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The Impact of Monetary Policy on the Some Economic Variables of Iraq Economy Through Credit Channel

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Abstract

The threshold effect of monetary policy on the nominal and real economic variables through the credit channel in Iraq has been investigated using the threshold structural vector autoregressive model from 1970-2018. The results showed that the threshold of money growth in the nominal sector (inflation) is 3.13% and in the real sector is 9.76 % per year. Also, the impact of monetary policy values above the threshold on the real sector (economic growth) through the credit channel This shows a statistically significant relationship, and values below the threshold have been confirmed only in the long run. In the nominal sector, the effect of the monetary policy above the threshold is only confirmed in the short run, and below the threshold values are This shows a statistically significant relationship.

Keywords: *Monetary Policy; Inflation; Economic Growth; Credit Channel; TSVAR Model*

Introduction

The aim of this study is to investigate the reaction of the real sector (gross domestic product) and the nominal sector (inflation) to positive and negative monetary base shocks at high and low threshold levels, considering the bank credit channel in Iraq.

How is the impact of expansionary and contractionary monetary policy on the high and low values of the monetary base threshold on the real and nominal sector of the Iraqi economy through the bank credit channel?

The most important objectives of implementing monetary policy in countries are price stability, improving economic growth, achieving full employment, and stability in the balance of payments. In general, monetary policy is a combination of rules and measures that central banks use to achieve the above goals (Loayza and Hebbel, 2002; Şanli, 2022) . Usually, monetary policies are used in response to internal and external shocks to minimize these shocks' impact on monetary policy goals. In the theoretical foundations of monetary economics, many economists have a consensus concerning the neutrality of the real effects of monetary policy in the long term and the existence of its real effects in the short term (Walsh, 2017). According to this, changes in money supply and monetary policies cannot always have real effects in all periods (Walsh, 2017). What is particularly important about monetary policies is how money growth affects the real economic variables, which is called the transmission mechanism of monetary policy. Monetary policy affects the real variables of the economy through different paths, which are the channels

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of monetary policy transmission. In fact, transmission the mechanism of monetary policy is the way the economy and monetary policy objectives respond to the implemented monetary policy. In other words, the transmission mechanism of monetary policy indicates how monetary policy affects its goals (Mahdilou et al., 2017; Joo et al., 2023). Various schools have their own views on the transmission mechanism of monetary policy mechanism to the real sector of the economy. One of the most important channels of transmission the mechanism of monetary policy is the credit channel. The credit and lending channel are also including the most important channels in the field of influencing the monetary policy on the real sector of the economy.

When the central bank implements a contractionary monetary policy and bank deposits decrease, the lending power of commercial banks decreases; in such a situation, due to the high dependence of businesses and consumers on financing through the banking network, the investment of the economy's productive sector decreases and the purchasing power of the consumer sector regarding durable goods also decreases. According to this, we can expect a decrease in the real sector of the economy. In developed countries, large businesses have financing through the issuance of stocks and bonds, but small and medium-sized enterprises (SMEs) mainly finance themselves through the banking network and obtaining facilities.

The contractionary monetary policy reduces deposits on the liabilities side of banks' balance sheets, and assuming that loans and securities on the assets side of banks' balance sheets are imperfect substitutes for each other, banks do not want to absorb deposit losses by reducing the holding of securities. According to this, the decrease in money supply causes a decrease in loans and bank facilities (Raei et al., 2018). Concerning the influence of monetary policy on the real sector of the economy, structural changes in the economy should be taken into consideration because structural changes over time change the relationships between variables. According to this, the relationships between the variables cannot be considered constant. In fact, the existence of defects in the labor and product market, as well as the existence of issues of price and wage stickiness, as well as the existence of convexity in the supply curve of the entire economy, cause the effects of monetary policy on the real sector of the economy to be asymmetrical.

It should also be determined that in the below and above values of the money supply threshold, way of the effect of positive and negative impulses on the money supply and credit channel on the nominal sector of the economy (inflation) and the real sector of the economy (GDP).

In the recent financial crisis, it became clear that the quantitative relationship between monetary and financial sectors and other macroeconomic variables needs to be investigated through non-linear models. In fact, positive and negative shocks of the same threshold may have asymmetric effects. Moreover, the effects of positive and negative monetary policy shocks may depend on the phase of the business cycle. Therefore, the effects of monetary policy through different transmission channels can require nonlinear instruments. Based on this, if the influence of monetary policy through the credit channel is different above and below the money supply threshold, it can be provided a separate policy implication. For example, if the reaction of production and inflation to the positive and negative impulse of the money supply and also the credit channel in the above threshold regime is different from the above threshold regime, it can be said that the money supply and the credit channel, if less than the threshold limit of the money supply in Iraq, will increase , how will be the reaction of production and inflation to positive and negative shocks to the credit channel and money supply and if asymmetry is observed regarding the below and above threshold regimes as well as positive and negative impulses, a policy recommendation can be delivered depending on the economic conditions of Iraq. Therefore, in the present study, the effect of the asymmetric threshold of monetary policy on the nominal and real variables of the Iraqi economy is investigated with an emphasis on the credit channel of monetary policy

transmission. In the current research, annual data during the Period 1970-2018 and the threshold structural vector autoregression (TSVAR) model is used. The chapters of the article are organized as follows: after the introduction, in the second section, the theoretical foundations, and literature review; in the third section, methodology; in the fourth section, the analysis of findings and in the fifth section, conclusions, Discussions and suggestions are presented.

Literature Review

One of the important financing tools for countries in periods when the main source of income faces problems is the use of borrowing tools from the banking network, which results in an increase in the volume of money in the economy and an impact on nominal and real variables. In fact, the increase in the amount of money in the economy can affect nominal and real variables in an economy in different ways, and these channels that transmit the effect of monetary policy to nominal and real variables are called monetary policy transmission channels. An important point that has been neglected in the studies of Iraq is the investigation of the threshold effects of monetary policy on nominal and real variables through the bank lending channel. In fact, it should be determined which channel and how it affects the nominal and real variables in the higher threshold and lower threshold values separately for positive and negative shocks, which is very important for policy making in Iraq. (Cuevas et al., 2022)

It is also possible that the positive and negative momentum of money supply through the credit channel in values above the money supply threshold and below the money supply threshold have different effects on the nominal and real variables of the economy. A clear relationship between the money supply and the real and nominal sector of the economy has not always been established in Iraq, and it should be determined how the monetary expansion and contraction policy will affect the nominal and real sectors of the country's economy through various mechanisms of monetary policy transfer and at high and low threshold values. It affects High fluctuations in money supply, facilities granted, prices of various assets such as coins, housing, high growth of the stock market indicate monetary and credit instability in the banking network of Iraq, which causes fluctuations in inflation and production. These fluctuations have a negative impact on the expectations and overall picture of the country's economy and limit the opportunities for higher and more stable growth. Based on this, the monetary policy maker, knowing the importance of the bank credit channel to transfer monetary shocks to the nominal and real sector, focuses on controlling inflation and increasing production. Therefore, knowledge and awareness of the threshold level of money supply in the use of the bank credit channel, the effects of monetary policy on the nominal and real sector, is important and can help monetary policy makers to achieve the goals of monetary policy with regard to the same channel used. In Iraq, most companies' are financing by bank networks. Accordingly, in the present study, the channel of bank credits is emphasized in the transmission of monetary policy. In addition to directly influencing the real and nominal sectors of the economy based on traditional theories, monetary policy can also indirectly affect the real and nominal sectors of the economy through components such as bank credits, exchange rates, interest rates, and assets. Non-credit channels such as exchange rate channels, interest rate channels, and asset prices were not successful in interpreting the financial crisis of 2008 (Salahesh and Kazerooni,2019: 46; Jiménez-Olmedo et al., 2022) . Accordingly, the credit channel was proposed by considering the shortcomings of markets and discretionary policies. Concerning the ineffectiveness of other monetary policy transmission channels in the financial crisis of 2008, it should be mentioned the intervention of governments in the market as well as the existence of asymmetric information and market quotes in private markets (Salahesh and Kazerooni,2019: 47). Regarding the credit channel, the information economy issues in microeconomics should be considered, which can be pointed out as an adverse selection, moral hazard, and costly monitoring. In fact, these cases can affect the role of the credit channel in influencing the nominal and real sectors by influencing the credit contracts. The strength and

weakness of the credit channel can be affected by the government's discretionary policies in the markets as well as the issues of the information economy, thereby increasing inefficiency in the financial markets (Bernanke and Gertler, 1995:13; Duarte et al., 2023)

The influencing of monetary policy through the credit channel is that with the increase in money supply, the amount of bank deposits increases, and subsequently, banks increase the financing of projects, which can lead to an increase in investment and consumption expenses in the economy, which results in a change in the GDP or inflation (Mishkin, 1995:69). In other words, banks tend to face low-risk borrowers. With the implementation of contractionary monetary policy, access to bank resources becomes difficult in the credit channel. It leads to an increase in the cost of financing for small businesses, and in contrast, big businesses that have more access to other financing tools are less affected. In general, in case of implementation of contractionary monetary policy, bank deposits will decrease, which can lead to a decrease in the facilities granted by banks, and in such a situation, businesses will face more financial resource restrictions and their investment expenses will decrease, which can ultimately reduce the gross domestic product (Mehrgan and Daliri, 2013:153).

As well as, another point of view is that by increasing the money supply in the economy, the interest rate decreases and leads to an increase in the asset prices and cash flows of the borrowing firms, and also causes an increase in the price of assets such as stocks, which itself causes an increase in the wealth of firms, which itself can lead to an increase in the production of firms (Gerali et al., 2010:17). Now, the way of the influencing of monetary policy and credit channels on the real and nominal sectors of the economy can be asymmetric. In this regard, new Keynesians believe that money is not neutral and also has asymmetric effects on production and employment. One of the proofs of new Keynesians is the way of monetary signaling. In this mode, negative shocks have greater effects than positive monetary shocks on the real sector and in its justification; they mention the convexity of the supply curve of the whole economy, which is the result of the stickiness of nominal wages and prices. This is presented in the model of (Ball and Mankiw, 1994:19).

In this model, the asymmetric adjustment of prices is caused by assuming a positive inflation trend. In general, in the absence of monetary policy, inflation leads to an increase in inflationary expectations higher than the current rate for the firms, and this issue increases the gap between inflationary expectations and actual inflation, while a negative monetary shock reduces the difference between inflationary expectations and actual inflation rate. Another mode of the asymmetry of the monetary policy is due to the size of the monetary policy. In this state, smaller shocks have greater effects than larger shocks. The menu cost model presented by (Ball and Romer, 1990:93-95) is in this regard.

In this model, following a small monetary shock, the level of production changes, but the level of prices remains constant, because the desirability of price stability is due to the existence of the menu cost is greater than the desirability of changing prices. Another mode of monetary policy asymmetry due to the different influencing of monetary policy in Business cycle. In a recession, the value of collateral decreases and weakens the economic position of the firms, and in such a situation, it becomes more difficult for banks to pay for loans (Zhu and Sebastian, 2017:12).

According to the theoretical foundations, the influencing of monetary policy on the nominal and real sectors of the Iraqi economy in the form of a credit channel and considering the failure of linear models as well as models that did not consider the asymmetry in the financial crisis of 2008, in the present study, the non-linear model of TSVAR was used. It is able to modeling the impact of positive and negative shocks of the research variables at above and below values of the monetary policy threshold on real and nominal sectors, Previous literature will be presented:

(Iddrisu and Alagidede, 2020), investigated the interest rate and lending the credit channel of monetary policy transmission in South Africa from 2000 to 2018 quarterly using the three-stages least squares method (3sls). The study results show that interest rate and lending channels are active in South Africa. Regarding the interest rate channel, 1% restriction in monetary policy will increase lending rate by 0.29%, 1% increase in investment lending rate will decrease by 0.063%, 1% reduction in investment also reduces inflation by 0.074%. Regarding the lending channel, 1% restriction in the monetary policy reduces the lending facilities of the banking network by 0.22%, 1% an increase in the lending facilities reduces investment by 0.2%, and finally, 1% a reduction in investment reduces inflation by 0.086%. (Abdul Rashid et al., 2020), investigated the role of Islamic and conventional banks in the transmission of monetary policy in Malaysia in the period of 2005-2016 using a panel data model. The study results show a credit channel for monetary policy transmission in Malaysia. In addition, the results show that Islamic banks react significantly less to changes in monetary policy instruments than conventional banks. As well as, based on the results, monetary policy instruments affect banks with lower liquidity and smaller size more. (Kumar and Dash, 2020), have investigated the change of monetary policy transmission on inflation in India in the period of 1997-2017 on a monthly basis using the model of variable parameters during TVP-FAVAR. The results of the study show that the effectiveness of the contractionary monetary policy in controlling inflation has improved over time, and this improvement is due to the change of monetary policy transmission channels to asset price and credit channels.

Also, contractionary monetary policy has been more effective in reducing inflation in the manufacturing sector than in the agricultural sector. (Guo et al., 2020), investigated the impact of housing prices on monetary policy transmission in China in the period 2009:1 - 2018:3 quarterly using two-stage least squares models of panel data and Tobit of panel data. The research results show that the contractionary monetary policy not only improves the total investment but also leads to the replacement of financial assets. The increase in housing prices acts as a factor to reduce the substitution effect created by monetary policy. (Catik and Akdeniz, 2019), investigated the contribution of different channels of monetary policy in influencing on production and inflation in Turkey using VAR model with a time-varying factor. The results showed that the contribution of the exchange rate channel in the money transfer to price was greater than the contribution of this channel in the transfer of the effects of money on production. According to this, in order to implement the inflation targeting policy, this transmission channel should be more considered. (Lombardi et al., 2018), investigated the transmission mechanism of monetary policy in 4 largest economies of the world, namely China, the United States, the European Union and Japan, in the period of 1998:1 -2016:4 using VAR model with time-varying factor. The research results show that global components have the strongest impact on China and the weakest impact on Japan. The impact of China's economy on the European Union is significant and shows their dependence on each other, and this impact has been minimal about Japan. (Memon and Jabeen, 2018), investigated the impact of the monetary condition index(MCI) and changes in its transmission channels about macroeconomic variables in the Persian Gulf states using principal component analysis and vector autoregression models. The research results show that the monetary condition index can be used as an instrument to predict the consumer price index and GDP of Bahrain and Qatar in the long term and as an index to predict the GDP of Oman and Iraq in the medium and long term, but it cannot be used as an index to predict the consumer price index and gross domestic production of Kuwait and Saudi Arabia. (Erdogdu, 2017), investigated the transmission channels of monetary policy on production and inflation in Turkey using the VAR model. The results show that the credit channel and asset price channel are inactive in transmitting the effects of monetary policy on production and prices, but on the other hand, the interest rate channel has contributed the most to the transmission of the impacts of monetary policy. (Ulke and Berument, 2016), investigated the asymmetry of monetary shocks in Turkey in the period of 1990-2014 on a monthly basis using the threshold vector autoregression model.

The results have shown that there is asymmetry in terms of the size and direction of the monetary shock in affecting the GDP. (Torres and Restrepo, 2016), have investigated the asymmetry of monetary shocks during the growth of housing prices Colombia in the period of 1994-2015 using monthly data and the Markov-switching model. The research results show that the monetary policy will be effective only in the case that housing prices decrease. (Tunc and Kilinc, 2016), have investigated monetary shocks in the business cycles of Turkey in the period of 2006-2014 using quarterly data and Markov switching model. The results showed that there is an asymmetry of monetary shocks during business cycles, so monetary shocks only have the ability to influence economic growth during the recession period, and monetary shocks are neutral in influencing economic growth during the boom period. (Allen and Robinson, 2015), have investigated the impact of the monetary policy shock on the economic growth of Jamaica in the period of 1997-2015 quarterly using the Markov switching model. The results show that the impact of the monetary policy on exchange rate and inflation depends on the state of monetary policy, and in fact, if the interventionist monetary policy is or not, it leads to a different impact of monetary transmission on inflation and exchange rate. (Mahdilou and Asgharpour, 2020) have investigated the role of the exchange rate channel in the nonlinear transmission mechanism of monetary policy in Iran in the period of 1991:1 - 2016:4 using MSVAR (markov-switching vector autoregressions) model. The results show that Pollion's view is confirmed in Iran's economy. In such a way that money in zero regime means the years after 2005 and one regime means the years before 2005 had an effect on production in the short term and had no effect on production in the long term. Also, the higher growth of money in the zero regime could not have a greater effect on production than in the one regime. On the other hand, the study of the effects of money on the level of prices indicates that in the long term, in the zero regime, where the growth of money was high, money had a greater and more lasting effect than prices. The estimated results concerning the role of the exchange rate channel in the money transmission mechanism indicate that the increase of money from the exchange rate channel in the zero regime did not play a role in the money transmission to production, while in the one regime, the exchange rate channel had a significant contribution to the transmission money to production and the changes in money through this channel caused a decrease in production. On the other hand, the contribution of the exchange rate channel in the money transmission to prices is greater and more permanent in zero-regime (high growth of money) than one -regime (low growth of money). Mahdilou et al. (2018) have evaluated the nonlinear role of channels of transmission of monetary policy in the Iranian economy in the period of 1991-2015 quarterly using the markov switching vector autoregressive model. The research results indicate that in one-regime (years before 2006), the credit channel in the short term, the exchange rate channel in the medium term and the housing price channel in the long term and in the zero regime (years after 2006), the short-term credit channel, the housing price channel in the medium term and the stock price channel in the long term have contributed the most to the transfer of the effects of money in production.

On the other hand, monetary policies in one- regime through the exchange rate channel and in zero-regime through the credit channel have had the greatest impact on the price level. Raei et al. (2018) have investigated the impact of monetary shocks and monetary policy transmission channels in Iranian economy in the period of 2015-2016 with quarterly data in the form of markov switching autoregressive models with distributive breaks. In this research, positive and negative monetary shocks have been extracted using the Markov switching model. The results showed that the channels of exchange rate, housing price and credits are unable to transmit the effects of monetary policy in the long term, and in fact money is neutral in the long term. In addition, there is asymmetry between positive and negative shocks and the effect of credit channel has been stronger than other channels. (Jalili et al, 2017). evaluated the transmission mechanism of monetary policy effects on the stock market in Iran using the structural vector autoregression model with monthly data of 2005-2012. The results indicate that monetary policy

changes from the liquidity channel and facilities granted to the non-governmental sector have a significant and positive effect on the total stock market index; as a result of the contractionary monetary policy through increasing liquidity and increasing the facilities granted to the non-governmental sector, the total index of the stock exchange improves.

On the other hand, changes in the monetary policy through the exchange rate and the real interest rate have a significant negative impact on the mentioned index. In this way, the contractionary monetary policy through the increase of the interest rate leads to the improvement of the total index of the stock market in the period under review, and the shocks caused by exchange rate changes have caused monetary policy turmoil in the short term and this turmoil has caused the deterioration of the overall index of the stock market in the studied period. (Jafari Samimi et al, 2017). have investigated the asymmetric effect of monetary policy and bank credits on business cycles in Iran in the period of 1997-2013 with quarterly data in the form of a threshold vector autoregression model. The results of the research showed that the effect of monetary policy and bank credits on production in high and low regimes is different in terms of intensity and direction of effect, and in fact, the asymmetric effects of monetary policies and bank credits are confirmed. (Shahhosseini and Bahrami, 2016) have investigated macroeconomic fluctuations and the mechanism of monetary policy transmission in Iran using the dynamic stochastic general equilibrium model. The results of the research showed that considering the banking system in the new keynesian dynamic stochastic general equilibrium modeling has a greater ability to explain the effect of monetary shock on the real variables of non-oil production, consumption and investment, and is able to show the mechanism of the credit channel of monetary transfer. In the case of ignoring the banking sector, the contractionary monetary shock does not have enough power to move the mentioned real variables away from their stable value and only affects the inflation rate. Jafari Samimi et al. (2016) have investigated the impact of monetary policy and bank credits on Iranian GDP using threshold vector autoregression model.

The results showed that the impact of monetary policy and bank credits on gross domestic product in each of the regimes of high gross domestic product and low gross domestic product is different in terms of intensity and direction of effect, in other words, the impact of monetary policy and bank credits on GPD is asymmetric and depends on regime change based on GDP variable. (Farzinvash et al, 2012) have investigated the asymmetric effects of monetary policies on production in the Iranian economy in the period of 1949-2008 using the autoregression model of mild transmission and transmission and logistics function. The results showed that the effectiveness of monetary policies on GPD was different in above and below oil income growth situations. During the period under review, with the implementation of contractionary monetary policy, production in the below state of oil income growth has increased more than the upstate of the below state of oil income growth more than in the above state of oil income growth. (Komijani and Alinjad Mehrabani, 2012) evaluated the effectiveness of monetary policy transmission channels on production and inflation in the period of 2008-2011 using vector regression model. The results showed that in the Iranian economy, the four channels of interest rate, exchange rate, stock index and bank lending have the power to transmission monetary policies on the growth rate of production and inflation. Also, monetary policy has the greatest impact on production growth through the channel of bank loans, and through the exchange rate channel, monetary policy has the greatest impact on the inflation rate.

Methodology

To obtain data and statistical information, reliable international sources such as:

1-THE WORLD BANK(www.worldbank.org).
2-INTERNATIONAL MONETARY FUND(www.IMF.org).
3-CENTRAL BANK OF IRAK(www.cbi.iq).

4- IRAQ STOCK EXCHANGE(www.isx-iq.net/isxportal/portal/contactus.html).
EVIEWS software was used to analyze the data.

The asymmetric impact of monetary policy thresholds on the real and nominal sectors of the Iraqi economy, with emphasis on the credit channel, using the threshold structural vector autoregressive model, has been investigated. Some variables' effects may differ in states above and below a certain limit and value (threshold). In such situations, non-linear models that allow the separation of positive and negative shocks and the analysis of their effects in values above and below the threshold have advantages over other models (Fang Guo, 2013). It should be noted that considering that the basis of the model is from the vector autoregressive family and in these models, the optimal interval is selected based on information criteria; therefore, the discontinuous effects of the variables are included in the model, and also regarding the causal relationship between some variables such as the exchange rate and stocks before estimation of the main model of the research is used to determine the direction of causality. The present study does not investigate the determinants of money growth in Iraq's economy. Still, its purpose is to investigate the impact of monetary policy on economic growth and inflation in Iraq above and below the threshold of money growth., and also separate positive and negative shocks on nominal and real variables, which issue can also be seen in the studies conducted in the literature review section of the research. According to Sadeghi and Roudari (2022), the threshold vector autoregressive model can be expressed as equation (1):

$$Y_t = A^1 Y_t + B^1(L)Y_{t-1} + (A^2 Y_t + B^2(L)Y_{t-1})I[s_{t-d} > \gamma] + U_t \quad (1)$$

Which $\mathrm{Y_t}$ It is a vector of endogenous variables (financial instability index, exchange rate, oil price, stock index) and $\mathrm{B^1(L)}$and $\mathrm{B^2(L)}$is a polynomial matrix discontinuous and $\mathrm{A^1Y}$ and $\mathrm{A^2Y_t}$ indicate the contemporaneous Term . Because the synchronicity effect may be different among regimes. I indicates the index function, if $\mathrm{s_{t-d}}$ is smaller than the threshold value(γ) , it is 0 and otherwise it is 1. $\mathrm{U_t}$ is structural disturbance component. Therefore, the threshold vector autoregression model can be written as equation (2):

$$Y_t = \begin{Bmatrix} A^1 Y_t + B^1(L)Y_{t-1} + U_t if I = 0 \\ (A^1 + A^2)Y_t + [B^1(L) + B^2(L)]Y_{t-1} + U_t if I = 1 \end{Bmatrix} \quad (2)$$

After dividing into two different regimes, now the non-linear structural vector autoregression approach can be used for analysis. A vector autoregression model of the order(P) can be expressed as equation (3):

$$y_t = \mu + A_1 y_{t-1} + \cdots + A_p y_{t-p} + \varepsilon_t \quad (3)$$
$$A(L)y_t = \mu + \varepsilon_t$$

Which A(L) is polynomial matrix discontinuous of order P, and $\varepsilon_t N(0, \Omega)$.According this, Wold Theorem ,under weak rule conditions, a stationary process can represent a discontinuous distribution of uncorrelated disturbance components. Therefore, equation (3) can be written as equation (4):

$$y_t = A^{-1}(L)\varepsilon_t \Longrightarrow y_t = B(L)\varepsilon_t B_0 = I \quad (4)$$

The $\mathrm{\varepsilon_t}$ component cannot be considered as structural shocks and is orthogonal by applying constraints. Therefore, Wold Theorem can be shown as equation (5):

$$y_t = C(L)e_t \quad (5)$$

If B0 is the unit matrix, we can find from equations (2 and 3) that:

$$\varepsilon_t = C_0 e_t \, , B_j C_0 = C_j \quad (6)$$

In the 4-variable system, the C0 matrix contains 16 components, and with normalization, we will have Var (et):

$$\Omega = C_0 C_0 \quad (7)$$

For further study, refer to the study of (Rodri et al, 2019).
In general, the equations are as follows:
A). Endogenous equations

$$GGDP_t = \alpha_{1i}(T_i)GGDP_{t-i} + \beta_{1i}(T_i)GCPI_{t-i} + \gamma_{1i}(T_i)GMB_{t-i} + \theta_{1i}(T_i)GCREDIT_{t-i}$$

$$GCPI_t = \alpha_{2i}(T_i)GGDP_{t-i} + \beta_{2i}(T_i)GCPI_{t-i} + \gamma_{2i}(T_i)GMB_{t-i} + \theta_{2i}(T_i)GCREDIT_{t-i}$$

$$GMB_t = \alpha_{3i}(T_i)GGDP_{t-i} + \beta_{3i}(T_i)GCPI_{t-i} + \gamma_{3i}(T_i)GMB_{t-i} + \theta_{3i}(T_i)GCREDIT_{t-i}$$

$$GCREDIT_t = \alpha_{4i}(T_i)GGDP_{t-i} + \beta_{4i}(T_i)GCPI_{t-i} + \gamma_{4i}(T_i)GMB_{t-i} + \theta_{4i}(T_i)GCREDIT_{t-i} \quad (8)$$

B). Exogenous equations

$$GGDP_t = \alpha_{1i}(T_i)GGDP_{t-i} + \beta_{1i}(T_i)GCPI_{t-i} + \gamma_{1i}(T_i)GMB_{t-i} + \theta_{1i}(T_i)GCREDIT_{t-i} \quad (9)$$

$$GCPI_t = \alpha_{2i}(T_i)GGDP_{t-i} + \beta_{2i}(T_i)GCPI_{t-i} + \gamma_{2i}(T_i)GMB_{t-i} + \theta_{2i}(T_i)GCREDIT_{t-i}$$

$$GMB_t = \alpha_{3i}(T_i)GGDP_{t-i} + \beta_{3i}(T_i)GCPI_{t-i} + \gamma_{3i}(T_i)GMB_{t-i} + \theta_{3i}(T_i)GCREDIT_{t-i}$$

In endogenous and exogenous equations, if the effects of monetary policy on the real and nominal sectors are different from each other, an interpretation can be provided regarding the effectiveness of the credit channel. In the above equations, we have:

$GGDP_t$: GDP growth; $GCPI_t$: The growth of Consumer price index growth; GMB_t: The growth of monetary base; $GCREDIT_t$: The growth of bank credits; T_i: Monetary base threshold; In equation (9), the credit channel (loans and bank facilities) is included as an exogenous variable in the model.

Results

Before estimating the main model of the research, it is necessary to ensure the stationary of the research variables. Because if there is a unit root and the estimation of the model at the level of the variable, the regression will be fake. For this purpose, For the time period 1970-2018. in Table (1), the results of the generalized dickey-fuller (adf) unit root test are presented.

Table 1. Generalized dickey-fuller (adf) unit root test.

Variable	Computational statistics	null hypothesis	p-value
GGDP	-9/724	The existence of a unit root with width from the origin	0/000
	-9/642	The existence of a single root with width from origin and trend	0/000
GMB	-3/697	The existence of a unit root with width from the origin	0/007
	-4/255	The existence of a single root with width from origin and trend	0/007
GCREDIT	-4/411	The existence of a unit root with width from the origin	0/001
	-4/814	The existence of a single root with width from origin and trend	0/001
GCPI	-6/402	The existence of a unit root with width from the origin	0/000
	-6/417	The existence of a single root with width from origin and trend	0/000

Source: Prepared by the researcher: According to table (1), the growth of all the variables of the research

is at the 1% error level and therefore all the variables should be entered in the threshold structural vector autoregression (TSVAR) model. In the following, the significance of the values of the monetary base growth threshold should be checked in both endogenous and exogenous conditions of the credit channel.

Table 2. Significance test and determination of the threshold - response variable: economic growth.

Threshold quantity of monetary base growth=0/0976		
p-value	**statistic**	Test
0/000	47/05	Sup-Wald
0/000	41/13	Avg-Wald
0/000	21/52	Exp-Wald

Source: Prepared by the researcher: According to table (2), in the mode of economic growth as the response variable, the threshold of the monetary base growth of Iraq is 9.76% per year, which is significant at the level of 1% error. In the following, in Table 3, the significance test and determination of the threshold in the variable mode of inflation response are presented:.

Table 3. Significance test and determination of threshold - response variable.

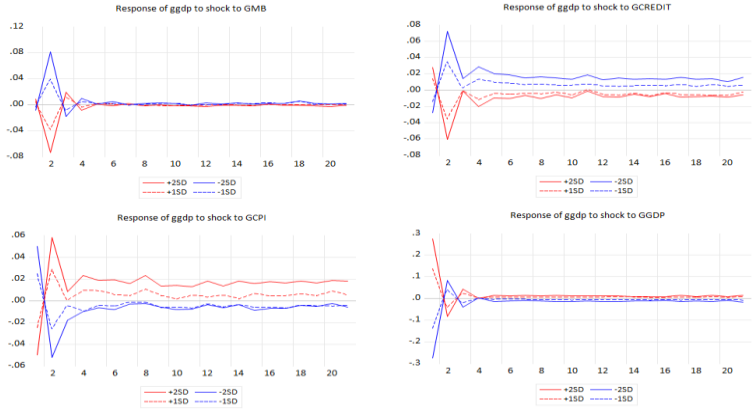
Threshold quantity of monetary base growth=0/0313		
p-value	**statistic**	Test
0/000	86/11	Sup-Wald
0/000	70/52	Avg-Wald
0/000	41/44	Exp-Wald

Source: Prepared by the researcher: According to Table (3), in the mode of inflation as the response variable, the threshold for the growth of the monetary base of Iraq is 3.13% per year, which is significant at the level of 1% error. In the following, equations 8 and 9 of the research have been analyzed and estimated in two states of above and below growth threshold of the monetary base and the response variables of economic growth and inflation.

Investigating the Impact of Monetary Policy on The Real Sector and Assuming the Endogeneity of the Credit Channel

Shock-Response Functions at Values Above the Monetary Base Growth Threshold.

Chart 1: Economic growth shock-response functions - endogenous credit channel and above-threshold.



Source: Prepared by the researcher

If the endogenous credit channel and response variable is economic growth, the monetary base growth threshold is 9.76 percent. According to chart 1, at values higher than the monetary base growth threshold, a positive shock to the monetary base has a negative impact on Iraq's economic growth in the short term and has almost no effect in the long term. As well as, if the monetary base growth is higher than the threshold, a positive shock to the amount of credit and bank facilities in this country will have a negative effect on economic growth, and this effect will exist in the long term. In addition, if the monetary -base growth is higher than the threshold, the positive shock to inflation in the long term has increased the economic growth of this country, which shows that in high inflation, the movement of inflation and production in this country are aligned, and in other words, the Phillips curve (due to the existence of the positive relationship between production and employment) for Iraq country in such conditions decreases[5].

Shock-response functions at below values of the monetary base growth threshold.

Chart 2: Economic growth shock-response functions - Endogenous credit channel and below threshold.

Source: Prepared by the researcher

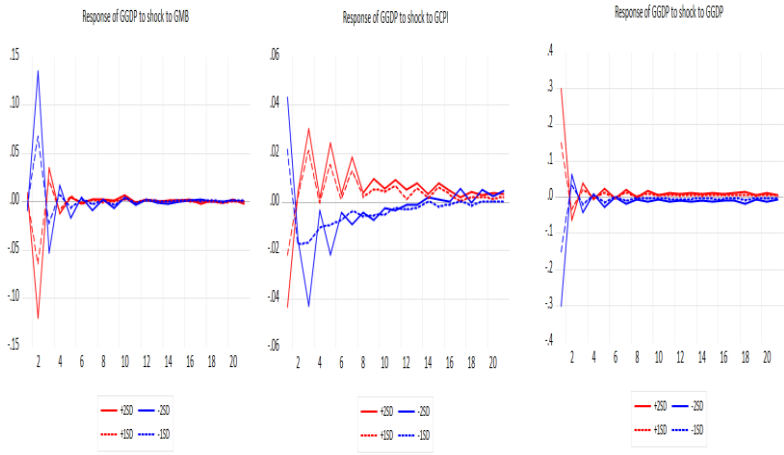
According to chart 2 at values lower than the monetary base growth threshold, a positive shock to the monetary base has a negative effect on the short term and a small positive effect on Iraq's economic growth in the long term, and in this case, the growth of bank credits has a positive effect in the short term and a negative effect in the long term. As in the case of above monetary base growth threshold, in the case of below monetary threshold growth, the monetary threshold has also caused a positive shock to inflation, increasing economic growth in Iraq, and in fact, in this mode, the Phillips curve has been downward in Iraq.

[5] It should be noted that according to the Granger causality test, there is a two-way causality between economic growth and inflation in Iraq.

Investigating the impact of monetary policy on the real and exogenous sector of the credit channel.

Shock-response functions at values above the monetary base growth threshold.

Chart 3: Shock-response functions of economic growth-exogenous credit channel and above-threshold.

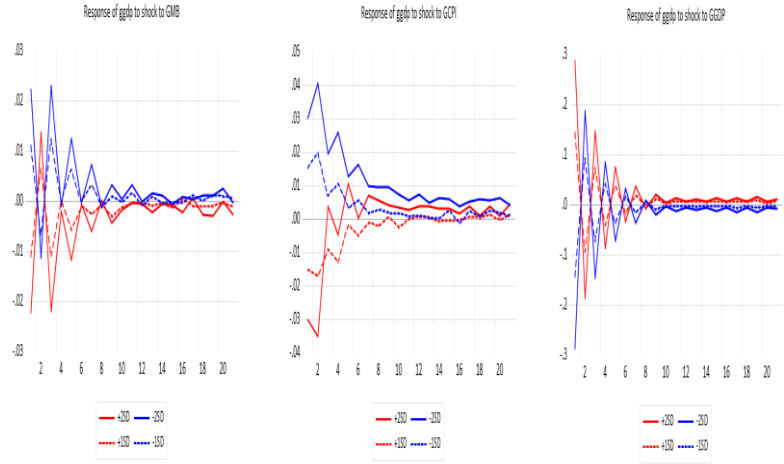


Source: Prepared by the researcher

According to chart 3, in the exogenous state of the credit channel and at above values of the monetary base growth threshold, a positive shock to the monetary base has had a negative impact on Iraq's economic growth in the 3rd period and a positive impact in the 4th period.
Its effect is similar to the endogenous nature of the credit channel and the above values of the threshold of Chart 1, and this shows that the effect of monetary policy on economic growth through the credit channel is not confirmed at high values of the monetary base growth threshold. The positive shock to inflation also had a negative impact on Iraq's economic growth only in the first period and in other periods, as shown in chart 1.

Shock-response functions at below values of the monetary base growth threshold.

Chart 4: Shock-response functions of economic growth-exogenous credit channel and below the threshold.



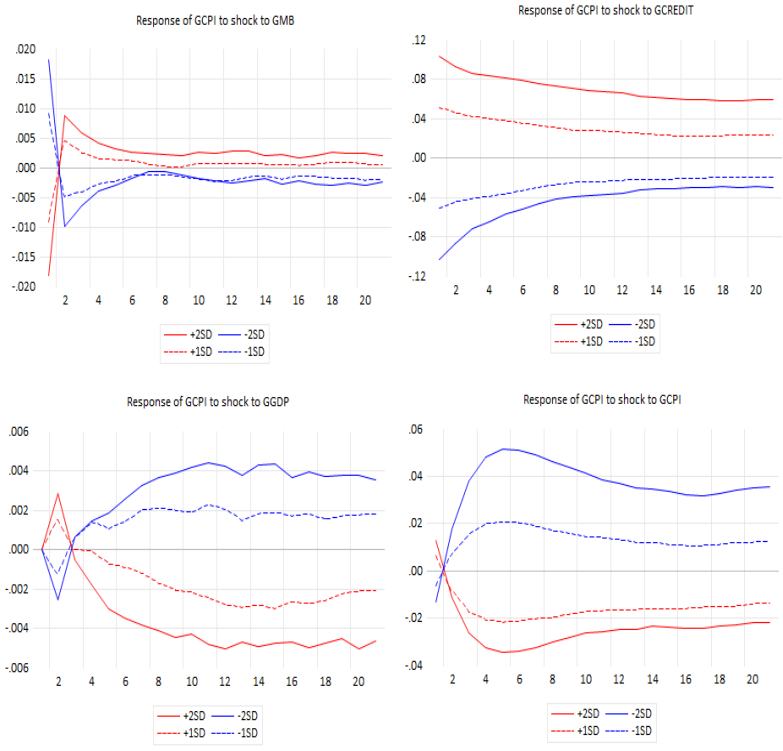
Source: Prepared by the researcher

According to chart 4, except for the second period, the positive shock to the monetary base has had a negative impact on Iraq's economic growth in other periods, while in the mode of credit channel endogeneity and at below values of the monetary base growth threshold, the positive shock to the monetary base in the short term has had negative impact and in the long term has had a little positive effect, and considering the different effect of the monetary base in these two modes in the long term, it can be said that the effect of monetary policy on economic growth through the credit channel at below values of the monetary base growth threshold and in the exogenous conditions of the credit channel in the long term is confirmed. In addition, the positive shock to inflation had a negative effect in the short term and a positive effect in the long term.

Investigating the impact of monetary policy on the nominal sector and assuming endogeneity of the credit channel.

Shock-response functions at values above the monetary base growth threshold.

Chart 5: Inflation shock-response functions – endogenous credit channel and above threshold.

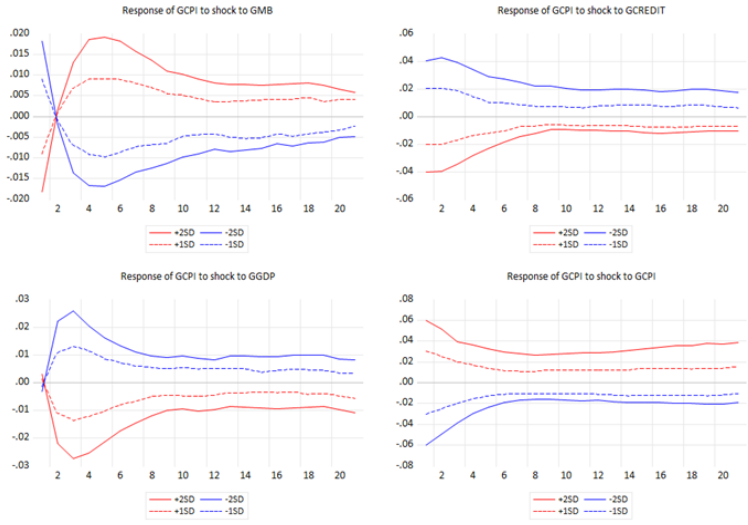


Source: Prepared by the researcher

According to chart 5, and in the endogenous mode of the credit channel and at above values of the monetary base growth threshold, the positive shock to the monetary base in the medium and long term has caused an increase in inflation in Iraq. In fact, with the monetary base growth over the threshold, it becomes possible to increase the demand for goods and services and subsequently inflation. Also, in this mode, the positive shock to bank facilities has also led to an increase in inflation. In addition, above the monetary base threshold, a positive shock to economic growth can reduce inflation in Iraq in the medium and long term.

Shock-Response Functions at Below Values of the Monetary Base Growth Threshold.

Chart 6: Inflation Shock-Response functions - endogenous credit channel and below threshold.



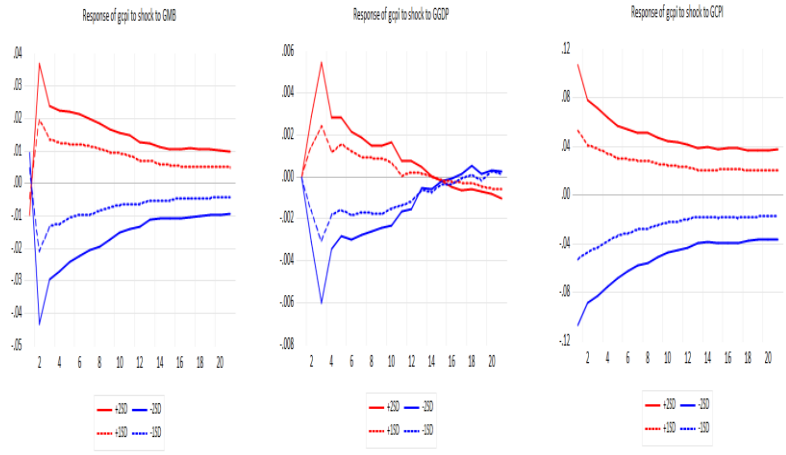
Source: Prepared by the researcher

According to chart 6 and in the endogeneity mode of the credit channel and at below values of the monetary base growth threshold, the positive shock to the monetary base in the medium and long term has caused an increase in inflation in Iraq. Also, the positive shock to bank facilities has had a negative impact on inflation, and the positive shock to GDP has reduced inflation. This shows that if the monetary base growth in Iraq is little and there is monetary stability, the growth of granted facilities can attract productive activities and prevent inflation.

Investigating the Impact Of Monetary Policy on The Nominal Sector And Assuming the Endogenous of Tthe Credit Channel.

Shock-response functions at values above the monetary base growth threshold.

Chart 7: Shock functions - Inflation response -exogenous credit channel and above threshold.

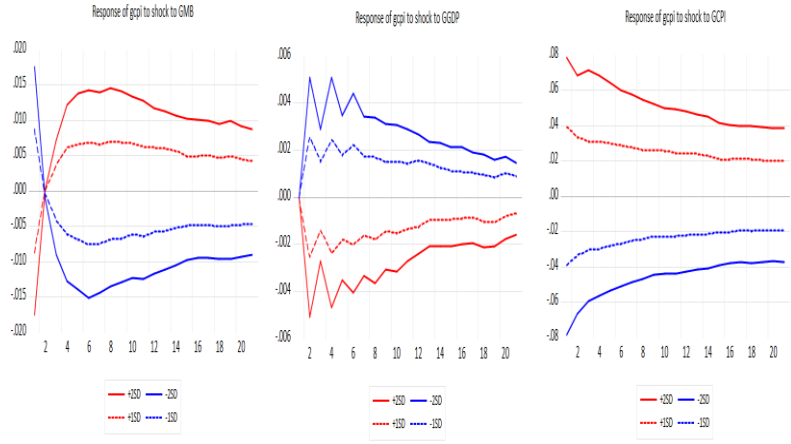


Source: Prepared by the researcher

According to chart 7, the positive shock to the monetary base has had a positive impact on inflation in all periods, and the positive shock to economic growth has had a positive impact on the inflation of Iraq in the short and medium term, and a negative impact on the inflation in the long term. By comparing of charts 5 and 7, it can be seen that in values above the monetary base threshold, due to the different impact of the monetary base in these two modes in the short term, it can be said that the effect of monetary policy on inflation through the credit channel is confirmed in values above the monetary base growth threshold in the short term.

Shock-response functions at below values of the monetary base growth threshold.

Chart 8: Inflation shock-response functions-exogenous credit channel and below threshold.



Source: Prepared by the researcher

In the exogenous mode of the credit channel and at below values of the monetary base growth threshold, according to chart 8, a positive shock to the monetary base in the medium and long term has caused an increase in inflation in Iraq, and a positive shock to economic growth has also caused a decrease in inflation in all periods. By comparing of charts 6 and 8, it can be seen that the effect of a positive shock to the monetary base on inflation below the monetary base growth threshold has not changed in both endogenous and exogenous modes of the credit channel, and this shows that the effect of monetary policy on inflation through the credit channel in amounts below the monetary base growth threshold is not confirmed.

Discussions

After presenting the previous literature, it was found that it did not adequately address the impact of monetary policy on some economic variables of the Iraqi economy through the credit channel, and that non-credit channels such as exchange rate channels, interest rate channels, and asset prices did not succeed in explaining the financial crisis of 2008, so the credit channel was proposed By looking at inefficiencies in markets and discretionary policies. The non-linear model of TSVAR was also used. It is able to model the impact of the positive and negative shocks of the research variables at the highest and lowest values of the monetary policy threshold on the real and nominal sectors in Iraq, and this is the research gap that the researcher will study. The results showed that the monetary growth threshold in the nominal sector is 3.13% and in the real sector it is 9.76% annually. And that the effect of monetary

policy values above the threshold on the real sector indicates a statistically significant relationship, and the values that fall below the threshold have been confirmed only in the long term. In the nominal sector, the effect of monetary policy above the threshold is confirmed only in the short term, and below the threshold values a statistically significant relationship is shown.

The researcher hopes that this research paper will be a source for other researchers to benefit from in subsequent studies.

Conclusions

One of the most important channels for the transmission of the effects of monetary policy is the credit channel and the granting facilities of the banking network. According to this, in the present study, the impact of monetary policy on the nominal sector (inflation) and real sector (economic growth) was investigated with an emphasis on the credit channel in Iraq for the period of 1970-2018 using the threshold structural vector autoregressive (TSVAR) model. The relationships between variables may not be constant over time, and in such situations, using linear models may provide unrealistic results. According to Fazzari and Variato (1994), New Keynesians believe that due to the existence of asymmetric information, the stickiness of wages and prices and the convex aggregate supply curve of monetary policy effects on nominal and real sectors may be non-linear and asymmetric. The results showed that the monetary policy threshold (money growth) differs in the nominal (inflation) and real (GDP growth) sectors. The monetary policy threshold for influencing the real sector is more than the nominal sector in the Iraqi economy.

If the endogenous credit channel and response variable is economic growth, at values higher than the money growth threshold, a positive shock to the money growth has a negative effect on Iraq's economic growth in the short term. It has almost no effect in the long term. Also, suppose the money growth is higher than the threshold. In that case, the positive shock to the amount of credit and bank facilities in this country will have a negative effect on economic growth, and this effect will exist in the long term. At values lower than the money growth threshold, a positive shock to the money growth has a negative effect in the short term and a small positive effect on Iraq's economic growth in the long term. In this mode, the growth of bank credits has a positive effect in the short term and a negative effect in the long term. In the exogenous mode of the credit channel and at the above values of the money growth threshold, a positive shock to the money growth has had a negative effect on Iraq's economic growth for 3rd period and a positive effect in the 4th period. This effect was similar to the credit channel's endogenous nature and the threshold's above values. This shows that the effect of monetary policy on economic growth through the credit channel is not confirmed at the above values of the money growth threshold. In the exogenous mode of the credit channel and also in the below values of the money growth threshold, the positive shock to the money growth has had a negative effect on the economic growth of Iraq except for the 2nd period, and this is while in the endogeneity of the credit channel and in the amounts below the money growth threshold, a positive shock to the money growth has had a negative impact in the short term and a small positive impact in the long term, and considering the different impact of the money growth in these two modes in the long term, it can be said that the impact of monetary policy on economic growth through the credit channel in the below values of the money growth threshold is confirmed in the long term. The effect of monetary policy (money growth growth) on the real sector of the Iraqi economy through the credit channel has been different based on the monetary policy threshold and the period. In other words, if the money growth in Iraq is more than 9.76% per year, the monetary policy through the credit channel is not able to stimulate economic growth in this country, but at below values of the money growth threshold, the monetary policy through the credit channel only in the long term. It can stimulate economic growth in this country. If the political goal of implementing an expansionary monetary policy is to create economic

growth in Iraq, this should be considered in the long-term growth below the threshold.

In the mode of the credit channel being endogenous and at high values of the money growth threshold, the positive shock to the money growth in the medium and long term has caused an increase in the inflation of Iraq. In fact, with the money growth over the threshold, it becomes possible to increase the demand for goods and services and, subsequently, inflation. Also, in this mode, the positive shock to bank facilities has also increased inflation. In the endogeneity of the credit channel and at below values of the money growth threshold, a positive shock to the money growth in the medium and long term has increased inflation in Iraq, and a positive shock to bank facilities has had a negative effect on inflation. In the exogenous mode of the credit channel and at the above values of the money growth threshold, a positive shock to the money growth positively affected inflation in all periods.

The Limits

1. Lack of resources and tools related to this topic.
2. The difficulty of obtaining data through direct visits to field sites, so reliance was made on websites.
3. Lack of financial support from specialized research centers.
4. The poor security and economic conditions of the country made the researcher not to visit the sites directly.

Suggestions and Recommendations

Through the foregoing, the researcher sees, it can be seen that in values above the money growth threshold, considering the different effects of the money growth in these two modes in the short term, it can be said that the effect of monetary policy on inflation through the credit channel is confirmed in values above the money growth threshold. In the exogenous mode of the credit channel and at below values of the money growth threshold, the positive shock to the money growth in the medium and long term has caused an increase in the inflation of Iraq. Therefore, the effect of a positive shock to the money growth on inflation below the money growth threshold, in two modes of endogeneity and exiguousness of the credit channel, has not changed, and this shows that the effect of monetary policy on inflation through the credit channel is not confirmed at below values of the money growth threshold. The effect of monetary policy (money growth) on the nominal sector of the Iraqi economy through the credit channel has been different based on the monetary policy threshold and the period. According to this, if the money growth is more than %3.13 per year, monetary policy through the credit channel can only affect inflation in the short term, and this is even though in values lower than the money growth threshold, monetary policy through the credit channel has not been able to affect inflation in this country. In general, if the money growth in Iraq is more than 9.76% per year, it will only stimulate inflation without affecting economic growth. With money growth of less than 3.13% per year, it is possible to stimulate economic growth in the long term without affecting inflation in this country.

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