIST



Graph 3.27: *The SIC results for BIST.*

SIC values of 8 different models are shown in Graph 3.27. Among these models, the model with the lowest SIC is ARDL (1, 0, 0, 1) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.54 below.

Table 3.56: *The ARDL model for BIST. (White Heteroscedasticity)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNBIST(-1)	0.765805	0.057757	13.25917	0.0000
IR	0.000381	0.000668	0.570235	0.5696
LNUSD	-0.241062	0.108545	-2.220845	0.0282
LNM2	-0.879156	0.357577	-2.458645	0.0153
LNM2(-1)	1.215694	0.341107	3.563972	0.0005
C	-2.254470	0.885038	-2.547315	0.0121

in the above model which is created in order to examine the relationship between stock prices and monetary policy, dummy variables were not required. Exchange rate and M2 money supply variables were also added to the model as control variables. The bound test results of the model are given in the table 3.56 below.

Table 3.57: *The Bound test results of ARDL model for BIST.*

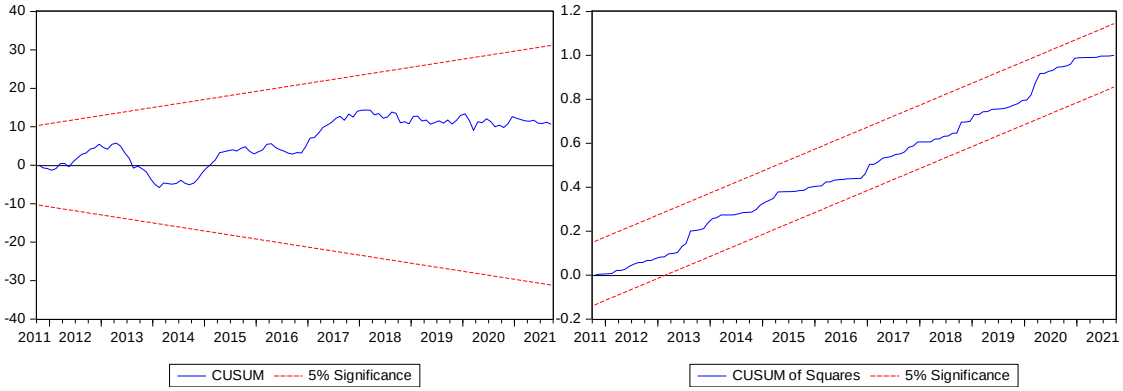
k	F-statistic	%	Critical Values	
			I(0)	I(1)
3	5.216838	**%10**	2.37	3.2
		%5	2.79	3.67
		%1	3.65	4.66

When the bounds test in Table 3.57 is examined, it is concluded that there is a cointegration relationship between the variables used in the model, since the F statistic value of the estimated model is greater than all critical values at %10, %5 and %1 sl.

Table 3.58: *The results diagnostic tests of ARDL model for BIST.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	0.278195	0.7576
Breusch-Pagan-Godfrey Test	2.622516	0.0274
Jargue-Bera Test of Normality	1.346939	0.5099
Ramsey RESET Test	0.019943	0.8879

The results of the diagnostic tests required to increase the reliability of the predicted model are given in Table 3.58 above. Autocorrelation and specification problems are not included in the model, and the normal distribution of residual terms is provided. On the other hand, according to the results of the BPG test, there is a problem of heteroscedasticity in the estimated model. To eliminate this problem, the model was reconstructed using the White test.



Graph 3.28: *CUSUM and CUSUM of Square tests for BIST.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests, and the results of these tests are shown in Graph 3.28, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.59: *The short and long term coefficient estimates of ARDL for BIST.*

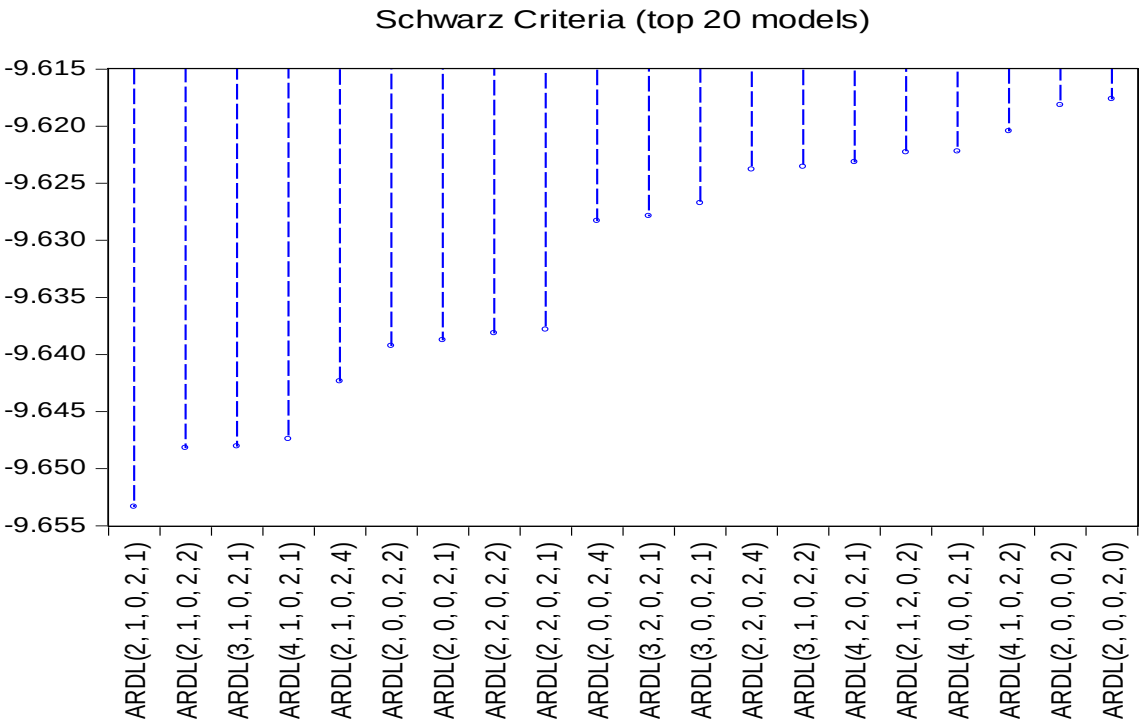
Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	0.000572	0.001717	0.333057	0.7397
D(LNUSD)	-0.437825	0.185435	-2.361076	0.0198
D(LNM2)	-0.671473	0.297560	-2.256598	0.0258
CointEq(-1)	-0.229896	0.042611	-5.395249	0.0000
Long- Term Coefficients				
IR	0.001627	0.002856	0.569732	0.5699
LNUSD	-1.029322	0.405162	-2.540521	0.0123
LNM2	1.436998	0.369453	3.889525	0.0002
C	-9.626452	3.178812	-3.028318	0.0030

When the short and long-term coefficients of the ARDL model are examined in Table 3.59, there is no long-term or short-term relationship between the policy rate and the Bist100 index. However, LNUSD and M2 money supply, which are the control variables added to the model, have a significant relationship with the Bist100 index in both the long and short run.

When the short-term ECM results are examined, it is seen that the error correction coefficient is statistically significant. Therefore, approximately 23% of short-term shocks are corrected in the long-term.

3.3.3.12. Test Results for HPI

The SIC values of 20 different models are shown in Graph 3.29. Among these models, the model with the lowest SIC is ARDL (2, 1, 0, 2, 0, 1) model. Therefore, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.58 below.



Graph 3.29: *The SIC results for HPI.*

Table 3.60: *The ARDL model for HPI.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNHPI(-1)	1.290298	0.068225	18.91228	0.0000
LNHPI(-2)	-0.345913	0.066768	-5.180813	0.0000
IR	-0.000325	0.000124	-2.626647	0.0099
IR(-1)	0.000329	0.000136	2.420347	0.0172
LNCPI	0.106403	0.027456	3.875464	0.0002
LNPPI	-0.135421	0.030783	-4.399202	0.0000

[Table 3.60. (Continue) *The ARDL model for HPI.*]

LNPPI(-1)	0.187679	0.047661	3.937764	0.0001
LNPPI(-2)	-0.116038	0.028741	-4.037441	0.0001
LNRSVI	0.008817	0.012086	0.729560	0.4673
LNRSVI(-1)	0.047084	0.015336	3.070283	0.0027
COVIDDUM	0.005018	0.001166	4.303535	0.0000
ISODUM	0.024017	0.002252	10.66354	0.0000
C	-0.108007	0.020268	-5.328909	0.0000

The dummy variables created for the full isolation period and Covid-19 pandemic were added as externalities to the above model, which was estimated to examine the relationship between housing prices and monetary policy. The bound test results of the model are given in Table 3.60 below.

Table 3.61: *The Bound test results of ARDL model for HPI.*

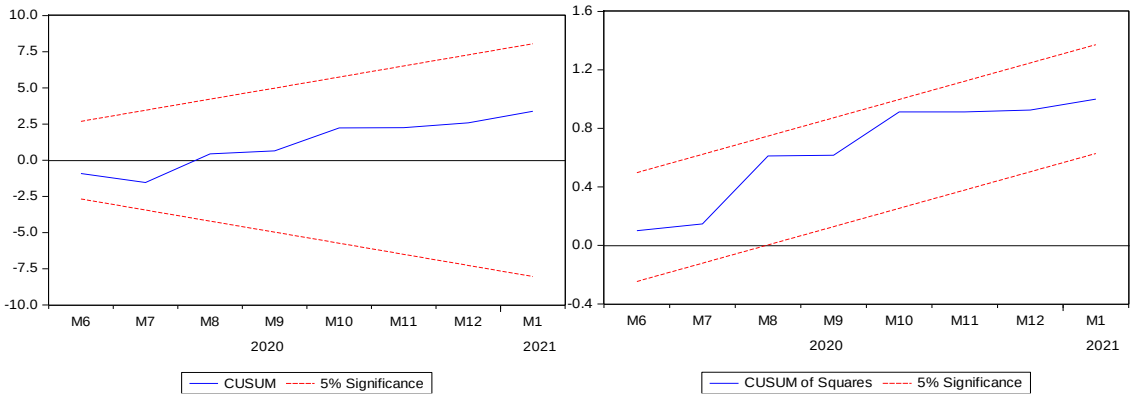
k	**F-statistic**	**%**	**Critical Values**	
			I(0)	**I(1)**
4	14.18749	**%10**	2.2	3.09
		%5	2.56	3.49
		%1	3.29	4.37

Since the F statistical value of the model estimated in Table 3.61 is greater than all critical values at %10, %5 and %1 sl., it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.62: *The results diagnostic tests of ARDL model for HPI.*

Tests	**Calculated statistics**	**probability**
Breusch-Godfrey Autocorrelation	0.4719	0.6252
Breusch-Pagan-Godfrey Test	0.0550	0.0622
Jargue-Bera Test of Normality	3.0845	0.2139
Ramsey RESET Test	0.0048	0.9448

Diagnostic tests that increased the reliability of the predicted model were performed and the test results are given in Table 3.62. According to the results in the table, respectively, errors of autocorrelation, heteroscedasticity, normal distribution and specification are not found in the estimated model.



Graph 3.30: *CUSUM and CUSUM of Square tests for HPI.*

The predicted model was finally subjected to CUSUM and CUSUM-of-Square robustness tests. In the Graph 3.30 is shown the results of these tests, respectively. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.63: *The short and long term coefficient estimates of ARDL for HPI.*

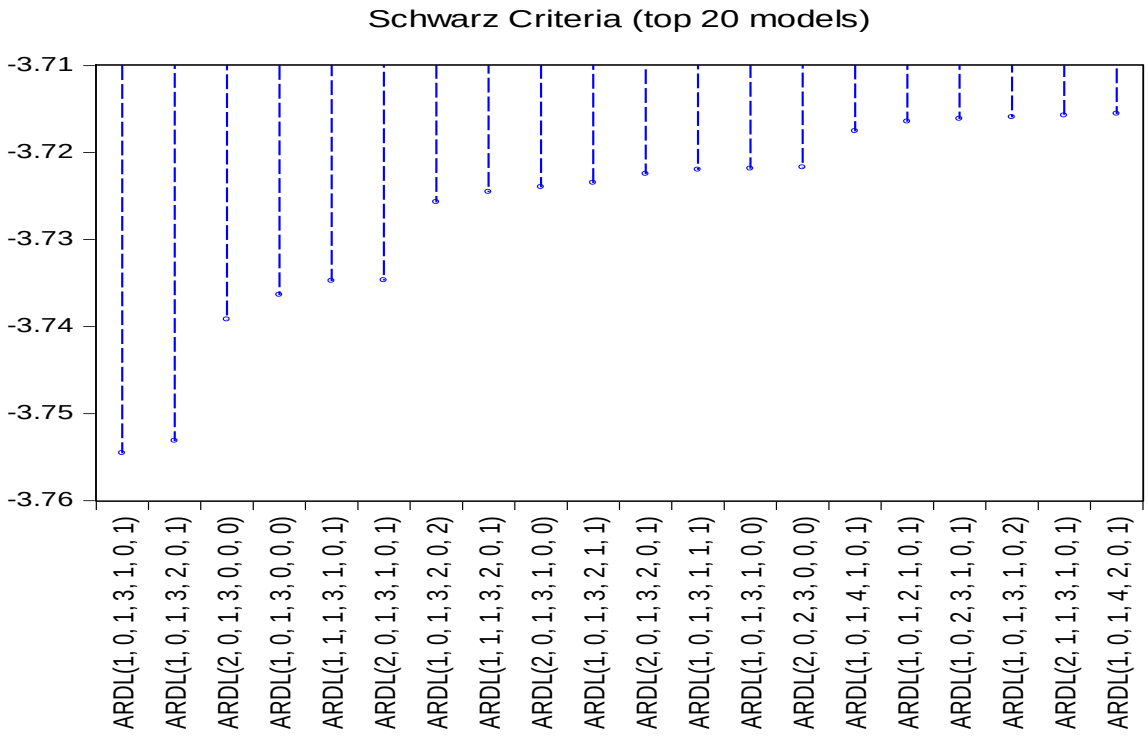
Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(LNHPI(-1))	0.384039	0.068175	5.633166	0.0000
D(IR)	-0.000335	0.000115	-2.909629	0.0044
D(LNCPI)	0.090422	0.046765	1.933543	0.0558
D(LNPPI)	-0.125769	0.033797	-3.721323	0.0003
D(LNPPI(-1))	0.118157	0.026856	4.399580	0.0000
D(LNRSVI)	0.007530	0.014309	0.526256	0.5998
D(COVIDDUM)	0.004353	0.002082	2.090983	0.0389
D(ISODUM)	0.024015	0.001444	16.633515	0.0000
CointEq(-1)	-0.052297	0.006847	-7.638003	0.0000
Long- Term Coefficients				
IR	0.000060	0.001294	0.046254	0.9632
LNCPI	1.913203	0.321807	5.945191	0.0000
LNPPI	-1.146809	0.257325	-4.456656	0.0000
LNRSVI	1.005153	0.217771	4.615643	0.0000
COVIDDUM	0.090235	0.019140	4.714354	0.0000
ISODUM	0.431839	0.085562	5.047105	0.0000
C	-1.942040	0.199050	-9.756545	0.0000

According to the short and long run coefficients of the model estimated in Table 3.63 above, the policy interest rate has a significant negative linear relationship with house prices only in the short run. An increase by %1 in IR causes a decrease by %0.00335 in HPI. There is no long-term relationship between IR and HPI. Control variables in the model are in a significant relationship with housing prices in the long run. The dummies added to the model for Covid-19 and full isolation period have had a significant impact on HPI both in the long and short term.

When the short-term ECM results are examined, it is seen that the error correction coefficient is statistically significant. The deviations occurring in the short term according to the ECM coefficient are corrected by approximately 5% in the long term.

3.3.3.13. Test Results for BRENT

The SIC values of 20 different models are shown in Graph 3.31. Since the model with the lowest SIC is ARDL (1, 0, 1, 3 1, 0, 1) model, the lag length of the model to be estimated was determined in this way. After determining the lag length, the results of the estimated model are presented in Table 3.64 below.



Graph 3.31: *The SIC results for BRENT.*

Table 3.64: *The ARDL model for BRENT.*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNBRENT(-1)	0.792753	0.041987	18.88088	0.0000
IR	-0.000698	0.001217	-0.573356	0.5676
LNCLIT	2.673139	0.764632	3.495981	0.0007
LNCLIT(-1)	-2.747848	0.693294	-3.963468	0.0001
LNM3	1.378710	0.509596	2.705497	0.0079
LNM3(-1)	-0.176752	0.558272	-0.316606	0.7521
LNM3(-2)	-0.653614	0.584317	-1.118594	0.2657
LNM3(-3)	-1.084395	0.370847	-2.924107	0.0042
LNUSD	-1.524438	0.374033	-4.075679	0.0001
LNUSD(-1)	1.143175	0.394151	2.900348	0.0045
LNMVPIC	0.577562	0.177686	3.250464	0.0015
LNPPI	2.666177	0.815170	3.270701	0.0014
LNPPI(-1)	-2.181421	0.789419	-2.763323	0.0067
ISODUM	-0.192291	0.033218	-5.788838	0.0000
C	3.070946	1.503614	2.042376	0.0435

In order to examine the relationship between oil prices and monetary policy, the ARDL model results in Table 3.64 above were obtained. Again, ISODUM was added to the model as an externality. The bound test results of the model are given in Table 3.65 below.

Table 3.65: *The Bound test results of ARDL model for BRENT.*

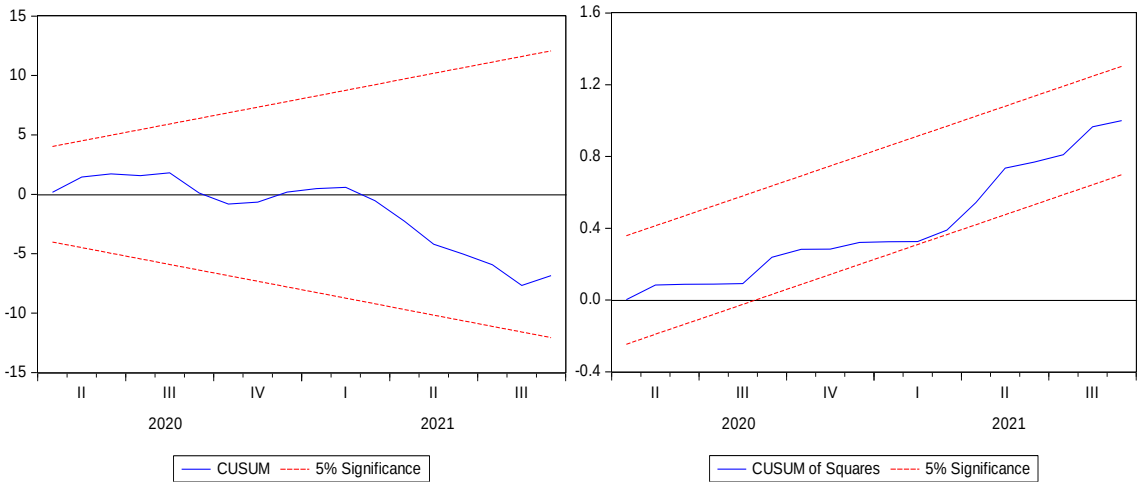
k	F-statistic	%	Critical Values	
			I(0)	I(1)
6	8.765473	**%10**	1.99	2.94
		%5	2.27	3.28
		%1	2.88	3.99

Since the F statistical value of the model estimated in Table 3.65 is greater than all critical values at 10%, 5% and 1% sl., it is concluded that there is a cointegration relationship between the variables used in the model.

Table 3.66: *The results diagnostic tests of ARDL model for BRENT.*

Tests	Calculated statistics	probability
Breusch-Godfrey Autocorrelation	4.528021	0.1039
Breusch-Pagan-Godfrey Test	15.92424	0.3180
Jargue-Bera Test of Normality	46.92449	0.0000
Ramsey RESET Test	0.204760	0.6518

In Table 3.66, the diagnostic tests were performed in order to detect the errors of heteroscedasticity, autocorrelation, specification and normal distribution of residual terms of the model estimated by ARDL approach. According to the BG-LM test results, there is no autocorrelation problem in the model. The model estimated according to the BPG test results has constant variance. According to the RRESET test results, there is no specification error in the model. Finally, according to the J&B test results, the condition of normal distribution of terms is no longer satisfied. But, since the model has a large number of observations as per CLT, the normal distribution condition can be neglected.



Graph 3.32: *CUSUM and CUSUM of Square tests for BRENT.*

Graph 3.32 above shows the results of the robustness tests of the estimated model. Looking at the CUSUM and CUSUM-of-Square graphs, it is seen that the estimated model is in the 95% confidence interval. Therefore, it is concluded that the coefficients of the predicted model are stable in the long run.

Table 3.67: *The short and long term coefficient estimates of ARDL for BRENT.*

Short- Term Coefficients and Error Correction Model				
Variables	**Coefficients**	**Standard Error**	**t- Statistics**	**Probability**
D(IR)	-0.003570	0.002142	-1.666844	0.0984
D(LNCLIT)	2.598300	0.526670	4.933449	0.0000
D(LNM3)	1.189759	0.419939	2.833170	0.0055
D(LNM3(-1))	1.438379	0.490968	2.929681	0.0041
D(LNM3(-2))	0.886615	0.359131	2.468782	0.0151
D(LNUSD)	-1.497544	0.313018	-4.784209	0.0000
D(LNMVPIC)	0.846449	0.298185	2.838672	0.0054
D(LNPPI)	2.821082	0.595655	4.736098	0.0000
D(ISODUM)	-0.205182	0.023146	-8.864775	0.0000
CointEq(-1)	-0.192783	0.023279	-8.281363	0.0000
Long- Term Coefficients				
IR	-0.003366	0.005848	-0.575554	0.5661
LNCLIT	-0.360479	1.520777	-0.237036	0.8131
LNM3	-2.586532	1.181599	-2.189010	0.0307
LNUSD	-1.839653	0.666606	-2.759729	0.0068
LNMVPIC	2.786821	0.961574	2.898187	0.0045
LNPPI	2.339020	0.970226	2.410800	0.0176
ISODUM	-0.927834	0.248760	-3.729836	0.0003
C	14.817773	6.570130	2.255324	0.0261

Table 3.67 shows the short- and long-term coefficients of the predicted model. According to the table, IR has no significant relationship with oil prices in either the short or long run. The control variables LNM3, LNMVPIC, LNUSD and LNPPI in the model are in a significant relationship with oil prices in the short and long term. LNCLIT is statistically significant in the short term. The dummy variable added to the model has a significant and reducing effect on oil prices in both the long and short run.

When the short-term ECM results are examined, it is seen that the CointEq(-1) coefficient is statistically significant. According to the ECM coefficient, the deviations arising from the short-term shocks stabilize at a rate of approximately 19% in the long-term.

3.3.4. T&Y causality test results

In this part of the study, the existence and direction of the causality relationship between the IR determined as the monetary policy criterion and the macroeconomic indicators used as the dependent variable in the ARDL models estimated above were analyzed with the Granger causality test based on the Toda-Yamamoto method and the results are given in Table 3.68 below.

Table 3.68: *The T&Y causality test results for all variables.*

Model	k+dmax	probability	Direction of Causality
M1 - IR	6+1	0.0038 0.1774	IR → M1
M2 - IR	6+1	0.0000 0.0095	IR ↔ M2
M3 - IR	6+1	0.0000 0.0018	IR ↔ M3
CPI - IR	5+1	0.0296 0.3931	IR → CPI
PPI - IR	4+1	0.0000 0.0011	IR ↔ PPI
PSCE - IR	4+1	0.0000 0.0052	IR ↔ PSCE
RSVI - IR	8+1	0.0000 0.1155	IR → RSVI
GDS - IR	5+1	0.0018 0.0592	IR → GDS
IPI - IR	4+1	03587 0.2307	×
USD - IR	6+1	0.0049 0.0000	IR ↔ USD
CLIT - IR	4+1	0.0311 0.9471	IR → CLIT
MVPIC - IR	6+1	0.0000 0.0440	IR ↔ MVPI
MVPIP - IR	3+1	0.0098 0.2204	IR → MVPI
BIST - IR	4+1	0.6141 0.0633	×
HPI - IR	4+1	0.0015 0.5636	IR → HPI
BRENT - IR	4+1	0.1965 0.7035	×

When Table 3.68 above is examined; H_0 hypothesis that the policy rate is not Granger cause of money supply definitions, producer price index, private sector credit

expansion, retail sales volume index, GDS rates, exchange rate, motor vehicle and house prices indices is rejected at %1 sl. On the other hand, the H_0 hypothesis that the policy rate is not the Granger cause of leading indicators and consumer prices indices was rejected at the 5% sl. Secondly, H0 hypothesis that M2 and M3 money supply, producer prices, private sector credit expansion and exchange rate are not Granger causes of policy rate is rejected at 1% sl., and H0 hypothesis that MVPIC is not Granger cause of policy rate is rejected at %5 sl. In addition, the H0 hypothesis that industrial production and Bist100 indices and oil prices are not mutually each other's Granger causes with the policy rate could not be rejected.

Therefore, as can be seen from the table, according to the findings obtained from the Toda-Yamamoto causality analysis, while M2 and M3 money supply, producer prices, private sector credit volume, exchange rate and CPI-based MVPI have a bidirectional causality relationship with the policy rate; there is a unidirectional causal relationship from the policy rate to consumer price indices, retail sales volume index, long-term government GDS rates, CLI, an cpi-based MVPI and housing price indices. Finally, there is any causal relationship between the policy rate and industrial production index, stock and oil prices.

3.4. Conclusion

In this study, it is aimed to evaluate how effective monetary policy is on macroeconomic indicators that keep the pulse of economic life in Turkey. According to the estimated ARDL and T&Y results in this study, the relationship between the policy rate and the related variable will be evaluated respectively below.

M1 money supply, which is the narrowest definition of money supply, has a significant and negative relationship with the policy rate both in the long and short run. There is a bidirectional causality relationship between these two variables. In other words, when there is an increase in the narrowly defined money supply or the policy rate, the other variable decreases. In addition, the M1 money supply increased during the Covid-19 epidemic. In this case, if the CBRT decides to implement a tightening monetary policy because it uses the policy rate as a monetary policy tool, M1 should increase the policy rate to decrease the money supply.

M2, which is a broader money supply than M1, has a significant, positive and bidirectional relationship with the policy rate in the long run. This means that when the

policy rate or M2 increases, the other variable also increases in the long run. When the policy rate increases, the deposit interest rates also increase as banks will borrow to the CBRT at higher interest rates. Therefore, higher interest rates will enable banks to create more fiat money. In addition, the Covid-19 pandemic has increased the desire of depositors to hold cash, and has had a reducing effect on the M2 money supply in the long run.

M3, which is the broadest defined money supply, has a significant, negative and bidirectional relationship with the policy rate in the long run. When the policy rate or M3 money supply rises, the other variable decreases. Since the increase in the policy rate will decrease the amount of money in circulation, demand deposits, and the funds obtained from the repo and money market in order to other related interests will increase, the M3 money supply, which includes these variables, also decreases. The M3 money supply decreased due to the CBRT's increase in interest rates within the scope of the tight monetary policies implemented after the middle of 2018 and 2020, due to the deterioration in foreign exchange and inflation expectations.

CPI have a significant and positive relationship with the policy rate. There is a one-way causality relationship from the policy rate to the consumer price index. The increase in the policy rate reduces foreign investments and foreign exchange inflows and increases the borrowing costs of the treasury. In this case, the domestic currency devaluates and inflation occurs. In addition, the monetary tightening policy of the CBRT in 2018 increased the CPI in both the long and short term. Therefore, in the sample period, it can be said that inflation in Turkey occurred due to cost. The CBRT is expected to decide to reduce the policy rate in order to reduce the cost pressure on consumer prices.

Monetary policy has a significant, positive and bi-directional relationship with PPI. Therefore, an increase in the policy rate or producer prices causes an increase in the other. Since Turkey is a foreign-dependent country in terms of raw materials, fluctuations in exchange rates increase producer costs. According to the results obtained, the Government is expected to decide to lower the policy rate in order to reduce producer prices. The monetary tightening decision in 2018 and the Covid-19 pandemic process had an up-ward impact on producer prices.

The PSCE has a significant, negative and bidirectional relationship with the policy rate in the long run. Therefore, the increase in the policy rate or the credit volume of the private sector causes a decrease in the other. The increase in the policy rate will increase

the borrowing cost of the private sector as it will increase the loan interest rates. Therefore, when the policy rates increase, the credit volume and investments of the private sector will decrease. The CBRT should implement an expansionary policy through the interest channel in order to increase the loan volume and thus the investments.

RSVI has a significant and negative relationship with the policy rate in the long run. In this relationship, there is a one-way relationship from the policy rate to the retail sales volume index. Based on the other analyzes in the study, it is concluded that the increase in the policy rate will increase the costs of transportation, raw materials, housing, etc., and indirectly reflect negatively on the retail sales volume. The monetary tightening and the coronavirus epidemic in 2018 negatively affected retail sales. Expansionary policies to be implemented by the CB through the interest channel will increase retail sales trade.

The interest rates of GDSs are significantly and positively related to the policy rate in the short and long term. A uni-directional relationship was obtained from the policy rate to the GDS rates. In this case, an increase in the policy rate increases the interest rate of long-term government GDS. This situation can be interpreted as the demand for GDSs will increase as the yield of the GDS is a factor that increases its demand. Therefore, since the CBRT's tightening policy will increase public costs, the Government will pay more interest to the market by resorting to long-term domestic debt instruments. Exchange rate increases etc. cases, which caused monetary tightening in 2018, caused a decrease in the interest rates of GDSs.

In the analysis made for the selected sample period, a significant, positive and bidirectional relationship emerged between the policy rate and the exchange rate in both the long and short run. Therefore, an increase in the policy rate or exchange rate causes an increase in the other. It gave a result consistent with the dummy analysis results used in the model. Due to the volatility in the exchange rate in 2018, the policy rate was increased and a tight monetary stance was displayed, which led to an increase in the exchange rate in the long run.

The CLI index has a significant and negative relationship with the policy rate in both the short and long run. In the analysis, a unidirectional relationship was found from the policy rate to the leading indicators index. An increase in the policy rate decreases the leading indicators index. CLI index consists of money supply, consumer expectations and construction permits. Therefore, the increase in the policy interest negatively changes money supply, building permits and the expectations of the economic decision-making

units. The full isolation process implemented in the period when the coronavirus epidemic was seen in Turkey has reduced the CLI index.

MVPI are calculated on a CPI-based and PPI-based basis. While both indices have a significant and negative relationship with monetary policy in the long run, only the CPI-based index has a significant relationship with the policy rate in the short run. Therefore, when the policy rate increases, motor vehicle prices decrease in the long run, while CPI-based prices increase in the short run. The fluctuations in the exchange rate, which caused monetary tightening in 2018, created a break up-ward on the trend covering PPI and CPI-based motor vehicle prices. In addition, the removal of SCT reductions implemented in 2019 also increased the prices of CPI-based motor vehicles.

While HPI are not affected by the policy rate in the long run, they have a significant and positive relationship with the policy rate in the short run. This relationship includes a unidirectional causality running from the policy rate to the housing prices. Considering the other analyzes in the study, when the policy rate increases, producer prices and exchange rates increase in the short run. Therefore, this situation increases the housing price index coupled with the costs. Due to the interruption of construction activities during the Covid-19 epidemic, especially during the full isolation period, the demand for housing could not be met, so prices broke up-ward in the short and long term. The CBRT may implement an expansionary monetary policy through the interest channel in order to intervene increasing in housing prices in the short-term.

In the analyzes in this study, there is no significant relationship between the industrial production index, oil prices and stock prices and the policy rate. The monetary tightening in 2018 had a reducing effect on the rising oil prices because of increasing exchange rates. In addition, the Covid-19 outbreak has had a reducing effect on the industrial production index both in the short and long term.

According to the results of the analysis for the sample period used in this study, the CBRT is recommended to implement an expansionary monetary policy in order to improve selected macroeconomic indicators, excluding motor vehicle prices, in the long run. Because the increasing policy rate imposes a cost burden on the economic units in Turkey. It is recommended that the government implement taxation-based fiscal policies such as motor vehicle tax (MVT) reduction, SCT reduction, etc. for increases in PPI and CPI-based motor vehicle prices as a result of expansionary policies.

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