# Monetary Policy and its Transmission Mechanisms in Algeria

**Halaili Narimane, FEROUANI Belkacem, Benladghem Fethi**

*Abstract*— **The present study has aimed to identify the transmission channels of the monetary policy on the domestic product and on the general level of prices in Algeria. In order to do so, we have applied the vector autoregressive model. The study has used quarterly data from the period between 1990 and 2010. Results show that when the discount rate is used as a variable that represents the monetary policy, then the interest rate and the exchange rate channels will have a role in transmitting the variations of the monetary policy to the domestic product. When inflation is targeted, the channels of the monetary policy had no significant role in the monetary transmission. When the money market rate is used as a variable that represents the monetary policy, the exchange rate and the credit channels had a significant role in transmitting the effects of the monetary policy to the domestic product and to the general level of prices.**

***Index Terms***— **Monetary policy; Vector autoregression, Algeria**

## I. INTRODUCTION

There is no doubt that the monetary policy has a significant impact on the economic activity. However, the transmission channels through which it does are still debated. In order for the monetary policy to run properly and thus achieve its goals, it is very important to understand how it works and the way it impacts the economic activity. According to the literature, there are mainly four transmission channels for the monetary policy, interest rate channel, exchange rate channel, asset price channel and credit channel.

The effectiveness of each transmission channel is closely related to the structure of the financial sector and the economic environment; the development of the financial sector through the various institutions, its tools and competitiveness will define the extent to which the monetary policy will impact the monetary variables such as: interest rates on loans, deposits, asset prices and exchange rates. The economic environment, through the degree of openness to the exterior and the degree of competitiveness, will define

the extent to which the monetary variables will impact the overall demand, output and inflation. The effectiveness of these transmission channels is expected to be higher with the development of the economy, the higher competitiveness and the fewer restrictions on the main variables. It is clear that the effectiveness of the monetary policy varies between the developed and the developing countries.

The objective of the present paper is to establish an overall vision about the transmission channels of the monetary policy in Algeria. The latter is characterized by its small economic system, the openness to the exterior world and a very tight productive system, and it relies on oil exportations as the major revenue.

The present paper is divided into five parts. The first part provides an overview on the monetary policy in Algeria. The second part deals with the literature review about the transmission channels of the monetary policy. The third part exposes the empirical evidence. The fourth part contains the empirical study that tries to define the relative importance of the different transmission channels in Algeria. Finally, the fifth part contains a conclusion.

## II. A HISTORICAL BACKGROUND ABOUT THE MONETARY POLICY IN ALGERIA

After the independence, the Algerian government has followed a centralized planning system. This has also been the case for the monetary policy.

The choice of the centralized planning system, has tied the hole banking sector to the rest of the economic policy of the country. The banking sector mission was limited to the finance of the national economic activities. Thus, the monetary policy did not contribute in the improvement of the economy. The monetary policy was omitted from the economic decision making system. It was only considered as a landing machine to finance the economic activity. However, the economic and the banking reforms that were started in the mid-eighties have given back all the importance to the monetary policy. Because of the intervention of the executive body in the decisions of the central bank, the previous reforms remained constrained. The arrival of the law 90/10 on the 14$^{th}$of April 1990, that is better known as the "money and credit law" was considered as the beginning of a new era. In fact, it has provided the central bank, the commercial banks and the financial institutions with the required discretion. From that time on, many banks and financial institutions have been created.

The money and credit law has allowed the extension of the banking sector in Algeria. According to the Economic and Social National Council, most of the finance is provided by public banks. This may be due to the strict conditions that are applied by private banks. The same thing has been observed with the insurance sector, where most of the contracts are provided by the public insurance institutions. This is mainly due to the lack of trust in the private insurance institutions or to the strict conditions that are applied by these institutions.

Before 1990, the tools of the monetary policy were of the direct type. After the 1990's the monetary policy has acquired many indirect tools, thanks to the 1990's reforms and to the money and credit law. Some of these tools are: minimum reserve requirements, discount rate, open market operations and money market rates. In addition, a new technique has

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been applied by the Algerian central bank in the first quarter of the year 2002. It consists in the recuperation of liquidity through auctioning.

## III. Literature Review

The subject of the transmission channels of the monetary policy has gained a huge importance on the empirical level. Most of the studies that have dealt with this subject have relied on the VAR model. Both the developed and the developing countries were studied. Results show the importance of the interest rates channel especially in the developed countries. This channel had a significant impact on the output and the general level of prices as expected by the theoretical models. Concerning the developing countries, the interest rates channel did not have the same influence.

In their study about the monetary transmission mechanism in Japan, Morsink and Bayoumi (2001) used the VAR models with quarterly, seasonally-adjusted datafrom1980Q1 to 1998Q3. In their basic model, they have included: economic activity, prices, interest rates, and broad money. They found that both interest rates and broad money significantly affected the output. After examining the basic model, they extended the VAR to examine different channels of the monetary transmission mechanism and concluded that: (i) both the monetary policy and the banks'balance sheets are important sources of shocks to output, and that (ii) banks play a crucial role in transmitting monetary shocks to the economic activity.

Al-Mashat and Billmeier (2007) examined MTMs in the Egyptian economy from January 1996 to June 2005. Their baseline VAR model includes exogenous and endogenous variables with monthly data. The exogenous variables include oil prices and the federal funds rate. The endogenous variables include real GDP, the WPI, the 3-month deposit rate, and different measures of the exchange rate. One of the results of this study is that the exchange rate channel plays a strong role in propagating monetary shocks to output and prices in the Egyptian economy.

In his analysis, Husain Ali Al-Omar (2009) used a VECM model with monthly data, covering the period from 1992 to 2006, to analyze the monetary transmission mechanism in Kuwait. His basic model included: Non-oil GDP, the index of prices, discount rate, the interbank interest rate, domestic loans, value of traded shares, the exchange rate of the dinar against the dollar, as endogenous variables and interest rate on the dollar in London as an exogenous variable. The results demonstrate that the interest rate, credit value, asset prices, and exchange rate channels are significantly important in indicating the negative impact of the monetary policy as represented by the discount rate. However, the effect of these channels impacts the price level only. These results are in line with the findings of other studies on the developing countries.

Hosein Sharifi-Renani (2010) studied the monetary transmission mechanism in Iran during the period of 1989–2009, using a structural VAR (SVAR) approach. The model consists of seven variables, Gross domestic production and the Iranian consumer price index without house prices representing the domestic activity and characterizing the goods market in the economy. M1 monetary aggregate and the required reserves or the borrowed reserves are our policy variables. The unofficial exchange rate is included to consider the effects of the monetary policy shocks on the national currency value. Nominal credit that allows a look at the interaction between monetary policy and credit through the credit channel of the MTM. House prices index insures the study of the other price channel of the MTM. The results indicated that in both models, the credit channel is the most effective channel in the Iranian monetary transmission mechanism.

Sayyed Mahdi Ziaei (2012) evaluated different channels of the monetary policy transmission mechanisms in Saudi Arabia during the period of 1992-2007, with a baseline of structural vector autoregressive (SVAR) models. Results indicate that the exchange rate channel and the credit channel play an important role in transferring the monetary shocks to output and prices in the Saudi economy.

## IV. The Transmission Channels of Monetary Policy

Among the various channels through which the monetary policy affects the economic activity and inflation, there is: The interest rate channel, the exchange rate channel, the credit channel and the asset prices channel (Taylor, 1995; Mishkin, 1995, 2004; Bernanke and Gertler, 1995; Mohanty and Turner, 2008).

### *4.1 The interest rate channel:*

The transmission of the monetary policy through interest rates has been a standard feature in the economic literature for over 50 years. It is the main monetary transmission mechanism in the basic Keynesian model, which has been mainstay of teaching in macroeconomics (Mishkin, 1995).

The expansionary monetary policy (increasing money supply - M) causes the real interest rate (ir) to fall, which means that the cost of capital is lowered. The fall in real interest rate induces businesses to increase investments spending and consumers to increase their housing and durable expenditures, which are also considered as investments. This increase in investment spending (I), leads to an increase in aggregate demand and toa rise in output (Y).

### *4.2 The exchange rate channel:*

In open economies, the monetary policy operates to a considerable extent through the exchange rate. A key assumption underpinning this relationship is the uncovered interest rate parity condition, after an expansionary monetary policy, interest rates decrease. A decrease in the domestic interest rates will lead to an outflow of capital. In this situation, deposits in the foreign currency become more interesting compared to deposits in the domestic currency. Therefore, the value of domestic deposits which is relative to foreign currencies falls. This matter leads to the depreciation of exchange rates. The depreciation of the domestic currency makes domestic goods relatively cheaper than foreign goods, thereby causing net export (NX) and output to rise.

### *4.3 The asset price channel:*

Tobin's q-theory (Tobin, 1969) provides an important mechanism for how movements in stock prices can affect the economy. Tobin's q is defined as the market value of firms divided by the replacement cost of capital (Mishkin 2001). The monetary policy has an impact on aggregate demand through assets or equity market. According to Tobin's Q theory, the decrease of interest rates due to an expansionary

monetary policy induces a reduction of the replacement cost of capital. The decrease in the cost of capital will increase equity prices. As a result, an expansionary monetary policy will also decrease the replacement cost of capital and increase equity prices. Under this condition, firms are encouraged to invest more and issue their equities. This matter leads to an increasing demand for investments and has a positive effect on output.

***4.4 The credit channel:***

This channel is mainly involved with the agency problems that are arising from asymmetric information and the costly enforcement of contracts in the financial market. The credit channel operates via two main channels, that are the bank lending channel and the balance-sheet channel (Mishkin, 1995).

The bank lending channel is applicable when the monetary policy is expansionary. The increase in money supply leads to an increase in bank deposits, which further increases the volume of money that banks have to loan out. This, in turn, Increases investments and ultimately, aggregate demand. An important implication of the credit view is that the monetary policy will have a greater effect on expenditures of smaller firms that are more dependent on bank loans than on large firms that can access the stock and bonds markets directly.

The balance sheet channel arises from the presence of asymmetric information in credit markets, particularly with respect to adverse selection and moral hazard. The channel of monetary policy transmission refers to the role that is played by the financial position of private agents in the transmission mechanism of the monetary policy. It arises because the shifts in policy not only affect market interest rates but also, the financial position of private economic agents, because changes in interest rates affect bank balance sheets, cash flows and the net worth of companies and consumers. Higher interest rates result in reduced cash flows, reduced net worth, drop in loans, and decline in aggregate demand.

A decrease in the firm's net worth means that lenders can rely on lower collateral for their loans, which raises the problem of adverse selection and reduces lending for investment spending. Lower net worth also results in the problem of moral hazard because business owners have a lower equity stake in the firm and, therefore, have incentives to take part in risky projects. As a result, lending and investment spending decreases.

## V. MODEL SPECIFICATION

Most of the studies in this field have applied the VAR model. It is a multivariate model that is used to assess the nature and the size of the relationship between many variables. It has been developed to overcome the traditional econometric models (Sims, 1980).

The VAR model is used in measuring the impact of the monetary policy that is represented by the official interest rate in both the product and the general level of prices. The basic VAR model includes three variables: domestic product, general level of prices and the official interest rate, respectively.

It is supposed that the reaction of both the product and the general level of prices to the changes in the monetary policy are not instantaneous. In order to assess the impact of the multiple transmission channels of the monetary policy, we will add a fourth variable, which is one of the following (the interest rate channel, the credit channel and the exchange rate channel. Concerning the asset price channel, it will not be included because the Algerian financial market is not active)

The VAR model can be considered as a generalization of the limited main model for P, Concerning the dimension K of time series' vector, we find $y_t = (y_{1t},\ldots,y_{kt})$ and $t=(1,\ldots,T)$. The VAR model is formulated as the following:

$$Y_t = a + A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + \mathcal{E}_t$$

Where $Y_t$ is the vector of the endogenous variables. $\mathcal{E}_t$ is the uncorrelated residuals. *P* is the number of lags. The latter can be determined using the Akaike information criterion (AIC) or the Schwartz criterion (SIC).

***5.1 Data collection :***

To study the monetary transmission mechanism empirically in Algeria, we use quarterly data from 1990Q2 to 2010Q4. The dataset included the following variables:

*GDP*: Gross Domestic Product
*CPI*: Consumer Price Index
*DR :* Discount rate
*MMR :* Money market rate
*LR*: Lending rate
*Loans*: Domestic credit
*NER*: Nominal exchange rate

These variables are taken from the International Monetary Fund's (IMF) and Bank of Algeria

Two variables are meant to represent the monetary policy, namely: the central bank discount rate and the average money market rates. These two variables have been selected because the central bank relies on both of them to regulate the economy. In the present study, tests are divided into two parts: the first part deals with the discount rate as a variable that represent the monetary policy. The second part deals with the average money market rates as a variable that represents the monetary policy.

Results from the augmented Dickey-Fuller test show that the time series are stationary at the first level, especially for the GDP, DR, Loans, MMR and LR. The CPI is stationary at the second level. The NER is stationary at the level(Refer to Table 01).

Table 1 : Augmented Dickey-Fuller teste

| **VARIABLES** | **Augmented Dickey-Fuller** | | |
|---|---|---|---|
| | **Level** | **1st différance** | **2nd differance** |
| GDP | 0.8490<br>[0.9943] | -4.0838*<br>[0.0018] | _ |

| | | | |
|---|---|---|---|
| CPI | -1.9200<br>[0.3187] | -2.0049<br>[0.2842] | -13.0118*<br>[0.0001] |
| DR | -0.6397<br>[0.8549] | -12.9874*<br>[0.001] | – |
| MMR | -0.7466<br>[0.8283] | -4.0360*<br>[0.0021] | – |
| LR | -0.7223<br>[0.8346] | -8.1693*<br>[0.0000] | – |
| LOANS | 3.3342<br>[1.0000] | -8.0413*<br>[0.0000] | – |
| NER | -3.1617*<br>[0.026] | – | – |

*: Reject Null Hypothesis at 5 %

### *5.2. The empirical findings*

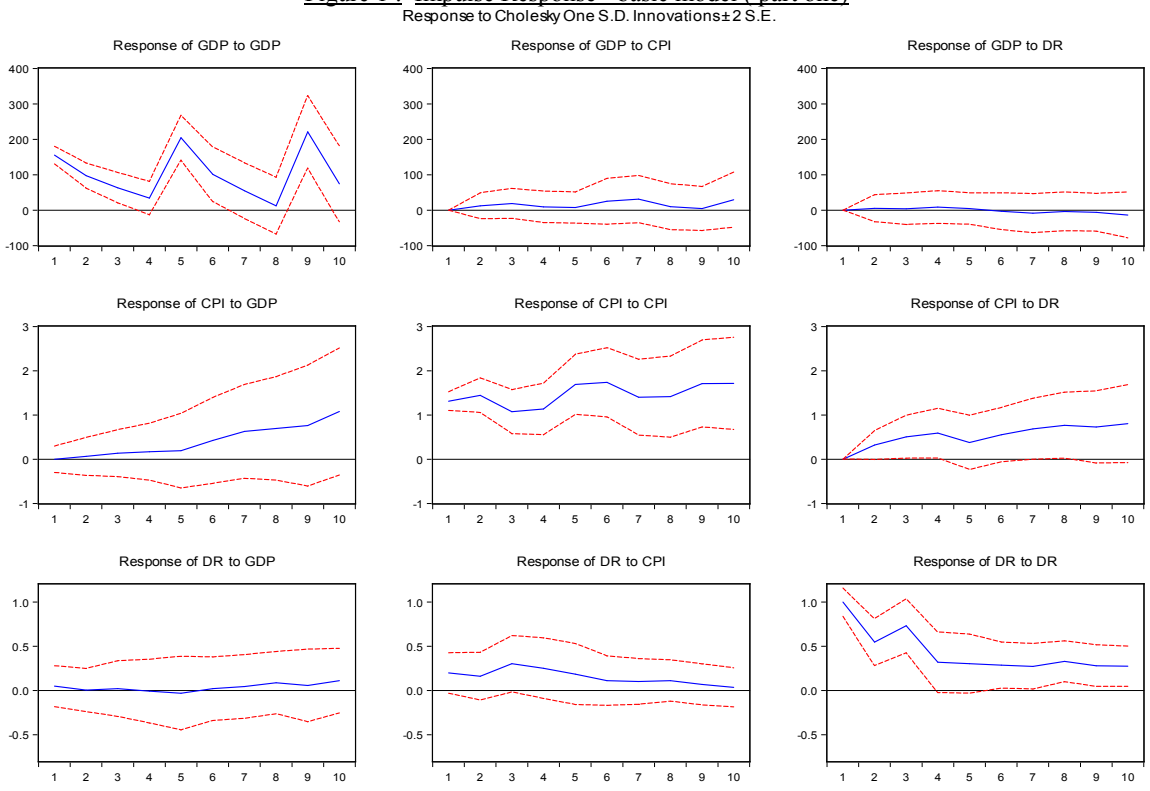
***Part 1:* The central bank discount rate as a variable that represents the monetary policy**

*Estimating the VAR model:*

the model is estimated using the following internal variables: GDP, CPI, DR. This will mainly help evaluating the responsiveness of the gross domestic product and the consumer price index to the changes in the monetary policy. The SIC and the AIC suggest the use of five lags (Table A1, Appendix A).

Based on the response functions, it is clear that the change in the monetary policy has an immediate impact on the gross domestic product and the consumer price index. The GDP appears to have a very weak responsiveness. As for the CPI, there is a positive responsiveness. This is illustrated in the following figure.

Figure 1 : Impulse Response - basic model ( part one)




The analysis of variance (as shown in table2),suggests that the discount rate in the main model explains 0.29% of the variation in the product and 8.45% of the general price level. The impact of the discount rate on the product is stable over the whole period. This is not the case for the general price level, where the impact is increasing over the studied period.

Table 2 : Variance Decomposition - the Basic Mode1

| Période | GDP | | | CPI | | |
|---|---|---|---|---|---|---|
| | Dr | CPI | GDP | Dr | CPI | GDP |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 99.99964 | 0.000358 |
| 2 | 0.083380 | 0.438084 | 99.47854 | 2.607094 | 97.29310 | 0.099811 |
| 3 | 0.113679 | 1.312083 | 98.57424 | 6.720163 | 92.86103 | 0.418810 |
| 4 | 0.298165 | 1.486199 | 98.21564 | 10.08160 | 89.19100 | 0.727405 |
| 5 | 0.167802 | 0.785644 | 99.04655 | 8.452544 | 90.66956 | 0.877892 |
| 6 | 0.160748 | 1.369658 | 98.46959 | 8.526319 | 89.49658 | 1.977104 |
| 7 | 0.232642 | 2.326928 | 97.44043 | 9.934722 | 86.02924 | 4.036035 |
| 8 | 0.245750 | 2.414210 | 97.34004 | 11.39331 | 82.73006 | 5.876628 |
| 9 | 0.189505 | 1.616076 | 98.19442 | 11.69097 | 80.98626 | 7.322779 |
| 10 | 0.306130 | 2.120580 | 97.57329 | 12.01602 | 77.77827 | 10.20571 |

***The interest rate channel:***

In order to test the interest rate channel, we have introduced the interest rate on loans as a new variable in the main model. Results from the analysis of variance show that the impact of the discount rate on the product has increased to 5.44% as shown in table3. The impact of the interest rate on loans has reached its highest level (0.75%). As for the impact on prices, the discount rate had a decreasing effect (4.46%). Finally, the impact of the interest rate on the general price level was about 0.64%.

Table 3 : Variance Decomposition – Interest Rate Channel

| Period | GDP | | | | CPI | | | |
|---|---|---|---|---|---|---|---|---|
| | Dr | Lr | GDP | CPI | Dr | Lr | GDP | CPI |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.002559 | 99.99744 |
| 2 | 0.780029 | 0.000857 | 99.20709 | 0.012019 | 1.195401 | 0.025046 | 3.486126 | 95.29343 |
| 3 | 1.805898 | 0.007483 | 98.12640 | 0.060222 | 2.507084 | 0.143080 | 8.265053 | 89.08478 |
| 4 | 2.763892 | 0.046253 | 97.02902 | 0.160833 | 3.592202 | 0.359873 | 12.91366 | 83.13426 |
| 5 | 3.561860 | 0.126566 | 95.99115 | 0.320426 | 4.461962 | 0.648312 | 17.00769 | 77.88204 |
| 6 | 4.190621 | 0.240947 | 95.03038 | 0.538050 | 5.177426 | 0.979055 | 20.48432 | 73.35920 |
| 7 | 4.668771 | 0.374415 | 94.14847 | 0.808348 | 5.788567 | 1.329985 | 23.39811 | 69.48334 |
| 8 | 5.021726 | 0.511811 | 93.34237 | 1.124093 | 6.328765 | 1.686585 | 25.83278 | 66.15187 |
| 9 | 5.274087 | 0.641351 | 92.60681 | 1.477754 | 6.819068 | 2.040015 | 27.87069 | 63.27023 |
| 10 | 5.447220 | 0.755477 | 91.93502 | 1.862283 | 7.272562 | 2.385185 | 29.58348 | 60.75877 |

(Figure B1 Appendix B ) shows that in the case of monetary shocks, that use to occur with the activation of the interest rate channel (as endogenous variable), there is a negative response to the gross domestic product for seven periods of time. However, when freezing this channel (as exogenous variable), the responsiveness of the GDP is near zero. This is a clear justification for the fact that this channel has a low impact on inflation.

***The credit channel:***

Concerning the credit channel, we have introduced the total credit variable to the main model. Results from the analysis of variance (table 4) show that the impact of the discount rate on the product is equal to 0.41% and 9.95% of the variation in the consumer price index. The impact of loans on GDP has reached 8.44%. However, the impact of loans on the variation in prices was limited to 0.88%.

Table 4 : Variance Decomposition – Credit Channel

| Period | GDP | | | | CPI | | | |
|---|---|---|---|---|---|---|---|---|
| | Dr | Loans | GDP | CPI | Dr | Loans | GDP | CPI |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.283906 | 99.71609 |
| 2 | 0.086761 | 0.829738 | 98.43694 | 0.646558 | 2.677754 | 0.353713 | 0.567155 | 96.40138 |
| 3 | 0.148356 | 1.759760 | 96.76848 | 1.323401 | 6.276744 | 0.286970 | 1.100748 | 92.33554 |
| 4 | 0.375068 | 2.020997 | 95.93035 | 1.673585 | 8.916123 | 0.402854 | 1.665893 | 89.01513 |
| 5 | 0.226484 | 1.178137 | 97.68455 | 0.910827 | 7.226504 | 0.460922 | 1.933366 | 90.37921 |
| 6 | 0.228728 | 2.994039 | 94.40323 | 2.374006 | 7.118126 | 0.556427 | 4.153158 | 88.17229 |
| 7 | 0.279023 | 5.228182 | 90.59785 | 3.894944 | 8.214085 | 0.718471 | 7.835604 | 83.23184 |
| 8 | 0.272530 | 6.083801 | 89.43602 | 4.207649 | 9.376356 | 0.893260 | 10.69332 | 79.03707 |
| 9 | 0.223229 | 5.350696 | 91.14935 | 3.276720 | 9.681490 | 0.899317 | 12.15840 | 77.26079 |
| 10 | 0.415272 | 8.442389 | 85.51687 | 5.625473 | 9.959128 | 0.888886 | 15.77940 | 73.37259 |

Response functions (Figure B2 Appendix B ) show that in the case of monetary shocks that are caused by the activation of the credit channel, the responsiveness of the GDP and the CPI will remain the same same as when the channel is deactivated. We can conclude that this channel does not have any significant impact on growth and inflation.

***The exchange rate channel:***

Finally, results indicate that the introduction of the exchange rate as shown in table 5 has reinforced the impact of the discount rate on the general price level. The latter has risen up to 14.64%, while the impact of the discount rate on the product has reached 9.59%. Concerning the exchange rate, it only explains 5% of the variation in the product and 0.21% of the variation in the general price level.

Table 5 : Variance Decomposition – Exchange Rate Channel

| Period | GDP | | | | CPI | | | |
|---|---|---|---|---|---|---|---|---|
| | Dr | Loans | GDP | CPI | Dr | Loans | GDP | CPI |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.033770 | 99.96623 |
| 2 | 1.537321 | 0.867695 | 97.42346 | 0.171526 | 1.877746 | 0.255350 | 4.267110 | 93.59979 |
| 3 | 3.618147 | 2.033513 | 93.88133 | 0.467011 | 4.171070 | 0.400016 | 7.840963 | 87.58795 |
| 4 | 5.477044 | 3.075305 | 90.62843 | 0.819217 | 6.302285 | 0.426049 | 10.23302 | 83.03865 |
| 5 | 6.915935 | 3.892590 | 87.99175 | 1.199720 | 8.193339 | 0.389902 | 11.82332 | 79.59344 |
| 6 | 7.957019 | 4.504340 | 85.93862 | 1.600018 | 9.856852 | 0.331914 | 12.93499 | 76.87625 |
| 7 | 8.675771 | 4.955058 | 84.35029 | 2.018885 | 11.31549 | 0.275604 | 13.76769 | 74.64121 |
| 8 | 9.146878 | 5.285795 | 83.11031 | 2.457016 | 12.58921 | 0.234028 | 14.43818 | 72.73858 |
| 9 | 9.431802 | 5.528379 | 82.12471 | 2.915105 | 13.69484 | 0.214177 | 15.01461 | 71.07638 |
| 10 | 9.578637 | 5.706168 | 81.32194 | 3.393255 | 14.64715 | 0.219490 | 15.53722 | 69.59614 |

The response function (figureB3 Appendix B) show that in the case of a monetary shock that is due to the activation of the exchange rate channel, there is a negative response to the gross domestic product for six periods of time, and then goes back to the normal levels. In the case of the deactivation of this channel, the responsiveness of the GDP will be near zero. This is a strong indication that the exchange rate channel has an impact on growth. The responsiveness of the consumer price index when the channel is activated appears to be the same as when the channel is deactivated (when used as an external variable).This should explain the low impact of this channel on inflation.

***Part 2:*** **The average money market rates as a variable that represents the monetary policy.**

***Estimation of the VAR model:***

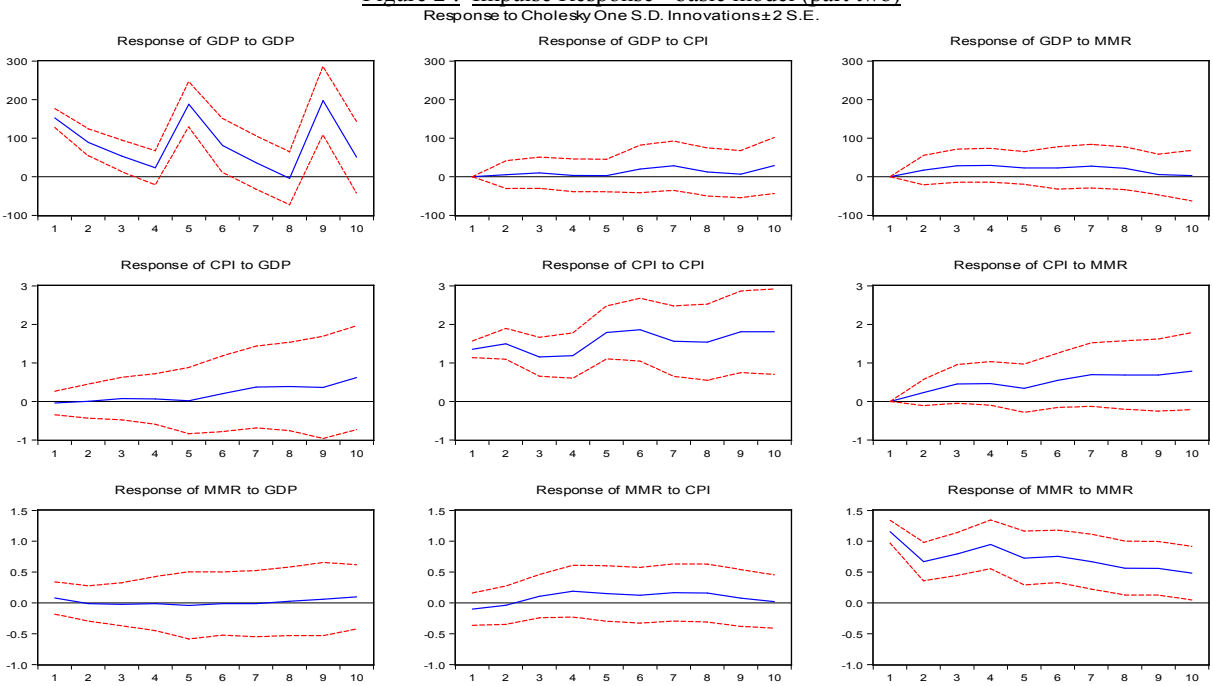
the model is estimated using the following internal variables: GDP, CPI, MMR. This will mainly help evaluating the responsiveness of the gross domestic product and the consumer price index to the changes in the monetary policy. The SIC and the AIC suggest the use of five lags (Table A2 Appendix A).

in order to estimate the model, we will follow the same steps as in the previous section.

Based on following Figure, we can see that in the case of a change in the monetary policy, there will be:

A positive response of the GDP for seven periods, and then goes back to the normal levels. A positive response to the CPI on the whole period of test.

Figure 2 : Impulse Response - basic model (part two)




Results from the analysis of variance show that the average money market rates in the main model contribute with 5.07% to the fluctuation in the product, representing 10.22% of the fluctuations in the price index.

Table 6 : Variance Decomposition– Basic Model

| Period | GDP | | | CPI | | |
|---|---|---|---|---|---|---|
| | MMR | CPI | GDP | MMR | CPI | GDP |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 99.90230 | 0.097703 |
| 2 | 0.925249 | 0.094337 | 98.98041 | 1.293461 | 98.66282 | 0.043721 |
| 3 | 3.113347 | 0.377961 | 96.50869 | 4.540334 | 95.33812 | 0.121545 |
| 4 | 5.377988 | 0.396187 | 94.22583 | 6.465195 | 93.38798 | 0.146825 |
| 5 | 3.428645 | 0.212192 | 96.35916 | 5.527221 | 94.36858 | 0.104197 |
| 6 | 3.763700 | 0.695075 | 95.54123 | 6.152836 | 93.49225 | 0.354914 |
| 7 | 4.535386 | 1.662335 | 93.80228 | 7.843220 | 91.06541 | 1.091373 |
| 8 | 5.075127 | 1.833280 | 93.09159 | 8.984164 | 89.35577 | 1.660068 |
| 9 | 3.487180 | 1.287971 | 95.22485 | 9.475514 | 88.58754 | 1.936950 |
| 10 | 3.398724 | 1.926798 | 94.67448 | 10.22020 | 86.80239 | 2.977408 |

***The interest rate channel:***

A new variable named Lending Rate is introduced to the model in order to evaluate the interest rate channel. Results from the analysis of variance (table7) show that the impact of MMR on the product is equal to 2.08%. MMR also has an impact on the

fluctuations of the consumer price index that is equal to 1.07%. The impact of the interest rate on CPI is equal to 7.9%. On the other side, the impact of the interest rate on the variation of the product is limited and does not exceed 2.16%. The response functions (Figure B4 Appendix B) show that in the case of a monetary shock that is due to the activation of the credit channel, the response of the GDP and the CPI will be the same as when the channel is deactivated. More precisely, the response of the GDP will be weak and negative. However, the response of the CPI will be slightly positive. This is a strong indication that this channel does not have an impact on growth and inflation.

Table 7 : Variance Decomposition – Interest Rate Channel

| Period | GDP | | | | CPI | | | |
|---|---|---|---|---|---|---|---|---|
| | MMR | LR | GDP | CPI | MMR | LR | GDP | CPI |
| 1 | 0.000000 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 0.000000 | 99.96232 | 0.037683 |
| 2 | 0.163442 | 0.063103 | 0.051293 | 99.72216 | 0.059538 | 0.430988 | 97.48804 | 2.021434 |
| 3 | 0.442000 | 0.220098 | 0.173708 | 99.16419 | 0.163129 | 1.225400 | 93.00339 | 5.608081 |
| 4 | 0.762607 | 0.462026 | 0.367021 | 98.40835 | 0.286882 | 2.195078 | 87.91652 | 9.601520 |
| 5 | 1.078148 | 0.762170 | 0.624965 | 97.53472 | 0.418641 | 3.223154 | 82.94418 | 13.41403 |
| 6 | 1.362531 | 1.087558 | 0.937863 | 96.61205 | 0.552761 | 4.246800 | 78.38164 | 16.81880 |
| 7 | 1.604633 | 1.408227 | 1.295146 | 95.69199 | 0.686734 | 5.235722 | 74.31088 | 19.76666 |
| 8 | 1.802611 | 1.702020 | 1.686986 | 94.80838 | 0.819438 | 6.177229 | 70.71911 | 22.28422 |
| 9 | 1.959545 | 1.955531 | 2.105004 | 93.97992 | 0.950324 | 7.067550 | 67.55790 | 24.42422 |
| 10 | 2.080599 | 2.162898 | 2.542351 | 93.21415 | 1.079064 | 7.907187 | 64.77016 | 26.24359 |

***The credit channel:***

The introduction of Total credit to the main model (Table8) reinforces the impact of MMR on the general price level, even in a limited manner 15.31%. It also impacts the domestic product at 4.53%. The impact of loans is however weak and does not exceed 0.17%. This impact raises to 7.83%. through the response functions (Figure B5 Appendix B), when a monetary shock occurs because of the activation of the credit channel (when used as endogenous variable), the gross domestic product will respond negatively in the next seven periods, but then goes back to the previous levels. However, when the channel is deactivated (used as exogenous variable), the GDP responds positively for eight periods, but then goes back to the normal levels. This is an indication that MMR impact can also come through the credit channel. . When the channel is activated, the response of the consumer price index will be positive on the whole period. When it is deactivated, the response will be positive but unsteady This is an indication that this channel can be used to manipulate inflation.

Table 8 : Variance Decomposition – Credit Channel

| Period | GDP | | | | CPI | | | |
|---|---|---|---|---|---|---|---|---|
| | MMR | Loans | GDP | CPI | MMR | Loans | GDP | CPI |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.048501 | 99.95150 |
| 2 | 0.440892 | 0.427549 | 98.99225 | 0.139309 | 0.725864 | 0.025855 | 1.589960 | 97.65832 |
| 3 | 1.193377 | 1.231013 | 97.14745 | 0.428158 | 2.015168 | 0.040360 | 3.427185 | 94.51729 |
| 4 | 2.005810 | 2.208983 | 94.96772 | 0.817487 | 3.630157 | 0.039947 | 4.888785 | 91.44111 |
| 5 | 2.737520 | 3.230084 | 92.76455 | 1.267844 | 5.444165 | 0.032776 | 5.949880 | 88.57318 |
| 6 | 3.338450 | 4.233173 | 90.67221 | 1.756168 | 7.377346 | 0.027869 | 6.703351 | 85.89143 |
| 7 | 3.803930 | 5.196433 | 88.72949 | 2.270147 | 9.371825 | 0.033110 | 7.238100 | 83.35696 |
| 8 | 4.147060 | 6.115751 | 86.93425 | 2.802942 | 11.38260 | 0.055209 | 7.619944 | 80.94224 |
| 9 | 4.386135 | 6.993985 | 85.26964 | 3.350241 | 13.37395 | 0.099956 | 7.894597 | 78.63150 |
| 10 | 4.539638 | 7.836278 | 83.71526 | 3.908823 | 15.31758 | 0.172436 | 8.093445 | 76.41654 |

***exchange rate channel***

Concerning the exchange rate channel, we have introduced the nominal exchange rate as a new variable to the model. Results from the analysis of variance show that the impact of MMR on the product has reached 6.85%. As for the variation of the consumer price index, it has reached 9.43%. The impact of the exchange rate on GDP is estimated at 7% maximum. On the other hand, the impact of the exchange rate on the variation of prices does not exceed 0.25% (table 9). The response function (Figure B6 Appendix B) shows that in the case of a monetary shock that is due to the activation of the exchange rate channel (when used as endogenous variable), the response of the gross domestic product will be negative for seven periods, but then goes back to normal. When this channel is deactivated (used as exogenous variable), the response of the GDP will be positive for eight periods, and then goes back to normal. This is an indication that a part of the impact of the MMR comes through the exchange rate channel. When this channel is activated, the response of the consumer price index is positive on the whole period, and when the channel is deactivated, the response remains positive but unsteady. This is an indication that this channel has an impact on inflation.

Table 9 : Variance Decomposition – Exchange Rate Channel

| Period | GDP | | | | CPI | | | |
|---|---|---|---|---|---|---|---|---|
| | MMR | NER | GDP | CPI | MMR | NER | GDP | CPI |
| 1 | 0.000000 | 0.000000 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.000117 | 99.99988 |
| 2 | 0.901586 | 1.025404 | 97.64725 | 0.425762 | 0.850995 | 0.244507 | 3.030633 | 95.87386 |
| 3 | 2.195284 | 2.439543 | 94.26183 | 1.103339 | 2.035249 | 0.418175 | 6.143666 | 91.40291 |
| 4 | 3.426562 | 3.729544 | 91.00509 | 1.838799 | 3.263736 | 0.481544 | 8.574735 | 87.67999 |
| 5 | 4.448074 | 4.754711 | 88.24127 | 2.555941 | 4.458656 | 0.472981 | 10.43326 | 84.63510 |
| 6 | 5.247954 | 5.525729 | 85.99003 | 3.236282 | 5.596731 | 0.428130 | 11.90637 | 82.06877 |
| 7 | 5.855215 | 6.091672 | 84.17153 | 3.881584 | 6.668223 | 0.371275 | 13.13189 | 79.82861 |
| 8 | 6.304990 | 6.501591 | 82.69476 | 4.498663 | 7.667250 | 0.318033 | 14.19865 | 77.81606 |
| 9 | 6.628557 | 6.795197 | 81.48193 | 5.094317 | 8.589802 | 0.278344 | 15.16216 | 75.96969 |
| 10 | 6.851650 | 7.002577 | 80.47179 | 5.673982 | 9.433456 | 0.258451 | 16.05703 | 74.25106 |

## CONCLUSION

The study aimed to identify the channels of the monetary policy in Algeria. Results show the relative importance of the monetary policy on the general level of prices. However, its impact on the product is still limited and insignificant. This is an indication that the structure and the institutions of the financial sector are weak. It is necessary to develop the structure and the legislative aspect of the financial sector in order to improve the effectiveness of the monetary policy and its impact on the domestic product. Concerning the channels of the monetary policy, when the discount rate is considered as a variable that represents the monetary policy, results show that the interest rate channel and the exchange rate channel play a key role in targeting growth. However, their impact on inflation is very limited. When the money market rate is considered as a variable that represents the monetary policy, results show that the credit channel and the exchange rate channel play a key role in targeting growth and inflation.

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# Appendix A: Tables

## Table A1. Lag Length Selection of the Basic and Extended Models.(Part One)

***Basic Model:***

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1085.523 | NA | 5.53e+08 | 28.64535 | 28.73735 | 28.68212 |
| 1 | -783.7667 | 571.7494 | 249668.4 | 20.94123 | 21.30924 | 21.08830 |
| 2 | -774.3659 | 17.06975 | 247365.5 | 20.93068 | 21.57470 | 21.18806 |
| 3 | -759.8915 | 25.13980 | 214827.6 | 20.78662 | 21.70664 | 21.15431 |
| 4 | -728.5647 | 51.93648 | 120046.0 | 20.19907 | 21.39511 | 20.67707 |
| 5 | -703.2892 | 39.90873* | 78929.61* | 19.77077* | 21.24281* | 20.35907* |
| 6 | -698.8336 | 6.683353 | 90147.70 | 19.89036 | 21.63841 | 20.58896 |
| 7 | -688.9714 | 14.01483 | 89782.41 | 19.86767 | 21.89173 | 20.67658 |

***Interest Rate Channel:***

➢ as endogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1213.555 | NA | 9.67e+08 | 32.04091 | 32.16358 | 32.08993 |
| 1 | -844.3086 | 689.9069 | 88806.66 | 22.74496 | 23.35831* | 22.99009 |
| 2 | -833.2896 | 19.42823 | 101620.5 | 22.87604 | 23.98007 | 23.31727 |
| 3 | -810.8638 | 37.17969 | 86596.88 | 22.70694 | 24.30165 | 23.34427 |
| 4 | -777.9851 | 51.04851 | 56502.02 | 22.26277 | 24.34816 | 23.09619 |
| 5 | -748.8168 | 42.21722* | 41097.76* | 21.91623* | 24.49231 | 22.94576* |
| 6 | -738.0030 | 14.51323 | 49158.45 | 22.05271 | 25.11947 | 23.27834 |
| 7 | -719.5494 | 22.82420 | 48984.26 | 21.98814 | 25.54558 | 23.40987 |

➢ as exogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1002.737 | NA | 67802081 | 26.54570 | 26.72970 | 26.61924 |
| 1 | -780.7253 | 414.8104 | 249466.5 | 20.94014 | 21.40015 | 21.12398 |
| 2 | -773.3569 | 13.18567 | 260873.8 | 20.98308 | 21.71910 | 21.27722 |
| 3 | -757.8769 | 26.47892 | 220810.3 | 20.81255 | 21.82458 | 21.21700 |
| 4 | -726.5770 | 51.06827 | 123604.3 | 20.22571 | 21.51375 | 20.74047 |
| 5 | -701.9228 | 38.27879 | 82719.30* | 19.81376* | 21.37780* | 20.43883* |
| 6 | -696.9227 | 7.368631 | 93286.33 | 19.91902 | 21.75907 | 20.65439 |
| 7 | -684.2967 | 17.60997* | 86565.76 | 19.82360 | 21.93966 | 20.66928 |

***Credit Channel:***

➢as endogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1637.003 | NA | 6.68e+13 | 43.18428 | 43.30696 | 43.23331 |
| 1 | -1199.981 | 816.5401 | 1.03e+09 | 32.10477 | 32.71812* | 32.34990 |
| 2 | -1187.514 | 21.98282 | 1.14e+09 | 32.19772 | 33.30176 | 32.63895 |
| 3 | -1166.346 | 35.09313 | 1.00e+09 | 32.06174 | 33.65646 | 32.69907 |
| 4 | -1131.954 | 53.39784 | 6.27e+08 | 31.57775 | 33.66314 | 32.41117 |
| 5 | -1096.170 | 51.79390* | 3.83e+08* | 31.05709* | 33.63317 | 32.08662* |
| 6 | -1087.560 | 11.55525 | 4.86e+08 | 31.25157 | 34.31833 | 32.47720 |
| 7 | -1076.418 | 13.78002 | 5.87e+08 | 31.37943 | 34.93687 | 32.80116 |

➢as exogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1013.619 | NA | 90286000 | 26.83209 | 27.01609 | 26.90563 |
| 1 | -779.9769 | 436.5425 | 244601.2 | 20.92044 | 21.38046 | 21.10429 |
| 2 | -772.1428 | 14.01892 | 252670.9 | 20.95113 | 21.68715 | 21.24528 |
| 3 | -758.1621 | 23.91442 | 222473.7 | 20.82005 | 21.83208 | 21.22451 |
| 4 | -728.0103 | 49.19505 | 128355.5 | 20.26343 | 21.55146 | 20.77819 |
| 5 | -697.8464 | 46.83329* | 74305.10* | 19.70649* | 21.27053* | 20.33155* |
| 6 | -695.4700 | 3.502111 | 89787.46 | 19.88079 | 21.72084 | 20.61616 |
| 7 | -687.4726 | 11.15434 | 94111.50 | 19.90717 | 22.02323 | 20.75285 |

***Exchange Rate Channel***

➢as endogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1338.304 | NA | 2.58e+10 | 35.32380 | 35.44647 | 35.37283 |
| 1 | -935.6980 | 752.2383 | 983823.1 | 25.14995 | 25.76330* | 25.39507 |
| 2 | -920.7262 | 26.39773 | 1014557. | 25.17700 | 26.28104 | 25.61823 |
| 3 | -899.2606 | 35.58762 | 886691.2 | 25.03317 | 26.62789 | 25.67050 |
| 4 | -856.5562 | 66.30420 | 446722.8 | 24.33043 | 26.41582 | 25.16385 |
| 5 | -827.8356 | 41.56937* | 328781.9* | 23.99567* | 26.57175 | 25.02520* |
| 6 | -814.0381 | 18.51768 | 363569.7 | 24.05363 | 27.12039 | 25.27926 |
| 7 | -799.7400 | 17.68449 | 404146.3 | 24.09842 | 27.65586 | 25.52014 |

➢as exogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1012.716 | NA | 88163992 | 26.80830 | 26.99231 | 26.88184 |
| 1 | -781.0626 | 432.8253 | 251690.4 | 20.94902 | 21.40903 | 21.13286 |
| 2 | -772.2029 | 15.85424 | 253070.6 | 20.95271 | 21.68873 | 21.24686 |
| 3 | -758.5939 | 23.27845 | 225016.6 | 20.83142 | 21.84345 | 21.23587 |
| 4 | -728.0473 | 49.83929 | 128480.6 | 20.26440 | 21.55244 | 20.77916 |
| 5 | -699.9936 | 43.55702* | 78624.52* | 19.76299* | 21.32703* | 20.38806* |
| 6 | -695.9649 | 5.937031 | 90964.43 | 19.89381 | 21.73387 | 20.62919 |
| 7 | -686.8636 | 12.69392 | 92615.35 | 19.89115 | 22.00721 | 20.73683 |

**Table A2. Lag Length Selection of the Basic and Extended Models.(Part two)**

***Basic Model:***

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1124.219 | NA | 1.53e+09 | 29.66365 | 29.75565 | 29.70042 |
| 1 | -792.2488 | 628.9955 | 312107.9 | 21.16444 | 21.53245 | 21.31152 |
| 2 | -784.1239 | 14.75324 | 319786.9 | 21.18747 | 21.83149 | 21.44485 |
| 3 | -771.4444 | 22.02217 | 291156.5 | 21.09064 | 22.01067 | 21.45833 |
| 4 | -735.8006 | 59.09369 | 145226.3 | 20.38949 | 21.58552 | 20.86748 |
| 5 | -713.0734 | 35.88512* | 102108.4* | 20.02825* | 21.50029* | 20.61655* |
| 6 | -705.6164 | 11.18555 | 107763.8 | 20.06885 | 21.81690 | 20.76746 |
| 7 | -698.4335 | 10.20728 | 115168.0 | 20.11667 | 22.14073 | 20.92558 |

***Interest Rate Channel:***

➢as endogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1227.710 | NA | 1.40e+09 | 32.41341 | 32.53608 | 32.46243 |
| 1 | -854.8729 | 696.6158 | 117268.8 | 23.02297 | 23.63632* | 23.26810* |
| 2 | -845.1594 | 17.12646 | 138879.6 | 23.18840 | 24.29244 | 23.62963 |
| 3 | -826.2647 | 31.32533 | 129872.3 | 23.11223 | 24.70694 | 23.74955 |
| 4 | -787.3639 | 60.39867 | 72319.03 | 22.50958 | 24.59497 | 23.34300 |
| 5 | -761.9518 | 36.78069* | 58067.75* | 22.26189* | 24.83796 | 23.29141 |
| 6 | -750.9739 | 14.73352 | 69157.49 | 22.39405 | 25.46080 | 23.61967 |
| 7 | -736.4066 | 18.01741 | 76333.24 | 22.43175 | 25.98919 | 23.85348 |

➢as exogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1016.891 | NA | 98405008 | 26.91820 | 27.10220 | 26.99173 |
| 1 | -784.3902 | 434.4102 | 274724.7 | 21.03659 | 21.49660* | 21.22043 |
| 2 | -777.9666 | 11.49498 | 294519.5 | 21.10438 | 21.84040 | 21.39853 |
| 3 | -764.8351 | 22.46175 | 265181.7 | 20.99566 | 22.00769 | 21.40012 |
| 4 | -730.7585 | 55.59871 | 137982.3 | 20.33575 | 21.62379 | 20.85051 |
| 5 | -709.2386 | 33.41245* | 100280.6* | 20.00628* | 21.57032 | 20.63135* |
| 6 | -702.4693 | 9.975711 | 107946.8 | 20.06498 | 21.90504 | 20.80036 |
| 7 | -692.4048 | 14.03733 | 107155.1 | 20.03697 | 22.15303 | 20.88265 |

***Credit Channel:***

➢asendogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1674.960 | NA | 1.81e+14 | 44.18317 | 44.30584 | 44.23219 |
| 1 | -1207.074 | 874.2081 | 1.24e+09 | 32.29143 | 32.90478* | 32.53656 |
| 2 | -1194.781 | 21.67548 | 1.38e+09 | 32.38897 | 33.49300 | 32.83019 |
| 3 | -1174.030 | 34.40193 | 1.22e+09 | 32.26396 | 33.85867 | 32.90128 |
| 4 | -1134.506 | 61.36687 | 6.71e+08 | 31.64490 | 33.73029 | 32.47832 |
| 5 | -1100.032 | 49.89702* | 4.24e+08* | 31.15873 | 33.73480 | 32.18825* |
| 6 | -1083.192 | 22.60006 | 4.33e+08 | 31.13664* | 34.20340 | 32.36227 |
| 7 | -1070.607 | 15.56593 | 5.04e+08 | 31.22651 | 34.78394 | 32.64823 |

➢as exogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1051.577 | NA | 2.45e+08 | 27.83097 | 28.01498 | 27.90451 |
| 1 | -788.0415 | 492.3952 | 302431.4 | 21.13267 | 21.59268 | 21.31651 |
| 2 | -781.5806 | 11.56160 | 323905.0 | 21.19949 | 21.93551 | 21.49364 |
| 3 | -770.0930 | 19.64979 | 304533.5 | 21.13403 | 22.14606 | 21.53848 |
| 4 | -735.5048 | 56.43335 | 156339.4 | 20.46065 | 21.74869 | 20.97541 |
| 5 | -708.1287 | 42.50503* | 97394.06* | 19.97707* | 21.54112* | 20.60214* |
| 6 | -702.3390 | 8.532247 | 107577.0 | 20.06155 | 21.90160 | 20.79693 |
| 7 | -696.5988 | 8.006050 | 119658.7 | 20.14734 | 22.26340 | 20.99302 |

***Exchange Rate Channel***

➢as endogenous variable

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1371.403 | NA | 6.16e+10 | 36.19481 | 36.31748 | 36.24383 |
| 1 | -943.3427 | 799.7962 | 1203056. | 25.35112 | 25.96447* | 25.59625 |
| 2 | -928.7061 | 25.80662 | 1251633. | 25.38700 | 26.49103 | 25.82823 |
| 3 | -914.1809 | 24.08126 | 1313084. | 25.42581 | 27.02052 | 26.06314 |
| 4 | -869.5937 | 69.22746 | 629564.9 | 24.67352 | 26.75891 | 25.50694 |
| 5 | -840.8153 | 41.65292* | 462647.9 | 24.33724 | 26.91332 | 25.36677* |
| 6 | -821.9292 | 25.34715 | 447479.9* | 24.26129* | 27.32805 | 25.48692 |
| 7 | -812.5141 | 11.64493 | 565629.1 | 24.43458 | 27.99202 | 25.85631 |

➢as exogenouse variable

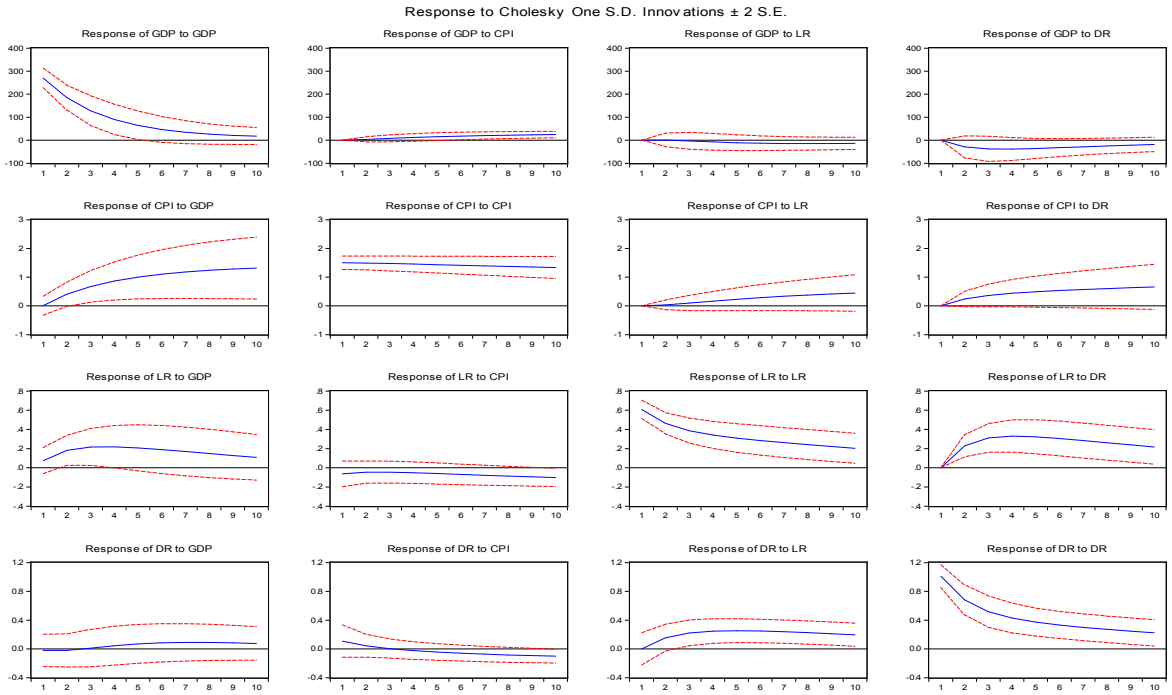
| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -1045.814 | NA | 2.11e+08 | 27.67931 | 27.86331 | 27.75284 |
| 1 | -789.0229 | 479.7932 | 310344.4 | 21.15850 | 21.61851 | 21.34234 |
| 2 | -781.1799 | 14.03486 | 320508.0 | 21.18895 | 21.92497 | 21.48309 |
| 3 | -769.6080 | 19.79413 | 300671.2 | 21.12126 | 22.13329 | 21.52572 |
| 4 | -735.1181 | 56.27288 | 154756.6 | 20.45048 | 21.73851 | 20.96524 |
| 5 | -708.7515 | 40.93762* | 99003.56* | 19.99346* | 21.55751* | 20.61853* |
| 6 | -702.7026 | 8.914168 | 108611.5 | 20.07112 | 21.91117 | 20.80650 |
| 7 | -695.8681 | 9.532379 | 117379.9 | 20.12811 | 22.24417 | 20.97379 |

*Note*: * Indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion.

## Appendix B: FiguresImpulse Response Functions (part one)

**Figure 1. Impulse Response Functions – Interest Rate Channel**

➢as endogenous variable




➢as exogenous variable

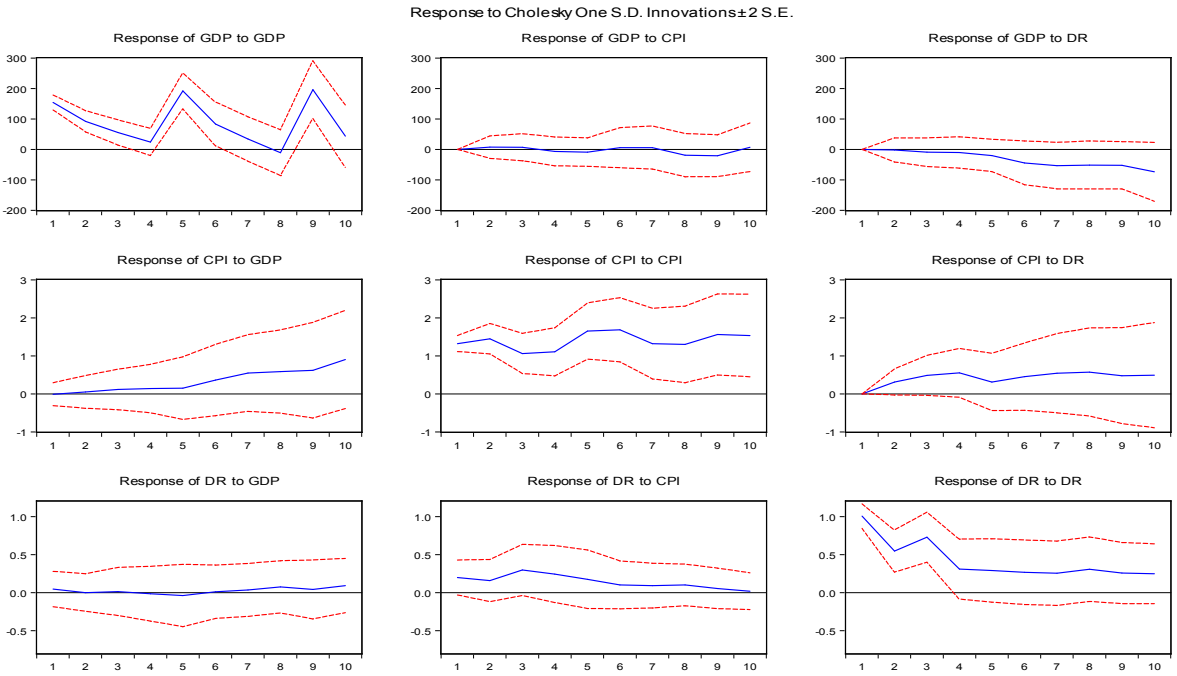
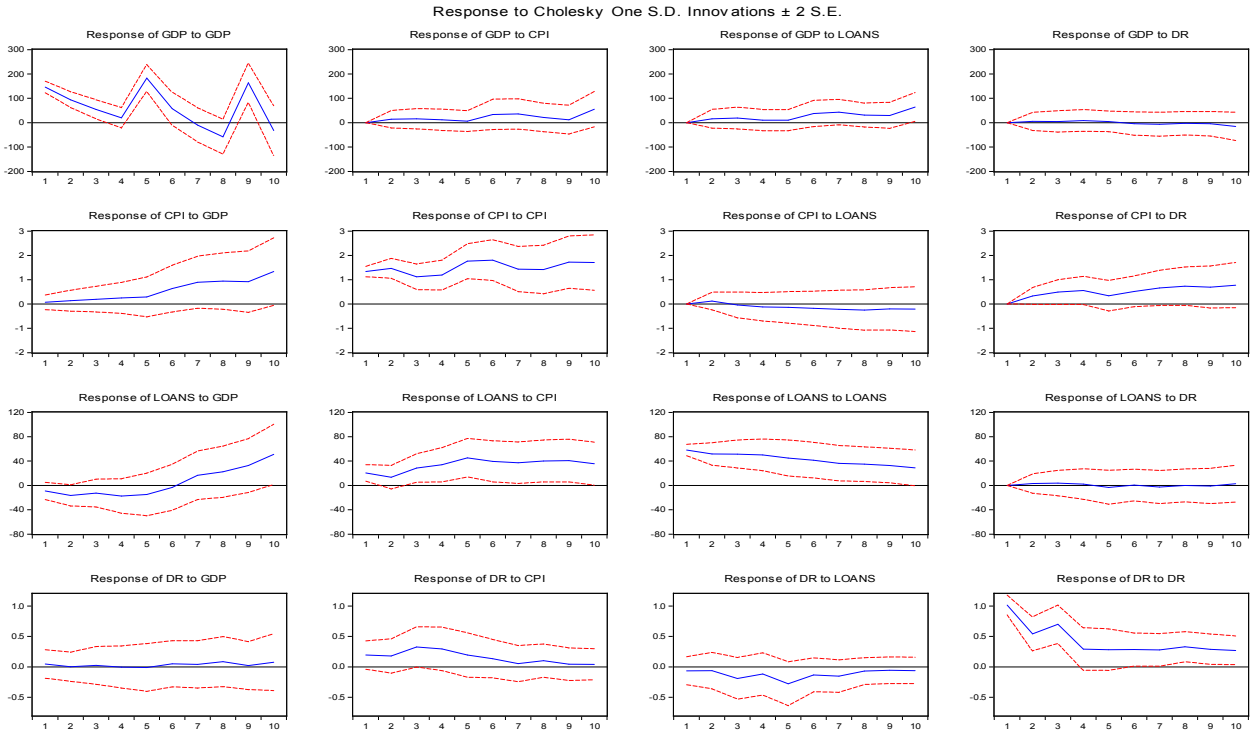



**Figure 2. Impulse Response Functions – Credit Channel**

➢as endogenous variable




➢as exogenous variable

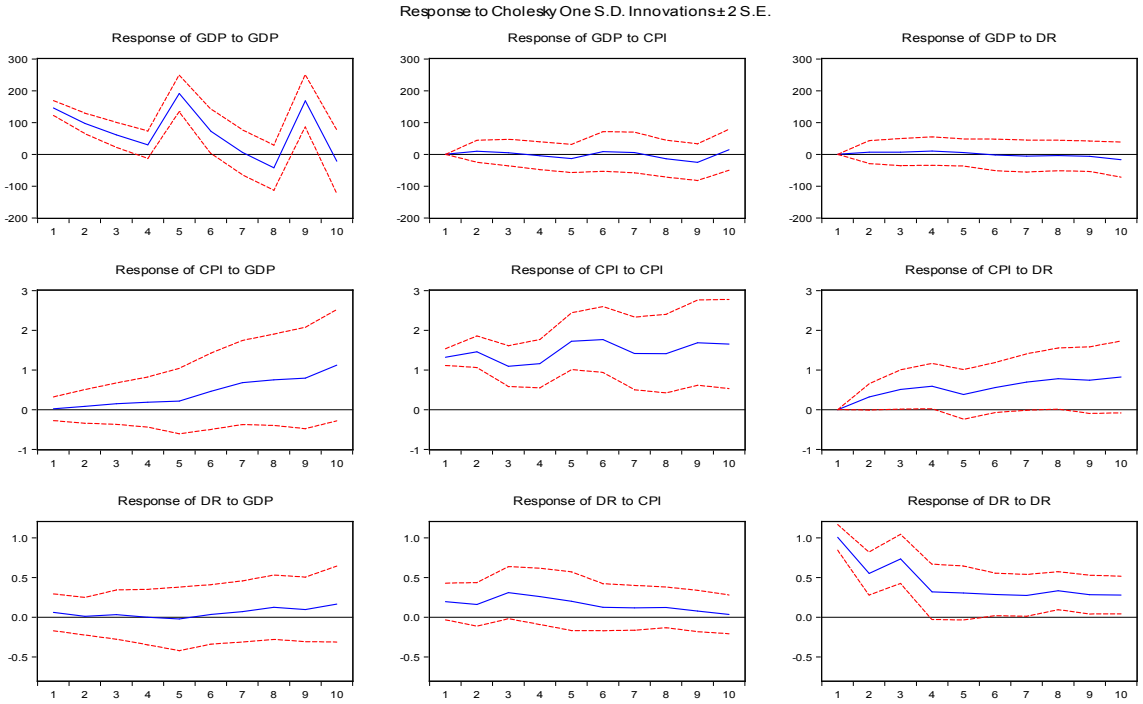
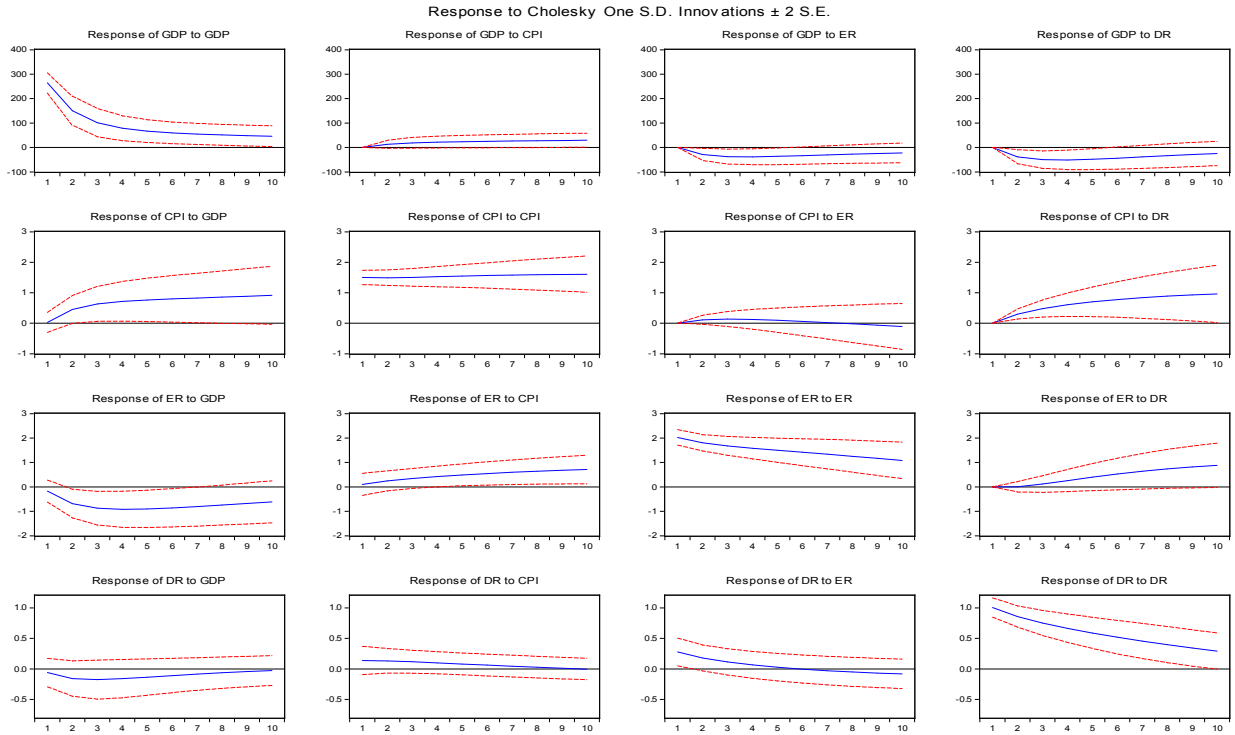



**Figure 3. Impulse Response Functions – Exchange Rate Channel**

➢as endogenous variable

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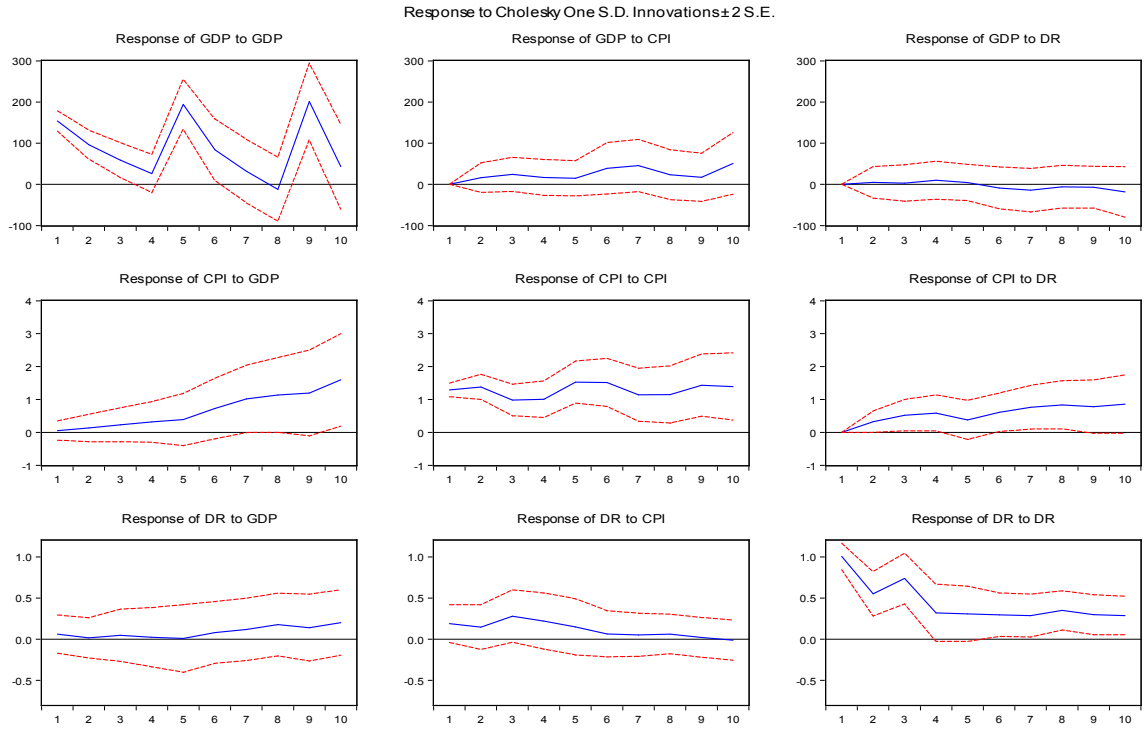
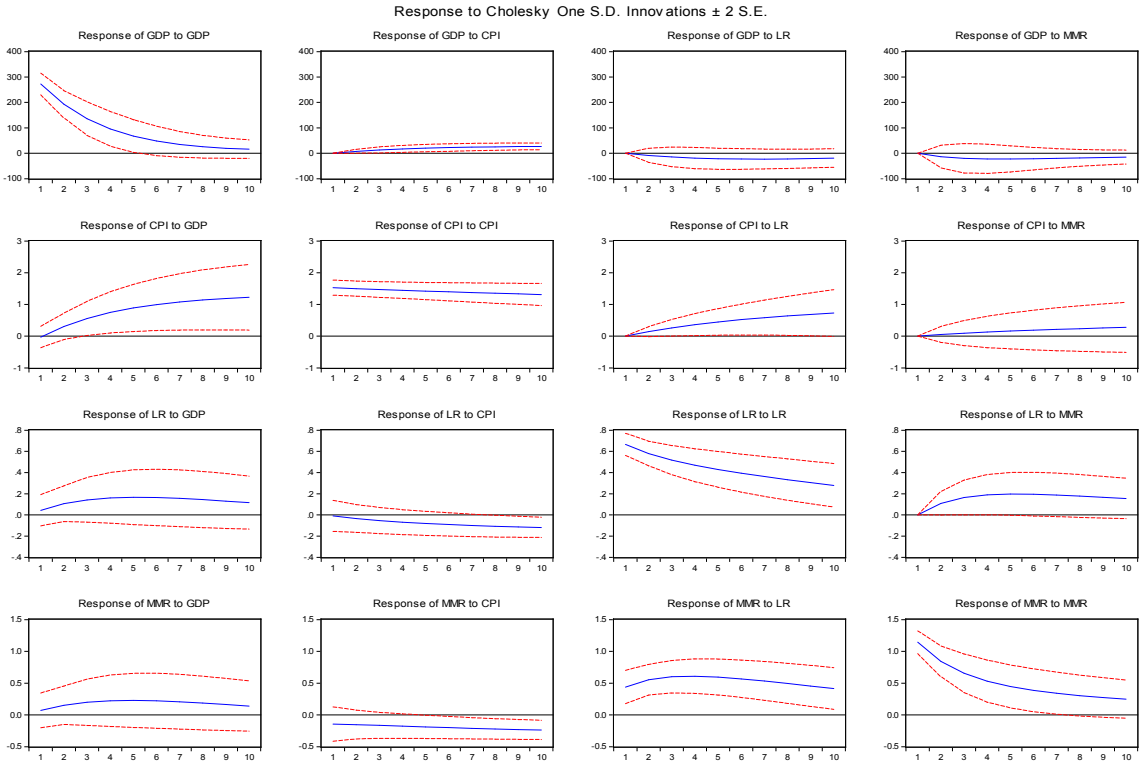



**Impulse Response Functions (part two)**

**Figure 4. Impulse Response Functions – Interest Rate Channel**

➢as endogenous variable




➢as exogenous variable

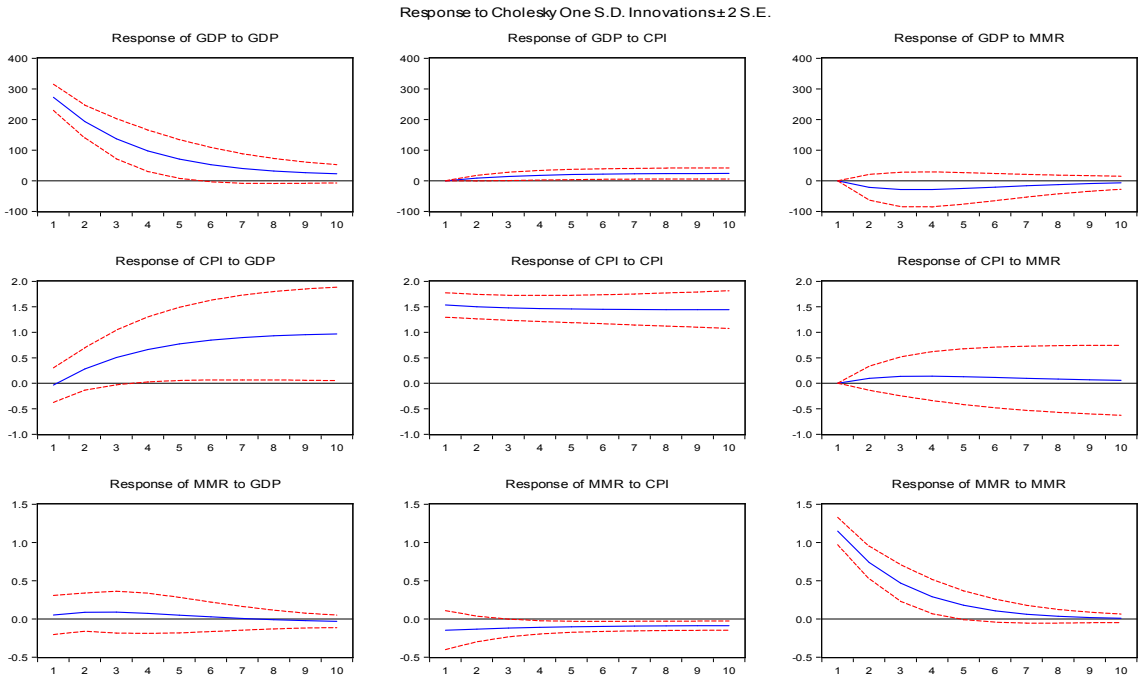
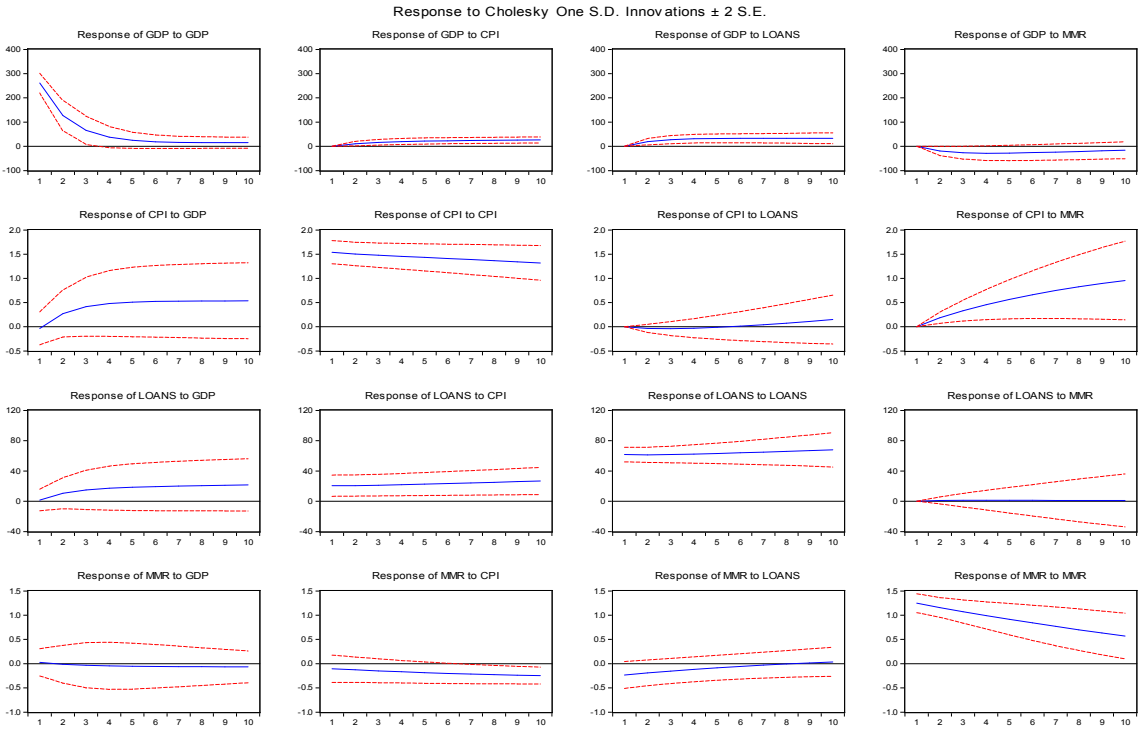



**Figure 5. Impulse Response Functions – Credit Channel**

➢as endogenous variable




➢as exogenous variable

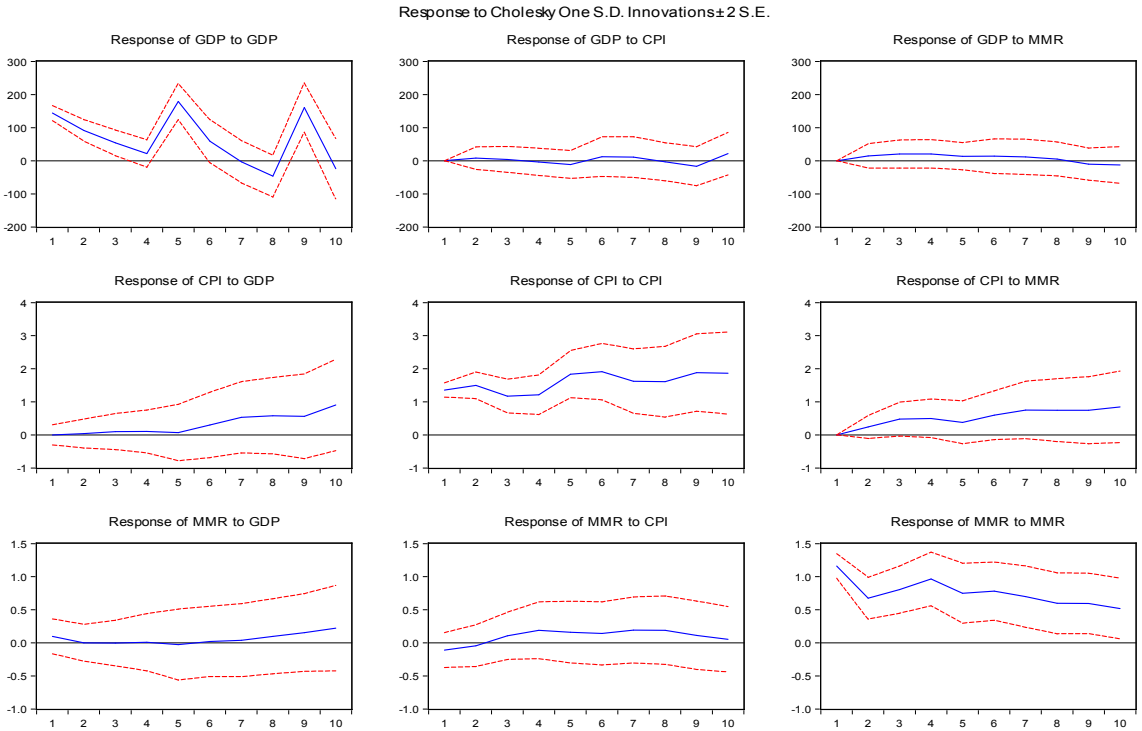
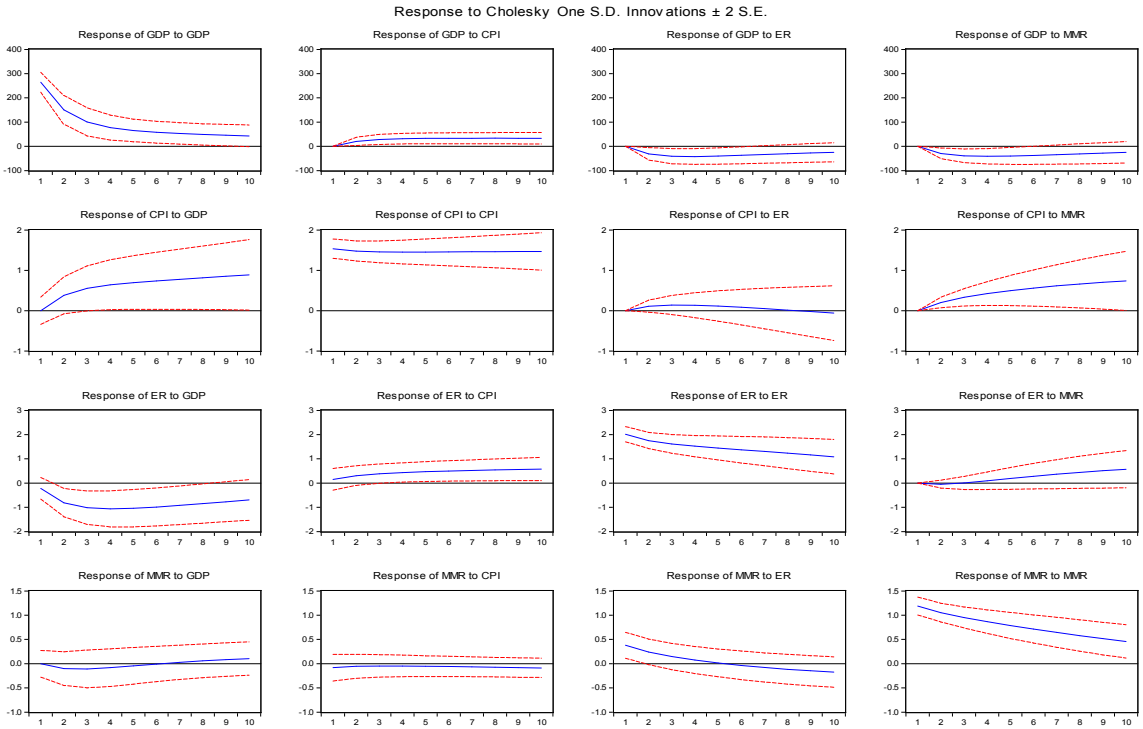



**Figure 6. Impulse Response Functions – Exchange Rate Channel**

➢as endogenous variable




➢as exogenous variable