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**-RESEARCH ARTICLE-**

# DOES MONETARY POLICY HAS AN ASYMMETRIC EFFECT ON COMMERCIAL BANKS LENDING CHANNEL IN IRAQ

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## ─Abstract─

The activities of the central bank's monetary policy affect the financial markets, and consequent modifications to the policy could alter the conduct of depositary institutions. This study explores the asymmetric effects of monetary policies on the lending channels

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of lending channels of commercial banks in Iraq using monthly data from 2005 to 2019. Non-linear autoregressive distributed lag (NARDL) is utilized to evaluate the Asymmetric effect. Monetary policies were proposed using the Interest Rate (IR), Cash Reserve Requirement (RR), and Broad Money Supply (M2). And Bank Credit (BC) was utilized to propose the lending route for commercial banks. The discovery demonstrates a non-linear link between monetary policy and bank credit. In addition, the Bound and Wald tests showed the long and short-term asymmetric impacts of monetary policy on the credit of Iraqi banks. Therefore, it is recommended that Iraqi policymakers evaluate the asymmetrical impacts and positive and negative monetary policy shocks while determining the most suitable strategy for Iraq's economic circumstances.

**JEL Classification: C32, E51, E52, E58**

**Keywords:** Commercial Banks, Bank Credit, Monetary Policy, NARDL Approach, Iraq

## 1. INTRODUCTION

Monetary policy uses monetary instruments to manage or control the volume, cost, availability, and direction of money and credits in an economy to achieve macroeconomic goals such as price stability, full employment, and sustained economic growth (Mishkin Frederic, 2013). The banking system is the essential avenue for monetary policy implementation. Financial instruments such as discount rates, open market operation, reserve requirements, etc., have no direct effect on economic activity. They influence economic activities through their effects on the banking sector's available resources. For instance, when the economy is experiencing inflationary pressure, the central bank can employ contractionary monetary policy to stabilize the price level. This can be accomplished by raising the required reserve ratio and discount rate. This will lower the amount available to commercial banks for credit facility purposes, causing the cost of borrowing to rise, loans to become more expensive, and individuals to borrow less. Both aggregate spending and investments will decline.

When the central bank implements contractionary monetary policies, private banks have fewer accessible resources. Consequently, their capacity to generate a profit is diminished. Conversely, expansionary monetary policy would have the opposite impact (Nguyen et al., 2017). Governments utilize monetary policy as one of their primary economic management tools to influence economic performance. Monetary policy is more effective in resolving economic disruptions than fiscal policy. Monetary policy objectives include the management of many monetary targets, such as price stability, growth promotion, full employment, a smooth business cycle, the prevention of financial crises, the stabilization of long-term interest rates, and the real exchange rate. According to empirical evidence, the emphasis is typically placed on maintaining price stability or ensuring low inflation rates.

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The monetary authorities, as represented by the central bank, tend to issue directives that create a sober banking system that accurately reflects the ability and solvency of banks and that diversifies the banking activities to achieve high competitive capabilities, obtain financial resources, and reduce investment-related risks. In the case of Iraq, it is crucial to determine if monetary policy has a causal relationship with an asymmetric effect on the banking sector. This study has found a gap in the existing literature and research regarding the asymmetric influence of monetary policy on the banking sector. The literature demonstrates that while the government exerts considerable effort to influence the banking sector through various policy tools, an analysis of the effects of these tools on banks' credit, which is the primary route of transmission for these policies, is inconclusive. This study will be conducted to close the knowledge gap about the effects of the various monetary policy instruments on bank credit in Iraq.

Therefore, the following research question will be revealed: Does the monetary policy have an asymmetric effect on banks' credit channels in Iraq?

## 2. LITERATURE REVIEW

The bank's monetary policy activities impact the financial markets, and the following changes in the markets, which are the result of monetary and other economic policies, influence the behavior (performance) of financial institutions such as banks. The financial system plays a crucial role in the economic progress of each nation, as it is responsible for preparing and allocating the necessary resources for investments. The influencing monetary mechanism is a regulated system of contrasting economic variables that link monetary fluctuations to the real sector of the economy. Considering the importance of monetary policies in directing and modifying the amount of credit extended by banks, the prevailing economic conditions in the Iraqi market, and the lack of research on the effects of symmetric/asymmetric monetary policy on bank performance in Iraq, the importance of conducting this research project cannot be overstated. This study aims to determine whether the asymmetric monetary shock impacts the performance of Iraq's commercial banks.

Neo-Keynesians developed the idea of credit channel of monetary policy for the first time, in which the monetary transmission mechanism is due to a credit shortfall. This idea is founded on asymmetric information and credit market fractions. This channel can influence monetary policy transmission through the balance sheet and bank lending channels (Filardo et al., 2020). Based on the bank lending channel, it is assumed that bank credits are the primary source of funding for small and medium-sized businesses. Therefore, credits are crucial in transporting money and connecting the monetary, financial, and actual economic sections (Boivin et al., 2010).

In general, banks that serve as the most significant parts of macroeconomics play a crucial role in forming a general equilibrium in the economy and transmitting economic shocks within the banks. In addition, these financial resources implement the monetary

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policies mandated by the central bank and work to further their financial interests. From this vantage point, the banking system is viewed as the primary conduit between the demand for and supply of money resources; any probable inefficiency or fault in its performance could pave the way for numerous shocks and issues in other sectors of the economy. As a result, banks' reaction to monetary and economic shocks is a substantial challenge for every banking system, as bank interests face obstacles during shocks, which may have severe repercussions in other areas.

Recent research (Dang, 2021) examined the effects of asymmetric monetary policies on liquidity production by Vietnamese commercial banks. They used the GMM approach, gathered data from 30 Vietnamese commercial banks from 2008 to 2018, and specified variables such as monetary policies regarding size, investment, and liquidity. The results indicated that Vietnam's monetary policies were not adequately enforced, which led to a decline in the performance of commercial banks and an increase in the country's liquidity.

By analyzing the effects of monetary policies on the performances of Vietnamese commercial banks, (Huan, 2021) explained the structure of markets and the government's ownership. From 1999 to 2017, the researchers utilized data from 25 commercial banks. Using the GMM approach, Nguyen et al. discovered that monetary policies had a significant impact on the market structure of Vietnamese commercial banks, with the expected results being a reduction in interbank rates on lending growth in commercial banks.

A study (Fang et al., 2019) analyzed the asymmetric impacts of monetary policy on the size of Chinese businesses. They gathered seasonal information from 2011 to 2016. The quantile regression results demonstrated that commercial banks gained influence when they were permitted to set interest rates. It was also shown that larger firms responded more strongly to changes in monetary policies than smaller firms.

Also, (Sahin et al., 2019) examined the Asymmetric effects of central bank funding on commercial banking sector behavior using the NARDL Model; empirical evidence demonstrates that for all types of lending, an increase in CBF (which is more expensive for commercial banks than alternatives) forces commercial banks to borrow from higher-cost channels. And the results reveal that if the central bank of Turkey raises the cost of borrowing for commercial banks' short-term loans and consequently reduces all types of lending, a lower funding price is related to an increase in lending. When examining the asymmetric impacts of CBF on lending decisions, no evidence of asymmetry regarding commercial lending was observed.

In addition, (Borio et al., 2017) examine the impacts of monetary policy on the return on assets, interest rate revenue, and loss provisions using a sample of 109 big international banks between 1995 and 2012. They discover that the beneficial impact on interest income outweighs the negative impact on loss provisions and other income. From 1970

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to 2006, (Ekpung et al., 2015) analyzed the effect of monetary policy on the performance of the banking industry.

From 1992 to 1999, (Akanbi et al., 2012) investigated the impact of monetary policy on three commercial banks (i.e., the first-generation banks) in the Nigerian financial system. The results demonstrated that an increase in the interest rate would result in a fall in the lending rate. In contrast, the liquidity and cash ratios had a statistically significant impact on the profitability of the selected banks, confirming the authors' hypothesis and taking a closer look at bank credits.

Ajayi et al. (2012) demonstrated that monetary policy is ineffective in stimulating bank credit over the long term. The bank rate, inflation rate, and exchange rate are positively correlated with bank credit, whereas the liquidity ratio and cash reserves ratio negatively correlate with total bank credit. The study was conducted between 1978 and 2008 using the two-step co-integration method developed by Engle and Granger. Khosravi et al. (2010) examined the effect of monetary and fiscal policy on economic development in Iran between 1960 and 2006 using an autoregressive distributed approach to co-integration. The empirical findings demonstrated the presence of a link between economic growth, monetary policy, and fiscal policy over the long term. In addition, the data shows that exchange rate and inflation, as surrogates for monetary policy, harm economic growth. (Hülsewig et al., 2009) examined the function of banks in the transmission of monetary policies via the expenditure channel using DSGE models. According to this study, financial expenses were the most influential factor in pricing changes. In addition, the data demonstrated that loan market degradation had little effect on the growth of monetary policy shocks. The researchers determined that the central bank's cost channel power, essential for transmitting monetary policies by low-interest rates, was weakening.

Brissimis et al. (2009) examined the effects of monetary policies on the performance of banks using the three variables of bank size, investment, and liquidity. The survey sampled six banks from France, Germany, Greece, Japan, the United States, and the United Kingdom. Researchers utilized panel data from selected banks. The results suggested that banks with more significant investment, liquidity, and size were more effective in mitigating the adverse impacts of monetary policies on lending capacity. Hülsewig et al. (2006) studied the transmission of monetary policy on German bank lending using the VAR method. The findings indicated that monetary policy significantly impacted bank lending through the credit channel. Fiorentini et al. (2001) explored the monetary policy transmission mechanism in Italy via the credit channel. The results demonstrated the importance of the credit channel in supplying the economy. On the other hand, the analysis revealed that the monetary policy transmission mechanism was neither convenient nor predictable, nor controllable for political aims. In addition, the study showed that the structure and interrelationships of banks and their features influenced the determination of the monetary policy transmission mechanism.

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The empirical research stresses asymmetries using various models, including simultaneous equations, VAR and GMM models, NARDL models, and Markov switching models. Some empirical evidence supports those mentioned above Keynesian, New Keynesian, and Classical theoretical theories. Numerous methods are presented in the literature for examining the effects of monetary policy on banks' lending channels, but none are perfect. This work contributes to the body of knowledge in multiple ways. First, using NARDL, we evaluate the asymmetric influence of monetary policy on banks' loans using empirical evidence. Second, this study will attempt to address a vacuum in the literature and provide empirical results for the case of Iraq. In addition, this study's proposed subject has never been investigated in Iraq.

## 3. DATA AND METHODOLOGY

### 3.1 Data

The paper explores the uneven impact of monetary policy on commercial banks' credit in Iraq, using monthly data from January 2005 to January 2019. The study relied on official sources, and data were gathered from the Central Bank of Iraq (CBI). The analysis utilized the following monetary policy indicators: (1) central bank interest rate, (2) cash reserve requirement, and (3) broad money supply (M2). While measuring the banking industry's performance, we utilize (1) commercial bank loans to the private sector (BC). In addition, the analysis employs several control variables: (1) Inflation, (2) the stock return market, and (3) a dummy variable is introduced to the model to account for the possibility that the ISIS period may influence the effect of monetary policy on banking performance.

## 4. METHODOLOGY

To capture the asymmetric effect of monetary policy on banks' performance, we employ (Shin et al., 2011) NARDL approach. This model allows us to assess the short- and long-run responses of banks' performance to monetary policy. The econometric model is given as:

$$BC_t = \beta 0 + \beta 1\ MP_t + \beta 2 Inf_t + \beta 3\ SR_t + DU + \mu \quad (1)$$

Where;

BC = Bank Credit
MP = Monetary policy indicators
Inf = Inflation
SR = Stock return
DU = Dummy variable of crisis
β0 = Constant Coefficient
μ = Error term

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The method also allows us to gather inferences regardless of the variables' integration orders. The technique decomposes monetary policy into its positive and negative:

$$\mathrm{BC}^{+} = \sum_{i=1}^{t} \Delta \mathrm{BC}_{i}^{+} = \sum_{i=1}^{t} \mathrm{Max}\,(\Delta \mathrm{BC}i, 0) \tag{2}$$

$$\mathrm{BC}^{-} = \sum_{i=1}^{t} \Delta \mathrm{BC}_{i}^{-} = \sum_{i=1}^{t} \mathrm{Min}\,(\Delta \mathrm{BC}i, 0) \tag{3}$$

The asymmetric long-run relationship without a constant term can be represented as:

$$BC_t = B_1^{+}\,\mathrm{MP}_t^{+} + B_1^{-}\mathrm{MP}_t^{-} + B_2 Inf_t + B_3 SR_t + u_t \tag{4}$$

Where, bank credit ($BC_t$) and MP are scalar I(1) variables. Granger et al. (2002) extend the model, where co-integration may exist for their positive and negative components. Schorderet (2003) generates the above specification for asymmetric co-integration such that there may be a stationary variable$Z_t$, which may be written as:

$$Z_t = B_0^{+} BC_t^{+} + B_0^{-} BC_t^{-} + B_1^{+}\mathrm{MP}_t^{+} + B_1^{-}\mathrm{MP}_t^{-} + B_2 Inf_t + B_3 SR_t \tag{5}$$

Where $BP_t$and $MP_t$are asymptotically cointegrated. If $B_0^{+}$= $B_0^{-}$ and $B_1^{+}$=$B_1^{-}$ , then the system reduces to (symmetric) co-integration. Following Shin et al. (2011), we extend the Linear ECM to a general NARDL-ECM as follows:

$$\Delta BC_t = \propto_0 + \rho \mathrm{BC}_{t-1} + \theta^{+}\mathrm{MP}_{t-1}^{+} + \theta^{-}\mathrm{MP}_{t-1}^{-} \sum_{j=1}^{p-1} y_{j\,\Delta BC_{t-j}} + \sum_{j=0}^{q-1}(\varphi_j^{+}\,\Delta \mathrm{MP}_{t-j}^{+} + \varphi_j^{-}\Delta \mathrm{MP}_{t-j}^{-}) + \sum_{j=0}^{q-1}(\varphi_j\,\Delta Inf_t) + \sum_{j=0}^{q-1}(\varphi_j\,\Delta SR_t) + DU + \varepsilon t \tag{6}$$

$$\Delta BC_t = \propto_0 + \rho\zeta_{t-1} + \sum_{j=1}^{p-1} y_{j\,\Delta BC_{t-j}} + \sum_{j=0}^{q-1}(\varphi_j^{+}\,\Delta \mathrm{MP}_{t-j}^{+} + \varphi_j^{-}\Delta \mathrm{MP}_{t-j}^{-}) + \sum_{j=0}^{q-1}(\varphi_j\,\Delta Inf_t) + \sum_{j=0}^{q-1}(\varphi_j\,\Delta SR_t) + DU + \varepsilon t \tag{7}$$

Where $\zeta_{t-1} = \beta C_t - \beta^{-}\mathrm{MP}_t^{-};\ \beta^{+} = -\theta^{+}/\rho : and \beta^{-} = -\theta^{-}/\rho$

This is the basic model that we will be estimated for the main inference of this study adapted from (Sahin et al., 2019). The lag orders (p and q) are determined by following the internal general-to-specific approach within the stepwise regression method, where the non-significant coefficients are dropped. To test for the existence of an asymmetric long-run relationship (co-integration), we benefit from the model based on the NARDL-ECM approach described above. In this study, we employ the NARDL-ECM methodology rather than a value at risk (VaR) methodology, using impulse response functions gathered from VaR for inferences requires the assumption that shocks to

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monetary policy rate capture monetary policy stance. One of the aims of this study is to analyze how increases and decreases in monetary policy indicators affect banks' performance. To capture that effect, we calculate the dynamic asymmetric (or non-linear) multipliers see, (Delatte et al., 2012; Shin et al., 2011; Van Hoang et al., 2016) for the details of the methodology. The multipliers are captured by:

$$m_h^+ = \sum_{j=0}^{h} \frac{\partial BC_{t+j}}{\partial \mathrm{MP}_t^+} \; and \; m_h^- = \sum_{j=0}^{h} \frac{\partial BC_{t+j}}{\partial \mathrm{MP}_t^-} \text{, Where h= 0, 1, 2, 3} \quad (8)$$

The multipliers given in equation (8) converge to the long-run coefficients calculated by $-\theta^+/\rho : and \beta^- = -\theta^-/\rho$.

## 5. RESULTS

Using three distinct estimating models, the asymmetric effects of monetary policies on the bank lending channels of Iraqi commercial banks are explored. To achieve this objective, the NARDL method is utilized to study the asymmetric effects of monetary policy and control factors on banks' loans.

### 5.1 Unit Root Tests

This study used stationary tests (ADF and KPSS) to determine if the co-integration degree is less than two. The primary purpose of these stationary tests is to determine whether the co-integration value of the analyzed variables is more significant than one. This is because if the variables have order integration of two or more, the observed F statistics (Pesaran et al., 2001) for assessing the long-term relationship cannot be relied upon (Ang, 2007).

Table 1. displays the outcomes of the ADF and KPSS examinations. According to the table, only the Stock Return (SR) variable was stationary; the others only became stationary when they were also stationary with the initial difference. In other words, the variables are cointegrated of order I(1), but none are cointegrated of order I. (2). Consequently, the regression results are trustworthy. Given that the researched variables are a combination of I(0) and I(1) orders, the NARDL method could be highly productive.

### 5.2 Effect of Asymmetric Monetary Policies on Bank Credit

In this section, we examine the effect of positive and negative monetary policies (MP), which includes IR, BR, and M2, on Bank Credit (BC). To this goal, equation 5-4 is re-written as follows:

**Table 1: ADF and KPSS Unit Root Tests**

| | ADF | | KPSS | | Stationary or non-stationary |
|---|---|---|---|---|---|
| | c | ct | c | ct | |

| | | | | | |
|---|---|---|---|---|---|
| BC | -4.90*** | -1.10 | 1.55 | 0.43 | non-stationary |
| IR_POS | -2.67* | -2.47 | 0.46* | 0.18* | non-stationary |
| IR_NEG | -2.31 | -1.06 | 1.21 | 0.31 | non-stationary |
| RR_POS | -3.74*** | -2.85 | 0.87 | 0.17* | non-stationary |
| RR_NEG | -1.39 | -1.64 | 1.60 | 0.31 | non-stationary |
| M2_POS | -2.51 | -3.43** | 1.72 | 0.26 | non-stationary |
| M2_NEG | -1.16 | -4.54*** | 1.71 | 0.22 | non-stationary |
| SR | -13.84*** | -13.80*** | 0.05*** | 0.05*** | Stationary |
| Inf | -1.56 | -1.80 | 0.90 | 0.23 | non-stationary |
| Statistics (1st difference) | | | | | |
| DBC | -8.79*** | -15.80*** | 0.13*** | 0.05*** | Stationary |
| DIR_POS | -13.49*** | -14.20*** | 0.37** | 0.12** | Stationary |
| DIR_NEG | -6.76*** | -10.77*** | 0.37** | 0.08*** | Stationary |
| DRR_POS | -12.89 | -13.41*** | 0.09*** | 0.08*** | Stationary |
| DRR_NEG | -14.03*** | -14.07*** | 0.18*** | 0.05*** | Stationary |
| DM2_POS | -5.27*** | -5.58*** | 0.14*** | 0.03*** | Stationary |
| DM2_NEG | -14.15*** | -14.51*** | 0.16*** | 0.05*** | Stationary |
| DInf | -3.83*** | -4.68*** | 0.20*** | 0.10*** | Stationary |

***denotes a significant level at 1%.
**denotes a significant level at 5%.
*denotes a significant level at 10%.
**Source**: Estimated by Authors.

$$\Delta BC_t = \propto_0 + \rho \mathrm{BC}_{t-1} + \theta^{+}\mathrm{MP}^{+}_{t-1} + \theta^{-}\mathrm{MP}^{-}_{t-1} \sum_{j=1}^{p-1} y_{j\,\Delta BC_{t-j}} + \sum_{j=0}^{q-1}(\varphi_j^{+}\,\Delta \mathrm{MP}^{+}_{t-j} + \varphi_j^{-}\Delta \mathrm{MP}^{-}_{t-j}) + \sum_{j=0}^{q-1}(\varphi_j\,\Delta Inf_t) + \sum_{j=0}^{q-1}(\varphi_j\,\Delta SR_t) + DU + \varepsilon_t \quad (9)$$

The various states of NARDL were evaluated. Table 2 represents the results of the optimized and evaluated state out of different states.

**Table 2: NARDL Results (Dependent Variable: BC)**

| Variables | Coefficient | Std. Error | T-statistic | Prob |
|---|---|---|---|---|
| BC(-1) | 0.961233 | 0.015047 | 63.88036 | 0.0000 |
| IR_NEG | 0.015856 | 0.011688 | 1.356633 | 0.1770 |

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| | | | | |
|---|---|---|---|---|
| IR_NEG(-1) | 0.008634 | 0.014972 | 0.576648 | 0.5651 |
| IR_NEG(-2) | -0.025045 | 0.012685 | -1.974347 | 0.0502 |
| IR_NEG(-3) | -0.017799 | 0.012005 | -1.482643 | 0.1403 |
| IR_NEG(-4) | 0.026129 | 0.007974 | 3.276659 | 0.0013 |
| IR_POS | -0.019750 | 0.007378 | -2.677006 | 0.0083 |
| IR_POS(-1) | 0.016999 | 0.008202 | 2.072470 | 0.0400 |
| IR_POS(-2) | 0.011973 | 0.008213 | 1.457850 | 0.1470 |
| IR_POS(-3) | -0.011786 | 0.006781 | -1.738135 | 0.0843 |
| RR_NEG | 0.043501 | 0.052948 | 0.821580 | 0.4127 |
| RR_NEG(-1) | -0.112230 | 0.051472 | -2.180385 | 0.0308 |
| RR_POS | 0.058329 | 0.027184 | 2.145684 | 0.0336 |
| M2_NEG | -0.003582 | 0.003963 | -0.903755 | 0.3676 |
| M2_POS | -0.013372 | 0.004723 | -2.831552 | 0.0053 |
| INF | 0.001791 | 0.000715 | 2.502799 | 0.0134 |
| INF(-1) | -0.002420 | 0.000854 | -2.835633 | 0.0052 |
| INF(-2) | -0.000260 | 0.000817 | -0.318471 | 0.7506 |
| INF(-3) | 0.001465 | 0.000871 | 1.682698 | 0.0946 |
| INF(-4) | 0.001064 | 0.000805 | 1.321739 | 0.1883 |
| INF(-5) | -0.002016 | 0.000706 | -2.857951 | 0.0049 |
| SR | 0.000214 | 0.000130 | 1.646812 | 0.1018 |
| SR(-1) | -9.21E-05 | 0.000131 | -0.700987 | 0.4844 |
| SR(-2) | -0.000114 | 0.000132 | -0.866675 | 0.3876 |
| SR(-3) | 0.000282 | 0.000150 | 1.875612 | 0.0627 |
| SR(-4) | 0.000165 | 0.000147 | 1.121473 | 0.2639 |
| SR(-5) | -0.000296 | 0.000145 | -2.037379 | 0.0434 |
| DU | 0.007068 | 0.009484 | 0.745336 | 0.4573 |
| C | 0.595451 | 0.200294 | 2.972891 | 0.0035 |

**Source**: Research Results

The AIC has examined a maximum of five optimal delays in this estimation. The optimal lags for each variable are as follows: the dependent variable of BC has one lag, while the positive and negative shocks of IR have three and four lags, respectively. Table 2 shows positive RR shocks have no lags, whereas adverse RR shocks have one optimal lag. The ideal delay for the variables Inflation and SR are five. In the estimating model described previously, the BC lag positively affects itself.

Furthermore, the aggregate of positive and negative interest rate shocks has a direct effect on BC. In other words, when an interest rate shock occurs, banks' internal credit increases. To protect the value of their assets, customers are encouraged to deposit funds in banks as their credit is increased. In addition, the positive shocks of RR have a direct influence, while the adverse shocks have an inverse effect on BC, as predicted by theory.

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Regarding the monetary supply component, only positive shocks have a negative and substantial influence on BC, while adverse shocks have no significant effect. Thus, when the monetary supply increases, the inflation rate will quicken, and depositors will be more likely to place their funds in banks. In addition, the total inflation coefficients and stock returns influence the BC adversely and positively, respectively. Finally, there is no significant effect of the dummy variable on BC. Therefore, the monetary policies in Iraq have asymmetric effects on the BC process. In this context, a study (Ajayi et al., 2012) demonstrated that monetary policy is ineffectual in increasing bank credit in the long run, as the inflation rate positively correlates with bank credit. Still, the cash reserves ratio is negatively correlated with total bank credit.

The co-integration test (Pesaran et al., 2001) is used to investigate the long-term relationship between the model's variables. Table 3, which presents the test's critical values, shows that the resultant F value exceeds the upper bound I (1) at all levels. Consequently, the data confirm a long-term link between all model variables.

**Table 3: F-Bound Test (Dependent Variable: BC)**

| **F-statistic value** | **6.47** | |
|---|---|---|
| Signif. | I(0) | I(1) |
| 10% | 1.8 | 2.8 |
| 5% | 2.04 | 2.08 |
| 2.5% | 2.24 | 3.35 |
| 1% | 2.5 | 3.68 |

**Source**: Research Results

The long-term coefficients of the model are estimated as the long-term relationship between the model's variables is determined. The results of this estimation are illustrated in Table 4.

According to Table 4, the long-term effects of interest rate shocks will be negligible. The long-term effects of RR shocks on BC are asymmetric, with positive RR shocks increasing BC and negative RR shocks diminishing BC. The money supply shocks harm the BC, but only the positive money supply shocks are statistically significant. Following theoretical estimates, the inflation rate has a 10% direct impact on BC. Similar to short-term results, the return stock and inflation have little long-term significance, and the dummy variable has no significant effect on BC. Similar to the short-term results, we may assume that monetary policies have asymmetric effects on BC.

**Table 4: Long-run Estimation Result (Dependent Variable: BC)**

| **Variables** | **Coefficient** | **Std. Error** | **T-statistic** | **Prob** |
|---|---|---|---|---|
| IR_NEG | 0.200554 | 0.161004 | 1.245646 | 0.2149 |
| IR_POS | -0.066154 | 0.077464 | -0.854005 | 0.3945 |

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| | | | | |
|---|---|---|---|---|
| RR_NEG | -1.772875 | 1.016755 | -1.743660 | 0.0833 |
| RR_POS | 1.504610 | 0.637758 | 2.359217 | 0.0196 |
| M2_NEG | -0.092397 | 0.113656 | -0.812948 | 0.4176 |
| M2_POS | -0.344939 | 0.177915 | -1.938781 | 0.0545 |
| INF | -0.009730 | 0.021673 | -0.448948 | 0.6541 |
| SR | 0.004102 | 0.009201 | 0.445801 | 0.6564 |
| DU | 0.182332 | 0.223409 | 0.816137 | 0.4158 |

**Source**: Research Results

As it has been determined that there is a long-term relationship between the model variables, the Error Correction Model (EMC) is employed. This model ties the short-term changes of the model's variables to their long-term equilibrium values. According to Table 5's data, the ECM coefficient model is negative, indicating that the current short-term imbalance will be corrected in the long run. In this estimation, the error correction coefficient is -0.03, meaning that 3% of the error model is corrected in a short time and that the short-term model converges to the long-term model. Conventionally, In the short run, the positive shocks of IR have a significant and negative effect on bank credit, meaning that an increase in IR will reduce bank credit. This result is consistent with economic theory, which states that banks must increase their lending rates when the central bank policy is tightened through a decrease in Interest rates.

Consequently, the cost of borrowing rises and, in most cases, becomes expensive, limiting the demand for credit (Amidu et al., 2006). Moreover, reserve requirement (RR) has no appreciable impact on bank credit. (Modigliani, 1986) contends that banks confront a shortage of financial resources when their legal reserves increase and that banks unable to replenish these resources will reduce their loan supply. Lastly, inflation is beneficial for BC. In this context, Ajayi et al. (2012) found a correlation between inflation rate and bank credits.

The Wald test is then used to determine whether the effects of negative and positive shocks on BC are symmetric or asymmetric. Table 6 displays the outcomes of this test. Accordingly, the impacts of harmful and favorable monetary policies (IR, RR, and M2) shocks on BC are not equal and asymmetric at the 10% error level, which is consistent with the findings of (Sahin et al., 2019) when revealed the asymmetric effect of monetary policy on banks' credit channels.

**Table 5: Short-run Results (Dependent Variable: BC)**

| Variables | Coefficient | Std. Error | T-statistic | Prob |
|---|---|---|---|---|
| D(IR_NEG) | 0.015856 | 0.009910 | 1.599981 | 0.1118 |
| D(IR_NEG(-1)) | 0.016715 | 0.008116 | 2.059409 | 0.0412 |
| D(IR_NEG(-2)) | -0.008330 | 0.007893 | -1.055284 | 0.2931 |
| D(IR_NEG(-3)) | -0.026129 | 0.007199 | -3.629424 | 0.0004 |

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| | | | | |
|---|---|---|---|---|
| D(IR_POS) | -0.019750 | 0.005788 | -3.412119 | 0.0008 |
| D(IR_POS(-1)) | -0.000187 | 0.005495 | -0.033963 | 0.9730 |
| D(IR_POS(-2)) | 0.011786 | 0.005724 | 2.059108 | 0.0413 |
| D(RR_NEG) | 0.043501 | 0.045416 | 0.957819 | 0.3397 |
| D(INF) | 0.001791 | 0.000588 | 3.043737 | 0.0028 |
| D(INF(-1)) | -0.000252 | 0.000618 | -0.408667 | 0.6834 |
| D(INF(-2)) | -0.000513 | 0.000655 | -0.782700 | 0.4351 |
| D(INF(-3)) | 0.000953 | 0.000616 | 1.545783 | 0.1243 |
| D(INF(-4)) | 0.002016 | 0.000568 | 3.550315 | 0.0005 |
| D(SR) | 0.000214 | 0.000115 | 1.861554 | 0.0647 |
| D(SR(-1)) | -3.67E-05 | 0.000155 | -0.237732 | 0.8124 |
| D(SR(-2)) | -0.000151 | 0.000165 | -0.914343 | 0.3621 |
| D(SR(-3)) | 0.000131 | 0.000161 | 0.816180 | 0.4157 |
| D(SR(-4)) | 0.000296 | 0.000123 | 2.399111 | 0.0177 |
| CointEq(-1) | -0.038767 | 0.004442 | -8.727806 | 0.0000 |

**Source**: Research Results

**Table 6: Asymmetric Test Results (Dependent Variable: BC)**

| Variables | F-Statistics | Prob |
|---|---|---|
| IR | 3.579767 | 0.0605 |
| RR | 7.853821 | 0.0058 |
| M2 | 7.325260 | 0.0076 |

**Source**: Research Results

Moreover, to test the nonlinearity of the long-run model for the BC dependent variable, its null hypothesis is:

$$H_0 = \frac{\beta^+}{\rho} = \frac{\beta^-}{\rho} \quad (10)$$

If this hypothesis is rejected, there is no symmetric long-term relationship. Table 7 indicates the results of this test in which it is shown that the values of T, F, and Chi-square are significant at the level of 5 percent. Hence, the null hypothesis is rejected and shows an asymmetrical relationship between the shocks of monetary policies and BC in Iraq.

**Table 7: Wald Test (Dependent Variable: BC)**

| Statistics | Value | Prob |
|---|---|---|
| T | -2.739599 | 0.0069 |
| F | 7.505400 | 0.0069 |
| $\chi^2$ | 7.505400 | 0.0062 |

**Source**: Research Results

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The diagnostic tests are used to check the correctness of the estimated model. Table 8 shows the results of these tests.

**Table 8: Results of Diagnostic Tests for a Suitable Model (Dependent Variable: BC)**

| $R^2$ | F-statistic | Prob(F) | D.W | ARCH-test | LM-test |
|---|---|---|---|---|---|
| 0.99 | 4627 | 0.0000 | 2.42 | 1.16 (0.28) | 0.34 (0.55) |

Digits in the parenthesis indicate the probability value of the tests
**Source**: Research Results

According to Table 8, the coefficient of model determination indicates that the independent variables explain the dependent variable by an average of 99.9%, and the F values suggest that the estimated regression is meaningful. Moreover, based on the results of DW, the ARCH test, and the LM-test, the estimated model is neither heteroskedastic nor serially correlated. Next, we explore the test for the stability coefficient utilized to determine the short- and long-term stability coefficients in ECM.

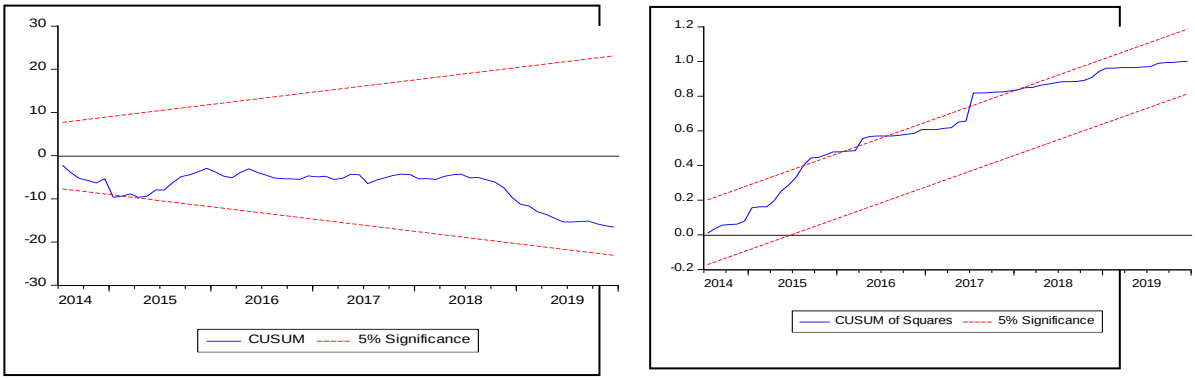


**Figure 1:** CUSUM and CUSUMQ test for dependent variable model: BC

## 6. CONCLUSION

This study's primary objective is to evaluate the asymmetric impacts of monetary policies on the credit channel of commercial banks in Iraq. Non-linear ARDL was used to evaluate the asymmetric short- and long-run relationships between the variables. The findings of testing the stationary state of the variables revealed that they are all Co-integrated in first order I. (1). This study employed Bank Credit (BC) as a bank lending channel to test the link mentioned above. Policy Interest Rates (IR), Cash Reserve Requirement (RR), and Broad Money Supply (M2) were employed to study the effects of monetary policy. The NARDL estimates demonstrated the uneven impact of Iraq's monetary policy on banks credit. In addition, the findings of the Bound and Wald tests supported the asymmetric nature of the variables in the long- and short-term. Consequently, model estimate indicated that IR, RR, and M2, as parameters of monetary policies, can expound on the significant performance of commercial banks in Iraq.

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This study shows that the NARDL approach to analyzing the effects of monetary policies on commercial banks' credit provides more accurate results than symmetric models such as ARDL. Since positive and negative monetary policy shocks have varied effects on banks' credit, it is suggested that symmetric ARDL cannot give comprehensive information. Consequently, employing a more suitable method, such as NARDL models, which provide more comprehensive data for formulating sound monetary and banking policies, could improve both the financial sector and economic growth. In addition, the monetary authorities, specifically the central bank of Iraq, must exert strict control over the bank behaviors and the asymmetric effects of the variables. The asymmetric repercussions cause policymakers and stakeholders to exercise caution when making choices or implementing monetary policy. Therefore, it is suggested that Iraqi officials pay special attention to the statistical data and financial listings in the Iraqi banking system to maintain the economic stability of Iraq's financial markets in light of the country's economic situation.

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