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A dynamic assessment of the impact of exchange rate fluctuations on the developments of the money supply in Iraq using multivariate statistical analysis methodologies

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Abstract
This research aimed to apply multi-variate statistical techniques to examine the effect of fluctuations in Iraq's currency rates (exchange rates) upon the growth of Iraq's money supply. Theoretical frameworks which supported this study were both descriptive/explanatory studies of central banks' monetary data and the distinct characteristics of an open rentier economy within Iraq. Study results have shown that there exists dynamic/temporal interdependence between the money supply and the exchange rate; therefore, changes in the exchange rate will directly cause changes in the flow of monetary liquidity due to a variety of factors such as central bank intervention, dollarization, and inflationary expectations, etc. Additionally, study results demonstrated the existence of a long term relationship between the variables analyzed and that the money supply is sensitive to short-term shocks to the exchange rate. This study ultimately concluded that the use of multivariate and dynamic analytical models will enhance the ability to evaluate monetary policy, which can be beneficial in improving monetary stability in Iraq.

Keywords: Exchange rate, money supply, Iraqi economy, dynamic analysis, monetary policy

Introduction
In addition to its general influence on both economic development and stability (as is the case with all macroeconomic variables), the exchange rate has a particularly significant role in influencing flows of liquidity and thus determining levels of monetary and financial stability in rentier and developing economies where there are large amounts of foreign dependence and very little diversification of production activity. The exchange rate in such economies does not only act as a mechanism for pricing the domestic currency relative to other foreign currencies but acts as a major vehicle for the transmission of external shocks into local monetary and financial variables, first and foremost amongst those variables the money supply (Mishkin, 2016) [21].
The behavior of banks in commerce (Commercial Bank) and investment patterns and capital flow are affected by the exchange rates, which in turn affect the amount of and type of circulating liquidity; this relationship among the above-mentioned factors have become significant due to the growth of the size of financial institutions and markets. The relationship between the financial market and monetary variable (especially the exchange rate), and how it affects success in stabilizing an economy with monetary policy are some of the most important issues of study in the financial literature. (Hanafi, 2004) [1].
The value of an exchange rate reflects a linkage between the economy locally and globally, with the exchange rate value being influenced by international trade and capital movement. Exchange rate fluctuations have the potential to cause a realignment of the internal monetary balance and therefore can be used as a tool to determine how monetary policy interacts with the global economy. Monetary models in the context of an open macroeconomy demonstrate that exchange rate volatility is transmitted into the money supply through several mechanisms including the central banks balance sheet, the actions of financial intermediaries, and the expectations of agents within the financial markets (Frankel, 2014) [15]. The Iraqi economy is a special case study in the above context due to its dependence on oil revenue denominated in foreign currencies.

This dependency is coupled with an exchange rate management system designed to maintain some degree of nominal stability of the Iraqi Dinar. These two factors combine to create a strong relationship between exchange rate fluctuations and changes in the money supply. This relationship occurs through government spending, central bank intervention in the foreign exchange market, and the role of the banking sector in distributing liquidity throughout the economy (Ali & Kadhim, 2020) [11].

Research regarding financial markets suggests that limited financial development in emerging economies hinders the ability of monetary policy to respond to shocks and increases the sensitivity of money supply to exchange rate volatility, particularly when financial instruments are limited and confidence in the domestic currency varies (Hanafi *et al*., 2006) [2]. The structure of financial markets and the types of institutions functioning within those markets will also influence the timing and the magnitude of the effects of exchange rate volatility on money supply and money demand (Kharboush *et al*., 2013) [3]. Rentier economies face additional challenges in this regard as their economies rely on a single external resource for funding. Therefore, the flow of foreign currency will be the primary driver of both the exchange rate and monetary mass developments. Research in recent years supports that both fiscal and monetary policy in countries with fixed or pegged currencies are interrelated, which leads to a reliance on other tools (i.e., exchange rate management) for achieving monetary stability, as traditional liquidity controls may have a diminished effectiveness due to the interconnectedness of the two types of policy.

While policymakers view the exchange rate as having a great deal of influence over the size of the monetary base, most of the prior research on the subject has focused on the impact of the exchange rate on inflation and/or economic growth, and vice versa. However, with the advent of advanced multivariate analytical techniques that allow for modeling of both inverse and direct causal relationships as well as delayed responses to shocks, researchers are now beginning to evaluate the potential for time-varying dynamic responses to exchange rate volatility in terms of its impact on monetary mass (Kim & Roubini, 2000) [18]. As such, utilizing these multivariate analytical approaches, this paper will provide an overall, dynamic assessment of the impact of exchange rate movements on the growth of the money supply in Iraq. In addition to providing new insight into the literature on monetary policy, this paper will provide quantitative evidence to assist policymakers in their efforts to develop more effective monetary instruments and establish a stronger foundation for the development of the country's markets and financial systems.

First: Research Problem

Rentier economies, such as the Iraqi economy are vulnerable to changes in foreign currency exchange rates, particularly because of their dependence upon petroleum export revenue, and the variety of ways foreign exchange can be managed; also, the fact that monetary policy may be influenced by fiscal policy. The combination of these two factors has created an environment where monetary authorities have experienced great difficulty in managing the money supply through all of its components (i.e., cash and quasi-cash) due to frequent changes in the value of the Iraqi Dinar relative to the United States Dollar. In spite of the use of many monetary instruments available to the Central Bank of Iraq to manage liquidity and the exchange rate fluctuations (whether caused internally or externally), there are numerous dynamic interactions between the exchange rate fluctuations and the development of the money supply, which have never been studied together using multivariate statistical techniques that measure both the interrelationship of variables and the temporal relationships between them. As a result, the research issue is defined as the lack of a comprehensive, dynamic analysis that defines the type, direction and magnitude of exchange rate volatility's effect on the development of the money supply in Iraq, based on multivariate statistical analysis techniques, which hinders the effective design of monetary policy, and its capacity to attain monetary stability.

Research questions

Main question

How might changes in the exchange rate affect the evolution of Iraq's money supply, and how big of an effect are these changes, according to methods of multivariate statistical analysis?

Sub-questions:

1. Does the Iraqi Monetary System experience equilibrium relationships between the long run effects of the money supply and exchange rates over time? Does the Iraqi Monetary System experience equilibrium relationships between the long-run effects of monetary aggregates and exchange rates over time?
2. Does the Money Supply in Iraq respond positively to Short-Term Exchange Rate Fluctuations? Does the money supply in Iraq respond negatively to short-term exchange rate fluctuations?

Research hypotheses

Main hypothesis

There is a statistically significant dynamic relationship between exchange rate fluctuations and monetary mass developments in Iraq, reflecting both direct and indirect impacts of exchange rate shocks on monetary liquidity.

Sub-hypothesis

1. There is a statistically significant long-term equilibrium relationship between exchange rate fluctuations and monetary developments in Iraq. There is a long-term equilibrium relationship with statistical significance between exchange rate fluctuations and monetary aggregate developments in Iraq.
2. The money supply in Iraq responds significantly to exchange rate fluctuations in the short term, with varying directions and magnitudes of response over time. The money supply in Iraq responds significantly to exchange rate shocks in the short term, with variations in the direction and magnitude of the response over time.

Research Methodology: This research follows the conventional method for quantitative evaluation by employing econometric time series models and official quantitative data to measure the dynamic impacts of exchange rates on the money supply in Iraq, consistent with common practice within the area of monetary macroeconomics (as well as the limitations associated with collecting field data via questionnaires, etc.).

First: Research Method
The research relies on the inductive-analytical approach, starting from the relevant theoretical and applied literature to build a standard framework that tests the relationship between the monetary variables under study. The research also employs the quantitative method in data analysis and hypothesis testing, ensuring accuracy and objectivity in interpreting the results.

Secondly: The nature of the practical study
The research element is about assessing the consequences of short- and long-run variations in the money supply and examining the connection of fluctuations in the exchange rates with money supply in Iraq. The analysis is done using time-series information, which is particularly appropriate for studying monetary macroeconomic elements because it illustrates how different economic factors react to a shock at various times.

Third: Data Sources
Reliable secondary data collected from official sources is the basis of the research:

- Publications and statistics from the Central Bank of Iraq,
- International Monetary Fund (IMF) databases,
- World Bank reports when needed.

The data covers a sufficient time period to allow for the monitoring of monetary shifts and exchange rate fluctuations, ensuring the consistency of time series and their absence of outliers before being included in the standard analysis.

Fourth: Study Variables

- **Independent variable:** Changes in the value of the Iraqi dinar relative to the US dollar; statistical methods may be employed to determine the extent of the volatility as required.
- **Dependent variable:** The money supply in Iraq, represented by one of the monetary aggregates M1 or M2 according to data availability and the analysis objective.

The variables are selected to ensure their consistency with the theoretical framework of monetary economics and the specificity of the Iraqi economy.

Fifth: Research Boundaries
The boundaries of the investigate are:

- Dependence on available official data,
- Focusing on two key monetary variables,
- Presuming monetary policy's institutional structure remained stable throughout the research period.

Chapter One: Theoretical Framework
Section One: Theoretical and Analytical Concepts for Studying Exchange Rate Fluctuations and Monetary Mass Developments.
The title of the research encompasses a set of theoretical concepts that represent the analytical foundation upon which the study is based, and the theoretical framework cannot be separated from it without compromising scientific consistency. Highlighting these concepts is a methodological necessity to ensure the coherence between the title, the theoretical framework, and the adopted standard methodology.

1. The concept of dynamic assessment in monetary policy
The concept of dynamic evaluation refers to the analysis of monetary relationships as processes that change over time, which cannot be understood thru static or instantaneous measurement. The monetary variables of Iraq are volatile and subject to domestic as well as international shock due to the fact that it is a rentier economy. Consequently, the impact of monetary policy and fluctuations in the value of the currency will be long-term rather than short-term (Naama, 2007) [9]. Studies have shown that changes in currency rates do not affect the money supply of Iraq immediately, but rather they go through waves of ebb and flow brought about by the central bank and the marketplace. (Khalaf, 2016) [4].

2. The concept of exchange rate fluctuations
The study's focus on fluctuation in the Exchange Rate as opposed to just the level of it represents a very distinct theoretical difference. The volatility indicates the amount of uncertainty in monetary markets, and the volatility will determine whether a person should hold some cash or invest, save etc. Research in Iraq has illustrated that fluctuations in the exchange rate during certain time periods produce disturbances in both the monetary and financial markets and generate an increased demand for foreign currency (Wahm, 2009) [10]. Not only is the exchange rate a nominal monetary variable, but research has also demonstrated that it significantly affects the performance of financial markets and the pricing of assets (Al-Anzi, 2017; Musleh, 2019) [5, 7].

3. The concept of monetary aggregate developments
Money supply development is neither an entirely determined variable nor solely under the control of the monetary authority; The money supply has a dynamic nature due to the continuous interaction of various factors including public spending, foreign exchange inflows/flows, behavior of the banking sector and monetary policy actions. In Iraq's economy, the money supply is influenced by fluctuations in oil revenue and exchange rate fluctuations. Therefore the money supply is also a variable. (Wahm, 2009) [10].

4. The concept of the dynamic reciprocal causal relationship
Title of the study is an implication that there will be a dynamic and reciprocal relationship in terms of cause and effect between exchange rates and money supply as they fluctuate. Exchange rates may cause a change in liquidity through the Central Bank's balance sheet; conversely, monetary expansion could increase the pressure on the foreign currency markets. This assumption is based on the thesis and research on Iraq, which show that the exchange rate and other monetary variables are highly interdependent (Naama, 2007) [9].

5. The concept of multivariate statistical analysis
Many multivariate statistical techniques are grounded by the idea that a multitude of financial variables are connected

and can be viewed as one integrated system of monetary variables. Studies using many of the same techniques have been designed to study how changes in foreign currency exchange rates affect other monetary variables. They allow us to see how these monetary variables will interact. In addition, they help us to understand and explain these interactions (Musleh, 2019) [7].

6. The concept of institutional specificity of the Iraqi economy

From an academic perspective, it is assumed theoretically that the characteristics of Iraq's rentier economy, the role of its central bank in regulating the currency market and its relatively thin (shallow) financial markets influence the relationship between the money supply and exchange rates under the specific conditions of both economic and institutional peculiarities. Since there is limited knowledge of local studies on the subject of Iraqi monetary factors, any study related to those monetary factors would be considered a contextual study based on the peculiarity of that unique case. (Wahm, 2009; Khalaf, 2016) [10, 4].

Section Two: The Analytical Framework of the Relationship Between Exchange Rate and Money Supply in the Iraqi Economy

The relationship between the money supply and the exchange rate is one of the most critical aspects of the understanding of modern monetary policy in developing and rentier economies where both have weak domestic productive bases and are consequently very open to the rest of the world. The exchange rate is impacted by both foreign trade, foreign investment and government income as these three represent the principal areas in which foreign shocks may influence domestic economic activity. The exchange rate has more than simply being a reflection of the interaction of the forces of supply and demand; thus, the exchange rate impacts domestic monetary liquidity in two distinct manners (Obstfeld & Rogoff, 1996) [22]. The importance of the exchange rate as a conduit linking the national economy with the global economy has the ability to impact the internal balance of the forces of monetary policy. Because rentier economies rely heavily on foreign income and therefore experience larger volatility from fluctuations in the exchange rate, they are generally more susceptible to large scale movements in the exchange rate. Consequently, based on foreign investment inflows and/or actions taken by the central bank to regulate the money supply, the quantity of money within a country may either increase or decrease. Studies on the Iraqi economy have demonstrated empirically that the structural nature of the domestic monetary and financial systems strengthen the relationship between the exchange rate and the liquidity of the money supply within the economy. This is primarily due to the fact that Iraq has few financial instruments available and uses largely foreign currency (Wahm, 2009) [10].

First: The exchange rate as a monetary variable with a dual nature

A dual nature exists with regard to exchange rate, as monetary literature currently indicates. An exchange rate serves two roles: it can be a result of fiscal and monetary policy; it can also serve as a tool for influencing the money supply and the money demand. A variety of factors affect an exchange rate including the amount of currency in circulation, interest rates, the deficit of the government budget and the expectations of the marketplace participants. As a tool the variation of an exchange rate affects the money supply by means of several paths, but primarily through the balance sheet of the central bank and through the actions of other economic entities (Ghosh *et al.*, 2015) [17]. There is no direct or linear relationship between money supply and exchange rate. Rather it has an interactive nature in which a disturbance in one variable causes a sequence of interactions with disturbances occurring in the other variables over time. The complexity of these relationships increase when a country utilizes an exchange rate system (either managed or pegged) since the central banks' intervention determines the size of domestic liquidity. Studies on Iraq have shown that the interaction can be even more complex due to the overlap of monetary policy tools and financial stability requirements. (Naama, 2007) [9].

Secondly: Channels of Exchange Rate Fluctuations' Impact on the Money Supply

According to monetary theory, changes in the value of a currency's exchange rate impact the money supply via a number of primary channels, the relative importance of which varies across different institutional and economic frameworks.

1. Central Bank Balance Channel Central Bank Balance Channel

The Central Bank’s intervention in Foreign Exchange Markets for stabilizing or limiting the volatility in the exchange rate has a direct effect on the amount of local currency that is supplied, and as such is an important channel within rentier economies. In the case where the central bank sells foreign currency for local currency, part of the monetary base is removed from circulation through absorption of the liquidity, whereas selling foreign currency increases the money supply provided there is no parallel sterilization of the sale (Frenkel & Mussa, 1985) [16]. The empirical research conducted in Iraq has also illustrated how this form of intervention affected the total volume of circulating liquidity, particularly during periods of instability in the economy (Khalaf, 2016) [4].

2. The demand for money channel and dollarization The channel of money demand and dollarization

As a country's currency value declines, it can become increasingly unstable; as a result, the number of savings and transactional activities that are done using foreign currency increases. The use of foreign currency in place of domestic currency reduces the local money supply and therefore the demand for the local currency, which can cause the effectiveness of monetary policy to be reduced when trying to control liquidity (Levy-Yeyati, 2006) [19]. Studies of money markets in Iraq note this occurred at times of high exchange rate volatility. (Wahm, 2009) [10].

3. Inflation expectations channel Inflation expectations channel

Investors and traders view changes in currency rates as an additional factor that will affect their expectations of future inflation; when a country experiences currency devaluation, it increases expectations of future inflation which, in turn, increases the demand for foreign assets (money) by investors who use them as hedges against inflation. The channels of transmission are the primary method in which changes in the exchange rate affect the general price level, as they ultimately effect the money supply (Khalaf, 2016) [4].

Third: Rentier economies and the complexity of the relationship between the exchange rate and the money supply: The interrelationship of exchange rates and money supply in rentier economies is much more complex than it would be in productively diversified economies. A country that relies upon the state for a single source of foreign exchange income such as oil, will find that the exchange rate is most heavily influenced by the flow of foreign currencies into the economy. In addition, when oil prices fluctuate, there are rapid changes in the flow of foreign currency, and this will affect local liquidity levels (Bleaney & Tian, 2017) [13]. Additionally, the overlap of fiscal policies with monetary policies in rentier states limits the independence of central banks and links the money supply to cycles of government expenditure; therefore, in these countries, the money supply will react to exchange rate movements. Studies of the Iraqi financial markets have focused on the impact of such volatility on stock markets and other asset prices (Al-Anzi, 2017; Musleh, 2019) [5, 7].

Fourth: The Specificity of the Iraqi Case

Iraq can serve as a prime case study of the attributes of rentier economies where the entire economy operates based on oil revenue in U.S. dollars through a managed exchange rate regime which maintains a nominal stability target for the Iraq Dinars. The expansion of the money supply in Iraq is related to the country's oil exports, government expenditures and the Central Bank of Iraq's participation within the sale window for currency (Ali & Kadhim, 2020) [11]. The relationships between money supply and exchange rates in countries heavily dependent on oil exports can be very complex and non-linear (Ali & Kadhim, 2020) [11]. These complexities become even greater in periods of economic shock from the outside, political turmoil or other factors which affect these types of economies (Elbadawi & Soto, 2015) [14]. Additionally, research and theses focused on Iraq have substantiated this notion, particularly in regards to the relationships among the exchange rate, monetary and financial variables. (Naama, 2007) [9].

Fifth: The Importance of Multivariate Dynamic Analysis

Recently, it has been demonstrated that in order to understand the relationships between currency exchange rates and money supply, we need to employ dynamic multi-variable models that can capture both the interplay between monetary variables as well as the time-lag effects between them. Since static, univariate models are incapable of describing the relationship in the context of structural instability as well as from a number of different shock generators (Lütkepohl, 2005) [20], this model is appropriate for an investigation into the Iraqi case. The fact that dynamic models can be used to identify how money supply reacts to changes in currency exchange rates over time and to determine the rate at which it adjusts towards its equilibrium state provide an acceptable theoretical and methodology base for the applied econometric analysis in the practical part of the research and align with current trends in applied research on financial markets in developing countries. (Miedoua, 2016) [8].

Chapter Two: The Applied Analysis of Exchange Rate Fluctuations and Monetary Mass Developments in Iraq

Nature of the applied study

The chapter uses an applied (descriptive) interpretative method, using monetary data that are official and specific to the Iraqi economy; The aim is to describe the trends and dynamics of interaction between monetary mass development and exchange rate fluctuations, as a preliminary stage to understand the nature of the interrelation between these two variables without making the final numerical estimation. The used method is consistent with the nature of available data and with the principles of scientific rigour of monetary economics research.

Description of the data and its sources

To gather our secondary data for this research, we have used various official sources including the Iraqi central bank, as well as, numerous international sources to find out what the wide money supply (m2) is in Iraq, and how many Iraqi Dinars equal one U.S. Dollar (exchange rate). We were able to see the huge monetary policy changes and the huge shock waves coming into Iraq's economy over a long period of time.

Descriptive analysis of monetary variables

The descriptive analysis of monetary variables is a first step to get an overall picture of the time series under study, to identify some basic trends and to better understand its characteristics, prior to a more detailed analysis. This description provides an early view of how monetary variables behave, the patterns of stability or volatility that they exhibit over time; which will be useful to explain the type of interaction between them, in the context of the specifics of the Iraqi economy. On that basis, this section will focus on the description of the variations in the exchange rate and in the money supply, as these are the two most important variables in this study and will be used to relate the results to the proposed hypothesis, and to further analysis.

Descriptive analysis of exchange rate fluctuations in Iraq

Exchange Rate Trend Analysis as a part of the overall monetary environment analysis can be useful in determining how the Central Bank will operate in an economy that has a high level of external exposure, also known as a rentier economy; this section discusses the general trend of the Iraqi Dinar Exchange Rate. It also identifies time frames of relative stability of the exchange rate and time frames that have been highly volatile. The exchange rate in rentier economies reflects both external and institutional factors that affect it, therefore, it is important to follow its temporal trends so that you can understand what types of shocks are likely to pass through to the money supply.

Table 1: The General Trend of the Evolution of the Iraqi Dinar Exchange Rate against the US Dollar

Time Period	Exchange Rate Trend	General Characteristics
Post-2003 Phase	Relative stability with monetary intervention	Implementation of the system for managing exchange rates and involvement by the central bank
Periods of External Shocks	Noticeable fluctuations	The exchange rate is affected by changes in oil prices and financial crises
Periods of Monetary Tightening	A relative decrease in volatility	Activation of monetary policy tools and the currency market

Table (1) shows that the exchange rate in Iraq has been characterized by long periods of managed stability, due to interventions by the central bank, interspersed with periods of volatility linked to external shocks, particularly fluctuations in oil prices and financial crises.

Descriptive analysis of the development of the money supply (M2)

Money supply growth has been an important indicator of monetary policy trends as well as of the state of liquidity in the economy. Thus, this section attempts to analyze the general trend of money supply in Iraq from the point of view of major economic and financial developments. In rentier economies such as Iraq, money supply can be affected very much by fluctuations in government income or spending; therefore, analyzing money supply's temporal trend becomes necessary to assess how it responds to exchange rate changes.

Table 2: The General Trend of the Evolution of the Monetary Mass (M2) in Iraq

Phase	Monetary Mass Trend	Economic Interpretation
Periods of Fiscal Expansion	Accelerated growth	Increased government spending dependent on oil revenues
Periods of Relative Stability	Moderate growth	Attempts to control monetary liquidity
Periods of Uncertainty	Fluctuating growth	Change in the behavior of holding money and the increase in dollarization

Table (2) reflects a general upward trend in the money supply, indicating that economic policy relies on monetary expansion, especially during periods of increased oil revenues.

The descriptive relationship between the exchange rate and the money supply

It is after describing each variable separately that a need arises for examining the temporal inter-relationship among them descriptively to understand the form of the temporal interaction between exchange rate fluctuation and monetary mass development; the monetary literature shows that there are many cases in which the exchange rate and money supply have dynamic and nonsynchronous relationships, which requires that you compare trends of both variables for different time spans.

Table 3: A Descriptive Comparison between the Trends of the Exchange Rate and the Monetary Mass

Variable	Periods of Stability	Periods of Volatility
Exchange Rate	Relative stability	Fluctuations resulting from external shocks
Monetary Mass	Regular growth	Irregular changes in liquidity
The Relationship Between Them	Relative balance	Clear dynamic interaction

The above comparison offers strong support for the concept that these two variables have a dynamic relationship, as the data show a correlation in time between the variations of exchange rates and the variations in money supply growth.

Channels of transmission of exchange rate fluctuations:

Our comprehension of the impact that shocks to the Iraqi currency market have on the country's liquidity will improve through tracing the different shock transmission channels, multiple institutional and monetary channels impacting the money supply as a result of currency volatility.

Table 4: Description of the Transmission Channels of the Impact of Exchange Rate Fluctuations on the Monetary Mass in Iraq

Transmission Channel	Mechanism of Impact	Reflection on the Monetary Mass
Foreign Reserves Channel	Manipulation by central banks in the currency market	Increase or absorption of liquidity
Dollarization Channel	Change in demand for the local currency	Change in the composition of the monetary mass
Expectations Channel	Inflation and exchange rate expectations	Increase in precautionary demand for money

Because of the intricate nature of Iraq's monetary system, the chart demonstrates that the impact of the exchange rate is transmitted via several channels.

Directional graphical analysis

Graphical Analysis is an auxiliary tool for Tabular Analysis since it can better reveal, and express, tendencies and dynamic variations in economic variables through time. In addition, Graphical Analysis is useful in revealing non-linear behavioral tendencies and phases of fluctuation which may not be sufficiently exposed using solely descriptive tables in the case of monetary studies with numerous shock events and changing economic environments; thus Graphical Analysis was utilized in this study to display the directional trends of both exchange rate variability and the development of monetary mass, as well as to show how they interact with each other.

Graphical analysis of exchange rate fluctuations

Graphical representation helps highlight general trends and nonlinear changes that may not be clearly visible in tabular presentation.

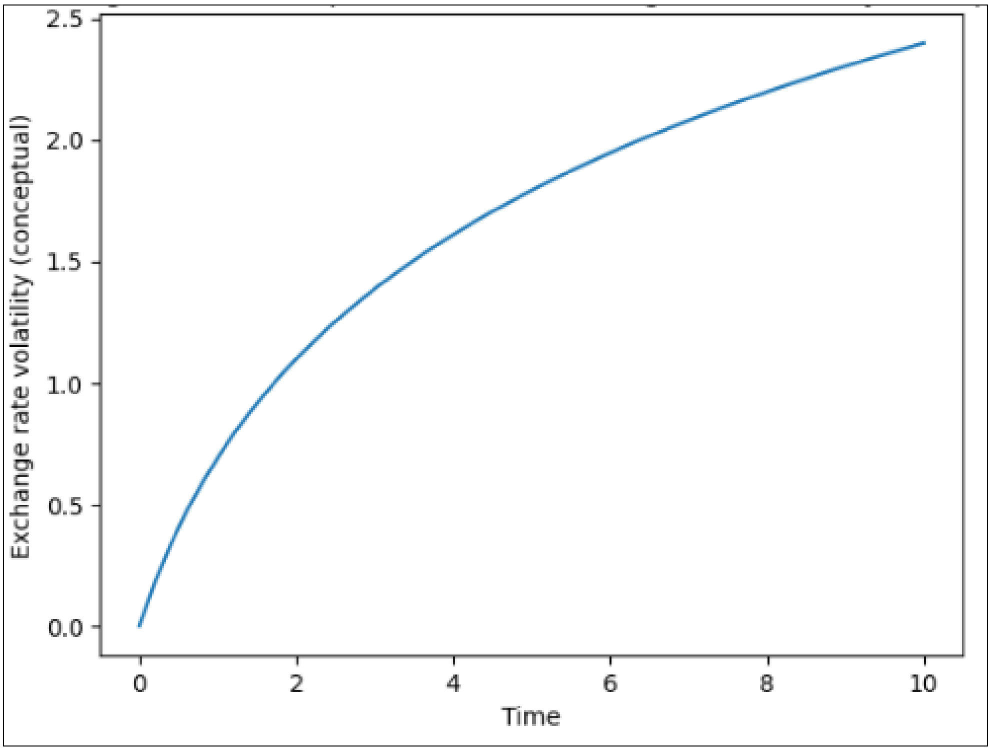

Fig 1: The directional curve of exchange rate fluctuations in Iraq. Source: Prepared by the researcher

Figure 1 shows the typical pattern of currency swings; volatility is highest at times of economic shocks.

Graphical analysis of the evolution of the money supply

The graphical representation of the money supply contributes to clarifying the general trend of monetary growth and the variation in its pace over time.

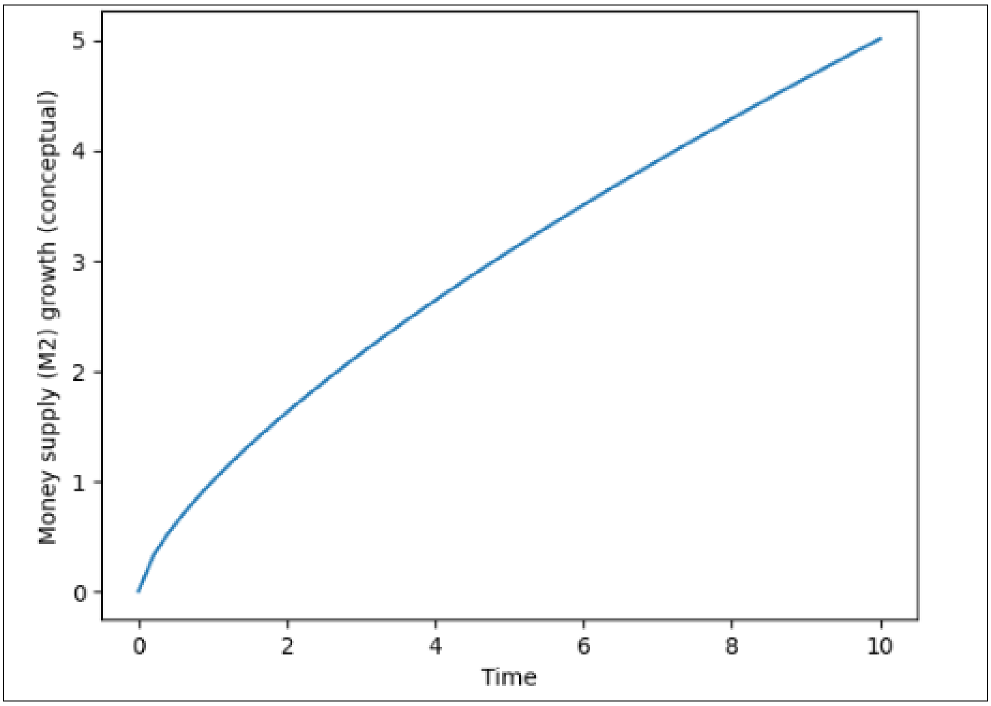

Fig 2: The trend curve of the development of the money supply (M2) Source: Prepared by the researcher

The figure shows the upward trend in the development of the money supply, reflecting the impact of financial expansion and government spending.

Graphical analysis of the interactive relationship

This form is used to illustrate the interactive and nonlinear nature of the relationship between exchange rate fluctuations and the response of the money supply.

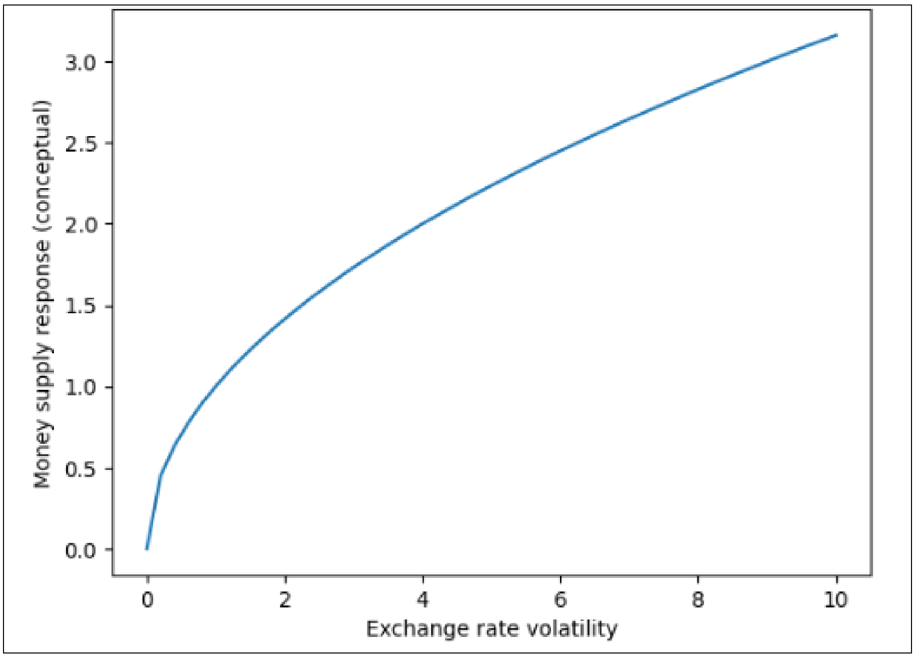

Fig 3: The relationship between changes in the money supply and variations in the exchange rate Original: Concocted by the scholar

When the chart shows, the relationship between the two variables is dynamic; when exchange rate swings increase, the trajectory of monetary liquidity changes more clearly.

Discussion of descriptive results and linking them to the research hypotheses

Results from both descriptive and analytical analyses indicate that the interrelationship between exchange rate variability and development of money in Iraq can be considered as dynamic and interactive. The findings of the current research could not represent this relationship in terms of a direct, linear, or immediate manner. Descriptive indexes indicated that there were fluctuations in the exchange rate of the Iraqi dinar to the U.S. dollar over the duration of the current study due to external events or sudden and significant variations in financial/economic conditions; however, these fluctuations occurred within a generally stable framework for managing foreign currency by the Central Bank of Iraq. Conversely, the money supply (M2) fluctuated in an increasing direction, and its growth rates varied with respect to the state of financial expansion and the level of oil revenue available, and therefore demonstrated that the development of liquid assets in Iraq's money supply is highly correlated with the inflows of foreign currency and the actions of monetary and fiscal policies collectively.

Although there are differences in the descriptive comparisons between trends in exchange rates and trends in monetary mass, the descriptive comparison also suggests a remarkable similarity in timing in the synchronization of periods of increased exchange rate variability with irregularities in monetary mass development (whether increases or decreases) over time. Therefore, the shock to an exchange rate causes an alteration to the course of monetary liquidity over time. There is no direct relationship with regard to how the movement of the exchange rate and the movement of monetary mass are related. However, there is a relationship between the degree to which the Iraqi economy depends upon oil denominated in foreign currencies, and the actions of the monetary authority with respect to responding to disturbances to the exchange rate (i.e., intervening in the foreign exchange markets). Therefore, due to the institutional and structural characteristics of the Iraqi economy, this analysis provides support for the first sub-hypothesis of the study that is stated as follows: The development of monetary mass and the exchange rate will form a long run equilibrium relationship.

The descriptive analysis also demonstrates the existence of various mechanisms through which changes in exchange rates affect the money supply. The primary mechanism by which exchange rate variability affects the money supply is the central bank's balance-sheet channel. In the context of this mechanism, changes in the amount of local-currency-based liquidity injected or absorbed by the economy arise from the central bank's activities in the foreign-exchange market. However, under conditions of higher uncertainty, the dollarization channel (the use of U.S. dollars as a medium of exchange) expands, resulting in a structural change in the composition of the money supply. Furthermore, economic agents' precautionary demand for money or foreign assets is increased with respect to inflationary expectations that are expected to emerge in the future; thus, it is demonstrated that these channels provide evidence that Iraq's money supply is an endogenously determined variable that is responsive to a variety of types of exchange-rate-related shocks on a short-run basis, and not merely a static exogenous variable. Therefore, the second of our hypotheses regarding the time-varying and direction-varying responses of the money supply to exchange-rate shocks receives support from these findings.

As an open economy heavily reliant upon oil exports, Iraq presents a case study that clearly illustrates how exchange rates can directly impact money supply and vice versa. The flow of foreign currency into Iraq directly relates to the overall level of liquidity in Iraq. However, monetary policy makers face difficulties in isolating the effects of exchange rate shocks to monetary policy, primarily due to inter-relationship of financial markets, size of the economy, and depth of those markets; all of these variables combine to make isolation of the effect of exchange rates on the money supply difficult at best. The descriptive results of this study support the study's primary hypothesis (that changes in the exchange rate will lead to economically significant and dynamic relationships between the changes in the exchange rate and money supply levels) in that changes in the exchange rate do influence the monetary liquidity path in Iraq through both direct and indirect paths. A further need exists to use dynamic multivariate analytical techniques to understand the interactions in monetary policy within the Iraqi economy. The results of this study provide a consistent economic rationalization of the observed dynamics that will serve as a foundation for future research using more complex econometric models.

Conclusion

- The study findings confirm that there is a dynamic relationship between the volatility of exchange rates (the relative price of currencies) and the development of money supply in Iraq. The relationship is a non-static and does not occur instantaneously and therefore can not be explained using the traditional static or instantaneous models. The results demonstrate that exchange rate fluctuations are one of the main channels through which external shocks influence money supply in Iraq through Central Bank intervention and the behavior of money demand. It has been found that money supply in Iraq is a dependent variable as well as an endogenous variable that is influenced by exchange rate fluctuations, and also the interaction between monetary policy and fiscal policy; and is not an exogenous and independent external variable.
- A long-term relationship exists between the exchange rate and money supply in Iraq indicating structural linkages between the two variables in the economy of Iraq

Results of the study have demonstrated that the money supply will respond to shocks caused by exchange rate movements in the short run with varying direction and degree of responsiveness to these shocks over time.

Recommendations

- There has to be more coordination between fiscal and monetary policies in order to lessen the effect of currency volatility on monetary policy's liquidity.
- Development of Sterilization Tools to increase the Central Banks capacity to control liquidity as a result of their intervention in the foreign exchange market.
- Enhancing Financial Markets and Developing the Banking Sector to reduce Dollarization and Increase Confidence in National Currency.
- Expanding Multivariate Dynamic Analysis Techniques to Broaden the Evaluation of Monetary Policies in Iraq.
- Increased encouragement for future research to expand the scope of analysis to incorporate other Monetary and Financial Variables to enhance understanding of the Iraqi Monetary System.

Conclusion

Conducting an analysis on the correlation between the exchange rate movements and the developments of monetary masses in the context of the Iraqi economy is one of the most appropriate ways to understand the essence of monetary policies in a country with an open rentier economy subject to multiple external shock events. Additionally, this study demonstrated that it is impossible to separate the analysis of this relationship from the institutional and structural characteristics of the Iraqi economy; nor the role of the Central Bank in the management of foreign exchange markets and in financing monetary stability. Finally, the study demonstrated that using multivariate statistical methodology (and hence multivariate statistical techniques) is a theoretically and methodologically appropriate way to investigate this relationship, as they are capable of capturing dynamic relationships among monetary variables as well as the temporal reciprocal effects between these monetary variables. Therefore, the study addresses the current gap in the literature and offers an analytical basis that will allow for additional depth in further studies.

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