Proceedings of IYSW, (2020), vol. **9**, pp 495-516.

Journal homepage: http://journals.sdu.edu.kz/index.php/iysw

VAR Analysis of the Monetary Transmission Mechanism in Kazakhstan

A.Rakisheva[1], A.Kalikhan[1] and H.Saydaliev[1,2]

[1]Business school, Suleyman Demirel University, Kaskelen, Kazakhstan

[2]School of Graduate Studies, University Putra Malaysia, Malaysia

Abstract

This article helps to evaluate the work of the main channels of the monetary policy transfer mechanism, namely, the work of the interest rate channel, exchange rate, and lending channel in the

Republic of Kazakhstan, by the help of vector regression model (VAR). It was revealed that the main transmission channel in the study period from 2005 to 2019 in Kazakhstan was the exchange

rate channel. The other two remaining channels of the monetary policy transmission mechanism (the bank lending channel and the interest rate channel) were of secondary importance

Keywords: Monetary policy, transmission mechanism, vector autoregression, Kazakhstan

The need for monetary policy of the state is to managing a stable purchasing power of the national currency. The implementation of the monetary policy of central banks is carried out using tools that affect economic processes, namely inflation and economic activity.

In developing and developed countries, the functioning of the transmission mechanism of monetary policy has its own difference in connection with the specific properties of the structure of the economy. The degree of development of financial markets, the financial situation of the banking system, the degree of dollarization, as well as macroeconomic conditions affect the transmission mechanism of monetary policy. It is important to stress that by controlling interest rates and interfering in the work of financial markets, the state increases the efficiency of the transmission of monetary policy. Monetary policy is a policy created and implemented by the government, his function is to affect the amount of money in the circulation, with respect to ensuring stability of prices, real production growth and also the full employment of the citizens. One of the key aspects of monetary policy is the mitigation of economic crises or curbing inflation, for which the state uses credit to regulate investments in the country's main sectors. Separate channels are usually distinguished in the structure of the transmission mechanism, transmitting the effect of changes in monetary policy's instrumental variables on macroeconomic variables.

Countries as Kazakhstan with a small open transition economy, where the dollarization level is extremely high, there are 3 main channels: the interest rate channel, the exchange rate channel, and the lending channel.

This article helps to evaluate the work of the main channels of the monetary policy transfer mechanism, namely, the work of the interest rate channel, exchange rate, and lending channel in the Republic of Kazakhstan, by the help of vector regression model (VAR). It was revealed that the main transmission channel in the study period from 2005 to 2019 in Kazakhstan was the exchange rate channel. The other two remaining channels of the monetary policy transmission mechanism (the bank lending channel and the interest rate channel) were of secondary importance.

According to the theory, when money supply increases, the price level responds also with increase and also causes a potential boost in the output over various channels such as the interest rate channel, credit channel, and the exchange rate channel.

An observational analysis of the monetary policy's mechanism reveals many important points for the economy of Kazakhstan, exploring the issue of the impact of monetary transfer on output or inflation.

The article examines such questions as: does the rise in the money supply influence the volume of production or the price level in Kazakhstan? Which channels have a special impact on the economy?

We investigate these problems using the vector autoregression method, using variables like the real effective exchange rate, credit in the economy, real interest rate, price level, money supply, real output. First, to see the overall effect of money on macroeconomics, we evaluate the basic model. In the second stage, we add various transmission channels for monetary credit policy in order to study how money affects the channel, how the channel affects real output and inflation, and how the effect of money on real output and inflation changes while restricting the effects of the channel.

In this article, the first section reviews the literature review, which describes the theoretically important aspects of the transmission mechanism and describes the institutional framework of monetary policy in Kazakhstan. The second section analyzes data describing the methodological foundations, and then the answers to our questions and research results are discussed in the next section. The final part consists of conclusions and recommendations.

Literature Review

Studying existing literature inspires us at the beginning to explore a large number of probable channels to find out how the money transfer mechanism works. The "interest rate channel" is known as the main transmission channel for the monetary transmission. Due to the liquidity effect, an increase in the money supply leads to a decrease in the real interest rate (Mishkin, 2006). Which will affect the decrease in the cost of capital and affect the increase in investment costs, and increases the cost of housing for consumers. When costs increase, this leads to an increase in total production and aggregate demand. An important point about the interest rate in many CIS countries is that the direct influence of the interest rate on the real sector of the economy is insignificant due to the low level of development of the money sector (Bezborodova, Mikhalenok, 2015).

In addition, in an economy with a high inflation rate, the interest rate channel loses its significance due to the high volatility of inflation (Lopes, 1998). The real interest rate can be coordinated when inflation is lower and less volatile.

There are two different approaches to determining the credit channel of the transmission mechanism of monetary theory. Firstly, a wide credit channel where money market weaknesses play an important role (Bernanke, Gertler, 1995).

An increase in the money supply leads to a decline in the domestic real interest rate (Mishkin, 2006). This explains why assets denominated in foreign currency are more attractive than assets denominated in national currency. These actions lead to the depreciation of the national currency and to the growth of net exports and production.

For states operating on an international environment, the exchange rate channel may also have an important role in transmitting monetary policy outcomes. An exchange rate channel with a low diversification of economies from terms of trade with other countries.

It is important to note that high inflation and dollarization are found in the CIS countries. If we follow Keynes's theory, the depreciation of the national currency due to monetary expansion leads to an increase in aggregate output by increasing net exports, but the depreciation of the national currency can reduce net wealth because of this, investments will become less attractive, which negatively affects borrowed funds, this reduces investment and output (Ireland, 2005).

Further, the credit channel of monetary policy is important.

A credit channel fulfills its impact through two main factors, including a bank credit channel and a balance channel (Mishkin, 1995).

For bank lending, a reduction in the money supply leads to a decrease in the number of bank deposits, which consequently leads to a further greater reduction in the amount of money that banks must issue on credit. This leads to lower investment and, ultimately, aggregate demand. The interest rate is not taken into account, this makes us understand that a decrease in interest rates may not be sufficient to resume investments. The net worth of firms is the main instrument of the balance sheet channel. Lower asset values and higher business costs due to higher interest rates leading to lower net worth of firms can be triggered by restrictive monetary policies. This suggests that an expansionist policy may take a long time for us to see its impact. This method is based on the effect of the volatility of capitalization of firms that affect lending risk and the

percentage premium for risk. The credit channel is used during the analysis of the transmission mechanism of developed countries.

In the CIS countries, the money market is expressed by a low level of development, and the second method is mainly used to formulate a credit channel - a narrow credit channel (Bezborodova, Mikhalenok, 2015, Callaur et al., 2005),

The channel is argued on the basis that in this situation financial institutions act as depositors and as a source of borrowed funds (Bernanke, Blinder, 1988). The shock of the money supply leads to an increase in the volume of these loans; it considers the negative impact on the interest rate.

The theoretical concept of the effect of money supply on macroeconomic indicators was defined in the works of J. Keynes. In the Keynesian model, fluctuations in money supply in the economy lead to a change in the interest rate in the financial market, which subsequently affects total costs, namely investment and change in output.

Classical works are studies by Friedman, Schwartz in the study of the transmission mechanism of monetary policy, as they are based on regression models, which, using empirical analysis, study the features of the relationship between money and real output,

In the twentieth century, the 1990s, interest in the problems of money transmission became popular due to the transition of most countries to the way of inflation targeting.

However, in the future, scientists stopped considering money supply as the main determinant of macroeconomic changes, including prices (Alieva et al., 2017) ..

Additional features of the monetary policy mechanism were revealed very late. The planned investments of firms and household expenses are affected by a change in the interest rate, but the interest rate also affects household expenses, for example, the purchase of durable goods on credit. Recent work has revealed that changes also occur in the securities market, since the exchange rate depends on the interest rate.

Thus, instead of monetary targeting, inflation targeting began to be used.

In various concepts, the authors focus on various aspects of the transmission of monetary theory (Horvath, Maino, 2006).

In the monetarist method, instead of the interest rate, a set of relative asset prices and the real welfare of the population are distinguished.

This method explains the impact of monetary policy on the economy with the help of Tobin's campaign (q-theory) on the impact of investment and wealth on consumption,

The transmission mechanism in the Modigliani (1975) approach emphasizes the function of capital and stock ownership. With the decline in stock prices, the significance of long-term monetary assets also decreases, which leads to a decline in resources and to a drop in consumption. A similar welfare effect can be calculated using real estate prices.

Methodology

An empirical analysis of the transmission mechanism in Kazakhstan was studied using vector autoregressive models on quarterly monthly data for 2005-2019. The VAR model is widely used for empirical analysis of transmission mechanisms, as it reveals the response of macroeconomic variables to the shocks of monetary credit policy:

$$Yt = A(L)Yt\text{-}1 + B(L)Zt + Ut$$

where Yt is the vector of endogenous variables;
- Zt is the vector of exogenous (external to the vector) variables;
- Ut is a vector of random errors;
- A (L), B (L) - matrices of lag operators.

As the main endogenous variables,
- GDP (billion tng),yt;
-indicator characterizing the level of prices - consumer price index (month to previous month,%), pt
-real lending rate (per month, %), st;
-reer (%),rt;
-credit growth, %,ct;
-broad money(billion tng),mt;

$$Yt=[yt,pt,st,rt,ct,mt]$$

The vector of exogenous variables is presented as follows:

$$Zt = [oilt, st],$$

When *Oilt - world oil price for one barrel, St - federal funds rate in % ,*

These variables are added to the model as exogenous for the study of external shocks (Le, Pfau, 2009). The oil price has been chosen since the economy of Kazakhstan is dependent on oil prices. To analyze the impact of the exchange rate and interest rates, impulse functions were built; here in after, it is used as the "base model"

To study the monetary transmission mechanism empirically in Kazakhstan, we use quarterly, seasonally-adjusted data from 2005Q1 to 2019Q4. The dataset included the following variables:

gdp: Gross Domestic Product, measured in billions of tenge

cpi: Consumer Price Index (CPI)

m2: Broad money, measured in millions of tenge

irate: Real lending rate, which equals bank lending rate minus inflation in the same period

credit: Domestic credit growth

reer: Index of the real effective exchange rate

oil: World oil price, in USD/barrel

ffr: US federal Funds rate

These variables are taken from the National Bank of Kazakhstan, koyfin.com website, ceicdata.com website, and from The World Bank.

Augmented Dicky- Fuller procedure

We are using time series data, so it is important to perform a stationarity test on those series to be sure that they are indeed stationary b-e if data is non stationary it simply means that they do

not exhibit min reversions, that is the data generating process of that series does not evolve around 0.

We are abusing quarterly data sets from 2005 Q1 to 2019 Q4. Firstly we are using variables that are presented in levels. We create log of formation of our variables, and for them in total we have 60 observations, but because in their levels form they are in billions of tenge so we have taken them in percent changes, and for them in total we have 59 observations.

In the first stage we are performing spurious regression, by looking at the outcome of this regression we can conclude whether our data are stationary or not. Using the rule of thumb: If R square is greater than Durbi Watson it is an evidence that those series we are working with are non- stationary and the regression is spurious, the outcome of this kind of regression can not be used in a quarter, it cannot be used for forecasting or for prediction. The outcome of this spurious regression is basically useless. We have R square = 0.4777, and Durbin-Watson d-statistic(6, 60) = 1.992557, which means that Durbin-Watson is greater than R square, and this is evidence that our series are stationary.

Then we start to check each variable separately for stationarity, using dfuller command and pay attention to p-value, which should be less than 0.05, in order for our variable to be stationary. Consumer price index (CPI) and broad money (M2) are not stationary because their p-values are 0.8456 and 0.3956 correspondingly. Therefore, we transform the variables into percent changes to get rid of non-stationarity. Here also Durbin-Watson (2.587988) is greater than

R square(0.1767), what indicates stationarity. P-values of all variables become less than 0.05,

As we observe different criteria each of them differently suggests the optimal lag lengths for the VAR model. As shown in the table we will use 4 lags while analyzing basic and extended models, nevertheless we found qualitatively analogous results with diverse lag lengths.

We concluded that the best criteria which represent the optimal lag length is Akaike Information Criterion. Further we will examine the least result in AIC and it will serve as the best lag length.

In this research we will consider reduced form of VAR model while analyzing Granger causality tests, variance decompositions and moreover impulse and response functions to evaluate the effects of each specific channel, particularly interest rate, exchange rate and credit channels.

When estimating Basic model's VAR, we take as endogenous variables(output, cpi, m2) and as vector exogenous variables (oil and ffr). The ordering of the variables is based on the hypothesis that shock to money supply will be transferred to the price level, which is expressed in cpi, and to the output. The exogenous variables are included so as to control for external shocks, assuming that the economy of Kazakhstan is open and the basis of monetary policy is the KZT/USD exchange rate.

In our article, the proxy of shocks in monetary policy is broad money (M2), because while formulating and implementing monetary policy at the National Bank of Kazakhstan M2 is treated as an operating target. In our reality the prime interest rate that National Bank frequently announces usually does not reflect the money market's demand and supply for money. It mainly plays a role as the referential rate to commercial banks, to help them in the process of setting their own lending and deposit rates. Therefore while conducting monetary policy in Kazakhstan it is not advisable to rely on interest rates.

Results

Lets begin to analyze the mechanism of monetary transmission. The analysis consists of Granger causality testing, variance decomposition and also the functions of impulse and response.

Basic VAR Model

According to the monetary theory when money supply increases, the price level responds also with increase and also causes a potential boost in the output. When we observe the basic VAR model we examine the comprehensive effect of money supply, without differentiating among channels. The Granger causality tests show that inflation Granger cause output at 1% significance level and in turn output Granger causes inflation also at 1% significance level. Nonetheless money does not cause neither output nor inflation. But when taking together money and inflation, output Granger causes them in 5% significance level. Also inflation Granger causes output and money, when they are taken together.

The results from Variance Decomposition shows us that own shocks have a very valuable impulse of fluctuations in M2, accounting for 74,24% fluctuation in the variance , while CPI shocks 2.03% and Output account for 23,72%. In the long run and in the short run , shock to Output can not contribute M2 and CPI much. Short run and long run story remain the same. For CPI, own shocks account for 40,84%, Output account for 56,18%,and M2 can cause 2.97%. This suggests that output can affect to CPI , but has little effect to M2.

We can acquire further approval and guidance by taking a look on impulse responses for the overall effect of money supply to output and inflation. For output, initially, an increase in money supply reduces the output for the first and second quarters. From the second quarter it starts to increase, till the third quarter. Then between the third and fourth quarter there is an incremental decrease, but other all the time there is a consistent change: increases and decreases. A positive effect of money supply to inflation is till the second quarter then there is steady decrease and starting from the fourth quarter steady increase and very little decrease in the seventh quarter.

Interest Rate Channel

Let's take a look for the analysis of traditional interest channels, we interpret it by adding the real lending rate to the basic model. We calculated the real lending rate by subtracting inflation rate in the same period from the bank lending rate. This gives us an opportunity to examine effects of interest rates on output and inflation, effect of money on interest rates, and see the difference in change in the impact of inflation and on output after taking into control interest rate’s role. VAR ordering changed and became output, cpi, irate, m2 as endogenous variables, exogenous did not change. By means of this ordering reproduce the evidence that a change in the money supply will influence the real lending rate, which would then affect investment. As stated by Keynesian economics, when real lending rate increases, this will lead to prevention of investments and finally force the decrease in output.

Firstly, Granger causality tests demonstrate that when adding the real lending rate to the model, money starts to Granger cause output at 10% significance level. But money does not Granger cause price level or interest rate. Furthermore the interest rate Granger cause price level and money supply, but do not cause output.

Variance decomposition demonstrates that after adding the real lending rate to the basic model , the shock of output to CPI decreased to 37.30%, By analyzing the interest rate channel, we identify that output has little effect on real lending rate. The real lending rate accounted for only 6-10% of the shocks to CPI, Output, M2. We can conclude that the significance of this channel is not high because of high volatility of inflation in the country,

Looking on impulse response function we can obtain further evidence. The shock to the money supply will provide a negative effect till third quarter and then it starts to increase till forth quarter, than drop in fifth quarter and then steady consistent increase till seventh quarter and in the eighth quarter in will go negative. The second graph shows that response of output to irate is mainly positive, with the negative decrease in third quarter, and a steady decrease in the period from fifth to seventh quarter. The response of CPI in contrary firstly till third quarter has negative effect, and then it locates in positive zone, decreasing in fourth quarter and starting constantly increase in fifth quarter.

Exchange Rate Channel

Let's get closer to the analysis of the effect of exchange rate channel, when analyzing we add the real effective exchange rate to the basic model. The ordering of the model now transforms to as follows output, cpi, reer, m2 as endogenous variables and exogenous remain same, based on the hypothesis that enhancing money supply direct to depreciation of national currency, hence increasing aggregate demand and net export. The Granger causality test gives us results that when adding the real effective exchange rate money supply does not cause output. But output causes the real effective exchange rate at 1% significance level and still causes cpi at 1% significance level, and also causes all variables when they are taken together.

Meanwhile none of the endogenous variables did not cause real effective exchange rate. Variance Decomposition in the exchange rate channel shows that REER has high influence to Output. After 4 quarters, we see that exchange rate can affect to output in percentage 37,54%, after 8 quarters, it accounts for 42,16%, whereas the CPI accounted for 13,56%of the shocks, Variance Decomposition shows that the exchange rate channel has a greater effect of transferring changes to prices in Kazakhstan than the interest channel. The impulse response function has

steady and mainly constant character, starting being located in the negative zone from the first toll fourth quarter and then becoming to steadily increase. The response of output starts with very little not noticeable increase and then from the second quarter starts to increase, but then in the fourth quarter it is located in the negative zone and only in the fifth period starts its raise. The response of cpi starts negatively till the third period and then corresponds with increase and back drop

Credit Channel

We include the Credit Growth variable to the Basic VAR model to analyze the Credit Channel. By using theory that if money supply increases, it will affect credit, which influences the increase in aggregate demand and GDP.

The Granger Causality test demonstrates to us that the price level Granger causes output at the 5% significance level. CPI which is represented by the price level can be affected by different factors For example prices of imported goods, volatility of the exchange rate. Credit does Granger cause the price level with normal significance level. Excluded variable Broad money can not cause Credit , because has p-value more than 5 %, p=0,2491 . This reflected that credit channel is lower than exchange rate channel

Variance Decomposition demonstrates impulse or shock to Output account for 77.02% variation of the fluctuation in Output(own stock) in the short run, that is quarter 4, whereas shock to Credit can cause 4,59% fluctuation in Output, and the price accounted for 13,67%. The Credit accounted for only 4-10% to Output and the price level, whereas it accounted for broad money for 36.17%. It shows us that the Credit Channel has less effect than the exchange rate channel.

The response of credit starts with steady constant increase till fourth quarter and then corresponds with a not fast decrease. The response of output starts from initial increase though it quickly declines corresponding with increase in one quarter and decrease in another. CPI positively responds to impulse caused by credit with initial steady increase and decrease in the third quarter, starting to boost again in the fifth quarter.

Conclusion

Summing up the study of the monetary transmission mechanism in Kazakhstan, we can draw the following conclusions: The transmission mechanism of monetary policy in Kazakhstan has its own difference in comparison with developed countries. It depends on the characteristics and structure of the economy, namely the formation of the money sector.

The characteristic of the economy of Kazakhstan is described by the following data: underdeveloped financial markets, a strong dependence on terms of trade with the outside world, and a high level of dollarization.

Like other countries with a small open transition economy, there are 3 main transmission mechanism channels: the exchange rate channel, the interest rate channel, the lending channel

Our result showed that in the analyzed period (2005-2019), the main channel was the exchange rate channel. The analysis shows the presence of a powerful effect of transferring exchange rate changes to the prices of goods in the economy.

The reason for the strong development of the foreign exchange channel is the high import intensity of the domestic market and the high share of imported goods in the population's consumption structure, high dollarization, monetary policy and exchange rates.

The reason for the weak development of the interest channel compared to the currency channel is due to the fact that the transmission mechanism of Kazakhstan had a limited impact on output and prices, and the exchange rate played the role of a nominal anchor.

In countries with a financial system with a dominant banking sector, moreover, dollarized, the role of this channel is less noticeable. Moreover, in an economy characterized by high inflation, the interest rate channel loses its importance due to the high volatility of inflation (inflation volatility in Kazakhstan, measured by the standard deviation of annual inflation over the past 10 years is about 4%, the average annual inflation over the past 5 years is at the level of 8.2%). The real interest rate is more controlled when inflation is low and less volatile.

Our studies show that the credit channel as well as the interest channel are less developed than the exchange rate channel.

The development of the financial system and the regulation of interest rates and monetary aggregates leads to an improvement in the operation of transmission mechanism channels.

In this regard, the solution of structural problems of the banking sector will help increase the patency of monetary policy channels. It is important to develop the capital market, build a yield curve and build a long-term segment of the deposit market, which will be facilitated by the introduction of savings deposits.

Solving the problems of the financial sector will help increase the permeability of the transmission mechanism channels. Building a yield curve and a long-term segment of the deposit market impacts the introduction of savings deposits. The measures discussed will improve the money transmission in the long-term segment and will contribute to the long-term development of economic growth.

References

Razafimahefa., I., 2012. “Exchange Rate Pass-Through in Sub-Saharan African Economies and its Determinants”, IMF Working paper, WP / 12/141

Roldos, J., 2006. “Disintermediation and Monetary Transmission in Canada”, IMF working paper WP / 06/84

Aliyeva, B., Daribaeva, M., Zholamanova M., 2017. “Monetary regulation”, study guide

Bezborodova, A., Mikhalenok, Yu., 2015. “Analysis of the transmission mechanism of monetary policy based on Bayesian vector autoregressions”, Bank Bulletin, April issue, pp. 23-30

Kallaur, P., Komkov, V., Chernookiy, V., 2005. “The mechanism of transmission of monetary policy in the economy of the Republic of Belarus”, Belarusian Economic Journal, No. 3, p. 4-15

Komkov, V., Abakumova, Yu., 2011. “Transformation of the money transmission mechanism in the economy of the Republic of Belarus”, Bank Bulletin, June 2011 issue, pp. 14-20

Bernanke, B., Gertler, M., 1995. “Inside the black box: The credit channel of monetart policy transmission”, Journal of economic perspectives, No9, p.27-48

Bernanke, B., Gertler, M., Gilchrist, S., 1999. “The Financial Accelerator in a Quantitative Business Cycle Framework”, Handbook of Macroeconomics 1, pp. 1341–1393

Tables

Table 1

Augmented Dicky-Fuller Test

	Data in levels,2005Q1 to 2019Q4 (60 observations)			Data in percent changes 2005Q1 to 2019Q4 (59 observations)		
	#Lags	T-statistic	P-value	#Lags	T-statistic	P-value
OUTPUT	1	-3.330	0.0008	1	-10.172	0.000
CPI	1	1.027	0.8456	1	-5.310	0.000
M2	1	-0.266	0.3956	1	-3.719	0.002
IRATE	1	-3.395	0.0006	1	-4.706	0.000
REER	1	-2.724	0.0043	1	-6.263	0.000
CREDIT	1	-2.089	0.0207	1	-6.342	0.000

Table 2

Lag Length Selection of the Basic and Extended Models

Lag	LogL	LR	FPE	AIC	SC	HQ
			Basic Model			
1	-570.8028	NA	287917.8	21.08374	21.41221*	21.21076
2	-553.2922	31.20054	211768.2	20.77426	21.43121	21.02831
3	-544.1893	15.22680	212308.3	20.77052	21.75594	21.15159
4	-523.1706	32.86548*	138861.7*	20.33348*	21.64737	20.84157*
			Interest Rate Channel			
1	-691.4603	NA	1750390	25.72583	26.30978*	25.95165
2	-664.3331	46.36277	1176446	25.32120	26.48911	25.77284
3	-637.7808	41.51812	817897.5	24.93749	26.68934	25.61494
4	-608.4239	41.63341*	524117.9*	24.45178*	26.78759	25.35505*
			Exchange Rate Channel			
1	-719.3411	NA	4824398	26.73968	27.32363*	26.96549
2	-697.3800	37.53347	3912602	26.52291	27.69081	26.97455
3	-669.4803	43.62505	2590079	26.09019	27.84205	26.76765*
4	-650.8627	26.40316*	2452694*	25.99501*	28.33081	26.89828
			Credit Channel			
1	-750.3093	NA	14876781	27.86579	28.44974	28.09161
2	-714.6735	60.90478	7337928	27.15176	28.31967*	27.60340
3	-690.3571	38.02201	5533637	26.84935	28.60120	27.52680
4	-667.2934	32.70848*	4457861*	26.59249*	28.92829	27.49576*

Table 3

Granger Causality Tests p-values for the X2 Tests VAR Analysis Using Data in Percent Changes

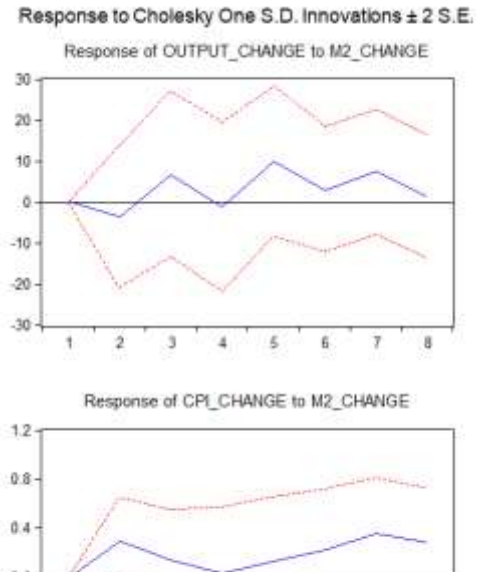
Dependent Var.	Excluded Variable(s)				
		Basic model			
	OUTPUT	**CPI**		**M2**	**ALL**
OUTPUT	—	0.0073	—	0.7647	0.0147
CPI	0.0000	—	—	0.4375	0.0000
M2	0.2195	0.5983	—	—	0.3052
		Interest Rate Channel			
	OUTPUT	**CPI**	**IRATE**	**M2**	**ALL**
OUTPUT	—	0.0050	0.0000	0.5502	0.0000
CPI	0.0000	—	0.3221	0.6654	0.0000
IRATE	0.3416	0.0000	—	0.0253	0.0000
M2	0.0504	0.4471	0.0739	—	0.0888
		Exchange Rate Channel			
	OUTPUT	**CPI**	**REER**	**M2**	**ALL**
OUTPUT	—	0.0072	0.0000	0.6904	0.0000
CPI	0.0000	—	0.4414	0.4983	0.0000
REER	0.8344	0.6740	—	0.7912	0.8753
M2	0.2803	0.2868	0.2170	—	0.2094
		Credit Channel			
	OUTPUT	**CPI**	**CREDIT**	**M2**	**ALL**
OUTPUT	—	0.0008	0.1487	0.4934	0.0077
CPI	0.0000	—	0.6189	0.8498	0.0000
CREDIT	0.1091	0.0996	—	0.2491	0.1931
M2	0.5790	0.5721	0.2891	—	0.2608

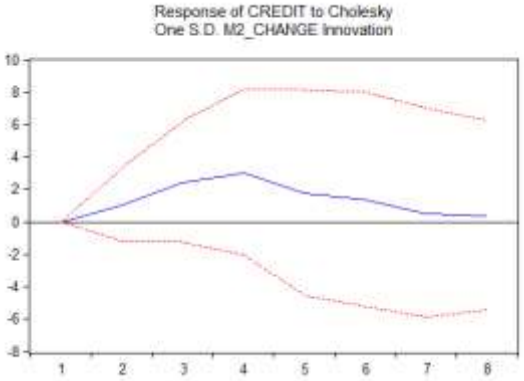
Table 4

Variance Decomposition (Order reflects Cholesky Ordering) VAR Analysis Using Data in Percent Changes

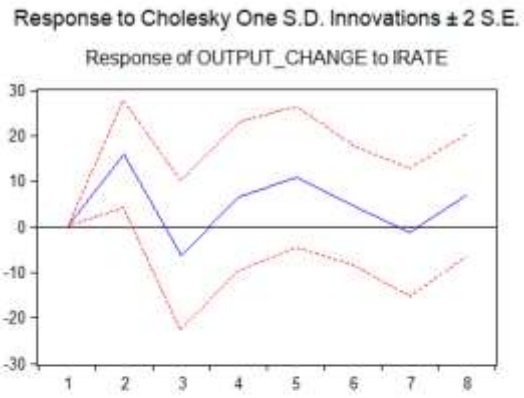
Variable	Period	Variance Decomposition				
			Basic model			
		S.E	GDP	CPI		M2
GDP	4	1.11964	83.31309	15.48995	—	1.196956
	8	4.64745	81.97117	14.92785	—	3.100978
CPI	4	1.899638	56.18577	40.84087	—	2.973353
	8	2.18386	59.68878	32.28528	—	8.025936
M2	4	5.593881	10.81116	1.190454	—	87.99838
	8	6.22373	23.72554	2.034275	—	74.24019
			Interest Rate Channel			
		S.E	GDP	CPI	IRATE	M2
OUTPUT	4	0.59159	80.9067	11.5332	6.777589	0.782513
	8	4.18329	76.55596	13.31215	7.468979	2.662911
CPI	4	1.805328	42.32569	47.94897	6.069608	3.655735
	8	1.990185	37.30714	41.31769	10.19398	11.18119
IRATE	4	4.117186	18.35178	14.41935	63.78678	3.442087
	8	4.692787	22.36734	12.83146	61.75752	3.043675
M2	4	5.750727	13.0372	1.00525	6.7652	79.19235
	8	6.055914	16.6778	1.323036	7.641101	74.35807
			Exchange Rate Channel			
		S.E	GDP	CPI	REER	M2
OUTPUT	4	9.61732	50.89369	9.77644	37.54016	1.789709
	8	2.84294	50.14459	13.56994	42.169881	1.11558
CPI	4	1.654755	36.61839	45.02163	16.116498	2.243485
	8	2.821273	32.40807	50.234	10.63817	6.719757
REER	4	10.74336	5.0122	4.914464	89.88402	0.189312
	8	12.49927	5.241071	4.341687	89.03829	1.378951
M2	4	5.438522	4.300417	1.036735	16.24694	78.4159
	8	5.753734	7.814404	1.058163	17.40059	73.72684
			Credit Channel			
		S.E	GDP	CPI	CREDIT	M2
OUTPUT	4	3.43428	77.02067	13.67548	4.596485	4.707364
	8	6.85356	76.34129	11.80011	4.34561	7.512993
CPI	4	1.890316	53.28971	42.17132	2.668966	1.870005
	8	2.237601	57.12936	30.30202	10.26109	2.307529
CREDIT	4	22.45072	24.73328	27.6751	44.33493	3.256699
	8	28.43338	24.44686	27.43531	45.42809	2.689736
M2	4	5.327195	12.49869	1.425468	36.17982	49.89602
	8	6.033701	23.79323	2.866377	33.5959	39.7445

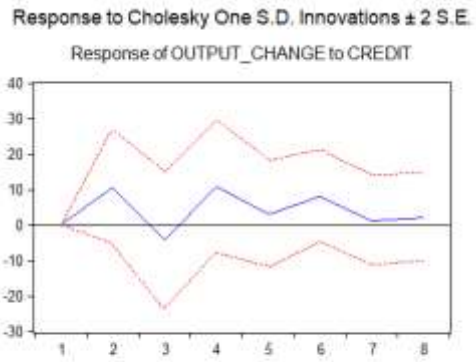
Figures

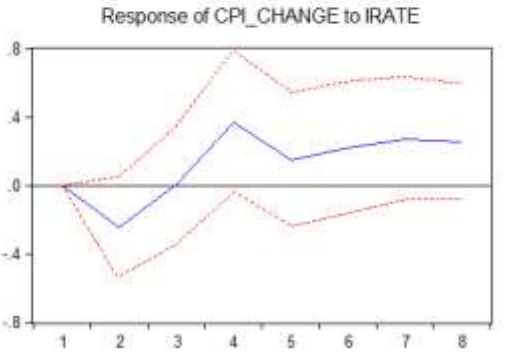

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of OUTPUT_CHANGE to M2_CHANGE

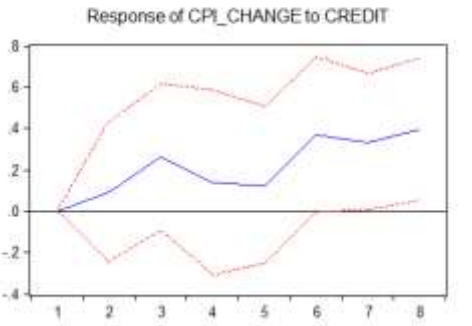

Response of CREDIT to Cholesky
One S.D. M2_CHANGE Innovation

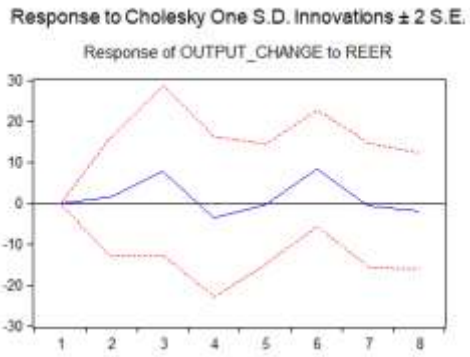
Response of CPI_CHANGE to M2_CHANGE

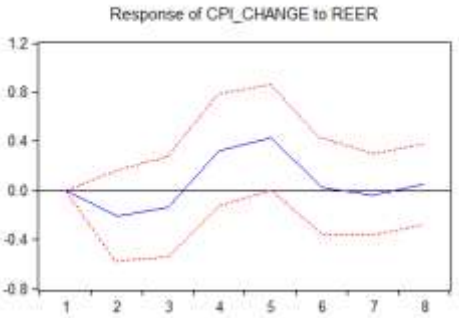

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of OUTPUT_CHANGE to IRATE

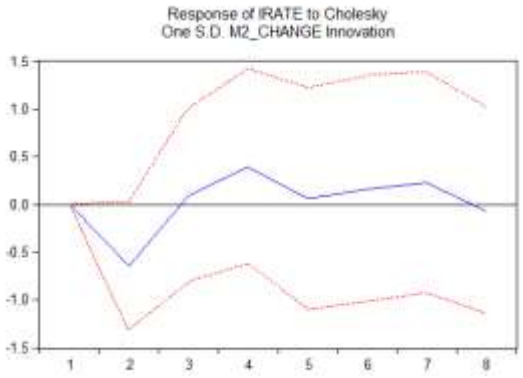

Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of OUTPUT_CHANGE to CREDIT

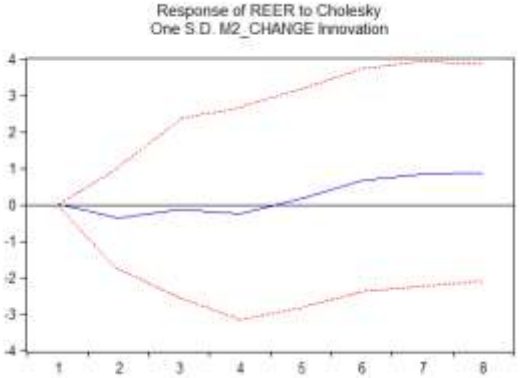

Response of CPI_CHANGE to IRATE


Response of CPI_CHANGE to CREDIT


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of OUTPUT_CHANGE to REER


Response of CPI_CHANGE to REER


Response of IRATE to Cholesky
One S.D. M2_CHANGE Innovation


Response of REER to Cholesky
One S.D. M2_CHANGE Innovation