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RESEARCH ARTICLE

The Efficiency of The Interest Channel in The Context of Monetary Policy in Developed Countries

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Abstract

In recent years, the consequences of globalization and global developments in an area or around the world have harmed monetary transmission channels, creating an axis shift and diminishing the efficiency of monetary policy instruments. There is significant evidence about the influence of foreign monetary policy transfer on the excess supply of credit, according to studies on the subject. As a result, dynamically unbundling different monetary policy channels or comparing the outcomes of various policies is regarded as a crucial observation. The efficiency of the interest rate channel of the monetary transmission mechanism is explored in this study using annual data from the IMF and World Bank databases for the countries included in the MSCI emerging markets index for the years 1995 to 2021. In the study, panel unit root tests, panel cointegration tests with structural breaks, and panel causality tests developed by Kónya (2006) were applied to the variables determined to contain cross-sectional dependence. Within the framework of the panel VAR model established in line with the results obtained from these tests, the efficiency of the interest channel was investigated with the impulse-response functions and variance decomposition methods. While interest rate shocks have no statistically significant impact on loans, they do have a beneficial impact on inflation in the first two years and a negative impact in the subsequent years (up to the 6th year). In conclusion, the findings of this analysis suggest that, while shock rises in interest rates have a modest influence on the gross domestic product, they do promote, albeit slightly, the drop in the inflation rate.
Keywords: *Monetary Policy Transmission Channels, Interest Rates, Monetary Policy, Central Banks and Policies*
Jel Codes: *E42, E43, E44, E58*

Gelişmiş Ülkelerde Faiz Kanalının Para Politikası Etkinliği

Özet

Küreselleşme ve küresel gelişmelerin bir bölgede ya da dünya genelindeki etkileri parasal aktarım kanallarını son yıllarda olumsuz etkilemiş, eksen kaymasına neden olmuş ve para politikası araçlarının etkinliğini azaltmıştır. Bu konuda yapılan araştırmalar, uluslararası para politikası transferinin kredi arz fazlası üzerindeki etkisi ile ilgili önemli kanıtlar olduğunu vurgulamaktadır. Bu nedenle, farklı para politikası kanallarının dinamik olarak ayrıştırılması veya farklı politikaların sonuçlarının karşılaştırılması önemli bir gözlem olarak değerlendirilmektedir. Bu çalışmada, MSCI gelişmekte olan piyasalar endeksinde yer alan ülkelere ait, IMF ve Dünya Bankası veri tabanlarından elde edilen ve 1995-2021 dönemlerini kapsayan yıllık veriler ile parasal aktarım mekanizmasının faiz oranı kanalının etkinliği araştırılmaktadır. Çalışmada yatay kesit bağımlılığı içerdiği belirlenen değişkenlere yapısal kırılmaları dikkate alan panel birim kök testleri, ve yapısal kırılmalı panel eşbütünleşme testleri ve son olarak Konya tarafından geliştirilen panel nedensellik testleri uygulanmıştır. Bu testlerden elde edilen sonuçlar doğrultusunda kurulan panel VAR modeli çerçevesinde, etki-tepki fonksiyonları ve varyans ayrıştırması yöntemleriyle faiz kanalının etkinliği araştırılmıştır. Krediler üzerinde faiz şoklarının istatistiksel olarak anlamlı bir etkisi yokken faiz şokları enflasyonu ilk 2 yıl pozitif etkilerken sonraki yıllarda negatif etkilemektedir. Özetle, bu çalışmanın sonuçları, faiz oranındaki şok artışların, gayri safi yurtiçi hasıla üzerinde etkisi kısıtlı olmakla birlikte, faiz oranlarındaki artışın enflasyon oranındaki azalışı zayıf olmakla birlikte desteklediği tespit edilmiştir.

Anahtar kelimeler: *Para Politikası Aktarım Mekanizmaları, Faiz Oranları, Para Politikası, Merkez Bankaları* ve Politikaları
Jel Kodu: *E42, E43, E44, E58*

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1. INTRODUCTION

Theoretically, after the 90s, the market-oriented policy of meeting the financing needs through the credit channel in developing countries began to evolve into the interest channel (Kim, 1995). For this reason, dynamic decomposition of different monetary policy channels or comparing the results of different policies is considered an important observation (Egert and MacDonald, 2009). The monetary policy transmission mechanism has been taken into consideration by both policymakers and the public sector in recent years, especially based on the relationship between monetary policy actions and the expectations of the public and is at the center of current studies (Papadamou, Sidiropoulos, and Spyromitros, 2015).

The cyclical fluctuations in the world and the uncertainties in the financial markets caused deviations from the targets set by the Central Banks, and this situation created pressure on the transmission mechanisms of the monetary authorities and led them to seek heterodox policies. This situation has led all Central Banks to go beyond traditional practices and expand their room for maneuvering and question their effectiveness (Yıldırtan and Sarılı, 2017). In a general economic paradigm, financial markets act as the "barometer" of the national economy, and it is observed that monetary policy reacts before the real market. Based on this premise, it is necessary to investigate the possible and potential effects of monetary policy on financial markets to predict the successors of monetary policy implementations on the economy (Wei and Han, 2021). Because, before the global financial crisis, current monetary policies were focused only on protecting the purchasing power of interest rates and partially on production. After the crisis, while the importance of financial stability and monetary policy emerged, it began to be questioned (De Gregorio, 2010). According to Gross and Zahner (2021), the standard Taylor model, which uses inflation rates and economic growth to approximate short-term interest rates, was largely discredited after the crisis (Elsayed, Naifar, & Nasreen, 2022).

For Central Banks to have an effective monetary policy and to achieve success, it is important that the central bank manages its monetary policy independently from the government, ensuring transparency and determining price stability as the main objective. At this point, it should not be overlooked that the independence of central banks is an important issue. Because of the policies implemented by a disreputable central bank, the potential moves it declares to implement, may lose their effectiveness and credibility in line with expectations. This issue is considered a constraint when conducting empirical analysis in transmission mechanism studies. When the empirical literature is examined in the economics literature, the importance of the role of transparency in terms of macroeconomic performance is frequently emphasized (Spyromitros and Tüysüz, 2012; Chortareas et al., 2002; Cecchetti and Krause, 2002; Dincer and Eichengreen, 2007; Kuttner and Posen, 1999; Fatás, Mihos, and Rose, 2007; Papadamou, 2015).

Because central banks have more information about the economy's future than the public, monetary policy actions can indirectly communicate information about the economy's outlook to the general population. The public may modify their views about non-monetary economic fundamentals as a result of this process, which is known as the information effect (Nakamura and Steinsson, 2018; Miranda-Agrippino and Ricco, 2021; Romer and Romer, 1990). This could be the source of unusual replies. The private sector, for example, may take the policy rate hike as a harbinger of impending economic expansion, leading to an upward adjustment in inflation expectations and a rise in actual inflation (Lee and Park, 2022). This study, it is aimed to reveal to what extent the Central Banks of developed countries can affect growth, inflation, and domestic loans through the interest channel by using the policy interest rates and be successful. In the study, based on the presumption that central banks can act independently in interest rate decisions and action, the inability to make independent

decisions and the assumption that governments do not determine the interest policy for populist practices should be considered as constraints.

2. RELATED WORKS

One of the main questions in macroeconomics is about the transfer of monetary policy shocks to the economy. This situation guides the development of the action-reaction relationship between interest rate policy and other economic dynamics (Christiano, Eichenbaum, & Evans, 1999). In the literature, various monetary transmission channels in developed markets are investigated in different periods and methods (Reifschneider, Tetlow and Williams, 1999; Christiano, et al., 1999; Gertler and Gilchrist, 1993; Kashyap and Stein, 1995; Brayton and Mauskopf, 1985). However, although the question about the method used in the transmission mechanism and its effect remains constant, different answers can be obtained with cyclical changes. For this reason, studies on this subject are always important (Can, Bocuoğlu and Can, 2020; Kaminska, Mumtaz, and Sustec, 2021).

While the monetary transmission mechanism, through which monetary policy is transferred to the real sector, has been discussed by economists in recent years, it can be separated into the interest rate channel and credit channel (Ramlogan, 2007). According to Romer and Rommer (1990), there are also two necessary conditions for the interest rate channel to work. The first is that banks should protect their transaction balances because of reserve movements, and the other is that money should not be a close substitute for conducting transactions in the economy (Wurandari, 2012). It is also important to monitor the changes in government revenues in response to shocks in interest rates. The reason for this is the importance of the maneuverability brought by the coordination of monetary and fiscal policy throughout the policy application period, and thus the possibility that monetary tightening can be accompanied by fiscal tightening through an increase in taxes (Mountford and Uhlig, 2009). On the other hand, there may be changes in interest rates in answer to fiscal policy shocks, as public expenditure and income shocks will have an impact, especially on output and debt. In addition, contractionary monetary policy shocks will cause a decrease in government revenue, but at the same time, a decrease in debt ratios will be possible on this occasion (Dungey and Fry, 2009). In light of all these, the simultaneous handling of monetary and fiscal policies or the network of relations is important in terms of effectiveness while applying the policy. Ankargren ve Shahnazarian (2019), use a structural VAR model with time-varying parameters to analyze the interaction between monetary and fiscal policy. In addition, it is stated in the study that the two policies are substitutes, while supply and demand shocks are complementary. Finally, it is stated that fiscal policy should be effective in terms of supporting monetary policy for a stable economic paradigm.

When the studies on monetary policy shocks and policy effectiveness are examined, Gross and Zahner (2021) applied the Bayesian mean approach model for interest rate determination before and during the global financial crisis to explain the monetary policy of the European Central Bank. It is put forward in the study that inflation is the prime driving force of monetary policy judgment after the crisis. The Taylor principle is rejected in the pre-crisis period, and it is stated that economic activity measures are the main driving force of the monetary policy of the European Central Bank (Elsayed et al., 2022).

Seyrek, Duman, and Sarıkaya (2004) compared the Monetary and New-Keynes transmission mechanisms for Turkey and stated that the money supply is an exogenous variable and that the monetary transmission mechanism works by affecting the credit volume of the money supply. In another study, Hansen (2000) examined the effect of real interest rates on finance growth. The impact of real interest rates on Japan's growth has been discovered. The banking sector also has large positive (negative) effects on output growth under a regime where real interest rates are higher (lower). With the low-interest rate policy, it was also revealed that the banking system was

suppressed in promoting growth. In parallel, a similar result was put forward by Azariadis and Smith (1998) and Peek and Rosengren (2005), and it is stated in the study that low-interest rates reduce efficiency in loan allocation.

After the 2011 crisis that shook Europe, along with the expansionary monetary policies, as of 2012, some Central Banks tried the negative policy rate, which is an unconventional policy tool. Negative interest rates were introduced by central banks to encourage banks to lend their excess reserves to the actual economy, so boosting economic activity. In a sample of 16 industrialized and emerging countries, Bul and Vlek (2021) discovered a considerable shift from short-term policy and interbank rates to long-term bond yields. Schelling and Towbin (2018) provided empirical evidence by examining the effects of the Swiss National Bank's (SNB) implementation of negative interest rates on individual Swiss corporate loans.

They found that banks with a high deposit volume expand their market share by offering more generous lending conditions and indirectly contributing to the economy. Basten and Mariathasan (2018), in their analysis of the Swiss banking market, similarly state that negative interest rates stimulate the loan supply. Both studies confirm the effectiveness of monetary policy through negative interest rate policy. Brandao-Marques, Gelos, and Harjes (2020) investigated the efficiency of price-based monetary policy frameworks in 40 developed and developing nations, finding a considerable shift from monetary policy rates to prices. In this study, while investigating the relationship of the interest channel, which is one of the monetary transmission mechanisms, with total output and inflation, the effectiveness of the monetary policy in the related countries will be investigated.

3. RESEARCH METHOD AND ANALYSIS

The efficiency of the interest rate channel of the monetary transmission mechanism is explored in this study using annual data from the IMF and World Bank databases of countries in the MSCI (Morgan Stanley Capital International) developed markets index for the years 1995 to 2021. Using domestic prices, current gross domestic product (GDP), loans (CRE), treasury bill interest rates (i), and consumer price index (CPI) were employed in the analysis, which was conducted using the E-views 8.0 and Gauss 17 programs.

The heterogeneity of the cross-section units should be explored in panel data analysis because the heterogeneity or homogeneity of the variables is crucial in determining the stationarity and unit root tests to use in the subsequent analysis. The null hypothesis that the slope coefficients are homogenous was tested in this study, and heterogeneity was studied using delta tests (Pesaran and Yamagata, 2008). The null hypothesis is rejected based on the test results in Table 2, indicating that the variables that make up the data set are heterogeneous.

Table 1: Homogeneity Test Results

Test	Test Stat.	P-value
Delta_tilde:	5.392	0.000
Delta_tilde_adj:	5.842	0.000

The interdependence of the parts that make up the panel data is so significant that it has an impact on the analyses' outcomes. In the situation of cross-sectional dependence, traditional least squares-based estimators are unsuccessful. In other words, if the variables are subjected to a shock, it is required to determine whether the horizontal sections are also impacted in the same way. If the existence of the dependency is established, the stationarity and cointegration tests that must be used must include tests that account for cross-section dependence.

Breusch, Pagan (1980), Pesaran (2004), and Pesaran et al. (2008) used tests to determine the presence of cross-section dependency in this study. In circumstances when the cross-section dimension is less than the time dimension (NT), the Berusch-Pagan (1980) LM test can be employed, while the Pesaran (2004) CD test can be used in both cases (T>N, N>T). Finally, the absence of cross-sectional dependence is the null hypothesis in these experiments.

Table 2: Results of Cross-Section Dependency Tests

	Model		i		GDP		Cre		Cpi	
	Test Stat.	P-value	T. S.	P-value	T. S.	P-value	T. S.	P-value	T. S.	P-value
LM (Breusch, Pagan 1980)	138.452	0.000	105.688	0.000	89.273	0.000	100.344	0.000	100.344	0.000
CDLM1 (Pesaran 2004)	18.123	0.000	13.068	0.000	10.535	0.000	12.243	0.000	12.243	0.000
CDLM2 (Pesaran2004)	10.449	0.000	-2.983	0.189	-2.319	0.495	-2.891	0.002	-2.891	0.020
Biased Adjusted CD (Pesaran vd. 2008)	17.118	0.000	2.469	0.230	1.050	0.944	2.555	0.005	2.555	0.996

The cross-sectional dependence of the variables utilized in the study and the model is shown individually in Table 2. The null hypothesis that there is no cross-section reliance for all variables and the model is rejected, and it is determined that there is cross-sectional dependence, based on these findings and Biased Adjusted CD test statistics. Unit root tests and cointegration tests should be done initially in order to properly examine econometric models. The existence of cross-section dependence should be emphasized here. Because the reliability of first-generation panel unit root tests suffers significantly when the model and variables are cross-sectionally dependent.

The stationarity of the variables was assessed using the CADF (Cross-Sectionally Augmented Dickey-Fuller) test created by Pesaran (2007) and the panel unit root test developed by Hadri and Kurozumi (2012) because the variables used in the study have cross-sectional dependence. The stationarity of the variables was then confirmed using Im, Lee, and Tieslau's (2005) panel unit root test, which additionally takes into consideration any structural breaks in the variables.

Table 3: CADF Unit Root Test Results

	i				gdp			
Country	**Level**		**First Difference**		**Level**		**First Difference**	
	Lag	**t-stat**	**Lag**	**t-stat**	**Lag**	**t-stat**	**Lag**	**t-stat**
Denmark	1	-2.596	1	-3.214	1	1.004	1	-1.789
Italy	2	-1.882	2	-2.682	2	-1.461	1	-3.166
New Zeland	1	-2.392	2	-2.683	1	-1.948	1	-2.739
Norway	1	-3.049	1	-3.012	1	-0.936	3	-1.848
Spain	1	-3.127	2	-2.327	1	-1.414	1	-3.334
England	1	-4.457	2	-2.874	2	-1.066	1	-2.67
USA	1	-2.762	1	-5.281	3	1.257	1	-1.947
CIPS (Panel)		-2.895***		-3.153***		-0.652		-2.499**
	cre				**cpi**			
Country	**Level**		**First Difference**		**Level**		**First Difference**	
	Lag	**t-stat**	**Lag**	**t-stat**	**Lag**	**t-stat**	**Lag**	**t-stat**
Denmark	2	-1.553	1	-4.828	4	-0.798	1	-2.02
Italy	2	-3.389	1	-4.148	4	0.039	1	-2.485
New Zeland	2	-2.963	1	-2.99	1	-2.723	1	-1.796
Norway	2	-3.581	1	-2.952	2	-0.45	1	-3.173
Spain	2	-1.605	1	-3.68	1	-0.47	1	-1.589
England	1	-3.327	1	-4.508	1	-1.562	1	-1.508
USA	2	-0.598	1	-4.644	1	-1.634	1	-2.636
CIPS (Panel)		-2.431**		-3.964***		-1.086		-2.172

**The optimal lag lengths were determined according to the Schwarz information criterion and the maximum lag length was taken as 4. CADF statistics critical values are -4.35 (1%), -3.43 (5%) and -3.00 (10%) in the fixed model (Pesaran 2007, Table I(b), p:275); -4.97 (1%), -3.99 (5%) and -3.55 (10%) in the fixed and trend model (Pesaran 2007, table I(c), p:276). Panel statistics critical values are -2.60 (1%), -2.34 (5%) and -2.21 (10%) in the fixed model*

(Pesaran 2007, table II(b), p:280); -3.15 (1%), -2.88 (5%) and -2.74 (10%) in the fixed and trend model (Pesaran 2007, table II(c), p:281). The panel statistic is the average of the CADF statistics. Critical values at N=10 and T=20 were taken into account when looking at the tables.

The I and CRE variables are stationary at the level, according to the CADF unit root test results in Table 3, however, the GDP and CPI variables contain a unit root at the level, indicating that they are not stationary, and the results varied by nation. As a result, a second unit root test was required. Table 4 shows that all variables are stationary at the level, according to the Hadri-Kuruzomi panel unit root test results. Furthermore, the results of the first-generation panel unit root test, which do not account for the variables' cross-sectional dependency and are presented in the appendices, reveal that the variables are stable at the level.

Table 4: Hadri-Kuruzomi Panel Unit Root Test Results

		Constant	P-value	Constant & Trend	P-value
i	Za_spac	-1.652	0.950***	-1.053	0.853***
	Za_la	-1.488	0.931***	-1.973	0.975***
gdp	Za_spac	-0.144	0.557***	-2.075	0.981***
	Za_la	0.743	0.228***	-2.349	0.990***
cre	Za_spac	-0.650	0.742***	-0.962	0.832***
	Za_la	-0.802	0.211***	2.547	0.005
cpi	Za_spac	-0.495	0.690***	0.089	0.464***
	Za_la	0.017	0.493***	1.210	0.113***

The null hypothesis was rejected on both a cross-section and panel basis, and the variables were stationary at the level, according to the panel unit root test results in Table 5 for the four variables employed in the model. Table 5 also shows the years in which both single and double breakouts occur, which differ by country.

Table 5: Im, Lee and Tieslau Structural Break Panel Unit Root Tests

i	One break model						Two breaks model					
	Level shift model: Break-in constant			Level and trend shift model: Break-in constant and trend			Level shift model: Break-in constant			Level and trend shift model: Break-in constant and trend		
	LM-stat.	Break	Lag	LM-stat.	Break	Lag	LM-stat.	Break	Lag	LM-stat.	Break	Lag
Denmark	-3.162	2007	0	-3.553	2001	0	-5.029**	2005 2010	0	-5.142**	2005 2008	0
Italy	-3.974**	2001	1	-4.116**	2001	1	-5.932***	2001 2009	1	-5.516***	2001 2009	1
New Zeland	-3.939*	2008	0	-4.029**	2008	0	-7.418***	2005 2009	0	-6.032***	2005 2010	0
Norway	-4.638***	2011	1	-4.828***	2011	1	-5.884***	2008 2014	1	-6.837***	2010 2014	1
Spain	-3.723*	2003	1	-3.871*	2001	1	-5.341**	2001 2012	1	-5.396***	2001 2012	1
England	-3.717*	2012	0	-2.616	2010	3	-5.936***	2001 2010	0	-5.154**	2001 2010	3
USA	-4.947***	2015	0	-5.538***	2011	0	-6.853***	2004 2012	0	-6.738***	2004 2012	0
Panel-LM	-8.507			-5.723			-17.051			-11.435		
Gdp	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**
Denmark	-3.979**	2007	0	-3.907*	2007	0	-6.209***	2004 2010	0	-6.485***	2007 2010	0
Italy	-4.358**	2006	4	-4.317**	2007	0	-5.691***	2007 2010	4	-9.542***	2008 2018	0
New Zeland	-4.244**	2018	3	-4.471**	2010	3	-5.245**	2005 2015	3	-6.084***	2004 2016	0
Norway	-4.824***	2008	0	-4.785***	2008	0	-5.897***	2005 2009	0	-7.247***	2005 2009	0
Spain	-2.66	2008	1	-4.198**	2016	2	-6.118***	2005 2015	1	-7.103***	2004 2015	2
England	-3.755	2008	0	-4.977***	2018	0	-9.255***	2008 2018	0	-13.5***	2008 2018	0
USA	-4.553*	2007	0	-4.507**	2008	0	-6.092***	2004 2013	0	-8.698***	2008 2018	0
Panel-LM	-8.765			-7.401			-18.332			-22.638		
Cre	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**
Denmark	-3.785*	2003	1	-6.823***	2014	1	-6.292***	2004 2013	1	-7.014***	2004 2014	1
Italy	-4.398**	2003	1	-4.444**	2003	1	-6.973***	2004 2012	1	-7.223***	2004 2012	1
New Zeland	-3.446	2003	1	-3.631	2003	1	-5.11**	2004 2012	1	-5.348**	2004 2012	1
Norway	-4.677***	2003	1	-4.615***	2003	1	-5.571***	2005 2013	1	-5.118**	2003 2010	1
Spain	-4.003**	2008	1	-3.876*	2008	1	-6.862***	2004 2012	1	-6.81***	2004 2012	1
England	-4.355**	2004	1	-4.656***	2004	1	-5.198**	2008 2016	1	-6.35***	2008 2016	1
USA	-4.238**	2003	1	-4.236**	2003	1	-7.726***	2004 2012	1	-7.948***	2004 2012	1
Panel-LM	-8.836			-7.872			-17.547			-14.644		
Cpi	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**	**LM-stat.**	**Break**	**Lag**
Denmark	-3.756*	2008	1	-3.724*	2008	2	-7.215***	2009 2018	1	-5.013**	2008 2017	0
Italy	-3.806*	2008	1	-3.89*	2013	0	-6.752***	2009 2018	0	-6.46**	2007 2013	3

New Zeland	-3.199	2005	0	-3.626	2014	2	-3.786	2003 2006	0	-4.127	2009 2018	0
Norway	-7.158***	2009	4	-7.63***	2009	4	-8.251***	2005 2010	3	-8.373****	2006 2014	2
Spain	-3.645*	2008	1	-3.648*	2008	2	-5.209**	2007 2013	0	-6.054***	2007 2013	0
England	-3.984*	2010	1	-4.606***	2010	1	-3.806	2001 2009	1	-4.705**	2010 2018	3
USA	-3.169	2007	0	-3.582	2013	0	-4.982**	2007 2013	0	-6.482****	2007 2018	0
Panel-LM	-8.865			-7.157			-15.629			-11.778		

*Level and trend shift model critical values; one break model: -4.604 (1%); -3,950 (5%); -3,635 (10%); two breaks models: -5,365 (1%); -4.661 (5%); -4.338 (10%). The maximum lag length was taken as 4 and the optimal lag lengths were determined by the "t-stat significance" approach.

After determining that the variables in the study were stationary at the level, the presence of a cointegration connection was determined in the second stage. Instead of using first-generation cointegration tests, whose reliability has been questioned due to cross-section dependence of the variables, Westerlund and Edgerton (2007) developed a second-generation panel cointegration test, which considers cross-sectional dependence and is referred to as the second-generation panel cointegration test in the literature. The Panel LM Bootstrap cointegration test, which is shown in Table 6, was used, and it was concluded that there is cointegration in both the fixed model and the fixed and trend-containing model, according to the test, which assumes the null hypothesis that there is cointegration between the variables.

Table 6: Panel LM Bootstrap Cointegration Test Results

	LM Test Stat.	Asymptotic P-Value	Bootstrap P-Value
Constant Model	41.519	0.000	0.950
Constant & Trend Model	48.425	0.000	0.951

In order to test whether the cointegration relationship between the variables is valid in the presence of structural breaks, similar to the stationarity analysis approach applied in the study, the panel cointegration test, allowing for many structural breaks and takes into account heterogeneity and cross-section dependence, and developed by Westerlund (2006), was applied. According to the test, the results of which are shown in Table 7 and in which the existence of the cointegration relationship is tested according to the null hypothesis, it is found that the variables have a cointegration relation even when there are structural breaks. In addition, the dates on which the mentioned structural breaks occurred can be seen in Table 7.

Table 7: Panel Cointegration Test Results with Structural Breaks

	Break in Constant				Break in Constant and Trend			
	Break Number	Break Dates			Break Number	Break Dates		
Denmark	3	2001	2009	2014	3	1999	2006	2011
Italy	2	1999	2013	---	3	1999	2010	2016
New Zeland	3	2000	2008	2015	2	2003	2008	---
Norway	3	2002	2009	2014	3	1999	2006	2012
Spain	2	1999	2013	---	3	1999	2005	2013
England	3	1999	2008	2014	3	1999	2006	2012
USA	2	2001	2009	---	0	---	---	---
Test Statistic	5.599				142.094			
Asymptotic p-value	0.000				0.000			
Bootstrap p-value	0.850				0.650			

*Bootstrap probability values were obtained from a 1,000 replication distribution. Asymptotic probability values were acquired from the standard normal distribution. The maximum number of breaks was taken as 4. The number of common factors was taken as 2.

Panel causality analysis established on Wald tests with cross-section-specific bootstrap critical values developed by Konya (2006) and used in the presence of cross-section dependence was used to examine the short-term situation after defining the existence of long-term equilibrium relations

between the variables. The null hypothesis, which implies that there is no causality between the variables, was rejected at least three times, accordingly to the test results in Table 8. The link between loans and interest is one of cause and effect, with loans being the cause and interest being the result. The direction of the relationship between the interest rates and the gross domestic product is a result of the interest to the gross domestic product, from the interest to the gross domestic product. The causality relationship between interest rates and inflation is the same as interest rates and gross domestic product, that is, interest rates are the cause of inflation. In this case, interest rates are the cause of both inflation and gross domestic product.

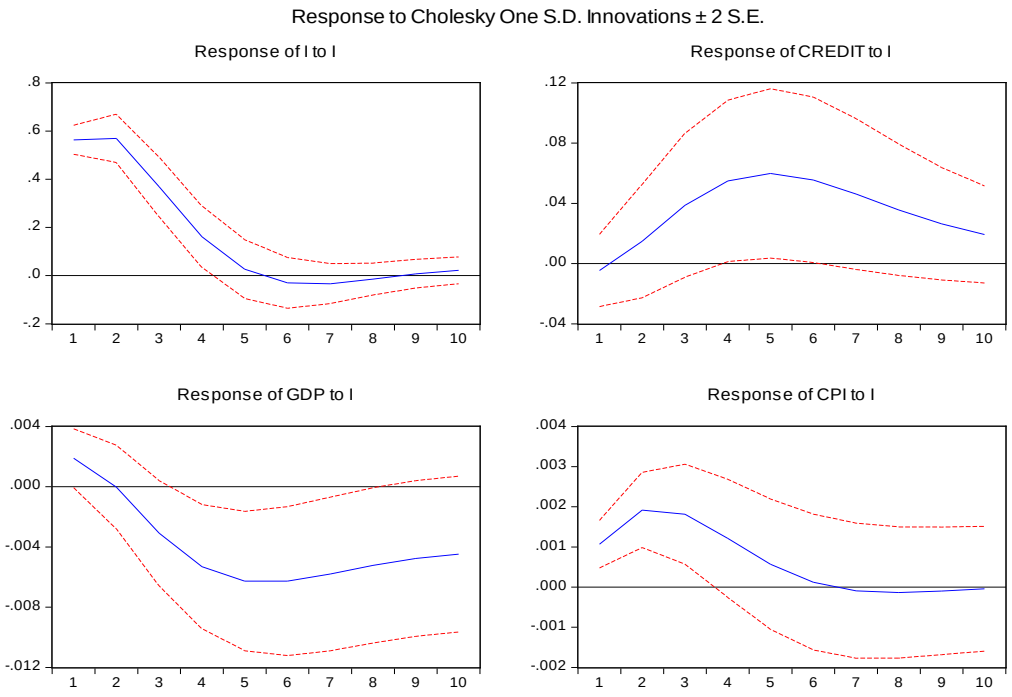
Table 8: Panel Causality Test Results

Causality	Panel Fisher İst.	Olasılık Değeri
I=>Cre	30.782	0.006
Cre=>I	7.122	0.930
I=>Gdp	3.728	0.997
Gdp=>I	42.755	0.000
I=>Cpi	7.412	0.918
Cpi=>I	26.550	0.022

* The maximum lag length was taken as 3 and the appropriate lag length was determined by the Akaike Information Criteria.

The VAR model created by Sims (1980) was used to examine if the monetary transmission mechanism operates successfully through the interest channel in the study's last part of the analysis. The impulse-response functions used to determine the response of the variables to shocks, as well as the variance decomposition methods used to determine the source of the changes in each variable, were determined using this model. Because of the nature of the approaches, the order of the variables in the system is critical at this point. Interest, loans, gross domestic product, and inflation were ranked as the order of influence in the monetary transmission mechanism process in this study, based on economic theory. The appendices contain information on determining the number of delays associated with the established VAR model, as well as stability tests and model outcomes.

Figure 1: Impulse-Response Analysis Results



From the results of the impulse-response analysis indicated in Figure 1 the percent size and direction of the response of the other variables to the one standard deviation increase shock applied to each variable separately, as well as the time elapsed after the application of the shock can be seen. The statistical significance of the results is determined by the dashed lines that determine the confidence interval of +/- 2 standard errors. When Figure 1 is examined, a one standard deviation shock in the interest rate variable has a statistically significant effect on GDP in the first year, then this significance disappears until the fourth year, but the effect becomes significant again after the fourth year. The effect of interest rate hikes on GDP decreases until the end of the sixth year and turns positive after the sixth year.

The effect of interest rate increases on loans is statistically insignificant throughout the entire period. The shock increase in interest rates increases the inflation rate in the first year, then decreases inflation until the end of the sixth year and after this date, the effect fades. The graphics of the action-response analysis of all the variables used in the study are attached in the appendices.

From the variance decomposition results, all of which are in the appendices, it is possible to see how much the changes in the variables are caused by their own shocks and to what extent they are caused by other variables, in summary, the effect of other variables on each variable. When the variance decomposition results of the Gross Domestic Product variable are analyzed, it is seen that the biggest effect on this variable originated from loans, approximately 10% in the first five years, but this effect is left to interest rates and inflation from the sixth year. From the variance decomposition results, it is seen that the effect on the inflation variable was initially caused by gross domestic product, interests, and loans, respectively, but as of the second year, this effect mostly belonged to the interests with a size of 11%.

4. RESULTS

The effects of globalization and global developments in a region or around the world have negatively affected monetary transmission channels, caused a shift in axis, and reduced the effectiveness of monetary policy instruments. Research on this subject emphasizes that there is important evidence for the international transfer of monetary policy with its effect on the excess credit supply. For this reason, the dynamic decomposition of different monetary policy channels or comparing the results of different policies is considered an important observation.

In this study, the effectiveness of the interest rate channel of the monetary transmission mechanism is investigated with the annual data of the countries included in the MSCI emerging markets index, obtained from the IMF and World Bank databases, and covering the 1995-2021 periods. In the study, the variables determined to have cross-section dependency were determined by Pesaran (2007), Hadri and Kurozumi (2012) and Im, Lee and Tieslau (2005) panel unit root tests, which considered structural breaks, Westerlund and Edgerton (2007) and Westerlund with a structural break. Panel cointegration tests and finally panel causality tests developed by Konya (2006) were applied. Within the framework of the panel VAR model established in line with the results obtained from these tests, the efficiency of the interest channel was evaluated with the impulse-response functions and variance decomposition methods.

The variables used in the study are domestic prices, current gross domestic product (gdp), loans (cre), treasury bill interest rates (i) and consumer price index (cpi), and E-views 8.0 and Gauss 17 programs were used in the analysis. While the shock in the interest rate variable had a statistically significant effect on GDP and inflation, its effect on loans was found to be statistically insignificant.

It has been determined that this effect, which comes through the interest channel, affects the gross domestic product weakly and negatively in the short term. Statistically significant, after the sixth

year, the response turns positive. While interest rate shocks do not have a statistically significant effect on loans, interest rate shocks affect inflation positively in the first 2 years and negatively in the following years (up to the 6th year). In summary, the results of this study show that shock increases in interest rates have a limited effect on the gross domestic product while reducing the inflation rate.

REFERENCES

Ankargren, S., & Shahnazarian, H. (2019). The interaction between fiscal and monetary policies: Evidence from Sweden (No. 365). Sveriges Riksbank Working Paper Series.

Azariadis, C., & Smith, B. (1998). Financial intermediation and regime switching in business cycles. American economic review, 516-536.

Basten, C., & Mariathasan, M. (2018). How banks respond to negative interest rates: Evidence from the Swiss exemption threshold.

Brandao-Marques, M. L., Gelos, M. R., Harjes, M. T., Sahay, M. R., & Xue, Y. (2020). Monetary policy transmission in emerging markets and developing economies. International Monetary Fund.

Brayton, F., & Mauskopf, E. (1985). The Federal Reserve Board MPS quarterly econometric model of the US economy. Economic Modelling, 2(3), 170-292.

Breusch, Trevor S. and Pagan, Adrian R., (1980), "The Lagrange Multiplier Test and Its Applications to Model Specification Ġn Econometrics," Review Of Economic Studies, Blackwell Publishing, Vol. 47 (1), pp. 239-253.

Bulíř, A., & Vlček, J. (2021). Monetary transmission: Are emerging market and low-income countries different? Journal of Policy Modeling, 43(1), 95-108.

Can, U., Bocuoglu, M. E., & Can, Z. G. (2020). How does the monetary transmission mechanism work? Evidence from Turkey. Borsa Istanbul Review, 20(4), 375-382.

Cecchetti, S. G., & Krause, S. (2002). Central bank structure, policy efficiency, and macroeconomic performance: exploring empirical relationships. Review-Federal Reserve Bank of Saint Louis, 84(4), 47-60.

Chortareas, G., Stasavage, D., & Sterne, G. (2002). Does it pay to be transparent? International evidence from central bank forecasts. Review-Federal Reserve Bank of Saint Louis, 84(4), 99-118.

Christiano, L. J., Eichenbaum, M., & Evans, C. L. (1999). Monetary policy shocks: What have we learned and to what end? Handbook of macroeconomics, 1, 65-148.

Dincer, N., & Eichengreen, B. (2007). Central bank transparency: where, why, and with what effects?

Dönek, E. (1995). "Relative Effectiveness of Monetary and Fiscal Policies on GNP in the Turkish Economy", Erciyes Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, S. 6, s. 409-415.

Dungey, M., & Fry, R. (2009). The identification of fiscal and monetary policy in a structural VAR. Economic Modelling, 26(6), 1147-1160.

Égert, B., & MacDonald, R. (2009). Monetary transmission mechanism in Central and Eastern Europe: Surveying the surveyable. Journal of Economic Surveys, 23(2), 277-327.

Elsayed, A. H., Naifar, N., & Nasreen, S. (2022). Financial Stability and Monetary Policy Reaction: Evidence from the GCC Countries. The Quarterly Review of Economics and Finance.

Fatás, A., Mihov, I., & Rose, A. K. (2007). Quantitative goals for monetary policy. Journal of Money, Credit and Banking, 39(5), 1163-1176.

Gertler, M., & Gilchrist, S. (1993). The role of credit market imperfections in the monetary transmission mechanism: arguments and evidence. The Scandinavian Journal of Economics, 43-64.

Gross, J., & Zahner, J. (2021). What is on the ECB's mind? Monetary policy before and after the global financial crisis. Journal of Macroeconomics, 68, 103292.

Hadri, K. and Kurozumi, E., (2012). "A simple panel stationarity test in the presence of serial correlation and a common factor", Economic Letters, 115, s.31-34.

Hansen, B. E. (2000). Sample splitting and threshold estimation. Econometrica, 68(3), 575-603.

Im, K. S., Lee, J., & Tieslau, M. (2005). Panel LM unit-root tests with level shifts. Oxford Bulletin of Economics and Statistics, 67(3), 393-419.

Kaminska, I., Mumtaz, H., & Šustek, R. (2021). Monetary policy surprises and their transmission through term premia and expected interest rates. Journal of Monetary Economics, 124, 48-65.

Kashyap, A. K., Stein, J. C., & Jeremy, C. (1995). The role of banks in the transmission of monetary policy. In Carnegie Rochester Conference Series on Public Policy (Vol. 42, pp. 151-195).

Kim, Y. (1995). The International Monetary System Since World War II. Growth and Change, 26(1), 161-178.

Kónya, L. (2006). Exports and growth: Granger causality analysis on OECD countries with a panel data approach. Economic Modelling, 23(6), 978-992.

Lee, S. and Park, J., (2022). Identifying monetary policy shocks using economic forecasts in Korea, Economic Modelling.

Miranda-Agrippino, S., & Ricco, G. (2021). The transmission of monetary policy shocks. American Economic Journal: Macroeconomics, 13(3), 74-107.

Mountford, A., & Uhlig, H. (2009). What are the effects of fiscal policy shocks? Journal of applied econometrics, 24(6), 960-992.

Nakamura, E., & Steinsson, J. (2018). High-frequency identification of monetary non-neutrality: the information effect. The Quarterly Journal of Economics, 133(3), 1283-1330.

Papadamou, S., Sidiropoulos, M., & Spyromitros, E. (2015). Central bank transparency and the interest rate channel: Evidence from emerging economies. Economic Modelling, 48, 167-174.

Peek, J., & Rosengren, E. S. (2005). Unnatural selection: Perverse incentives and the misallocation of credit in Japan. American Economic Review, 95(4), 1144-1166.

Pesaran, H, M. ve T. Yamagata. (2008). Testing Slope Homogeneity in Large Panels, Journal of Econometrics, 142: 50-93.

Pesaran, H., M. (2004). General Diagnostic Tests for Cross Section Dependence in Panels, Working Paper 0435, University of Cambridge.

Pesaran, H., M., Ullah, A. ve T. Yamagata (2008). A Bias-Adjusted LM test of Error Crosssection Independence, The Econometrics Journal, 11(1): 105-127.

Pesaran, M., (2007). "A simple panel unit root rest in the presence of cross-section dependence", Journal of Applied Econometrics, 22, s.265-312.

Reifschneider, D., Tetlow, R., & Williams, J. (1999). Aggregate disturbances, monetary policy, and the macroeconomy: The FRB/US perspective. Fed. Res. Bull., 85, 1.

Romer, C., & Romer, D. (1990). New Evidence on the Monetary Transmission Mechanism (Brookings Papers on Economic Activity).

Schelling, T., & Towbin, P. (2020). Negative interest rates, deposit funding, and bank lending (No. 2020-05). Swiss National Bank.

Seyrek, İ., Duman, M., & Sarıkaya, M. (2004). Parasal aktarım mekanizması ve para politikası aracı: Türkiye'de aktarım mekanizması. CÜ İktisadi ve İdari Bilimler Dergisi, 5(1), 201-212.

Sims, C.A. (1980). Macroeconomics and Reality, Econometrica, XLVIII, 1, 1-48.

Spyromitros, E., & Tuysuz, S. (2008). Do monetary policy transparency, independence and credibility enhance macro-financial stability? Available at SSRN 1309737.

Wei, X., & Han, L. (2021). The impact of COVID-19 pandemic on transmission of monetary policy to financial markets. International Review of Financial Analysis, 74, 101705.

Westerlund, J. (2006). Testing for panel cointegration with multiple structural breaks. Oxford Bulletin of Economics and Statistics, 68(1), 101-132.

Westerlund, J. (2007). Testing for error correction in panel data. Oxford Bulletin of Economics and statistics, 69(6), 709-748.

Wulandari, R. (2012). Do credit channel and interest rate channel play important role in monetary transmission mechanism in Indonesia? A structural vector autoregression model. Procedia-Social and Behavioral Sciences, 65, 557-563.

Yildirtan, D. C., & Sarili, S. (2017). Panel Data Analysis of Monetary Transmission Mechanism for European Union Countries. Journal of Social Science Studies, 4(2), 42-56.

APPENDICES

Appendix 1: Results of First-Generation Panel Unit Root Tests

Level	i		Gdp		Cpi		Cre	
	Test Stat.	Prob.	Test Stat.	Prob.	Test Stat.	Prob.	Test Stat.	Prob.
LLC	-2.114	0.017**	-4.718	0.000***	-3.850	0.000***	-1.940	0.026**
IPS	-0.031	0.487	-2.155	0.015**	-0.431	0.333	-4.922	0.000***
ADF-Fisher	10.804	0.487	26.282	0.023**	28.013	0.014**	49.945	0.000***
PP-Fisher	20.645	0.111	41.222	0.000***	24.533	0.039**	19.881	0.133

In LLC, Breitung, IPS, ADF and PP tests, the maximum lag length was taken as 3 and the optimal lag length was determined according to the Schwarz information criterion. ***, ** and * indicate 1%, 5% and 10% significance levels, respectively.

Appendix 2: Determining the VAR Model Lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-138.8335	NA	0.000101	2.147872	2.234800	2.183196
1	859.3532	1921.322	3.88e-11	-12.62185	-12.18721*	-12.44523
2	893.3153	63.32791	2.96e-11	-12.89196	-12.10961	-12.57404*

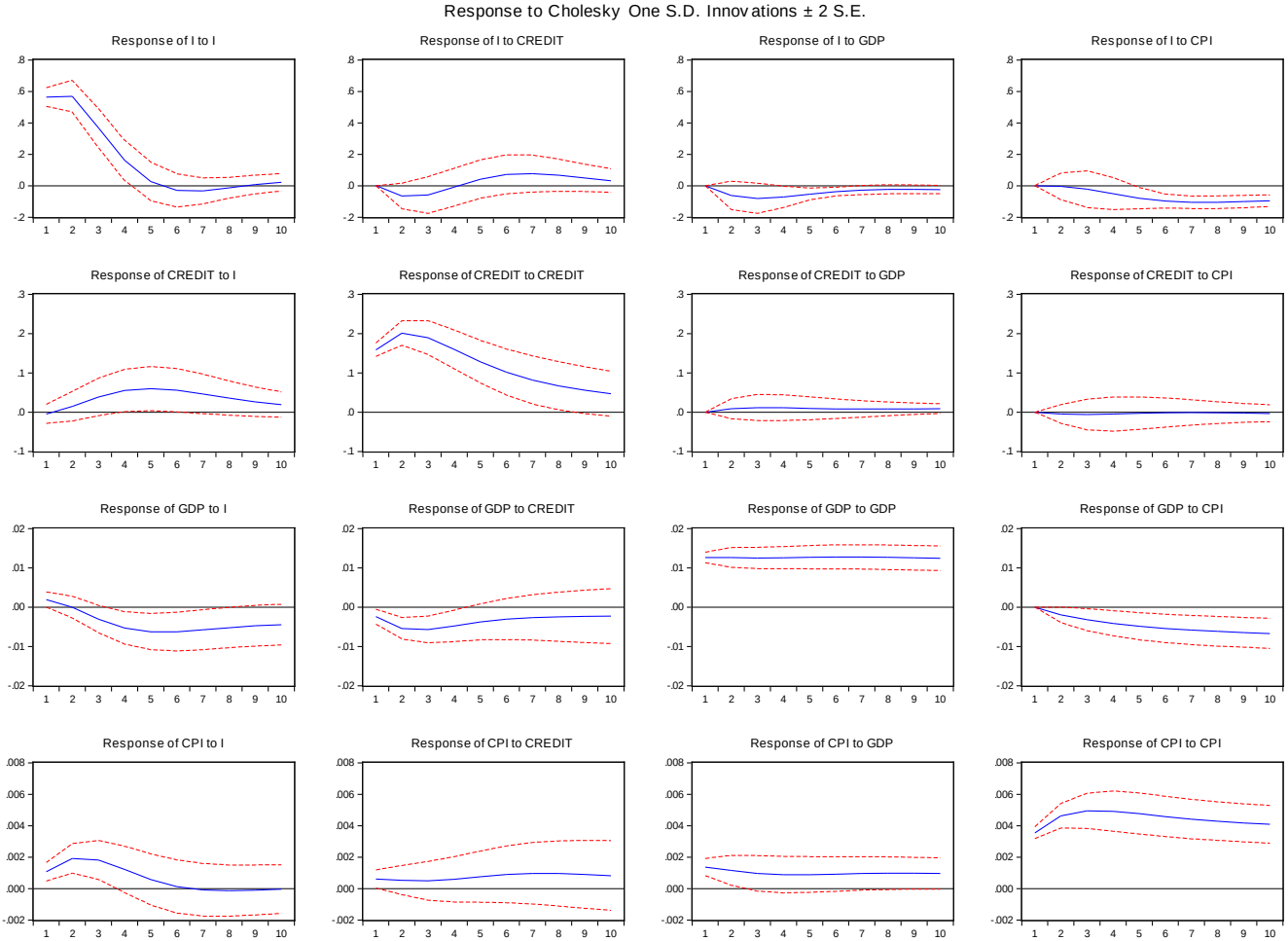
Appendix 3: VAR(2) Model Results

	i	Cre	Gdp	Cpi
I(-1)	1.024598	0.036558	-0.002661	0.001073
	(0.07382)	(0.02079)	(0.00170)	(0.00052)
	[13.8790]	[1.75838]	[-1.56157]	[2.05371]
I (-2)	-0.362071	-0.002597	-0.000818	-0.001748
	(0.06568)	(0.01850)	(0.00152)	(0.00046)
	[-5.51303]	[-0.14039]	[-0.53984]	[-3.75917]
Cre(-1)	-0.483701	1.285848	-0.015749	-0.002397
	(0.27045)	(0.07617)	(0.00624)	(0.00191)
	[-1.78853]	[16.8822]	[-2.52304]	[-1.25186]
Cre (-2)	0.599831	-0.407037	0.018553	0.002564
	(0.27047)	(0.07617)	(0.00624)	(0.00191)
	[2.21772]	[-5.34360]	[2.97182]	[1.33913]
Gdp (-1)	-4.758529	0.812071	1.058594	-0.049172
	(3.67737)	(1.03566)	(0.08488)	(0.02603)
	[-1.29400]	[0.78411]	[12.4719]	[-1.88881]
Gdp (-2)	4.520052	-0.693648	-0.062834	0.049072
	(3.67640)	(1.03539)	(0.08486)	(0.02603)
	[1.22948]	[-0.66994]	[-0.74048]	[1.88546]
Cpi (-1)	-1.275382	-1.302563	-0.559504	1.305756
	(11.9727)	(3.37188)	(0.27635)	(0.08476)
	[-0.10652]	[-0.38630]	[-2.02466]	[15.4056]
Cpi (-2)	-6.561590	2.095905	0.392425	-0.340839
	(12.1666)	(3.42648)	(0.28082)	(0.08613)
	[-0.53931]	[0.61168]	[1.39743]	[-3.95721]
C	17.75248	-2.030613	0.379742	0.078956
	(3.10689)	(0.87500)	(0.07171)	(0.02199)
	[5.71390]	[-2.32071]	[5.29545]	[3.58977]

Appendix 4: Testing the Stability of the VAR Model

Root	Modulus
0.997214	0.997214
0.980312	0.980312
0.824305	0.824305
0.550641 - 0.378650i	0.668267
0.550641 + 0.378650i	0.668267
0.356798 - 0.056576i	0.361256
0.356798 + 0.056576i	0.361256
0.058086	0.058086

Appendix 5: Impulse Response Analysis Results



Appendix 6: Variance Decomposition Results

Variance Decomposition of I:					
Period	S.E.	I	CREDIT	GDP	CPI
1	0.563489	100.0000	0.000000	0.000000	0.000000
2	0.806041	98.74095	0.667170	0.588738	0.003142
3	0.892198	97.64618	0.989334	1.300498	0.063985
4	0.911002	96.79204	0.960147	1.872267	0.375545
5	0.917330	95.54397	1.150227	2.191270	1.114530
6	0.926549	93.75849	1.716698	2.312795	2.212017
7	0.936788	91.85064	2.352617	2.349436	3.447302
8	0.945493	90.18986	2.800097	2.368693	4.641351
9	0.952509	88.87227	3.022762	2.394351	5.710613
10	0.958441	87.82647	3.097960	2.431674	6.643892

Variance Decomposition of CREDIT:					
Period	S.E.	I	CREDIT	GDP	CPI
1	0.158696	0.084122	99.91588	0.000000	0.000000
2	0.256859	0.365279	99.49333	0.109116	0.032278
3	0.321858	1.678014	98.06641	0.196592	0.058981
4	0.363585	3.593067	96.09514	0.246670	0.065119
5	0.390214	5.468492	94.19546	0.274122	0.061929
6	0.407155	6.880940	92.76772	0.293271	0.058068
7	0.417915	7.749870	91.88168	0.312730	0.055718
8	0.424812	8.202273	91.40576	0.336794	0.055172
9	0.429333	8.406233	91.16941	0.367248	0.057112
10	0.432377	8.486749	91.04684	0.404186	0.062227

Variance Decomposition of GDP:					
Period	S.E.	I	CREDIT	GDP	CPI
1	0.013006	2.115798	3.551126	94.33308	0.000000
2	0.019016	0.989879	9.818764	88.10479	1.086570
3	0.023867	2.305444	11.94758	83.24640	2.500573
4	0.028216	5.194648	11.44653	79.41105	3.947772
5	0.032173	7.796856	10.18570	76.67535	5.342099
6	0.035727	9.408358	8.988904	74.95045	6.652292
7	0.038906	10.15623	8.042985	73.92842	7.872364
8	0.041776	10.37532	7.323280	73.29013	9.011273
9	0.044409	10.33454	6.765994	72.81244	10.08703
10	0.046869	10.19266	6.315832	72.37131	11.12019

Variance Decomposition of CPI:					
Period	S.E.	I	CREDIT	GDP	CPI
1	0.003989	7.177254	2.299338	11.64882	78.87459
2	0.006528	11.31584	1.518276	7.489723	79.67616
3	0.008451	11.35372	1.237462	5.756657	81.65216
4	0.009909	9.752102	1.244670	4.975651	84.02758
5	0.011070	8.077956	1.452840	4.621725	85.84748
6	0.012049	6.829111	1.773223	4.481666	86.91600
7	0.012903	5.959772	2.101608	4.451961	87.48666
8	0.013663	5.325469	2.363585	4.473532	87.83741

9	0.014347	4.834436	2.534629	4.512330	88.11861
10	0.014969	4.441642	2.625974	4.551753	88.38063