The Wave Effect of Exchange Rates on the General Index of the Iraq Stock Exchange

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Abstract		Original Research Article

The study of the wave effect of exchange rates on the general index of the Iraq Stock Exchange aims to examine the potential impact of monetary policy trends on stock market performance and the role of financial and banking reforms in enhancing the financial market. Additionally, it seeks to understand how exchange rates have influenced the stock market in Iraq. The study employed the Wavelet methodology to explore the correlation between the exchange rate variable and the general stock market index. Specifically, it used the wavelet or frequency methodology developed by Grinsted *et al.,* (2004) to reveal the co-movement between the study variables. The findings indicate a bidirectional causality extending from the exchange rate to the general stock market index and vice versa across different time frequencies and periods. The arrows point to upward and downward movements within the white cone-shaped boundary. In the short term, the relationship was initially positive and then negative, as evidenced by the arrows pointing to the upper-right quadrant, indicating a positive relationship between the variables. The arrows moved rightward in 2006 and 2007, leftward in 2010, upward in 2017, and rightward again in 2020. The results demonstrate that the stock market index is influenced by exchange rates, with an unstable relationship between them.
Keywords: Wave Effect, Wavelet, Exchange Rates, General Stock Market Index.

INTRODUCTION

The stock market is one of the most critical components of the financial system in any country. It serves as a mechanism for providing necessary funding for numerous investments that contribute to economic growth. Therefore, serious efforts must be directed toward developing this market by identifying the key factors that facilitate its growth and influence its development. Monetary policy is among the tools that promote the growth and activity of the stock market through its established mechanisms. The financial system is the primary driver of economic development, and it mobilizes the financial savings needed to fund various economic activities. It achieves this by channelling financial resources from surplus to deficit units, encouraging investments through attractive investment opportunities, and providing funding. Additionally, it enhances the efficiency and allocation of financial savings, positively impacting economic growth. However, financial systems in developing countries often suffer from inefficiency and an inability to mobilize financial savings to levels that enable acceptable economic growth rates. This shortfall is attributed to what is known as financial repression policies. Furthermore, monetary policy, represented by the actions and measures undertaken by the central bank to monitor and regulate currency, aims to achieve economic policy objectives. Traditionally, the activities of monetary authorities fall within the framework of economic policy in its various aspects to attain desired goals, such as high growth rates, full employment, price stability, and balance in the payments system. Today, however, monetary policy has become increasingly centred on a primary objective: financial stability.

Research Problem:

The research problem revolves around the following question: Do exchange rates impact the general index of the stock market? It is well-known that the effect varies from one economy to another and even within the same economy. Opinions differ regarding the nature of these implications and effects. Some argue that exchange rates have negative impacts, while others believe their effects are positive. This divergence of views constitutes the core of the research problem.

The objective of the Study: The study aims to achieve the following:

1. Identify the potential impact of monetary policy trends on the stock market's performance.
2. Examine the role of financial and banking reforms in enhancing the financial market.
3. Understand how exchange rates have influenced the stock market in Iraq.

Research Hypothesis:

The study seeks to verify the hypothesis that monetary policies impact the stock market in Iraq and that exchange rates in Iraq exert a more significant influence on the general stock market index.

RESEARCH METHODOLOGY

The study adopts an inductive and deductive approach, moving from the general to the specific. This involves transitioning from the general principles of financial, banking, and monetary reforms and financial liberalization, which have been globally implemented, toward exploring their applicability in the Iraqi economy. It also examines the requirements for their implementation in the context of Iraq's economic realities. The study employs a qualitative and analytical approach to the theoretical aspects of the research. For the practical aspects, an econometric model is utilized to measure the relationship between exchange rates and the stock market.

Previous Studies:

1. **Fayza Hassan Mesjat (2020):** This study aimed to measure the impact of monetary policy variables in Iraq, including interest rates, money supply, exchange rates, and inflation rates, on the general stock price index. The results indicated a strong effect of inflation rates on the general stock price index, while the impact of the other variables was weaker. This weakness was attributed to the unique circumstances of the Iraqi stock market, which is heavily influenced by economic and security instability.
2. **Zahra Darwish, Alaa Al-Din Al-Qadri, and Mohamed Al-Khatib Nemer (2019):** The study addressed the issue of exchange rate fluctuations and their impact on financial markets. The econometric analysis revealed an inverse relationship between the mentioned variables, moving from exchange rates to the Kuala Lumpur index. This aligns with the

analytical side of the study, suggesting that the Kuala Lumpur index can be considered a general indicator of economic activity.

3. **Navaz Naghavi, Devinder Kaur, and Muhammad Shujaat (2018):** The findings showed a positive impact of liberalization on efficiency, mainly regarding financial market informational efficiency. The effect of financial liberalization on market efficiency was positive and significant after achieving a certain threshold of institutional development. Below this threshold, the impact of financial liberalization on stock market efficiency was negative.
4. **Shahida Perveen and Mustaghis-ur-Rahman (2018):** In their study, titled "The Impact of Fiscal and Monetary Policies on Stock Market Performance: An Empirical Study of the Pakistan Stock Exchange," the results indicated a long-term policy-stock market performance association; on the other hand, there was a short-term relationship between monetary policy measures and stock market performance, government expenditures, budgetary characteristics, and money supply had a significant positive effect. In contrast, tax revenues and interest rates significantly negatively impacted stock market capitalization in the long term.
5. **Jamal Qasim Mahmoud (2018):** The study "The Impact of Fiscal and Monetary Policies on Economic Growth in Arab Countries" found that shocks in monetary and fiscal policy variables significantly impacted economic activity, with the effects varying from one country to another.
6. **Idris (2017):** The study "Financial Liberalization and Its Role in Shaping the Trends of the Banking Industry in Iraq" concluded that financial liberalization positively impacts banking industry indicators in Iraq.

Study Variables:

Exchange rates are represented as (X3) as the independent variable, while the general index of the stock market is defined as (Y0) as the dependent variable. Monthly data from the Central Bank of Iraq were utilized, while annual data were used to analyze the variables, as shown in the table below.

Table and Figure 1: Exchange Rates and the General Index of the Iraq Stock Exchange

Year	Exchange Rate	General Index of the Iraq Stock Exchange
2004	1453	64.21
2005	1469	54.71
2006	1467	27.46
2007	1255	32.17
2008	1193	42.83
2009	1170	133.56

Year	Exchange Rate	General Index of the Iraq Stock Exchange
2010	1170	93.32
2011	1170	133.07
2012	1166	119.56
2013	1166	118.04
2014	1188	103.34
2015	1190	871.88
2016	1190	585.17
2017	1190	580.54
2018	1190	510.16
2019	1190	493.76
2020	1190	461.70
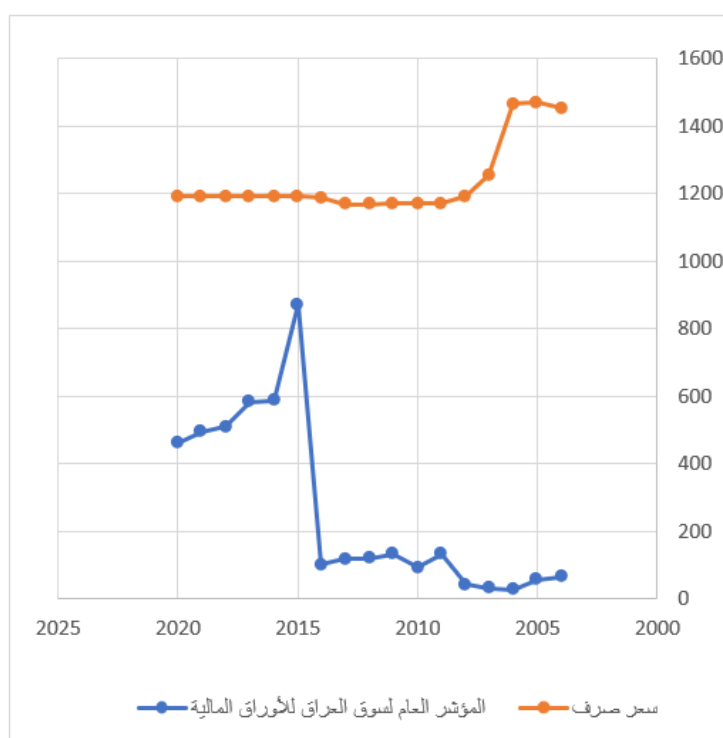
Source: Central Bank of Iraq, Annual Report, 2004–2020.

Exchange rates play a significant role in influencing the performance of financial markets, mainly through their impact on stock prices. An increase in foreign exchange rates encourages individuals to hold as many stocks as possible, especially when interest rates are low, which results in lower stock prices. Conversely, a depreciation of the local currency increases the country's exports, enhancing the competitiveness of local companies in the international market. This leads to higher profits and returns for these companies, subsequently raising their stock prices in the financial market (Al-Toma, 2007: 24). From the previous table, it is observed that the exchange rate was 1,453 IQD per USD in 2004 and then declined, indicating a continuous appreciation of the local currency up until 2013, when the exchange rate stabilized at 1,166 IQD per USD. However, in 2005, the exchange rate increased to 1,469 IQD per USD, marking a rise of 1.10% compared to the previous year. This increase was attributed to several factors (Central Bank of Iraq, 2005: 10):

1. **Rumors about the Dollar Reserves:** Rumors circulated regarding the depletion of dollar reserves in the Central Bank, prompting individuals and banks to purchase large quantities of dollars from the auction, fearing a potential halt in currency sales.

2. **Auction Policies:** The Central Bank sold portions of requested amounts in the auction while intensifying oversight on private banks, limiting state entities' requests to the Ministry of Finance and restricting auction participation to customers only. This reinforced the perception that the Central Bank could not meet all requests, confirming the prior rumors.

3. **Security Instability:** Increased travel and migration abroad during this period heightened demand for dollars and participation in the auction.

4. **Delayed Food Ration Distribution:** The Ministry of Trade's several months of delay in

supplying ration card items fueled rumors about the gradual removal of the ration card system. This led to higher food prices in the market, increased import activity, and consequently, heightened demand for dollars, raising their price in the local market.

In subsequent years, the exchange rate stabilized, reflecting the effectiveness of monetary and fiscal policies in the country. For instance, the exchange rate remained constant at 1,170 IQD per USD in 2009, 2010, and 2011 and 1,166 IQD per USD in 2012 and 2013. In 2014, the exchange rate increased to 1,188 IQD per USD, reflecting a growth rate of 1.89%. It continued to rise in the following years (2015–2020), reaching 1,190 IQD per USD.

Financial Markets (Importance and Concept): A financial market is "a mechanism through which savings are directed to individuals or investing institutions while simultaneously determining interest rates and the prices of financial assets such as stocks and bonds." The primary function of the financial market is to transfer funds from parties with surplus funds to those facing a shortage of funds. In doing so, it balances the forces of monetary supply and demand by using the interest rate. For the interest rate to reflect the true equilibrium value, all restrictions must be removed, thereby achieving a fair value representing capital's relative scarcity. (Al-Daami, 2009: 83).

Iraq Stock Exchange Liberalization Measures:
In line with the new directions of Iraq's financial economy, the policies of financial and economic liberalization, the emphasis on a more significant role for the private sector and foreign investment, and to overcome efficiency obstacles and enhance corporate performance, the Iraq Stock Exchange implemented a series of reforms for its corporate system, including:

1. **Establishment of the Securities Commission (2004):** Founded under the temporary Securities Market Law No. 74 of 2004, the Commission is an independent governmental body responsible for supervising and regulating listed companies and strengthening corporate governance mechanisms globally (Temporary Law for Iraq Securities Market, 2012).

2. **Representation in Conferences:** Representing the Iraq Stock Exchange in local, Arab, and international conferences to strengthen cooperation, development, and exchange of expertise. Additionally, it actively participated in the Euro-Asian Federation of Exchanges Executive Committee after being re-elected as a member for the second time in 2010 (Iraq Stock Exchange, 2010: 10).

3. **Issuance of Stock Price Index (ISX):** A stock price index was issued following the Arab Monetary Fund standards and implementing the Dow Jones Index. This was done in collaboration with the Euro-Asian Federation of Exchanges, adopting the international method for calculating stock prices in global markets (Iraq Stock Exchange, 2006: 14).

4. **Implementation of the XOM System:** This secure and high-precision system allows investors to access and manage their investments remotely from their companies' premises (Iraq Stock Exchange, 2011: 22).

5. **Registration with ISIN:** 62 joint-stock companies are registered with the International Securities Identification Numbers (ISIN). This registration is one of the deposit requirements, making these companies internationally recognized (Al-Ubaidi, 2010: 157).

6. **Integration with Arab Monetary Fund Database:** Adopting requirements and procedures for joining the Arab Monetary Fund's database as part of the market's openness initiatives.

Internationally, the Iraq Stock Exchange joined the Euro-Asian Federation of Exchanges for the first time in 2005 and became a member of the Arab Federation of Exchanges after meeting all registration conditions. These memberships provide the market with expertise and continuous training, enhancing efficiency. The latter half of 2004 witnessed significant trading activity in shares of companies listed in the market.

Key Mechanisms for Iraq Stock Exchange Reform:

1. The stock market should play a central role in privatising public sector companies in Iraq.

2. Participation in local, Arab, and international conferences and seminars, fostering cooperation, development, and exchange of expertise, and initiating training programs in collaboration with Arab, regional, and international federations.

3. Organizing and managing daily trading sessions using manual and electronic trading methods, transitioning all companies to electronic trading for the first time in Iraq's financial market history. Agreements were made with the Securities Commission to implement electronic systems.

4. Issuing a directory for Iraqi joint-stock companies, providing financial information and data reflecting their financial status.

5. Establishing branches of the Iraq Stock Exchange in significant provinces and regions, enabling electronic connections to the market and facilitating participation for all Iraqis.

6. Partnering with a television channel to broadcast live trading sessions, similar to Gulf stock market practices.

7. Coordinating with the Securities Commission and the Central Bank of Iraq to deposit government and semi-government bonds in

depository centers and trade them electronically in the Iraq Stock Exchange.

Second: Wavelet Analysis of the Relationship Between Monetary Policy Variables and the General Stock Market Index (Manage and Yousfi *et al.,* 2022, 130-131)

The Wavelet methodology is used to understand the correlation between monetary policy variables and the general stock market index. The wavelet or frequency methodology, developed by Grinsted *et al.,* (2004), aims to uncover the co-movement between monetary policy variables (broad money supply, interest rate, exchange rate, inflation) and the index of the overall stock market. Wavelet analysis's primary benefit over conventional time-series modelling is its capacity to record both continuous and slow co-movements. This makes it possible to comprehend the relationship between two-time series in the frequency and time domains with greater precision. Traditional approaches, on the other hand, ignore the frequency perspective and solely concentrate on the time domain. A bivariate framework based on continuous wavelet processing is used in the wavelet approach. This method interprets the co-movement between two-time series throughout the time and frequency domains and allows for a broad range of localization. Both wavelet coherence and cross-wavelet transform techniques are used to apply wavelet coherence. According to the continuous wavelet transformation, the coherence falls between 1 and 2.

The Continuous Wavelet Transforms $(N_a(p, q))$
Shows the projection of a wavelet $(\psi(.))$
In contrast to the time sequence $(a(t) \in K^2(R))$,
i.e.:

$$N_a(p, q) = \int_{-\infty}^{\infty} a\,(t) \frac{1}{\sqrt{q}} \psi \left(\frac{t - P}{M} \right) dt \qquad (1)$$

An essential feature of this technique
Is its potential to decompose a time series $(a(t) \in K^2(R))$ and seamlessly reconstruct it. Furthermore, this technique preserves the power of the observed time sequence as follows:

$$a(t) = \frac{1}{C_\psi} \int_0^\infty \left[\int_{-\infty}^\infty N_a\,(p, q) \psi_{p,q}(t)\,du \right] \frac{dq}{M^2}, M > 0. \qquad (2)$$

And additionally, it retains the power of the time sequence observed as:

$$\| a \|^2 = \frac{1}{C_\psi} \int_0^\infty \left[\int_{-\infty}^\infty | N_a(p, q) |^2 \; dp \right] \frac{dq}{M^2}. \qquad (3)$$

Wavelet coherence.

The correlation between each monetary policy variable and the general index of the stock market can be analyzed over time by considering the methodology implemented on a broad scale independent of the time series (i.e., wavelet coherence). In practice, wave power and wavelet transform are first defined.

Torrence and Compo (1998) mentioned that the wavelet transform can be illustrated by the sequence of two time series $a(t)$ and $b(t)$ as follows:
$$N_{ab}(p, q) = N_a(p, q)N_b^*(p, q) \qquad (4)$$

Where $N_a(p, q)$ and $N_b(p, q)$ Represent the continuous wavelet transforms of $a(t)$ and $b(t)$, respectively. Here, p denotes the location index, q The scale, and (*) represents the complex conjugate.

The cross-wavelet transform can be used to calculate wave power by $| N_a(p, q) |$. The cross-power spectra separate the segment where high energy concentration is detected, referred to as the "cumulus of restricted variance," in the associated time-frequency domain of the time series.

Wavelet coherence techniques can identify specific sections in the time-frequency domain where unexpected and significant differences in the time series' co-movement patterns occur. The modified wavelet coherence coefficient equation is defined as specified by Torrence and Webster.

$$W^2\,(p, q) = \frac{|M(M^{-1} N_{ab}(p, q))|^2}{M(M^{-1} | N_a\,(p, q) |^2)\, M(M^{-1} | N_b(p, q) |^2)}$$

A technique of coherence is used to express the letter M. The degree of wavelet-squared coherence is represented by the wavelet-squared coherence value, which spans from zero to one ($0 \leq W^2(p,q) \leq 1$). Whereas values close to one signify a high correlation (strong shared wave motion), values close to 0 signify no correlation (no shared wave motion). One may think of this as a particular squared correlation metric between the two time series. The fictitious distribution of wavelet coherence is investigated using the Monte Carlo approach. By overcoming the problem of squared coherence, which is unable to discern between positive and negative correlations between the two series, the Monte Carlo method enables us to investigate the lead/lag relationship between two-time series.

Wavelet Coherence Analysis

In the second step, the relationship and interdependence between stock market movements and specific monetary policy variables, as well as their correlation, are examined and compared using wavelet coherence analysis. The arrows in the graphical representations show the relative phase shift between two-time series as well as the predicted wavelet coherence technique. The vertical axis displays frequency between 4 and 64, while the horizontal axis displays the period from 2004 to 2020. On the vertical axis, long-term periods range from 16 to 64, while short-term durations fall between 4 and 16. The arrows show which way the causality and correlation links run. A positive correlation between the two series is indicated if the arrows point to the right. When the arrows point to the left, there is a negative correlation between the two variables. The first variable leads or causes the second, as indicated by arrows going to the lower left ↙ or higher

right ↗. Arrows that point to the higher left ↖ or lower right ↘, on the other hand, indicate an inverse relationship in which the second variable leads or influences the first. Furthermore, the upward ↑ and downward ↓ arrows show that the lagging variable is represented by the descending arrow, while the upward-moving variable is the leading or dominant one. Time is represented by the horizontal axis, and frequency by the vertical axis. The cone of influence, which denotes the edge of noteworthy outcomes, is depicted by the white cone-shaped line. The significance level or correlation between the two variables is shown by the colour gradient on the figure's right side. High correlations between the time series variables are indicated by red, and regions of high significance—that is, regions with a significance level below 5%—are indicated by thick black contours encircling them. The lead/lag relationship between the two variables, demonstrating their phase relationship and linkage, is represented by the arrows in the wavelet coherence analysis.

Wavelet Frequency Analysis Between Exchange Rate and General Stock Market Index

Figure (2) illustrates the continuous wavelet transform between the exchange rate and the general stock market index. It demonstrates that the general stock market index exhibits short-term effects, as evidenced by small scattered black spots. These indicate that the stock market's effectiveness was relatively weak in the short term. On the other hand, the exchange rate shows wavelet effects during the short-term periods of 2007, 2008, 2009, 2010, 2014, and 2018. However, these effects are inconsistent, and the short-term impact is relatively weak.
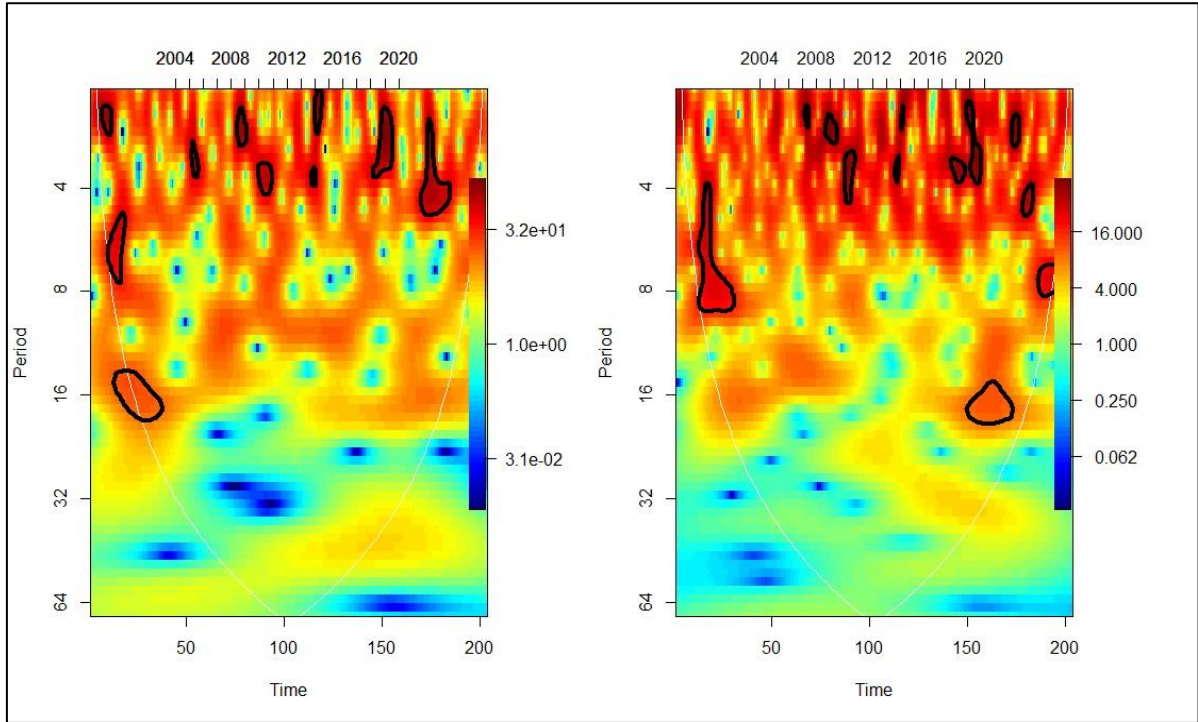
X3

Y0

Figure (2): Exchange Rate Variable (X3) and Stock Market (Y0)
Source: Prepared by the researcher based on the outputs of the statistical program (R).

Wavelet Coherence Between the Variables

Figure (3) illustrates the wavelet coherence between the exchange rate and the general stock market index. It highlights several high-degree co-movements between the two variables. Additionally, numerous small patches show significant reliance across both short-term and long-term monthly frequency ranges at the start, middle, and end of the data period. The analysis shows significant wavelet coherence with statistically meaningful indications of correlation and dependency between the variables.
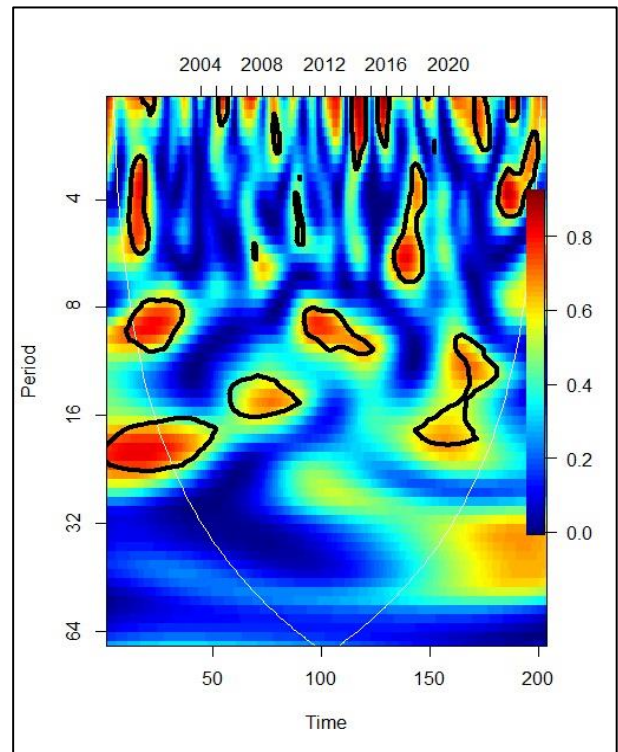

Figure (3): Wavelet Coherence Between Variables (X3) and (Y0)
Source: Prepared by the researcher based on the outputs of the statistical program (R).

Wavelet Effect Between Broad Money Supply and the Stock Market

Figure (4) illustrates the wavelet effect between the exchange rate and the general stock market index. The results derived from the wavelet analysis reveal a bidirectional causality extending from the exchange rate to the stock market index and vice versa across different time frequencies and periods. The arrows indicate upward and downward movements within the white cone-shaped boundary. In the short term, the relationship started as positive, then turned negative. This is evident as the arrows pointed to the upper right indicate a strong positive relationship between the two variables. Notably:

- Arrows pointed to the right in 2006 and 2007, indicating positive alignment.
- Arrows shifted to the left in 2010, indicating a negative correlation.
- Arrows pointed upward in 2017.
- Arrows returned to the right in 2020.

These patterns suggest that exchange rates influence the stock market index, though the relationship remains unstable over time.
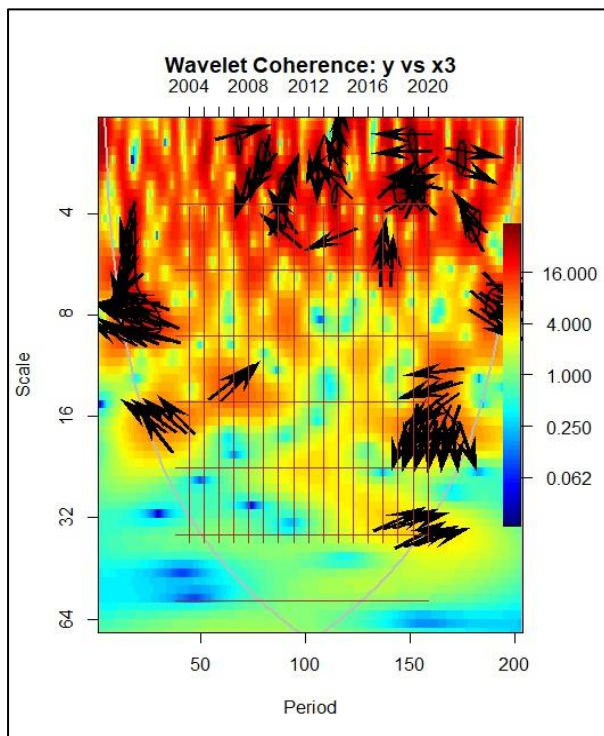

Figure (4): Wavelet Effect Between Exchange Rate and Stock Market Index
Source: Prepared by the researcher based on the outputs of the statistical program (R).

In the long-term period, defined as the range (16-64), the arrows point downward to the left during 2017–2020, indicating a negative correlation. Subsequently, the arrows shifted to the right during the same period, reflecting a transition to a positive relationship. This highlights a dynamic and evolving interaction between the exchange rate and the stock market index over the long term.

CONCLUSIONS

1. Exchange rates significantly impact the performance of stock markets and, consequently, the real economy, which supports the validity of the research hypothesis.
2. The policies implemented in Iraq were not inherently flawed; however, the timing of their implementation was not entirely appropriate, which affected the monetary policies within Iraq's real economy.
3. The performance of the Iraq Stock Exchange is limited, and the developments in its index do not reflect the nature of internal transactions but result from the country's economic fluctuations, albeit with a delayed effect.
4. Investor behavior in the Iraq Stock Exchange is cautious, indicating that their reaction to increases or decreases in stock prices is subdued and lacks direct responsiveness due to fears of repeating historical financial market events.

RECOMMENDATIONS

1. Monetary and fiscal policymakers should coordinate closely to achieve the desired economic outcomes. This coordination benefits overall economic activity, as aligned and stable monetary and fiscal policies lead to low inflation rates, market-driven interest rates, balanced payments, and realistic and stable exchange rates.
2. Investors in developing and emerging financial markets, like those in advanced economies, should consider the central bank's and government's policies and decisions before making investment decisions. This helps in building sound strategies that align with market trends.
3. The state should align its fiscal, monetary, and economic behavior with liberalization trends and adapt to capital inflows and outflows.
4. When the government decides to privatize certain companies, listing them on the stock market for trading is crucial, ensuring that privatization is conducted transparently and in front of the public.

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