

# Is there an interest rate channel for monetary policy in Turkey?

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## Abstract

The changes in monetary authority's decisions may affect the behavior of economic agents and thus the level of aggregate demand. Namely, a change in the short term interest rate is made by the central bank directly affects the user cost of capital and firms' decisions about investment expenditure. In the monetary policy literature, this mentioned process is defined as the interest rate channel. To guide policy makers it is important to investigate whether interest rate channel operates. Determination of the effect of short-term interest rate changes on the long-term interest rate is necessary for introducing the effects of the monetary authority's decision on output. Because the changes in the short-term interest rates affect the investment and consumption decision by changing the long-term interest rate.

The aim of this paper is to investigate empirically the interest rate channel of monetary transmission mechanism in Turkey for 1995:1-2008:9 periods. The findings showed the existence of interest rate channel. Because the inflation rate decreased in post 2002, the functioning of interest rate channel was examined by dividing the sample into two sub-periods (1995:1-2002:2 and 2002:3-2008:9). The results present that the interest rate channel was operated only in the second sub-period.

*Key words:* Interest rate channel, monetary transmission mechanism, monetary policy

*JEL classification:* E52.

## 1. Introduction

The relation between the monetary policy decisions and changes in the level of output and prices is expressed by the monetary transmission mechanism. The effect of a change in monetary policy on output operates by various monetary transmission channels. Mishkin (1995) defines four channels of monetary transmission; traditional interest rate channel, credit channel, exchange rate channel and other asset prices channel. An additional

channel may operate through the effect of monetary policy credibility on inflationary expectations. The interest rate channel describes the effects of higher (lower) real interest rate on consumption and investment. If the central bank increases the short term interest, the interest rate channel operates as follows:

- Real interest rate is expected to rise
- Changes in firms' decisions about investment and consumers' spending on housing and durable goods are expected to exist.
- Output growth and inflation are expected to decrease

The present paper<sup>1</sup> contributes to the empirical evidence of the interest rate channel for Turkey, using the data for 1995:1-2008:9. The number of researches which focus on interest rate channel of monetary transmission mechanism is especially less in Turkey. This paper is supposed to contribute to literature in this framework. On the other hand after 2001 price stability has been maintained in Turkey. In the monetary policy literature there is a view that in the periods when price stability was satisfied monetary transmission mechanisms operate more effectively is dominant. In this study the validity of this view will be investigated by concerning Turkey.

The remainder of the paper is organized into three sections. After the introduction part, Section 2 reviews empirical findings of studies on the traditional interest rate channel of monetary transmission mechanism. Section 3 discusses the data and methodology used in this paper. Section 4 reports the empirical results, and Section 5 concludes.

## 2. Literature review

The first phase of the interest rate channel of monetary transmission operates through the short-term interest rates by influencing the market interest rates or in other words long-term interest rates. Hence while searching the interest rate channel literature the researches on this field should be addressed firstly. Many of these studies associated the effect of short-term interest rates on long-term interest rates to the unanticipated policy decisions and highlighted that the impact of anticipated policy changes on market interest rates will be too low.

Cook and Hahn (1988) investigate the relationship between changes in federal funds rate target which is the policy instrument of Federal Reserve and market interest rates in USA in 1970s. They use the Journal to compile a record of 76 changes in the federal funds rate target over the period from September 1974 to September 1979. The results reveal that Federal Reserve has a strong effect on market interest rates. Kuttner (2001), investigates the effect of changes in Federal Reserve policy on a spectrum of market interest rates, using Fed funds futures data. Findings indicate that a strong relationship between unanticipated policy actions and market interest rates.

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<sup>1</sup> This paper is the developed version of Erdoğan and Yıldırım (2009).

Cochrane and Piazzesi (2002) search for the effect of federal funds target changes on interest rates, 1984-2001 in U.S. According to their findings, target changes seem to be accompanied by large changes in long-term interest rates. Unexpected target change affects Treasury yields by 52 base points at a 10-year maturity. Berument and Froyen (2006), examine the effect of federal funds rate innovations on longer-term USA nominal interest rates for the period 1975–2002. Impulse response functions report that the effect on the 1-year government security rate is greater in magnitude than it is on the 10-year rate.

Peersman (2002) examines the relationship between short-term interest rate and long-term interest rate by using SVAR for Germany for the period 1979:1 – 1998:12. According to the results, after a monetary policy shock the short-term and long-term interest rates move in the opposite direction.

During the second phase in the interest rate channel changes in the market interest rates affect the expectations and therefore consumption and investment decisions. There are theoretical and empirical studies which address the first and second phase of the interest rate channel.

Taylor (1995) outlines a simple framework for analyzing the monetary transmission mechanism. According to Taylor, interest rates affect the firm's investment behavior and household consumer behavior. Zhang and Sun (2006) build a general equilibrium model with durable and nondurable goods to analyze how the consumer credit sector affects the monetary transmission mechanism. Their model finds that development and expansion of the consumer credit market improve the efficiency of the interest rate channel. Iwata and Wu (2006) test the effectiveness of the monetary transmission using monthly data between 1991 and 2001 period in Japan. They found that the interest-rate channel is the most important channel of monetary transmission. Chirink and Kalckreuth (2003), examine the importance of the interest rate and credit channels on business fixed investment in Germany. They use a dataset containing financial statement, user cost, and creditworthiness data for 6,408 firms. Findings demonstrate that both interest rate and credit channels are important for monetary transmission in Germany.

Angeloni et al (2003), intend to investigate how monetary policy affects the euro area. According to their findings, where the interest rate channel is not dominant, there is some direct evidence supporting the presence of a bank lending channel. Bilan ve Kryshko (2007) investigate the monetary transmission mechanism and the dominance of the interest rate channel using the data between the 1997:1–2003:12 period in Ukraine. They show that there is no persuasive evidence that the interest rate channel dominates other channels of monetary transmission. Disyatat and Vongsinsirikul (2003), test the data for the 1923:Q1-2002:Q4 period in Thailand. The empirical results show that interest channel and bank lending channel are operative in Thailand.

Bhuiyan and Lucas (2007), analyze the impact of Canadian monetary policy on ex ante real interest rates and inflationary expectations using the monthly data from 1980 to 2002. According to findings that the transmission mechanism from monetary policy shocks to real output are through the exchange rate and the real interest rate channel. They estimate that 22 basis points increase in the overnight target rate raises the one-year ex ante real interest rate by 18 basis points and this response is significant for four months.

Yue and Zhou (2007) test the data for the 1996:1–2005:8 period in China. Their findings show that there is no causality neither between investment expenditure and the market interest rate nor between household consumption expenditure and the market interest rate. According to these authors, the reasons contributing to the impeded transmission of monetary policy in China are as follows:

- Incompletely liberalized interest rate system
- Asset-backed securitization
- Household consumption least sensitive to market interest rate

Papadamou and Oikonomou (2007), test the monthly data of eight transition economies<sup>2</sup> for the period 1996:4–2004:4. Their results indicate that, the traditional money channel is the dominant transmission mechanism of the monetary policy in Estonia and Latvia. In Poland and Hungary, the money and credit channels are both important.

Charoenseang and Manakit (2007) investigate monetary transmission mechanism in Thailand during 2000:6–2006:7. They showed that the transmission of the interest rate channel has become weak after an inflation targeting framework is adopted. Poddar, Sab and Khackhatryan (2006) examine the operation of interest rate channel, credit channel, equity price channel and exchange rate channel in Jordan during the 1996:Q1–2005:Q1 period. Their results show that these channels are insignificant.

We can not reach the studies that only deal with the interest rate channel in Turkey. On the other hand, the number of papers which examined the relationship between short-term and long-term rates are also limited.

Inal (2006) tries to predict the impact of the changes in short-term interest rates made by The Central Bank of Republic of Turkey on the long-term interest rates for the period of July 2001- March 2006. The study states that, following the successful implementation of monetary and fiscal policy after the crisis in February 2001, the efficiency of monetary transmission mechanism increases in Turkey and a more powerful relationship between short-term and long-term interest rates begins to occur.

Aktaş et al (2008) examine the traditional transmission mechanism in Turkey. According to the findings, a change in Central Bank's interest rate

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<sup>2</sup> These are Estonia, Hungary, Latvia, Lithuania, Poland, Czech Republic, Slovakia and Slovenia (new members of the European Union since 1 May 2004).

decision is effective in the financial markets especially on the bonds' interest rates. On the other hand, response of stock prices and monetary policy surprises is not statistically significant and the reaction of exchange rate is found to be small. Therefore the monetary policy interest rate channel of transmission mechanism is found to be effective through market interest rates. In this study to examine the impact of changes in monetary authority's interest rate decision on long-term interest rates, the period 20 December 2004 – 14 August 2008 which has 24 month-term treasury bonds is taken into consideration.

The analysis in this study is not limited with the relationship between short-term interest rates and market interest rates. The relationship between long-term and short-term interest rates gives hints for the monetary transmission process. However to show the functioning of the interest rate channel, it is necessary to introduce the impact of changes in short-term interest rates on investment spending. Accordingly, if a change in short-term interest rates leads to a change in long-term interest rates (e.g. interest rate loans) and investment and consumption spending respectively, then it can be said that interest rate channel operates. Indeed the studies mentioned in literature survey generally examined the real effects of the changes in short-term interest rates while dealing with interest rate channel process. Hence while examining the interest rate channel process, the first and second stages will be taken together.

### 3. Data and methodology

This paper investigates the effectiveness of the interest rate channel of the monetary transmission mechanism in Turkey during the 1995:1-2008:9 period with monthly data using a VAR model. An advantage of the VAR approach is that it provides the means to distinguish between the endogenous impulses that monetary authorities implement and the exogenous monetary response (Smets and Wouters, 1999: 490).

The interbank overnight interest (ON) rate is used as an indicator of a change in monetary policy. The short-term interest rate in interbank money market is a basic policy tool of the Central Bank. So, short-term interest rate in interbank money market is preferred as an indicator of a change in monetary policy decision, because, C.B.R.T. (Central Bank of Republic of Turkey) implemented inflation targeting (implicit inflation targeting period) in the 2002–2005 period. Also since 2006, short-term interest rates have been used as the basic policy instrument. Bank makes changes in short-term interest rates without ignoring the goal of price stability. Adjustments in interest rates carried out according to the development in inflation. Central bank by monitoring endogenous and exogenous variables that affect inflation rate can frequently change its interest rate decisions to influence the expectations of economic agents. As the changes in interest rate decisions affect the interest rate in the targeted direction, the effectiveness of monetary

policy will increase. For example in case of a decrease in energy prices, if the inflation is expected to decrease, short-term interest rates will be lowered. Changes in short-term interest rates determine the direction of the market interest rates and affect the investment and consumption decisions of economic agents.

Credit interest rate (CREDIT)<sup>3</sup> is used as an indicator of long-term interest rate. When the household demand for durable goods increases, investment costs should decrease for investment demand to increase. A decrease in firm's credit interest rate encourages the investment incentive. It will be more proper to investigate the relationship between the production of durable goods and fixed capital formation variables and firm's decisions by the changes in firm's credit interest rate. Therefore for representing long run interest rates, credit interest rates were used. We use the durable goods consumption (DGC) expenditure to measure the effects of changes in monetary policy on consumption and fixed capital formation (FCF) to measure the effects of changes in monetary policy on investment. Finally, Consumer Price Index (CPI) is used as an indicator of price level (inflation).

The interest rate channel is a process in which a change in monetary policy affects the real interest rate and then through consumption and investment lead to a change in the output level. The key variable in process of interest rate channel is the long-term real interest rate. A change in the short-term interest rate leads to a change in the real interest rate and then to a change in output level due to a change in the components of the aggregate demand, i.e. consumption and investment. The effect of a change in monetary policy affects inflation finally.

All series in the estimation are in logarithms except the interest rate series. As a result of a seasonality test, we find that the fixed capital formation series exhibits a seasonality effect. Whether the series have seasonal effect is investigated by using dummy variables methods. Dummy variables for each period are created by using 1 values for the interested period and 0 values for other periods. After the estimation of the variables, if the dummy variables are statistically significant, it is concluded that the series have seasonal effects. The results of seasonality test of fixed capital formation (FCF) series are showed in Appendix 2 for first and second sub periods and all period seasonal effects have been eliminated by X12 method. In the unit root analysis the deseasonalized series are used. We have adjusted this series by the Census X12 Method. The credit interest rate is from the Undersecretaries of Treasury reports while the other series are from the Central Bank of Republic of Turkey. The model is estimated using E-views 6.0. Granger and Newbold (1974) have emphasized that estimation results with non-stationary time series can be subjected to a spurious

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<sup>3</sup> Loan interest rate is the interest rate applied to firms lending. Credit interest rate prepared by the Undersecretaries of Treasury is the weighted averages of maximum deposit rates as announced by banks to be valid during the month.

regression problem. Therefore the stationarity properties of individual series have been analyzed using ADF (Augmented Dickey Fuller) and Zivot and Andrews tests that allow for possible structural breaks in the series.

Perron (1989) suggested that many macroeconomic time series may not be characterized by unit roots as they may be subjected to structural breaks, i.e. they may be trend stationary with a shift. In this sense he dealt with the 1929 Great Depression and oil price shocks in 1973. He searched for the stationarity of the series with existing unit root in null hypothesis against the alternative hypothesis which stated that 1929 Great Depression or oil price shocks in 1973 are trend stationary with a shift. Perron's study showed that series which are difference-stationary as a result of unit root tests that do not consider a break can be trend-stationary with structural change. Zivot and Andrews (1992) expended Perron tests to consider situations where the break point may be endogenous (Perron, 1989; Zivot and Andrews, 1992). Hence we have tested the stationarity of individual series first by an ADF test and second by a Zivot and Andrews test. Finally the relationships between stationary series will be interpreted according to the results of the impulse-response function and variance decomposition.

#### 4. Results

Initially series are tested for unit root. Table 1 and Table 2 show the ADF-Dickey Pantula and Zivot and Andrews tests results of the series.

**Table 1**  
ADF and Dickey Pantula Test Results

Variables	ADF TEST			DICKEY PANTULA TEST		
	Test Statistic	Critical Values (1%)	Critical Values (5%)	Test Statistic	Critical Values (1%)	Critical Values (5%)
ON	-5.445021	-4.014635	-3.437289	-	-	-
CREDIT	-2.486861	-4.014635	-3.437289	-11.53178	-2.579139	-1.942781
DGC	-2.374790	-4.014635	-3.437289	-13.87539	-2.579139	-1.942781
FCF	-1.509376	-4.014635	-3.437289	-6.019858	-2.579139	-1.942781
CPI	-0.331069	-4.014635	-3.437289	-3.123037	-2.579139	-1.942781

It can be seen from Table 1 that the ON series is level stationary, the CREDIT, DGC, FCF and CPI series are difference stationary. Nevertheless using unit root test which does not consider the structural change can lead to wrong results about stationarity if there is a structural break. Consequently Zivot and Andrews test is used and test results are showed in Table 2.

**Table 2**  
Zivot and Andrews Test Results\*

Variables	Model A				Model B				Model C			
	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period
ON	-13.2	-5.43	-4.80	74	-5.70	-4.93	-4.42	81	-13.4	-5.57	-5.08	74
CREDIT	-4.09	-5.43	-4.80	-	-4.46	-4.93	-4.42	118	-4.46	-5.57	-5.08	-
DGC	-4.86	-5.43	-4.80	72	-4.38	-4.93	-4.42	-	-4.72	-5.57	-5.08	-
FCF	-3.22	-5.43	-4.80	-	-5.45	-4.93	-4.42	75	-5.44	-5.57	-5.08	74
CPI	-1.51	-5.43	-4.80	-	-5.02	-4.93	-4.42	72	-5.17	-5.57	-5.08	73

\* AIC is used for the decision of appropriate lag.

It can be seen from the Table 2 that ON series is level stationary according to both Zivot and Andrews and ADF tests. Moreover all series are trend stationary with a break. CREDIT series is trend stationary with a break in trend (Model B). DGC series is trend stationary with a break in intercept (Model A). FCF and CPI series are trend stationary with a break in both in constant and trend (Model C) as a result of Zivot and Andrews test. According to these results all series are made stationary with suitable Model.

The ordering of the series in VAR model affects the impulse response analysis. Ordering of the variables can be made according to causality tests. VAR models which assume all variables behave together in time are usually formed independent of theory or at least with little priori information (Johnston and Dinardo, 1996: 297; Gujarati, 2006: 749). After analyzing the exogeneity and endogeneity of the series by causality test, the series are ordered from exogenous towards endogenous. However, this paper deals with the theoretic mechanism of interest rate channel rather than the relations between the series. Because of this, series are estimated using VAR according to the interest rate channel mechanism without ordering them as endogenous-exogenous (Erdoğan ve Yıldırım, 2009). This paper analyzes interest rate channel in Turkey using an ordering in the VAR model which is made according to the theory instead of causality test. This ordering can be seen from Table 3.

**Table 3**  
Variables Order of VAR Model

A Change in Policy Instrument (Increase or Decrease)	→	A Change in Credit Interest Rate	→	A Change in Aggregate Demand (A Change in Investment and Consumer expenditures)	→	A Change in Consumer Price Index (Inflation)
ON	→	CREDIT	→	DGC , FCF	→	CPI



#### *4.1. Impulse response analysis*

After the determination of the appropriate lag length<sup>4</sup> of the VAR model and ordering of the variables, the relationship between the series was analyzed. Following that, estimation impulse response analysis was applied. The impulse response function is used to measure how the other endogenous series and the series itself will respond to a shock in an endogenous variable (Pindyck and Rubinfeld, 1991: 385-386). Thus the effects of an unanticipated shock in a variable on other variables could be assessed. Results of the impulse response function analysis are seen in Figure 1.

According to the results in Figure 1 one unit shock in the ON series leads to an increase in CREDIT series. This increase is however short lived as it loses its significance after 3<sup>rd</sup> month. So contractionary monetary policy appears to lead to a decrease in the interest rates for only short periods. The response of the DGC series to a shock in ON series is a decrease in 2<sup>rd</sup> month. This indicates that contractionary monetary policy results in a fall in consumption expenditure in the 2<sup>rd</sup> month. The FCF series falls in the 2<sup>rd</sup> and 3<sup>rd</sup> month after a unit shock in ON series. This indicates that contractionary monetary policy results in a decrease in both consumption and investment simultaneously. Finally a positive shock in the interest rate increases the production costs and prevent inflation rate from falling. In fact contractionary monetary policy implementation may lead to an upward movement in inflation rates.

#### *4.2. Variance decomposition*

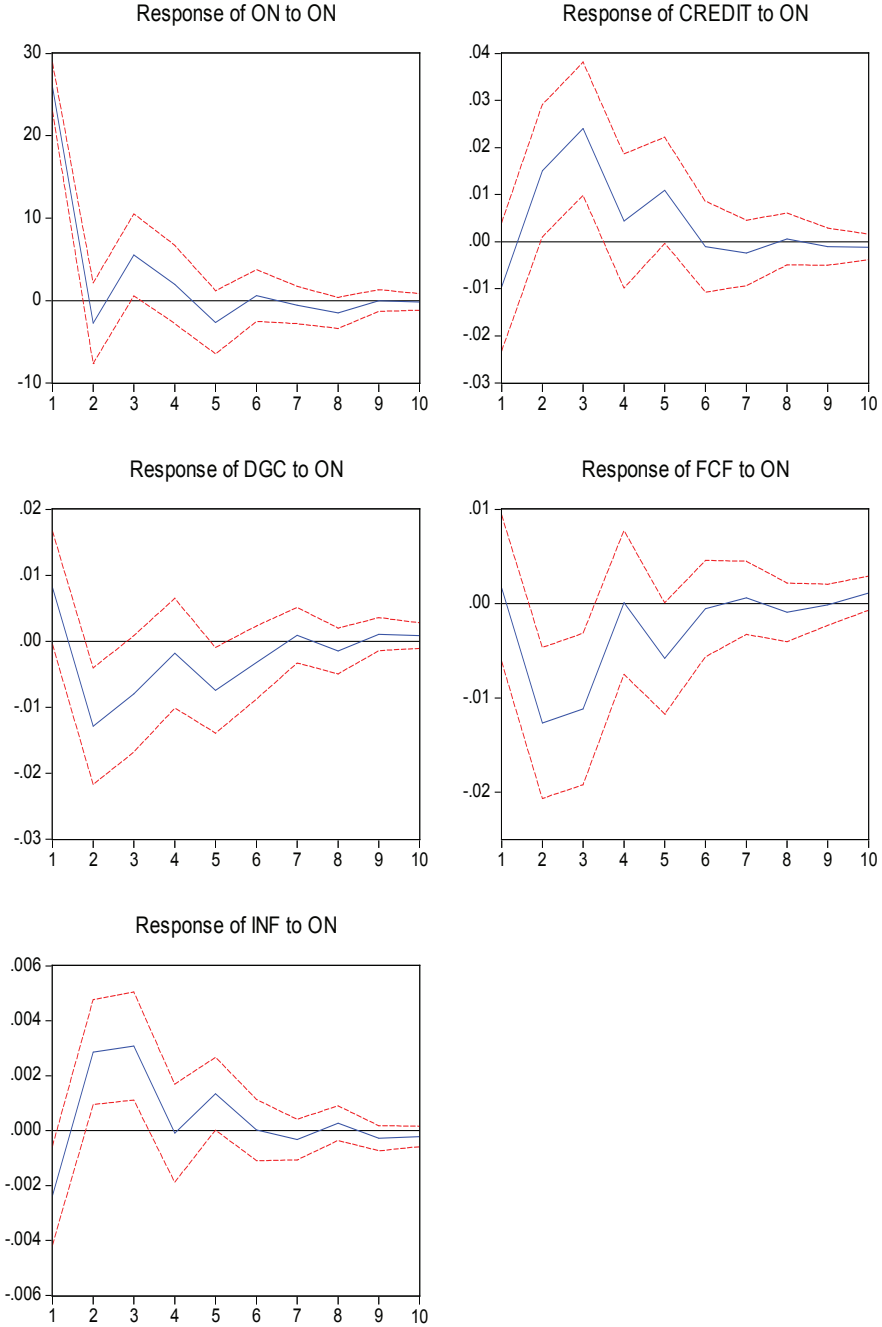
Variance decomposition is another way of characterizing the dynamic movements of VAR system (Pindyck and Rubinfeld, 1991: 389). In variance decomposition analysis we analyze how much of the effect of the shock is due to other variables or itself. In this way the sources of the changes in the series are examined. The results of the Variance Decomposition are listed in Table 4.

The results from Table 4 indicate that the changes in the CREDIT series are mostly explained by ON series after itself. A change in CREDIT series is explained by ON series in the ten months. A change in DGC series is mostly explained by the CREDIT series in the ten months. Also a change in FCF series is mostly explained by ON series after DGC. In the second and third months ON series explains 6 % and 10 % of the change in FCF series and DGC series explains about 20 % in the ten month. Finally a change in CPI series is mostly expressed by ON series in the first three months.

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<sup>4</sup> LR (Likelihood Ratio), AIC (Akaike information criterion), SC (Schwarz information criterion), FPE (Final prediction error) and HQ (Hannan-Quinn information criterion) information criterions are used to find out the optimal lags. LR, FPE and AIC gave the minimum value for 3 lags, SC and HQ gave the minimum value for 0 lag. According to these results we decided to use 3 lags in the VAR model.

**Figure 1**  
Impulse Response Analysis



**Table 4**  
Variance Decomposition

Variance Decomposition of ON:					
Period	ON	CREDIT	DGC	FCF	CPI
1	<b>100.0000</b>	0.000000	0.000000	0.000000	0.000000
2	73.27964	3.570371	12.57997	2.711368	7.858650
3	71.02480	3.974148	11.80134	3.015563	10.18415
10	67.50194	4.118840	15.30695	3.382142	9.690125
Variance Decomposition of CREDIT:					
Period	ON	CREDIT	DGC	FCF	CPI
1	1.242540	98.75746	0.000000	0.000000	0.000000
2	4.121994	94.65953	1.008439	0.001098	0.208942
3	10.71914	87.63847	1.104477	0.279280	0.258633
10	<b>10.33531</b>	72.74539	8.135552	4.731542	4.052207
Variance Decomposition of DGC:					
Period	ON	CREDIT	DGC	FCF	CPI
1	2.275691	13.90495	83.81936	0.000000	0.000000
2	7.482402	13.12127	79.08453	0.026328	0.285476
3	9.317382	12.83413	77.37669	0.035796	0.435997
10	10.15289	<b>12.85670</b>	69.48164	6.160964	1.347805
Variance Decomposition of FCF:					
Period	ON	CREDIT	DGC	FCF	CPI
1	0.112661	5.149311	21.54066	73.19737	0.000000
2	6.405604	5.139084	20.09399	68.21638	0.144939
3	10.76162	4.997002	19.13176	64.95545	0.154159
10	<b>10.53352</b>	4.994311	<b>23.32795</b>	59.83561	1.308605
Variance Decomposition of CPI:					
Period	ON	CREDIT	DGC	FCF	CPI
1	4.283522	1.093085	8.573012	1.550452	84.49993
2	9.520016	1.524862	11.09419	1.594040	76.26689
3	14.37988	2.047514	13.72467	1.445958	68.40198
10	14.83837	2.251675	15.39832	1.953275	65.55837

Stationarity of the series are tested by Zivot and Andrews test and as a result series which have structural break are made stationary by eliminating the break. Because of this, the structural change is not tested in VAR analysis again. On the other hand to eliminate the structural break exogenous variable is not added to VAR analysis. The system is exactly identified because there is no exogenous variable in the system. Due to this it is not necessary to investigate for rank and order condition. For testing the reability of the results of the VAR analysis some tests are applied. LM test is used for searching whether VAR model has autocorrelation. According to the test results all probability values are greater than 0,05 which means the model does not have autocorrelation problem. On the other hand unit root test is applied to investigate whether the VAR model is stationary. All roots are in unit circle which means VAR model is stationary. Another test is for heteroscedasticity. Chi-square value which is obtained by this test is 352 and the probability value is 0,162. According to these, the null hypothesis that is

the model does not have heteroscedasticity is not rejected and the model does not have heterosdasticity problem. Finally, normality test is applied and it is found out that chi-square value is 356,7 and joint probability value is 0,00. These results show that null hypothesis which says that error terms are normally distributed is rejected, so series are not normally distributed. In this study normal distribution assumption is disregarded.

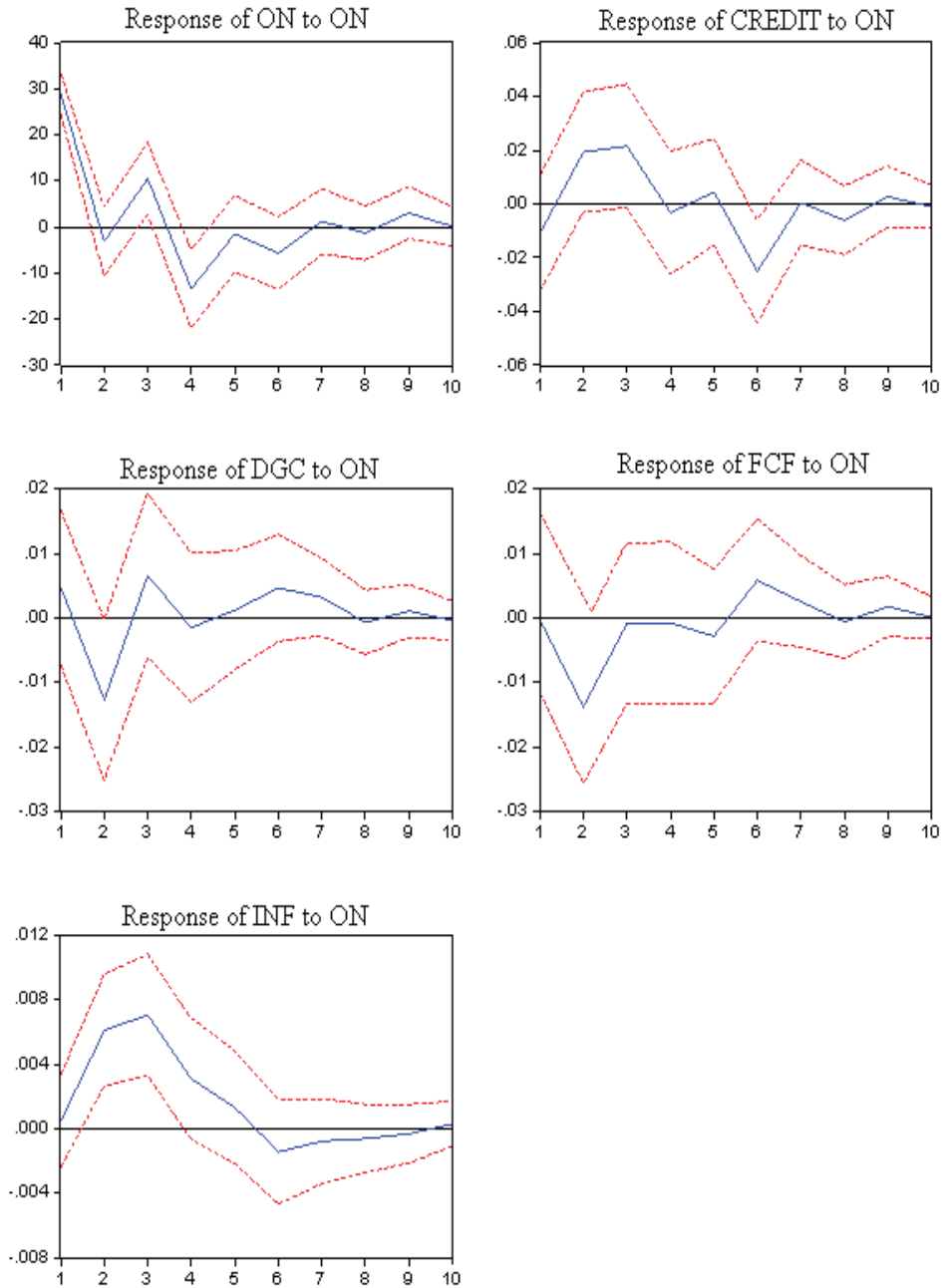
The results obtained from the main period showed that interest rate channel is operative after 2002. Since Turkey has passed to implicit inflation targeting in 2002 as Başçı, Özel ve Sarıkaya (2007) stated because of the high inflation rate and volatility in Turkey until 2002, increase in public debt burden leads to an increase in real interest rates. Consequently, because the economic agents are less sensitive to the changes in interest rates, the functioning of the traditional monetary transmission channel was not obvious. In the period that inflation targeting was implemented, the decrease in inflation rate strengthens the power of the interest rate channel (Başçı, Özel ve Sarıkaya, 2007: 476). For pointing out this situation the main period is separated into two sub-periods as (1995:1–2002:2) and (2002:3–2008:9) and the VAR analysis is repeated for each period.

**Table 5**  
Zivot and Andrews Test Results for Two sub period\*

1. SUB PERİYOD (1994M12 – 2002M02)												
Variables	Model A				Model B				Model C			
	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period
ON	-18.3638	-5.43	-4.80	74	-8.1493	-4.93	-4.42	74	-16.1645	-5.57	-5.08	74
CREDIT	-6.8177	-5.43	-4.80	61	-5.1016	-4.93	-4.42	62	-5.0269	-5.57	-5.08	-
DGC	-5.2032	-5.43	-4.80	72	-3.9429	-4.93	-4.42	-	-3.9177	-5.57	-5.08	-
FCF	-4.0213	-5.43	-4.80	-	-3.3557	-4.93	-4.42	-	-3.4626	-5.57	-5.08	-
CPI	-3.2585	-5.43	-4.80	-	-3.7702	-4.93	-4.42	-	-4.0598	-5.57	-5.08	-
2. SUB PERİYOD (2002M03 – 2008M09)												
Variables	Model A				Model B				Model C			
	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period	Minimum t Statistic	Critical Values (1%)	Critical Values (5%)	Breaking Period
ON	-5.1092	-5.43	-4.80	51	-4.0749	-4.93	-4.42	-	-4.2009	-5.57	-5.08	-
CREDIT	-3.8361	-5.43	-4.80	-	-4.2564	-4.93	-4.42	-	-4.3860	-5.57	-5.08	-
DGC	-4.6975	-5.43	-4.80	-	-4.7584	-4.93	-4.42	18	-4.7192	-5.57	-5.08	-
FCF	-1.8390	-5.43	-4.80	-	-5.8702	-4.93	-4.42	51	-5.8717	-5.57	-5.08	50
CPI	-4.2338	-5.43	-4.80	-	-3.8932	-4.93	-4.42	-	-3.9912	-5.57	-5.08	-

\* AIC is used for the decision of appropriate lag.

**Figure 2**  
Impulse Response Function for 1<sup>st</sup> Sub Period



For the first sub-period when Zivot and Andrews test results were viewed, it can be seen that the ON series is level stationary with a structural break in constant and trend (Model C). CREDIT series is level stationary with a structural break in trend (Model B), and DGC series is level stationary with a structural break in constant (Model A). These series were made stationary according to the appropriate model. FCF and CPI series are difference stationary and are made stationary by taking difference.

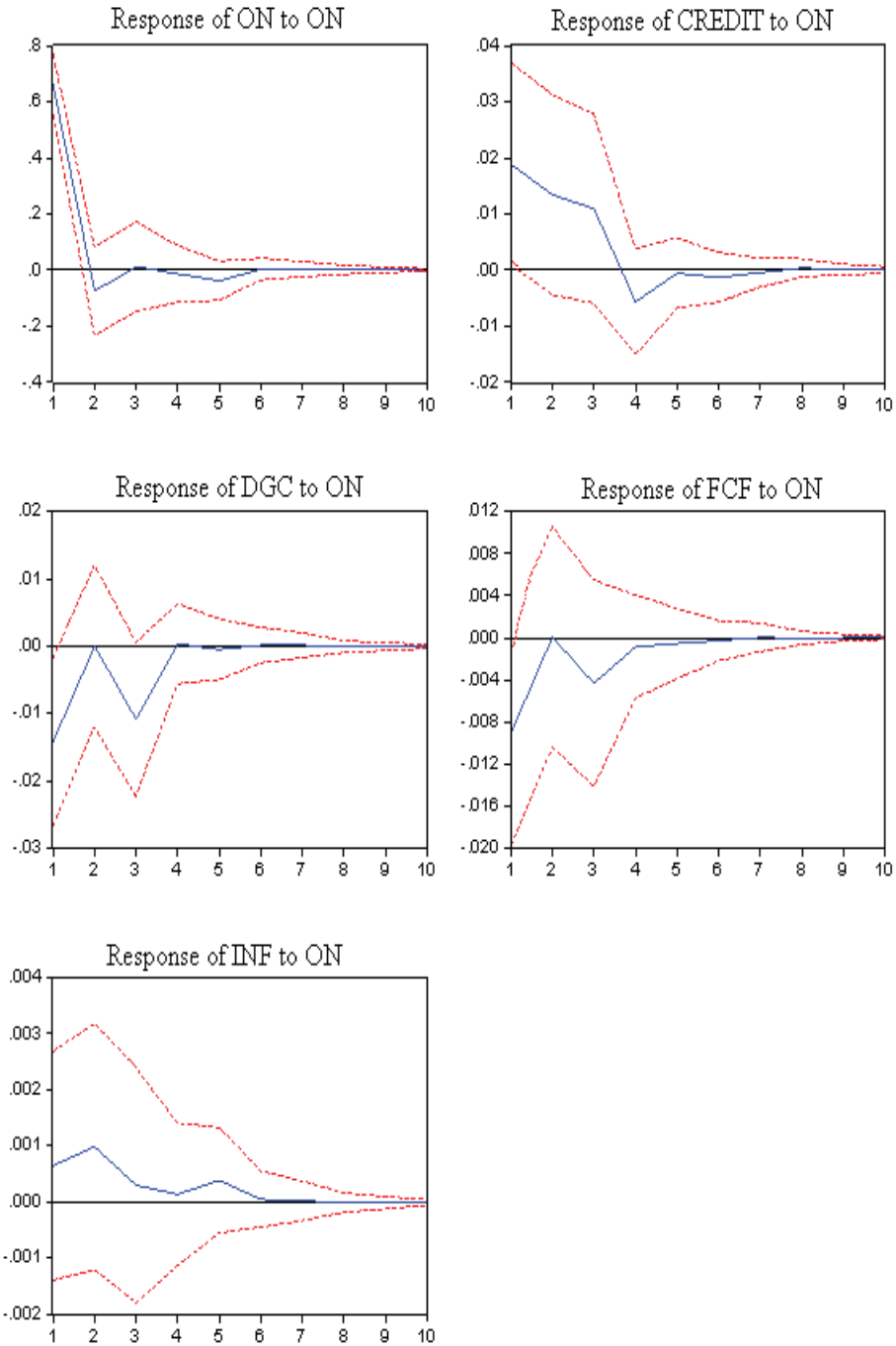
Zivot and Andrews test results for the second sub-period show that ON series is level stationary with a structural break in constant (Model A) and DGC series is level stationary with a structural break in trend (Model B). FCF series is level stationary with a structural break both in trend and constant (Model C). These series were made stationary according to the appropriate model. Finally CREDIT and CPI series which are difference stationary were made stationary by taking the difference.

In Figure 2 the results for the impulse response function for the first sub-period can be seen. One unit positive shock of standard deviation in ON series leads to a decrease in CREDIT series in the 6<sup>th</sup> period. This shock does not affect DGC and FCF series, but CPI series respond with increase in 2<sup>nd</sup> and 3<sup>rd</sup> periods. Because of the rapid increase in the cost of inputs in the end of the period, contractionary monetary policy was not effective in lowering inflation rate.

The impulse response results can be seen in Figure 3 for the second sub-period. As a result of one unit positive shock in standard deviation of ON series, the response of CREDIT is increasing in the 1<sup>st</sup> period while DGC and FCF series decrease. On the other hand CPI series did not respond.

The important points when we examine the variance decomposition analysis for comparing two sub-periods are; ON series is the most exogenous variable for two sub-periods. Also variance decomposition for credit series shows that ON series explains the 11% of the changes in CREDIT series in the 10<sup>th</sup> period and DGC explains 14% of the changes in CREDIT series. On the other hand, in the 2<sup>nd</sup> sub-period the changes in CREDIT series are explained by ON series. If variance decomposition of DGC series is examined, it can be seen that CREDIT series has the highest power in explaining the changes for both sub-periods. The change in ON variable affects the CREDIT variable and finally CREDIT variable affects the DGC and FCF series. However the result that in the first sub-period the changes in CREDIT series are mostly explained by DGC series indicates that the interest rate channel is not functioning after the 10<sup>th</sup> period in this sub-period. The variance decomposition of FCF series points out that DGC series has the most power to explain changes in the first sub-period; in the second sub-period in accordance with the interest rate channel CREDIT series has the maximum power of explanation. Finally when the variance decomposition of CPI series is examined, the series that has the most power of explanation is ON in first sub-period and CREDIT series in second sub-period.

**Figure 3**  
Impulse Response Function for 2<sup>nd</sup> Sub Period



**Table 6**  
Variance Decomposition for Sub Periods

Variance Decomposition for 1. Sub Period						Variance Decomposition for 2. Sub Period					
Variance Decomposition of ON:						Variance Decomposition of ON:					
Period	ON	CREDIT	DGC	FCF	CPI	Period	ON	CREDIT	DGC	FCF	CPI
1	100.00	0.000	0.000	0.000	0.000	1	100.0000	0.000	0.000	0.000	0.000
2	73.330	3.654	20.097	0.785	2.131	2	87.438	0.004	9.996	0.578	1.982
3	72.248	3.843	17.575	0.685	5.646	3	86.992	0.465	9.930	0.585	2.026
10	63.611	3.389	25.200	1.639	6.158	10	86.916	0.469	9.934	0.586	2.092
Variance Decomposition of CREDIT:						Variance Decomposition of CREDIT:					
Period	ON	CREDIT	DGC	FCF	CPI	Period	ON	CREDIT	DGC	FCF	CPI
1	1.226	98.773	0.000	0.000	0.000	1	6.376	93.623	0.000	0.000	0.000
2	4.727	91.042	2.117	1.106	1.004	2	9.920	88.593	1.131	0.013	0.341
3	8.421	84.134	2.192	4.318	0.932	3	9.903	88.084	1.606	0.066	0.339
10	11.18	65.537	14.368	3.763	5.142	10	9.910	88.067	1.607	0.067	0.347
Variance Decomposition of DGC:						Variance Decomposition of DGC:					
Period	ON	CREDIT	DGC	FCF	CPI	Period	ON	CREDIT	DGC	FCF	CPI
1	0.759	12.805	86.434	0.000	0.000	1	5.638	27.298	67.062	0.000	0.000
2	5.686	12.599	79.511	0.4679	1.734	2	5.598	27.121	66.291	0.021	0.967
3	6.592	11.786	79.390	0.4962	1.734	3	5.609	27.122	66.167	0.021	1.078
10	6.589	11.498	74.610	2.9787	4.323	10	5.608	27.114	66.141	0.021	1.113
Variance Decomposition of FCF:						Variance Decomposition of FCF:					
Period	ON	CREDIT	DGC	FCF	CPI	Period	ON	CREDIT	DGC	FCF	CPI
1	0.003	8.109	31.512	60.374	0.000	1	3.187	5.234	3.295	88.282	0.000
2	6.382	7.635	30.855	52.714	2.412	2	3.002	5.504	3.219	83.848	4.423
3	5.819	6.949	34.135	49.480	3.614	3	2.983	5.535	3.170	82.515	5.795
10	5.494	7.621	42.612	39.373	4.898	10	2.973	5.554	3.158	82.173	6.141
Variance Decomposition of CPI:						Variance Decomposition of CPI:					
Period	ON	CREDIT	DGC	FCF	CPI	Period	ON	CREDIT	DGC	FCF	CPI
1	0.132	0.019	2.018	0.131	97.69	1	0.044	2.285	4.707	2.568	90.393
2	14.24	1.008	11.151	0.203	73.383	2	0.049	5.077	3.888	2.098	88.885
3	26.678	3.260	9.1425	0.462	60.455	3	0.122	5.195	3.763	2.023	88.894
10	26.204	4.651	16.571	1.181	51.391	10	0.125	5.253	3.731	2.010	88.879

As a result, the interest rate channel is not functioning in the first sub-period, but powerful evidences have been obtained that it is functioning in the second sub-period in which also price stability was satisfied.

## 5. Concluding remarks

The results from the impulse response analysis have shown that a change in the short-term interest rate causes a fall in long-term interest rate in the second month and also a decrease in investment spending and consumption expenditure which are the components of aggregate demand in the third month. As a result of this study it can be said that interest rate



channel is an effective monetary transmission mechanism on real variables in Turkey only temporarily. However it must be pointed out that the effect of a change in interest rate on investment and consumption expenditure is short-lived.

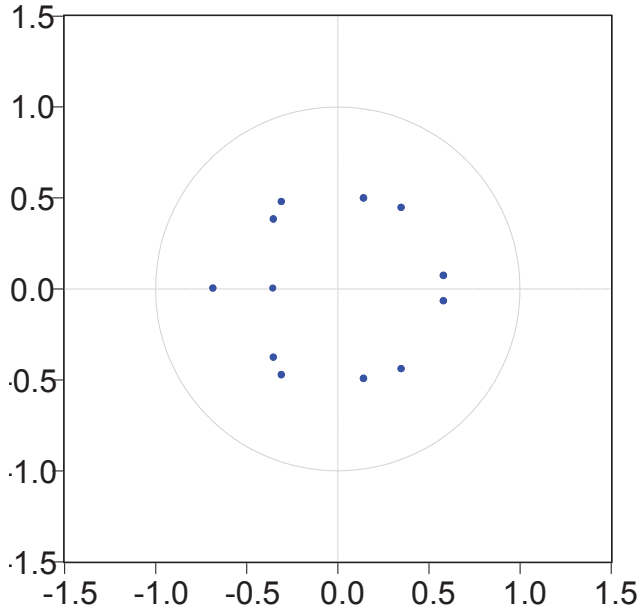
Considering the whole period according to the impulse response function, an increase in short-term interest rates leads to an increase in long-term interest rates in 2<sup>nd</sup> and 3<sup>rd</sup> months and finally investment and consumption spending decrease in the 2<sup>nd</sup> month. On the other hand an increase in inflation rate is observed in the 2<sup>nd</sup> and 3<sup>rd</sup> months. These results indicate that the interest rate channel operates in Turkey, but just affects investment and consumption spending only in the short-term.

Analysis for sub-periods stated that in the first sub-period, the results of impulse response function are not consistent with the interest rate channel operation. In the case of a positive shock in the short-term interest rate, long-term interest rates fall in the 6<sup>th</sup> month, no effect occurs on investment and consumption spending. In the second sub-period (after 2002) when the price stability was satisfied, a positive shock in short-term interest rates leads to an increase in long-term interest rates in the 1<sup>st</sup> month and a fall in investment and consumption spending according to the results of impulse response function.

In the period after 2002 the result that the interest rate channel was functioning better reveals the importance of price stability. In the 1990s inflation rates in Turkey have shown a high and unstable trend. It is not easy to determine the effectiveness of monetary transmission channels in the periods of price instability. In order to overcome inflation, stabilization programs were implemented in 1994 and 1999 and they failed in a short time period. Also, price stability was not achieved. Transition to the Strong Economy Program was announced in April 2001 against the serious financial crisis experienced in November 2000 and February 2001. This program recommended regulations about restructuring of financial sector and improvement of public finance and in May the New Central Bank Law No. 4651 was adopted. With this law price stability has been made the Central Bank's main goal, priority was given to transparency and accountability and to open credit to public sector was prohibited. In the period after 2002, the implementation of monetary policy consistent with the goal of price stability increased the credibility of Central Bank. By the increase in the credibility, the Bank obtained more power in managing expectations and also high credibility has provided the conditions for price stability. Price stability has increased the effectiveness of interest rate channel just like monetary transmission mechanism.

## Appendix 1

### Inverse Roots of AR Characteristic



## Appendix 2

### The Results of Seasonality Test of FCF

	All Period (Probability)	1. Sub Period (Probability)	2. Sub Period (Probability)
@SEAS(1)	0.0000	0.0000	0.0000
@SEAS(2)	0.0000	0.0000	0.0000
@SEAS(3)	0.0000	0.0000	0.0000
@SEAS(4)	0.0000	0.0000	0.0000
@SEAS(5)	0.0000	0.0000	0.0000
@SEAS(6)	0.0000	0.0000	0.0000
@SEAS(7)	0.0000	0.0000	0.0000
@SEAS(8)	0.0000	0.0000	0.0000
@SEAS(9)	0.0000	0.0000	0.0000
@SEAS(10)	0.0000	0.0000	0.0000
@SEAS(11)	0.0000	0.0000	0.0000
@SEAS(12)	0.0000	0.0000	0.0000

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## Özet

### Türkiye’de para politikasının faiz kanalı işlemekte midir?

Parasal otoritenin kararlarındaki değişiklikler, iktisadi birimlerin davranışlarını ve dolayısıyla toplam talep düzeyini etkilemektedir. Diğer bir deyişle merkez bankasının kısa vadeli faiz oranlarında yapacağı bir değişiklik sermaye kullanım maliyetini ve firmaların yatırım harcaması kararlarını yönlendirmektedir. Para politikası literatüründe bu süreç faiz kanalı kavramı ile adlandırılmaktadır. Politika yapıcılara yol göstermesi açısından faiz kanalının işleyip işlemediğinin araştırılması büyük öneme sahiptir. Kısa vadeli faiz oranlarında gerçekleştirilen bir değişikliğin uzun dönemli faiz oranları üzerinde doğuracağı etkinin belirlenmesi, parasal otoritenin alacağı kararların hasıla üzerindeki etkilerinin ortaya konması açısından gereklidir. Çünkü kısa dönemli faiz oranlarındaki değişiklik uzun dönem faiz oranlarını değiştirerek yatırım ve tüketim kararlarını etkilemektedir.

Bu çalışmanın amacı Türkiye’de 1995:1-2008:9 için parasal aktarım mekanizmasının faiz kanalını araştırmaktır. Bulgular faiz kanalının varlığına işaret etmektedir. Enflasyon oranında 2002 yılından sonra gerçekleşen düşüş nedeniyle faiz kanalının işleyişi, tüm dönem iki alt döneme (1995:1-2002:2 ve 2002:3-2008:9) ayrılarak analiz edilmiştir. Sonuçlar, faiz kanalının sadece ikinci alt dönemde işlediğini göstermektedir.

*Anahtar kelimeler:* Faiz kanalı, parasal aktarım mekanizması, para politikası.

*JEL classification:* E52.