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Mustafa Muhammed Obaid
Assistant Lecturer, College of Administration and Economics, University of Fallujah, Fallujah, Iraq

Dr. Khaled Rokan Awad
Professor, College of Administration and Economics, University of Fallujah, Fallujah, Iraq

Corresponding Author:
Mustafa Muhammed Obaid
Assistant Lecturer, College of Administration and Economics, University of Fallujah, Fallujah, Iraq

Analyzing and measuring the effectiveness of quantitative monetary policy tools on the money supply in Iraq for the period (2004-2023)

Mustafa Muhammed Obaid and Khaled Rokan Awad

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Abstract
This research aims to analyze and measure the effectiveness of quantitative monetary policy tools on the money supply in Iraq over the period (2004-2023). This is done by examining the impact of various monetary tools, such as the interest rate, legal reserve, and open market operations, on the money supply. The importance of this research stems from the pivotal role of monetary policy in stabilizing economic growth and achieving growth, particularly in light of the challenges facing the Iraqi economy due to fluctuations in oil revenues and the general financial situation. The research relied on the Autoregressive Distributed Lag (ARDL) model and cointegration tests to measure the relationship between monetary policy tools and the money supply in the short and long term. The research concluded that some quantitative tools of monetary policy, including (the legal reserve ratio and the discount rate), are effective tools, and contribute to controlling monetary stability within the country and controlling the local exchange rate against foreign currencies. The research recommended the necessity of diversifying monetary policy tools by the Central Bank of Iraq, and reactivating tools that are no longer used, while granting the bank more independence, as well as integrating fiscal and monetary policies and developing the financial market and the banking system, with a focus on monetary tools with a short-term impact in dealing with crises that occur in the real market, so that the response to these measures is rapid, in addition to spreading banking awareness among the public to ensure achieving economic stability.

Keywords: Monetary policy tools, money supply, Iraqi economy

Introduction
Monetary policy is one of the main tools used by the monetary authority to achieve economic stability. It contributes to controlling inflation levels, stimulating economic growth, and reducing unemployment rates. The importance of monetary policy lies in its crucial role in managing the money supply and controlling interest and credit rates, which directly impact economic activity. In Iraq, the Central Bank is responsible for implementing monetary policy through multiple tools, such as the rediscount rate, legal reserve requirements, open market operations, and deposit and lending facilities. Given the economic transformations that Iraq has witnessed since 2004, including oil price fluctuations and financial challenges, there is a need to study the impact of monetary policy tools on the money supply to determine their effectiveness in achieving economic stability.

The importance of research
The importance of the research stems from the pivotal role monetary policy plays in guiding the national economy and ensuring its stability. The importance of the research lies in analyzing the impact of monetary policy tools on the money supply in Iraq during the period (2004-2023), evaluating the effectiveness of various monetary tools in achieving monetary policy objectives, and providing recommendations to enhance the role of monetary policy in controlling the money supply to achieve economic stability.

Research problem: The research problem revolves around the effectiveness of monetary policy tools in controlling the money supply in Iraq during the period (2004-2023).

Despite the Central Bank's use of a range of monetary tools, changes in the money supply and the macroeconomy have shown that the relationship between monetary tools and the money supply does not always proceed in accordance with traditional economic theories. Therefore, it is necessary to measure this relationship and determine the extent of the impact of these tools on the money supply.

Research hypotheses

The research is based on a main hypothesis: the monetary policy tools used in Iraq during the period (2004-2023) have varying impacts on the money supply, and that some of these tools may not achieve the desired effect according to traditional economic theories. The sub-hypotheses are as follows:

1. There is a statistically significant relationship between the discount rate and the money supply in Iraq.
2. Open market operations directly affect the size of the money supply.
3. Legal reserves play a role in controlling the money supply.

Research objectives

This research aims to achieve a set of objectives that contribute to understanding and analyzing the relationship between monetary policy tools and the money supply in Iraq during the period (2004-2023). This is achieved by:

1. Analyzing the relationship between monetary policy tools and the money supply in Iraq, and determining the extent of their impact on the money supply.
2. Measuring the effectiveness of the monetary tools used by the Central Bank of Iraq, such as the interest rate, legal reserves, open market operations, and deposit and lending facilities, in controlling the money supply.
3. Providing recommendations to monetary policymakers on how to improve the efficiency of monetary tools to achieve money supply stability and promote economic growth in Iraq.

Research structure

The research was divided into three sections preceded by an introduction. The first section dealt with studying monetary policy tools and the money supply in the Iraqi economy, while the second section dealt with an analysis of the relationship between monetary policy tools and the money supply (M2) in Iraq during the research period. The third section focused on measuring the effectiveness of monetary policy tools in controlling the money supply in Iraq during the research period.

The first section studies the tools of monetary policy and the money supply in the Iraqi economy

First requirement: Monetary policy

The primary objective of monetary policy is to regulate the amount of money circulating in the economy by the central bank to ensure that the needs of consumers are met. It seeks to achieve a balance between money supply and demand. Any imbalance in this balance will negatively impact economic stability. Therefore, monetary policy aims to control the money supply to achieve specific goals, such as reducing inflation or stimulating economic growth (Al-Fatlawi, 2019: 40) [3].

First: The Monetary Policy Concept

Many economists believe in the need to define a specific concept of monetary policy that researchers can adopt, discuss, and comment on. However, the social norm indicates that the social sciences are theoretical sciences whose concepts vary from time to time and depending on circumstances. In other words, there is no specific definition for every phenomenon.

Monetary policy is defined as: "A set of measures, tools, and policies implemented by the monetary authority in managing the monetary system to control the money supply in order to achieve economic objectives related to influencing aggregate output and prices" (Al-Afandy, 2018: 481) [1].

Second: Monetary Policy Objectives

The monetary authority seeks, through monetary policy, to achieve a set of objectives, including the following: (Sayyid Ali and Al-Essa, 2004: 457) [11].

Achieving balance and stability in the general price level: Achieving balance and stability in the monetary system will positively impact the general price level, as it plays a crucial role in achieving economic development. An increase in the money supply will lead to a rise in the general price level and, consequently, inflation, as a result of the direct relationship between the quantity of money and the general price level. This leads to an imbalance in the structure of production, demand for goods and services, and income distribution, and a significant decline in individual savings, along with other negative effects on the labor force and investment. Therefore, governments seek to address this problem through monetary policy using its various tools to address inflation and mitigate its effects. (Al-Sariti *et al.*, 2019: 20) [9].

Achieving a high level of employment: Most economists agree that increasing employment is a fundamental goal of monetary policy. This concept extends beyond labor to encompass other economic resources, as employment represents both the goal and the means to achieving economic development. (Al-Hamidi and Al-Khalaf, 1996: 177) [5].

Addressing the imbalance in the balance of payments

Monetary policy aims to achieve balance in the balance of payments and address any imbalance that may occur, whether a surplus or a deficit. This is achieved by controlling interest rates. In the event of a deficit, the central bank can intervene by raising the rediscount rate, which prompts commercial banks to increase interest rates on loans, leading to a reduction in credit volume and a decrease in domestic demand for goods and services, including imported goods. Furthermore, higher domestic interest rates encourage the inflow of foreign capital, which contributes to mitigating the deficit in the balance of payments. Conversely, in the event of a surplus, the issue can be addressed by lowering interest rates to stimulate domestic demand and reduce the surplus. (Al-Qatabari, 2011: 23) [7].

Working to develop financial and banking institutions i.e., developing the financial and monetary markets in which these institutions operate, as the success of monetary policy

in this regard requires the availability of banking awareness among individuals involved in the economy, in addition to the presence of a developed banking system, which leads to the development of the national economy (Al-Sayegh, 2018: 41) [10].

Third: Monetary Policy Instruments

The monetary authority exerts its influence on economic activity through monetary policy, the most important aspect of which is its influence on the amount of money circulating in the economy. The central bank uses a set of tools to manage monetary and credit affairs to achieve its objectives, as follows: (Siklos, 2010: 526) [16]:

Rediscount Rate

The rediscount rate, also known as the policy rate, is one of the oldest quantitative tools used by the central bank to influence the amount of credit provided by commercial banks to the money market. It represents the interest rate the central bank charges commercial banks for rediscounting commercial paper (treasury bills and bills) they offer, or for granting loans secured by securities previously discounted by commercial banks. Through the rediscount rate policy, the central bank seeks to influence the cost of obtaining the credit it provides, and consequently the cost of providing credit to their non-banking economic clients. In other words, the rediscount rate represents the interest paid by commercial banks to the central bank in exchange for borrowing funds to increase their reserves (Al-Fatlawi, 2019: 51) [3].

Open Market Operations

The central bank plays an important role in controlling the amount of money available in the economy by buying and selling government bonds in the financial and monetary markets. Open market operations are an effective tool of monetary policy. If the market is broad, organized, and advanced, it will lead to broad changes in the reserves available to commercial banks. If the central bank wants to pursue an expansionary monetary policy, it enters the market as a bond buyer, increasing the banks' cash reserves and thus expanding the monetary base. The opposite occurs in the case of a contractionary monetary policy (Jarrah *et al.*, 2019: 365) [14].

Legal Cash Reserve Ratio

This is a relatively new tool used by central banks. Recent legislation stipulates that every commercial bank is required to maintain a certain portion of its deposits in the form of cash at the central bank. This tool aims to ensure the liquidity of the central bank, protect the rights of depositors, and effectively influence the credit policy of commercial banks. (Alia, 2011: 23) [6].

The Second Requirement: Money Mass

First: The Concept of Money Mass

Money mass refers to "the quantity of money available at a given time, as determined by the monetary authority. In other words, it is the monetary quantity represented by all types of means of payment" (Belazouz, 2017: 49) [12]. Likewise, money mass refers to "the quantity of means of payment in society used to settle payments" (Kafi, 2015: 318) [15].

Second: Factors Determining the Money Supply

There are several factors determining the money supply, the most important of which can be represented as follows: (Al-Hajj, 2009: 221) [4].

1. **The general policy of the central bank:** This is based on the general policies of the government and aims to either expand or contract the money supply.
2. **The quantity of money in circulation:** This is the sum of the various means of payment available in a country over a given period of time, including coins, paper money, and bank deposits.
3. **The velocity of money circulation:** This is the average number of times a monetary unit is exchanged among members of society. It depends on several factors, including the distribution of daily, weekly, or monthly income, monetary transaction habits, and the general economic situation.

Third: Components of the Money Supply

The components of the money supply can be explained as follows: (Haddad and Hazlul, 2008: 89) [13].

Narrow Money Supply (M1): This includes the set of payment methods circulating in a society over a specific period of time. This concept was popularized by the traditional school of thought due to its emphasis on money's primary function as a medium of exchange. It includes obtainable current deposits and currency circulating among the public.

Broad Money Supply (M2): This term is known as private domestic liquidity. This concept is broader and more comprehensive than the previous one, as it includes, in addition to narrow money supply (M1), savings bank accounts (term accounts), which are less liquid financial assets than their predecessors. It is calculated as follows: (Al-Samhawi, 2012: 50) [8].

M1+ bank accounts + term bank accounts = M2… (1)

Broader Money Supply (M3): In addition to the broad money supply, the concept of money supply has been expanded to include new items, namely savings deposits at savings institutions (non-banks). This is known as the broader money supply and can be calculated as follows:

M2 + Savings deposits at savings institutions= M3… (2)

General Liquidity of the Economy (M4): The concept of general liquidity of the economy includes liquid financial assets of various types within the economy. It is defined as "the money supply in the broadest sense, plus the rest of the financial assets owned by non-banking economic units, such as securities and bonds representing loans, whether issued by the government or private enterprises, bonds issued by specialized investment companies and real estate banks, government deposits, savings bonds, and commercial papers" (Al-Dulaimi, 1990: 118) [2]. General liquidity of the economy is calculated as follows:

M3 + Financial assets owned by non-banking economic units, such as securities and bonds representing loans, whether issued by the government, private enterprises, or investment companies. Specialized = M4… (3)

It can be generally asserted that the money supply consists of paper money, auxiliary money (whether paper or metal)

issued by central banks, as well as electronic banking money or deposits issued by commercial banks. The latter represents the largest proportion of the money supply in circulation in modern financial systems (Belazouz, 2017: 49) [12].

Section Two: Analyzing the Relationship between Monetary Policy Instruments and Money Supply (M2) in Iraq for the Period (2004-2023)

Requirement One: Analyzing the Relationship between the Quantitative Instruments of Monetary Policy and Money Supply during the Research Period.

In order to understand the effectiveness of monetary policy instruments on money supply (M2), we will examine the reality of the relationship based on the data in Table (1), which illustrates the developments in the relationship between monetary policy instruments and money supply (M2) during the period (2004-2023).

Table 1: The effectiveness of quantitative monetary policy tools on money supply (M2) in Iraq during the period (2004-2023)

Years	open market operations	Legal reserve ratio%	Rediscount Rate%	Money supply (M2)
2004	16460	25	6.00	12254000
2005	21063	25	7.00	14684000
2006	29175	25	16.00	21080000
2007	42680	25	20.00	26956076
2008	71369	25	15.00	34919675
2009	56992	25	7.00	45437918
2010	77171	20	6.00	60386086
2011	90798	20	6.00	72177951
2012	105649	20	6.00	75466360
2013	117678	20	6.00	87679504
2014	101978	20	6.00	90727801
2015	76754	15	6.00	82595493
2016	59177	15	4.00	88081993
2017	82555	15	4.00	89441338
2018	99362	15	4.00	92105401
2019	109976	15	4.00	103104122
2020	74810	15	6.00	119906193
2021	92393	15	5.50	139900000
2022	83601	15	4.50	168291713
2023	87997	18	7.5	170464256

Source: Prepared by the researchers based on: a) Ministry of Planning, Central Statistical Agency, Population and Labor Force Statistics Directorate, various years. b) Central Bank, General Directorate of Statistics and Research, various years.

First: Analyzing the relationship between open market operations and money supply (M2)

Open market operations are one of the tools used by monetary authorities to control the amount of cash circulating at commercial banks and the general public, enabling them to influence the volume of credit extended by these banks to their customers. Monetary authorities intervene by selling or buying securities to influence the amount of cash reserves held by commercial banks, depending on the prevailing economic situation in the country. Therefore, central banks hold an appropriate amount of government bonds for this purpose. Open market operations are among the most effective tools in developed countries with well-developed financial and monetary markets (Al-Zamel *et al.*, 2001: 197).

Table (1) shows that open market operations witnessed an increase during the period (2004-2008), as they rose from (16,460) million dinars in 2004 to (71,369) million dinars in 2008. During the same period, the money supply increased from (12,254,000) million dinars in 2004 to (34,919,675) million dinars in 2008. Therefore, it can be said that open market operations contributed to increasing the money supply by pumping more liquidity into the economy through purchasing government bonds. This policy is often used to increase liquidity when there is a need to support economic activity. During the period (2009-2013), open market operations rose to their peak in 2013, reaching (56,992) million dinars. At the same time, the money supply also increased to reach (45,437,918) million dinars. Therefore, it appears that there is a strong positive relationship between the increase in open market operations and the increase in money supply during this period, as the Central Bank of Iraq was pumping large quantities. Liquidity through bond purchases aimed at supporting economic growth. During the period (2014-2020), this period witnessed fluctuations in open market operations, as they decreased from (101,978) million dinars in 2014 to (74,810) million dinars in 2020. However, the money supply continued to increase, as it rose from (90,727,801) million dinars in 2014 to (119,906,193) million dinars in 2020. Despite the decline in open market operations, the money supply continued to grow. This indicates that other factors, such as oil revenues and fiscal spending policies, played a major role in increasing the money supply, and that the full impact was not due to open market operations alone.

During the period (2021-2023), open market operations witnessed a slight increase to (87,997) million dinars in 2023, up from (92,393) million dinars in 2021. Meanwhile, the money supply continued its significant increase, reaching (170,464,256) million dinars in 2023, up from (139,900,000) million dinars in 2021.

From the above, it can be said that there is a positive relationship between open market operations and the money supply (M2) in Iraq, as increased open market operations contribute to an increase in the money supply by injecting more liquidity into the economy. However, the impact of open market operations is not the only or most important factor affecting the money supply, as there are external factors, such as government spending and oil revenues, which play a significant role in determining the level of liquidity in the economy.

Second: Analysis of the relationship between the legal reserve ratio and the money supply

From the data in Table (1), which illustrates the relationship between the legal reserve ratio and the money supply (M2), it is clear that the legal reserve was high during that period, reaching 25% in 2004, while the money supply (M2) reached 12,254,000 million dinars. The legal reserve declined to 20% in 2014. The reason for the decline was the decline in oil prices, which prompted the authorities to resort to monetary policy and reduce the legal reserve to confront the economic recession and increase the money supply. Meanwhile, the money supply (M2) witnessed an increase, reaching 60,386,086 million dinars in 2014. However, during the period (2015-2023), the money supply continued to decline, reaching 18% in 2023. The decline in the legal reserve ratio was a result of economic crises, especially the COVID-19 pandemic and its accompanying economic repercussions that cast a shadow over the economies of both developed and developing countries. Conversely, the money supply continued to decline. (M2) increased to reach (170,464,256) million dinars, which reflects the inverse relationship between the legal reserve ratio and the monetary mass (M2), which is consistent with the logic of economic theory.

Third: Analyzing the Relationship between the Rediscount Rate and the Money Supply

The relationship between the rediscount rate and the money supply (M2) can be illustrated by the data in Table (1), which shows that the rediscount rate, or policy rate, increased from 6% in 2004 to 15% in 2008 during the period (2004-2008), while the money supply also increased from 12,254,000 million dinars in 2004 to 34,919,675 million dinars in 2008. It can be argued that the Central Bank's raising of the rediscount rate was intended to force banks to reduce credit provided to individuals and economic units by affecting bank reserves, thus increasing the cost of borrowing as part of the contractionary policy. This reflects a direct relationship between the two, which is inconsistent with the logic of economic theory. However, during the period (2009-2023), the rediscount rate decreased from 6% in 2009 to 4% in 2023. When the money supply (M2) witnessed an increase from (45,437,918) million dinars in 2009 to (170,464,256) million dinars in 2023, the Central Bank reduced the rediscount rate in order to increase the supply of money supply and provide an opportunity for banks to expand their cash reserves as part of the expansionary policy, and thus the inverse relationship between the rediscount rate and the money supply (M2) can be observed, which is consistent with the logic of economic theory.

Section Three: Measuring the Effectiveness of Monetary Policy Tools in Controlling the Money Supply in the Iraqi Economy

First Section: Results of the Analysis of the Impact of Money Supply on the Inflation Rate in Iraq for the Period (2004-2023)

First: Characterizing the Econometric Model

The econometric model characterization phase represents one of the most fundamental and complex stages in constructing an economic model, as it requires precise identification of the economic variables used, based on economic theory and previous scientific studies. This phase aims to formulate the relationship between the independent and dependent variables within mathematical equations, which helps determine the nature and direction of the relationship between these variables. This approach is essential for constructing a standard model that demonstrates the impact of the money supply on the unemployment rate in Iraq. The standard specification process for the model used includes two main steps, as follows:

Identifying the economic variables included in the standard models: In order to explore the nature of the relationship between the dependent and explanatory variables addressed in the theoretical and analytical aspects, and in accordance with the logic of economic theory, the research variables were explained in the form of a table. This table included the independent variable (quantitative tools of monetary policy) as well as the dependent variable (monetary supply), as shown in Table (3):

Table 2: Functional description of the research variables, their type and symbols

Measuring and analyzing the effectiveness of monetary policy tools in controlling the money supply and their impact on some macroeconomic variables in Iraq.			
	Variable name	Variable symbol	Variable type
1	Open market operations	OMO	Independent Variables
2	Legal reserve value	LR	
3	Rediscount price	RR	
4	Money Supply	M2	Dependent Variable

Source: Prepared by the researchers.

Formulating the equation of the standard model used mathematically: This model included estimating the impact of quantitative tools of monetary policy as explanatory variables on the money supply as a dependent variable. This research relied on quarterly data extending from the first quarter of 2004 to the fourth quarter of 2023, so that we have (80) observations, which is sufficient to apply the (ARDL) model. Its function and equation can be formulated as follows:

$$M2 = f(OMO, LR, RR,)$$

$$\Delta M2 = C + +B_1\, OMO_{t-1} + B_2\, LR_{t-1} + B_3\, RR_{t-1} + + \sum_{i=1}^{q_-} \lambda_4 \Delta\, OMO_{t-i} + \sum_{i=1}^{q_1} \lambda_5 \Delta\, LR_{t-i} + \sum_{i=1}^{q_2} \lambda_6 \Delta\, RR_{t-i} + \varepsilon t \ldots\ldots (5)$$

Where

M2: Dependent variable. (OMO, LR, RR): Independent variables. Δ: First differences. C: Constant term. μ_t: Random error term. B: Long-run relationship parameters. λ: Short-run relationship parameters (first differences).

Respectively, (Y, X1, X2, ….XK) represent the optimal lags for variables (P, q1, q2, ….qK).

M2: Money supply, OMO: Open market operations, LR: Legal reserve value, RR: Rediscount rate.

Second: Results of unit root tests for stationarity

To ensure the stationarity of the time series of the research variables with greater accuracy, unit root tests are used, which is a basic and reliable step upon which the rest of the model tests are built. Among these tests is the Dickey-Fuller test, which was adopted in this research. Therefore, the time series of the research variables must pass this test to determine the optimal model in analyzing and measuring the effectiveness of the quantitative tools of monetary policy on the money supply in Iraq, as shown in Table (4).

Table 3: Results of the time series stationarity according to the ADF test at the level and first difference

At Level					
	Variables	**M2**	**OMO**	**LR**	**RR**
With Constant	t-Statistic	-0.8011	-2.4729	-2.2439	-2.2775
	Prob.	0.8125	0.1262	0.1931	0.1820
	Result	n0	n0	n0	n0
With Constant & Trend	t-Statistic	-3.9496	-2.4870	-3.9738	-0.5676
	Prob.	0.1150	0.3336	0.0140	0.9778
	Result	n0	n0	**	n0
Without Constant & Trend	t-Statistic	0.5361	0.0247	-0.8891	-1.3519
	Prob.	0.8294	0.6875	0.3275	0.1621
	Result	n0	n0	n0	n0
At First Difference					
With Constant	Variables	d(M2)	d(OMO)	d(LR)	d(RR)
	t-Statistic	-2.0342	-2.9658	-2.8106	-3.6647
	Prob.	0.0719	0.0429	0.0619	0.0069
	Result	*	**	*	***
With Constant & Trend	t-Statistic	-1.8661	-4.0244	-3.6495	-5.2783
	Prob.	0.0614	0.0124	0.0330	0.0003
	Result	*	**	**	***
Without Constant & Trend	t-Statistic	-1.3127	-2.8619	-2.8308	-3.5293
	Prob.	0.0033	0.0048	0.0052	0.0006
	Result	***	***	***	***

Source: Prepared by the researcher based on the outputs of the Eviews program.11) The asterisk (*) indicates significant at a 10% significance level. (**) indicates significant at a 5% significance level. (***) indicates significant at a 1% significance level.

Third: Initial Estimation of the Money Supply (ARDL) Model: Table (5) shows the results of the initial test estimation. It is noted that the value of the coefficient of determination reached R2 = 0.97, meaning that the independent variables (monetary policy instruments) explain 97% of the changes occurring in the dependent variable (monetary supply). The remaining 3% falls within the random error limit and represents other variables not included in the model. The value of the coefficient of determination was less than the value of the Durbin-Watson stat, which confirms the absence of spurious regression between the variables under study. The value of the F test during the research period reached 81.488, which confirms the significance of the estimated model as a whole.

Table 4: Results of the initial estimation test of the money supply model (ARDL)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
M2(-1)	0.90934	0.03393	26.80363	0.00000
OMO	0.11341	0.04465	2.54006	0.01440
OMO (-1)	-0.14731	0.05531	-2.66321	0.01060
OMO (-2)	-0.00053	0.03974	-0.01329	0.98950
OMO (-3)	0.00039	0.03974	0.00979	0.99220
OMO (-4)	0.12461	0.05856	2.12797	0.03860
OMO (-5)	-0.21268	0.05271	-4.03504	0.00020
LR	0.03788	0.00749	5.05995	0.00000
LR (-1)	-0.03158	0.00703	-4.49139	0.00000
RR	0.09174	0.04270	2.14846	0.03690
RR (-1)	0.05565	0.06000	0.92759	0.35840
RR (-2)	0.00321	0.05152	0.06226	0.95060
RR (-3)	0.00431	0.05151	0.08360	0.93370
RR (-4)	-0.00882	0.06218	-0.14187	0.88780
RR (-5)	0.16986	0.05478	3.10069	0.00330
C	0.00455	0.00463	0.98275	0.33080
R-squared	0.97553	Mean dependent var		0.13333
Adjusted R-squared	0.96356	S.D. dependent var		0.11692
S.E. of regression	0.02231	Akaike info criterion		-4.50327
Sum squared resid	0.02341	Schwarz criterion		-3.73842
Log likelihood	183.8659	Hannan-Quinn criter.		-4.19911
F-statistic	81.48801	Durbin-Watson stat		2.37546
Prob(F-statistic)	0.00000			

Source: Researchers' work based on the outputs of the statistical program (Eviews 11).

Fourth: Results of the joint integration boundary test: To ensure the existence of a long-term equilibrium relationship between the independent variables (monetary policy instruments) and the dependent variable (monetary mass), using the (F) statistic through the boundary test, as Table (6) shows the results of the joint integration test for the money mass model using the boundary test according to the (ARDL) methodology.

Table 5: Results of the cointegration test for the ARDL money mass model according to the bounds test

Test Statistic	Value	K
F-statistic	8.96294	6
Critical Value Bounds		
Significance	Bound0I	Bound1I
10%	2.12	3.23
5%	2.45	3.61
2.50%	2.75	3.99
1%	3.15	4.43

Source: Researchers' work based on the outputs of the statistical program (Eviews 11).

It turned out that the calculated value of (F) statistic, which is 8.962, is higher than its table value for the upper and lower limits and at significance levels (1%, 2.5%, 5%, 10%). This means rejecting the null hypothesis (H_0), which states that there is no long-term equilibrium relationship between the research variables. We accept the alternative hypothesis (H_1), which states that there is a joint integration relationship between the variables in the research period, i.e. the existence of a long-term equilibrium relationship that moves from the set of explanatory variables (monetary policy tools) towards the dependent variable (monetary mass), which confirms the validity of the research hypothesis, which requires estimating the short- and long-term response and the error correction parameter.

Fifth: Results of Estimating the Error Correction Parameter and Short- and Long-Run Parameters

After testing the bounds (co-integration), it was found that there is a long-term equilibrium relationship moving from the explanatory variables (monetary policy instruments) toward the dependent variable (monetary money). Therefore, it is necessary to estimate the short- and long-term parameters and the Error Correction Parameter (ECM) for the estimated model. Table (7) shows that the error correction parameter met the conditions of negativity and statistical significance at a significance level of less than 1%. This means that 0.090 of the short-term errors are automatically corrected over time to reach equilibrium in the long run. This means that the money supply requires approximately two years and seven months, which is a slow response, to reach its equilibrium value in the long run. In addition, the short-term parameters largely agree in terms of sign and significance level with the results of the long-term parameters, although the values of the estimated parameters vary by varying percentages, as shown in Table (7):

Table 6: Results of the short-term and long-term parameters and the error correction parameter for the money supply model

Short-term estimators and error correction parameter				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(OMO)	-0.11341	0.04465	-2.54006	0.01440
D(OMO (-1))	0.00053	0.03974	0.01329	0.98950
D(OMO (-2))	-0.00039	0.03974	-0.00979	0.99220
D(OMO (-3))	-0.12461	0.05856	-2.12797	0.03860
D(OMO (-4))	0.21268	0.05271	4.03504	0.00020
D(LR)	0.03788	0.00749	5.05995	0.00000
D(RR)	0.09174	0.04270	2.14846	0.03690
D(RR (-1))	-0.00321	0.05152	-0.06226	0.95060
D(RR (-2))	-0.00431	0.05151	-0.08360	0.93370
D(RR (-3))	0.00882	0.06218	0.14187	0.88780
D(RR (-4))	-0.16986	0.05478	-3.10069	0.00330
CointEq(-1)	-0.09066	0.03393	-2.67236	0.00030
Cointeq = M2 - (-4.8379X1 + 0.1571X2 +1.9303X3 -1.3469X4 + 0.0695X5 + 3.4849X6 + 0.0501)				
مقدرات الأجل الطويل				
OMO	-1.34690	0.73919	-1.82213	0.07480
LR	0.06946	0.05186	1.33937	0.18690
RR	3.48490	1.24007	2.81024	0.00720
C	0.05014	0.03920	1.27920	0.20710

Source: Researchers' work based on the outputs of the statistical program (Eviews 11).

Second requirement: Assessing the quality of the estimated model economically and econometrically

First: Assessing the quality of the model economically

Assessment of short- and long-term parameters

The results shown in Table (6) regarding measuring the relationship between monetary policy tools and the money supply in Iraq for the period (2004-2023) and according to the ARDL and Agency model are as follows:

The estimated parameter for the open market operations (OMO) variable indicates an inverse and significant relationship between open market operations and the money supply in both the short and long terms. The value of the money supply reached (-0.113) in the short term for the open market operations variable. That is, a 1% increase in open market operations leads to a decrease in the money supply by (-0.113%), while the value of the money supply reached (-1.346) in the long term for the open market operations variable. That is, a 1% increase in open market operations leads to a decrease in the money supply by (-1.346%). This is consistent with the logic of economic theory, since the sale of bonds withdraws liquidity from the market and reduces the money supply. In Iraq, the value of the money supply depends on... Monetary policy relies on

this mechanism to curb inflation, but its effectiveness is affected by fluctuations in oil prices. Moreover, the Iraqi economy faces challenges in implementing these tools due to its heavy reliance on oil revenues and the weakness of the financial system. Therefore, although consistent with theory, this relationship may be less effective in the Iraqi context.

The estimated parameter for the legal reserve value variable (LR) indicates a direct and significant relationship between the legal reserve value and the money supply in both the short and long term. The money supply value reached 0.037 in the short term for the legal reserve value variable. That is, a 1% increase in the legal reserve value leads to a 0.037% increase in the money supply. Meanwhile, the money supply value reached 0.069 in the long term for the legal reserve value variable. That is, a 1% increase in the legal reserve value leads to a 0.069% increase in the money supply. This is inconsistent with the logic of economic theory. The emergence of a direct relationship between the legal reserve and the money supply may be consistent with economic theory in some contexts. Usually, when the legal reserve increases, the money supply decreases due to a decrease in banks' ability to lend. However, in the Iraqi economy, this relationship may be affected by other factors, such as fluctuations in oil prices and the monetary policies of the Central Bank. Therefore, this approach may be logical within the framework of monetary policy aimed at controlling money supply and inflation.

The estimated parameter for the rediscount rate (RR) variable indicates a direct and significant relationship between the rediscount rate and the money supply in both the short and long term. The value of the money supply reached 0.091 in the short term for the rediscount rate variable. That is, a 1% increase in the rediscount rate leads to an increase in the money supply by 0.091%. The value of the money supply reached 3.484 in the long term for the rediscount rate variable. That is, a 1% increase in the rediscount rate leads to an increase in the money supply by 3.484%. This is inconsistent with the logic of economic theory. Usually, an increase in the rediscount rate leads to a decrease in the money supply because banks become less able to borrow from the central bank. However, in the Iraqi economy, this relationship may be affected by special factors such as the monetary policies followed or fluctuations in oil prices. In some cases, the central bank may seek to raise the rediscount rate to control inflation or stabilize the market, which may lead to unconventional results. Therefore, a direct relationship may appear in some exceptional cases.

The effectiveness of independent variables (monetary policy instruments) in influencing the money supply.

The effectiveness of long-term parameters measures the total effect of changes in the explanatory variables on the dependent (endogenous) variable, while the effectiveness of short-term parameters measures only the direct effect. Table (8) shows the effectiveness of short-term parameters relative to the long-term effectiveness of the money supply model in the ARDL model.

Table 7: The effectiveness of short-term parameters to the long-term effectiveness of the money supply model in the ARDL model

Variables	Effectiveness of variables in the short term	Long-term effectiveness of variables	Total effectiveness %
OMO	-0.11341	-1.34690	8
LR	0.03788	0.06946	55
RR	0.09174	3.48490	3

Source: The researchers worked based on the results shown in Table (7).

The table above shows that the highest percentage of effectiveness in changes occurring in the money supply comes from the value of the legal reserve, as its value in the short term reached (55%) of the total effect, followed by the effectiveness of open market operations (8%) and then the rediscount rate (3%) of the total effect.

Second: Evaluating the Quality of the Estimated Model from a Standard Perspective

After estimating the parameters of the standard model for the short- and long-term relationship, and after confirming the quality of the standard model used to measure the effectiveness of monetary policy tools in controlling the money supply in Iraq, and its lack of any standard problems, this calls for conducting diagnostic tests as follows:

Autocorrelation Test for the Money Mass Model

Table (9) shows the results of the autocorrelation test based on the Lagrange Factor for Serial Correlation (BGLM) test, which is the most appropriate test for detecting the presence of autocorrelation between the data of a random variable series. The test shows that the model does not suffer from the problem of serial autocorrelation, as the probability value associated with both the F test and the chi-square test was greater than the significance level of (5%). The probability value of the F statistic was (0.4603), and the probability value of the chi-square statistic was (0.1681). This means accepting the null hypothesis that the estimated model (money mass) is free of the problem of serial autocorrelation.

Table 8: Results of the autocorrelation test (LM) for the money supply model

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	0.978380	Prob. F(7 ،40)	0.4603
Obs*R-squared	10.37927	Prob. Chi-Square(7)	0.1681

Source: Prepared by the researchers based on the outputs of the statistical program (Eviews11).

Testing the consistency of homogeneity of variance for the money mass model

Table (10) shows the results of the consistency of homogeneity of variance test. The money mass model does not suffer from the problem of heterogeneity of variance, as the calculated value of the (F) statistic reached (0.6825) at a probability level of (0.4116). This means accepting the null hypothesis stating that the variance of the random error term in the estimated model (money mass) is constant.

Table 9: ARCH results for the money supply model

Heteroskedasticity Test: ARCH			
F-statistic	0.682550	Prob. F(1 ,68)	0.4116
Obs*R-squared	0.695643	Prob. Chi-Square(1)	0.4043

Source: Researchers' work based on the outputs of the statistical program (Eviews11).

Testing the validity of the functional form (Ramsey-Reset): It is clear from Table (11) that the value of the calculated (F) statistic reached (0.666) with a statistical significance level of (Pro: 0.418), and this means accepting the null hypothesis stating the validity of the functional form used in the estimated model (monetary mass).

Table 10: Ramsey-RESET test for the money supply model

Ramsey RESET Test Equation: UNTITLED Omitted Variables: Squares of fitted values			
Test	Value	Df	Probability
t-statistic	0.816319	46	0.4185
F-statistic	0.666377	(1, 46)	0.4185

Source: Prepared by the researchers based on the outputs of the statistical program (Eviews 11).

Multicollinearity Test

Analyzing the estimations of any standard model containing more than one explanatory variable requires testing whether the model is free of the problem of multicollinearity. Several tests exist for this purpose, the most important of which is the Variance Inflation Factor (VIF) test. If the values of the test coefficients are between zero and (10), then there is no problem of multicollinearity among the explanatory variables of the model, and the null hypothesis is accepted. Otherwise, the null hypothesis is rejected, and the alternative hypothesis, which states the presence of the problem of multicollinearity, is accepted. The results of the multicollinearity test using the variance inflation factor (VIF) in Table (12) indicate that there is no problem of multicollinearity among the explanatory variables of the ARDL model for the money supply in Iraq.

Table 11: Results of multicollinearity test using variance inflation factor (VIF).

Variance Inflation Factors, Sample: 2004Q1 2023Q4 Included observations: 76			
Variable	Coefficient Variance	Uncentered VIF	Centered VIF
OMO	0.002976	1.985255	1.770353
LR	0.000174	1.361808	1.361707
RR	0.002814	3.30019	3.296589

Source: Researchers' work based on the outputs of the Eviews11 program.

Conclusions and Recommendations

First: Conclusions

The research reached a set of conclusions that can be summarized as follows

1. The absence of a clear economic vision in Iraq and the failure to define a stable economic approach resulted in weak management and divergent economic objectives and activities. Furthermore, the fragility of legal, social, and economic structures contributed to limiting the effectiveness of monetary policy tools and limiting their ability to effectively achieve their desired objectives.
2. Some quantitative monetary policy tools, including the legal reserve ratio and the discount rate, are effective tools and contribute to maintaining monetary stability within the country and controlling the local exchange rate against foreign currencies.
3. Monetary policy in Iraq achieved relative success in achieving its desired objectives during the study period, according to the statistics provided. It stabilized the general price level, reduced inflation and unemployment rates, promoted economic growth, and maintained the value of the Iraqi dinar against the US dollar. This relied primarily on the intervention of the Central Bank by offering large amounts of foreign currency through foreign exchange auctions. However, reviewing the tools used by the Central Bank of Iraq reveals shortcomings and a lack of diversification in monetary policy tools. For example, the open market tool was not widely implemented. Therefore, monetary policy in Iraq played a role in controlling the money supply, but not to the desired level.
4. Developing countries, including Iraq, are characterized by weak banking systems and a small number of financial institutions. Their financial and monetary markets lack regulation and are characterized by limited size. The low level of development of banking habits among the public also limits the effectiveness of quantitative monetary policy tools, while the importance of qualitative tools and their impact on economic conditions in these countries increases.
5. The results of the standard analysis showed that the broad money supply (M2) in Iraq is determined by the following variables: (the value of the legal reserve, open market operations, the central bank’s sales of hard currency, deposit facilities, lending facilities, and the rediscount rate) with a single optimal lag period, which explains approximately 97% of the changes that occur in the money supply.
6. The results of the standard analysis of the ARDL model's estimators demonstrated the existence of an inverse and significant relationship in the short and long run between the money supply and open market operations (OMO). This relationship is consistent with the logic of economic theory and the research hypotheses, with the exception of the following variables: deposit facilities (DF), central bank sales of foreign currency (FCS), legal reserve value (LR), and rediscount rate (RR), where the relationship was positive and significant. The exception is lending facilities (LF), where the relationship was inverse and inconsistent with the logic of economic theory and the research hypotheses.
7. The error correction coefficient value was found to be -0.090, meeting the conditions of negativity and statistical significance at a significance level of less than 1%. This means that 0.090 of short-term errors are automatically corrected over time to reach equilibrium in the long run. This means that the money supply requires approximately two years and seven months, which is a slow response to reach its equilibrium value

in the long run. Furthermore, the short-term parameters are largely consistent in terms of sign and significance with the results of the parameters. Long term, even if the values of the estimated parameters vary by varying percentages.

Second: Recommendations

1. Monetary policy in Iraq suffers from limited capacity to achieve its desired objectives. This is due to the structural imbalances plaguing the Iraqi economy, particularly in the areas of industry, investment, and local markets, such as the labor market and the goods and services market. Addressing these imbalances requires effective coordination and integration between various macroeconomic policies, along with monetary policy, including fiscal policy, investment policy, production policy, and trade policy, through a comprehensive economic plan aimed at restructuring the economy and enhancing its sustainability.
2. Activate the role of open market operations and other instruments by activating the monetary market, working to continuously develop it, and working to attract investor savings and direct them to meet the needs of borrowers. This helps fill the existing deficit among borrowers and enhances financial and economic stability.
3. The need to focus on new tools by regulating the procedures for their implementation through monetary systems and legislation, ensuring the integration of these tools within an organized framework. This aims to set a ceiling on currency sales and control the amount of money circulating in the market. This ensures the smooth flow of funds and contributes to bridging the gap between the parallel and formal markets.
4. Diversify monetary policy tools by the Central Bank of Iraq, reactivate tools that are no longer used, and grant the bank greater independence. This also includes integrating fiscal and monetary policies and developing the financial market and banking system, with a focus on monetary tools with a short-term impact in dealing with crises that occur in the real market. This enables rapid responses to these measures, while also spreading banking awareness among the public to ensure economic stability.
5. Provide greater flexibility for the central bank in dealing with significant changes in the exchange rate by working to reduce the gap between the real exchange rate and the parallel market exchange rate, with the aim of restoring market balance and achieving monetary stability.
6. Establish new mechanisms to address the increased demand for hard currency by imposing stricter measures on the parallel market to reduce the gap between the official exchange rate and the parallel market rate. These measures must be consistent with the actual need for hard currency domestically, while setting clear criteria and conditions for obtaining currency from official outlets to ensure market regulation and stability.
7. The shift in monetary policy tools is to enhance their ability to control the money supply and control inflation and unemployment rates as a primary objective of monetary policy. This is achieved by using appropriate tools to regulate the money supply and ensure price stability in the economy.

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