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Analysis and measurement of the parallel sterilization of the exchange rate and its repercussions for bridging the gap in the Iraqi economy for the period 2004-2023

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Abstract : The exchange rate in Iraq is witnessing a lengthy discussion to bridge the gap between the official and parallel rates, but this gap occurs as a result of market behavior in the Iraqi economy, as monetary policy in Iraq, especially after the second amendment to the official exchange rate (1320), works to reduce the gap that occurs due to small... Merchants who carry out parallel sterilization within the market itself. Parallel sterilization means parallel sterilization, which is non-centralized or parallel behavior within the money market and is linked to the demand for cash for liquidity purposes in light of the availability of the opportunity cost of anticipating what can be called the basic or large expected interest return in holding cash. The research problem was represented by a statement. The phenomenon of parallel sterilization in the market in light of the measures taken by monetary policy? As for the goal of the research, it focused on a group of goals, but the most prominent goals are reducing the gap between the two prices in light of the rise in oil revenues and the increase in foreign reserves at the Central Bank of Iraq. The research hypothesis was that there is a significant effect between demand on the exchange rate and supply. As for the most important conclusion that the research came out of Parallel sterilization is a phenomenon generated as a result of parallel demand, which constitutes a heavy burden on monetary policy tools. The most important recommendation is the necessity of reducing the gap between the two prices in light of monetary policy measures.

Keywords: exchange rate - parallel sterilization - monetary policy - exchange rate gap exchange rate - NARDL.

Research Methodology

Firstly: Research Problem: The research problem lies in the following questions:

1- What is the phenomenon of parallel sterilization in the market in light of the measures taken by monetary policy?
2- Why does the exchange rate continue to rise in the parallel market until now?
3- What are the solutions proposed by monetary policy to reduce the price gap?
4- What is the nature of the causal relationship between the variables in the research?

Secondly: Research Objective: The research aims to elucidate the following:

1- Interpretation of the phenomenon of parallel sterilization arising in the market through the exchange rate gap.
2- The relationship between foreign reserves and window sales and their impact on the exporting currency.
3- Identifying monetary policy measures to fill the gap between the two prices, especially in recent times.
4- Highlighting growth rates for all variables in the research.
5- Interpretation of the relationship between variables through the non-linear autoregressive distributed lag (NARDL) model.
6- Narrowing the gap between the two prices in light of the rise in oil revenues and the increase in foreign reserves at the Central Bank of Iraq.

Thirdly: Research Significance: The importance of the research focuses on clarifying the phenomenon of parallel sterilization, as well as reducing the gap between the official and parallel prices and the relationship of foreign reserves with window sales through the non-linear distributed lag model, while proposing solutions to narrow the gap in the near future.

Fourthly: Research Hypothesis: The research hypothesis is derived from the following:

Null Hypothesis: There is a positive relationship between foreign reserves and the parallel exchange rate in the long term. Alternative Hypothesis: There is a negative relationship between foreign reserves and the parallel exchange rate in the long term.

Fifthly: Research Sample:

- Temporal Sample: It extends from the period 2004-2023.
- Spatial Sample: Represented by a set of variables in monetary policy. Data was obtained from the annual statistical bulletin issued by the Central Bank of Iraq, and the statistical website.

Sixthly: Research Method: The researchers used the analytical method to interpret the results and variables by extracting growth rates using the equation ((current - previous) / previous) * 100. As for extracting the exchange rate gap, it was done using the following equation: ((parallel rate / official rate) - 1) * 100. Then, the results were applied and hypotheses were tested using the standard non-linear autoregressive distributed lag (NARDL) model, as well as the stability of the time series using the expanded Dickey-Fuller and Phillips-Perron tests. The researchers then used the Wald test to assess the model's validity and efficiency, along with graphical representations.

Seventhly: Research Structure: The research is divided into three requirements:

1- The first requirement: Research Methodology.
2- The second requirement: The theoretical framework of the exchange rate, foreign reserves, foreign currency sales window, and exchange rate gap.
3- The third requirement: The practical analytical and measurement framework.

Eighth: The Hypothetical Research Framework:

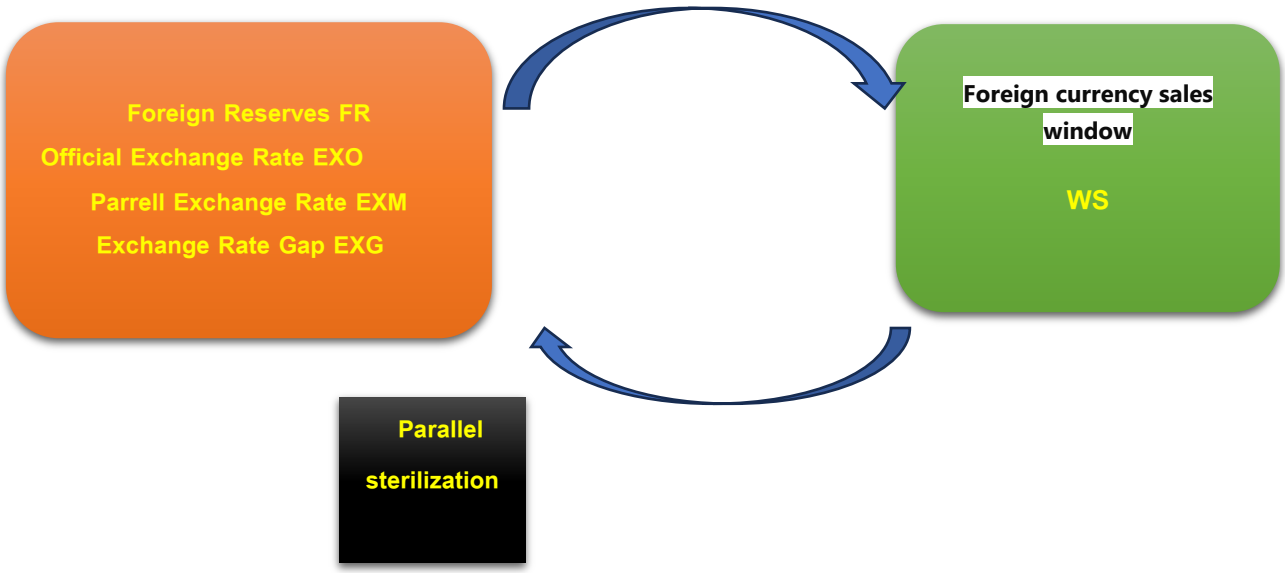

Diagram (1): Prepared by the researchers.

The theoretical framework of the exchange rate and foreign reserves

Everyone in society, as well as experts in economic and political affairs, understands the importance of the exchange rate in the country. It's the tool through which the state can control the exports and imports of the concerned country. If the country suffers from a trade deficit, the government reduces the exchange rate to decrease this deficit, and vice versa. Thus, it serves as a link between the global and local economies.

First: The Concept of the Exchange Rate

The multiplicity of concepts of the exchange rate is due to differences in economic systems, historical stages, researchers' perspectives, and methods used to determine an appropriate definition for the exchange rate, which we will delve into.

The exchange rate is defined as the exchange ratio between the foreign and domestic monetary units. More precisely, it is the rate at which a specific currency is bought in exchange for another currency (Al-Hamzawi, 2004, p. 17). It's also defined as the number of units of foreign currency exchanged for the local currency (Najmeh, 2011, p. 15). Furthermore, it can be understood as a convertible currency that can be legally exchanged for another convertible currency (Holden MacDonald, 2007, p. 39).

Second: Types of Exchange Rates

The exchange rate is a crucial element in international economic relations, as it facilitates trade between trading nations and affects the competitiveness of locally produced goods exported abroad. There are various types of exchange rates, including:

1. Nominal Exchange Rate: It represents the exchange rate between two currencies or the number of units of the local currency exchanged for one unit of foreign currency. It's the rate applied to official transactions (Arab Monetary Fund, 2022).
2. Real Exchange Rate: It measures the ratio of the general price level in the domestic economy to that abroad, expressed in a common currency, such as both in dinars (Ali, 2015, p. 4).
3. Effective Exchange Rate: It's a measure of the weighted average value of a currency against two or more currencies, where the more important currencies in the currency basket receive greater emphasis (Holden MacDonald, 2007, p. 98).
4. Equilibrium Exchange Rate: It's the rate at which the quantity of a certain currency demanded equals the quantity supplied, determining the equilibrium in the market for a specific currency (Mahmoud, 2000, p. 76).
5. Parallel Exchange Rate: It's the rate prevailing in parallel markets, subject to bargaining between parties. It's a variable rate from one currency to another and from one client to another, not officially fixed. Its announcement is personal, indicating the possibility of more than one parallel market for the same currency at the same time (Nezeys, 1993, p. 12).

Third: Functions of the Exchange Rate

Through the foreign exchange market, the exchange rate can perform several functions, including:

1. Medium of Exchange: It facilitates the transfer of purchasing power from one country to another and from one currency to another. Various means are used for exchange, differing in type, value, and distinctive features, and the exchange process is regulated between participants in both sides of the foreign exchange market (Awad Allah, 2004, p. 45).
2. Speculation: It involves buying currencies from the market when their value is low and selling them simultaneously in another market when the price is higher to make a profit (Al-Husseini, 1999, p. 180).
3. Credit: The foreign exchange rate provides banking credit through banks dealing with it. These banks grant loans to exporters and importers after conducting buying and selling operations. Additionally, these banks provide financing for short and long-term capital (Al-Abadi, 2005, p. 40).
4. Hedging and Risk Avoidance: This process aims to avoid foreign exchange risks due to the possibility of a depreciation in the exchange rate. It involves selling currency forward to maintain the value of the foreign currency against other currencies in case of its depreciation (Shihab, 1996, p. 244).

Fourth: Parallel Sterilization

Sterilization refers to the absorption process of the effect of the increase in the money supply in the parallel market, followed by withdrawing the national currency from the market to maintain the stability of the circulating money supply. In this case, the parallel market plays an essential role in sterilization, as the accumulation of this money supply would lead to rampant monetary inflation (Central Bank of Iraq, 2019, p. 9). Conversely, the phenomenon of parallel sterilization has emerged, which refers to a decentralized or parallel behavior within the monetary market associated with the demand for cash for liquidity purposes, given the opportunity cost of expected basic or high interest rates in holding cash (Saleh, 2024: 5).

Fifthly: The difference between the exchange rate gap in the official and parallel markets:

The official exchange rate is regulated and supervised by the monetary authority in the official market, while the parallel exchange rate is irregular and distant from the regulatory measures and supervision exercised by the authorities (Almuammar and Aljumaili, 2022, p.113). The "window" is a central market for foreign exchange operations in Iraq, and the central market is the one that meets the demand for the dollar and which the local demand for the dollar leads to the unification of the mechanisms of the foreign exchange market in all regions of Iraq. Therefore, the official exchange rate is the rate announced in the window, which represents the exchange rate for

selling foreign currency to licensed banks and exchange companies, while the parallel exchange rate represents the market rate, which is the rate at which dollar exchange companies and banks sell foreign currency to traders and other participants. It takes into account the balance of supply and demand, and through the window, the Central Bank of Iraq tries to control the market rate and achieve the desired goal of the window (Mohammed and Mahmoud, 2017, p.306). The official exchange rate indicates the purchasing power of the local currency against foreign currencies, while the parallel exchange rate is one of the results of the exchange control system. This market forms in case the central bank fails to meet the citizens' demand for foreign currency, thus the exchange rate gap is the difference between the window rate and the market rate, and it comes in two types: the first type is the margin between the central bank rate and the banks' selling rate for final applicants in foreign currency, and the type of sale, whether cash or by transfer. The second type is attributed to other factors, the most important of which is the element of expectations when the local demand for foreign currencies is not met (Aswan and Alshukri, 2022, p.3788).

Sixthly: Foreign reserves:

1. **Concept of foreign reserves**: It refers to foreign assets available and accessible at the discretion of the monetary authority to finance the deficit in the balance of payments, through intervention in the exchange market to influence the exchange rate or for other purposes. It is also defined as the total financial and technical means necessary to finance international trade, including the accumulated and treasury part of the resources retained by the monetary authority and capable of being used at any time without restriction (Sajat, 2022: p.5).
2. **Importance of foreign reserves:** The objectives of foreign reserves are as follows (Obaid, 2022: p.21):

1. Enhancing confidence in exchange rate policy, especially in countries that adopt fixed or managed floating exchange rate policies, and ensuring the ability of monetary authorities to intervene to support the national currency.

2. Maintaining a level of liquidity in foreign currency while considering liquidity constraints and risks so that the country can mitigate the negative effects of external shocks, especially in countries with access to international financial markets in times of crisis.

3. Instilling a degree of confidence in international markets regarding the country's ability to meet its external obligations on a regular basis.

3. **Efficiency of foreign reserves:** The motives for demand for reserves are largely proportional to most motives for demand for money, especially for speculative, precautionary, and transaction purposes, and sometimes the demand for reserves may run parallel to the demand for money according to the treasure theory. The motives or reasons for reserves can be summarized as follows (Sowaidj, 2021: pp.20-21):

1. **Transaction motives**: This motive is the main driver of demand for foreign reserves as central banks may need accumulated balances for transaction purposes such as covering purchases of goods and services, servicing future debts due to temporary shortages in exports.

2. **Intervention in the foreign exchange market**: This occurs through the intervention of the monetary authority in the foreign exchange market either to ensure the market operates smoothly or due to the commercial motive tendency. This motive indicates that monetary authorities will intervene to prevent the local currency from rising to a level that could generate losses in the competitiveness of the export sector. This requires that the amount of foreign reserves held by the central bank be capable of bearing the specified role performed by the activities of the monetary authority.

3. **Precautionary motive:** Countries with high levels of reserves are more capable of withstanding panic in the financial market and sudden or unforeseen reversals in capital flows. They not only reduce the costs of crises but also make crises like these less likely. It serves as a preventive motive for insurance against crises. Countries that have accumulated large reserves before the crisis are actually expected to act differently from countries with lower levels of foreign reserves.

Efficiency can be measured by dividing foreign reserves by the monthly value of imports.

Seventhly: Operation Mechanism of the Currency Window at Present:

1. Banks submit requests to purchase dollars for the purpose of enhancing the balances of their accounts abroad to the Operations Department and Debt Management / Currency Exchange Window Section using Subscription Request Form No. (1), which includes information related to all parties involved in the transfers, including the beneficiary. This is based on customer requests, and the equivalent amount in Iraqi dinars is recorded on the bank's current accounts opened with the Central Bank / the type of account designated for subscription operations in the currency window. The bank must commit not to change the beneficiary of the enhancement process after subscribing to the window.

2. Requests to purchase dollars in cash are submitted to the Financial Operations Department and Debt Management / Currency Window Section based on Subscription Request Form No. (1), and the equivalent amount in Iraqi dinars is recorded.
3. The bank strengthens the subscription request in the window with the following attachments:
a. Electronic statement with the names of exchange companies wishing to purchase dollars in cash through the bank, according to Form No. (2) for exchange company data participating in the window.
b. Undertaking according to Form No. (3)
attached to each subscription request, whereby the bank undertakes to verify the legality of its clients' imported funds and their legitimacy and to comply with the requirements of the Anti-Money Laundering and Counter-Terrorism Financing Law No. 39 of 2015. In case of non-compliance, the bank bears all legal consequences arising therefrom, and the declaration is signed by each of the authorized director, regional manager, compliance officer, anti-money laundering officer, and risk management officer
c. Written commitment according to Form No. (4) attached to each external reinforcement request (documentary credit or foreign remittance), stating that the bank has conducted research, investigation, and verification of all parties involved in the external reinforcement process, including the ultimate beneficiary, against local and international sanctions lists, especially OFAC lists and lists of freezing terrorists' funds, before submitting the subscription request in the currency exchange window.
d. Deposit entry via the Real-Time Gross Settlement (RTGS) system in Iraqi dinars deposited in the account designated for foreign currency purchase operations, five working days before the execution date of the sale operation or as decided by the Central Bank, indicating the date and type of participation.

The Analytical and Econometrics Framework

Table (1) below explains the exchange rate in the official and parallel markets and indicates the gap between them for the period 2004-2023.
The official exchange rate in 2004 was recorded at 1453 dinars per dollar, the same rate as in the parallel market for that year, meaning there was no gap between the two rates. The lack of a gap is attributed to the use of indirect monetary policy tools in the market as well as the stability in the general price level.
Adjustments to the official exchange rate occurred from 2005 to 2008 due to the implementation of the Iraqi Central Bank Law No. (56) of 2004, which resulted in full independence of monetary policy in its execution. This was accompanied by fluctuations in the parallel market during the same period, with varying rates of gap between the two rates attributed to high demand for foreign currency compared to the supply by the Iraqi Central Bank.
In 2009, the official exchange rate began to stabilize at (1170) dinars per dollar, with little fluctuation in the parallel market and a corresponding slight variation in the gap during the same period. This stability was attributed to the Iraqi Central Bank's use of the foreign currency selling window with cash sterilization through foreign reserves against the Iraqi dinar.
On December 20, 2020, due to the economic situation resulting from a double shock (health and economic), the Iraqi Central Bank adjusted the official exchange rate from (1190) to (1460) to cover government spending and reduce the deficit in the general budget. This continued in 2021 and until 2022, with an exchange rate in the parallel market of (1482) dinars per dollar.
On February 8, 2023, the Iraqi Central Bank adjusted the official exchange rate from (1460) to (1316) by the bank's board of directors due to the improved financial situation of the country resulting from the rise in oil prices, increasing foreign reserves at the Iraqi Central Bank, as well as the approval of the medium-term budget for the period (2023-2025) and the containment of the pandemic (COVID-19).

Table (1) Official and Parallel Exchange Rates and Gap Between Them for the Period (2004-2023)

Year	Official Exchange Rate	Growth Rate %	Parallel Exchange Rate	Growth Rate %	Gap Between Rates %
2004	1453	-	1453	-	(99)
2005	1469	1.10	1472	1.30	(98.99)
2006	1467	(0.13)	1475	0.20	(98.99)
2007	1255	(14.4)	1267	(14.10)	(98.99)
2008	1193	(4.94)	1203	(5.05)	(98.98)
2009	1170	(1.92)	1182	(1.74)	(98.98)
2010	1170	0	1186	0.33	(98.97)
2011	1170	0	1196	0.84	(98.94)
2012	1166	(0.34)	1233	3.09	(98.94)

Year	Official Exchange Rate	Growth Rate %	Parallel Exchange Rate	Growth Rate %	Gap Between Rates %
2013	1166	0	1232	(0.08)	(98.97)
2014	1187	1.80	1214	(1.46)	(98.95)
2015	1189	0.16	1247	2.71	(98.92)
2016	1190	0.08	1275	2.24	(98.94)
2017	1190	0	1258	(1.33)	(98.98)
2018	1190	0	1209	(3.89)	(98.99)
2019	1190	0	1196	(1.07)	(98.95)
2020	1192	0.16	1240	3.67	(98.99)
2021	1460	22.4	1474	18.8	(98.98)
2022	1460	0	1482	0.54	(98.98)
2023	1316	(0.86)	1531	3.30	(98.83)

Source: Central Bank of Iraq, Department of Statistics and Research, Annual Statistical Bulletin, Selected Years.

- Column (4) extracted by researchers.
- Columns (3), (5), and (6) extracted by researchers based on data from Tables (2) and (4).
- () Negative value within parentheses.
- The figure (1) below illustrates the growth rates for the official and parallel exchange rates, as well as the gap between them, for the period from 2004 to 2023. It is evident that the official exchange rate began fluctuating in the early period, followed by stabilization until 2021 due to inconsistent governmental policies in decision-making, which significantly affected the market in terms of overall price levels. Consequently, the parallel exchange rate continued to fluctuate continuously due to the lack of commitment by some banks, exchange companies, and intermediaries in the sales window, in addition to the new mechanism used by the Central Bank of Iraq in executing transfers and documentary credits (the electronic platform) in 2022 and beyond, following the U.S. Treasury Department's decision to enhance international transfer operations to reduce money laundering and terrorism financing. This impacted the parallel exchange rate due to the rejection of a large number of transfers and credits by the international auditing company in 2023, as well as the U.S. Treasury Department, leading to an observed increase in the parallel exchange rate in 2023. Figure (1) illustrates this trend. The Investment and External Transfers Department, Section of External Transfers, issued Circular No. 5/6/343 on 18/1/2024 to all authorized banks (The Central Bank of Iraq plans to gradually phase out the electronic platform for external transfers during 2024 and completely abolish it by the end of the year, retaining it only for auditing and statistical purposes).

Figure (1): Growth Rate for Official and Parallel Exchange Rates and the Gap Between Them for the Period (2004-2023) %.

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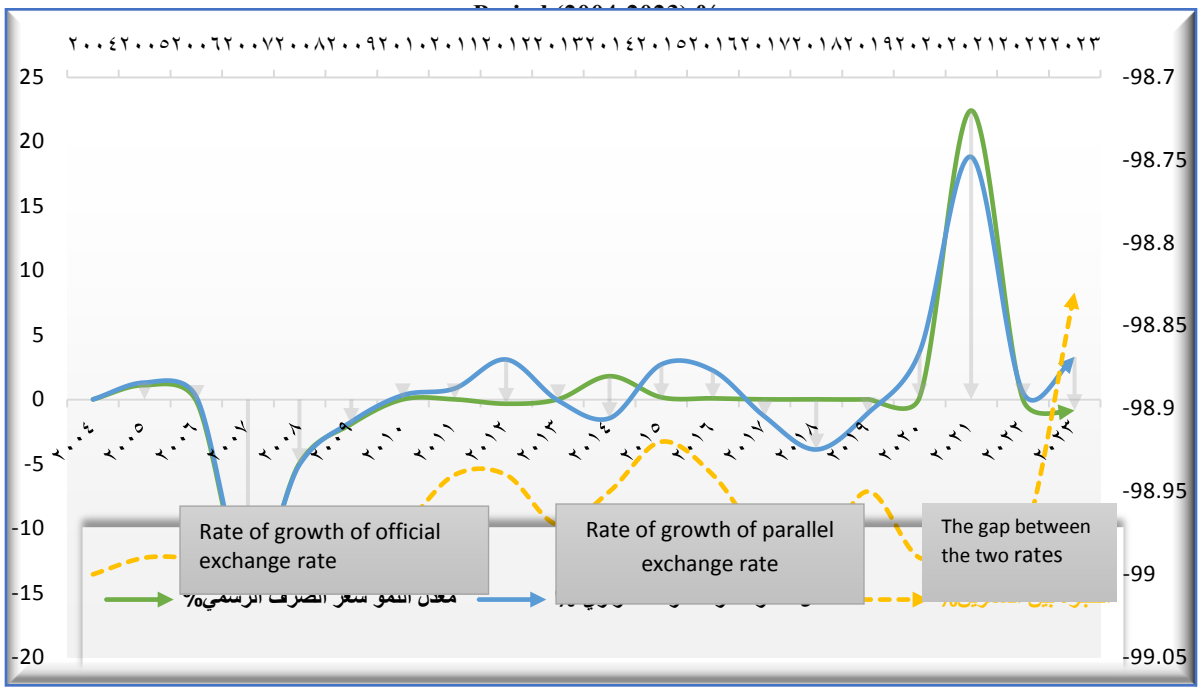


The figure was prepared by the researchers based on the data from Table (1).

Secondly: Foreign Reserves and Window Currency Sales: Table (2) below illustrates foreign reserves, window currency sales, and their growth rates for the period 2004-2023. It explains that official cash sterilization through the foreign currency sales window at the Central Bank of Iraq provides the required supply for imports, whether in the government or private sector, offset by Iraqi dinars transferred to the public finances to cover government operational and investment expenditures. This mechanism is intended for official cash sterilization.

Foreign reserves amounted to 10,109 billion dinars in 2004 and continued to rise until 2013 to reach 90,097 billion dinars, with a growth rate of 10.8%. However, they began to decline in 2014, reaching 76,973 billion dinars, with a growth rate of -14.5%, continuing to decrease until 2017 to reach 57,893 billion dinars, with a growth rate of 9.0%. This was attributed to the decrease in oil revenues due to military events in 2014, continuing until the liberation in 2017, as well as the failure to approve the general budget for 2014.

Table (2) Foreign Reserves and Window Sales for the Period (2004-2023)

Year	Foreign Reserves (Billion Dinar)	Growth Rate (%)	Window Sales (Billion Dollar)	Growth Rate (%)
2004	10,109	-	645	-
2005	17,846	76.5	861	33.4
2006	26,158	46.5	307	(64.3)
2007	38,678	47.8	681	121.8
2008	58,958	52.4	2,500	267.1
2009	52,224	(11.4)	2,828	13.12
2010	59,263	13.4	3,403	20.3
2011	71,119	20.0	3,941	15.8
2012	81,312	14.3	4,099	4.0
2013	90,097	10.8	7,226	76.2
2014	76,973	(14.5)	6,655	(7.90)
2015	63,435	(17.5)	3,415	(48.6)
2016	53,106	(16.2)	3,567	4.45
2017	57,893	9.0	3,466	(2.83)

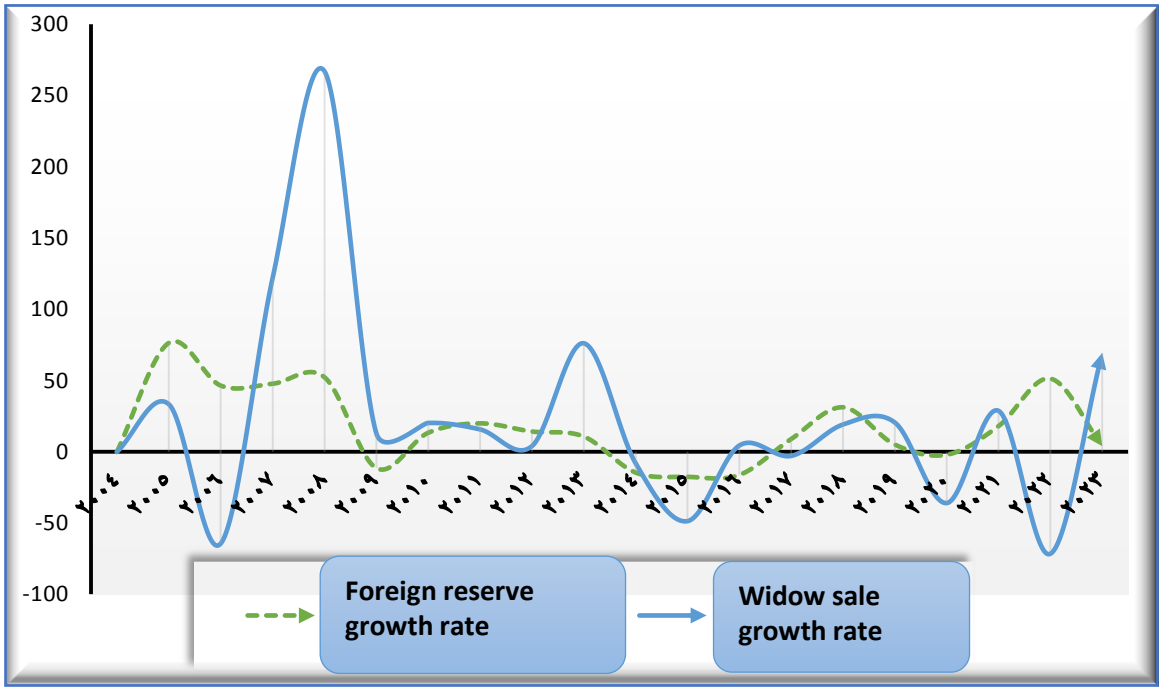
Year	Foreign Reserves (Billion Dinar)	Growth Rate (%)	Window Sales (Billion Dollar)	Growth Rate (%)
2018	76,017	31.3	4,134	19.2
2019	79,918	5.1	4,988	20.6
2020	78,293	(2.0)	3,195	(35.9)
2021	92,526	18.1	4,114	28.76
2022	140,086	51.4	1,172	(71.5)
2023	145,748	4.0	1,986	69.4

Source: Central Bank of Iraq, Statistical Website, Selected Years.

- Columns (3) and (5) are prepared by researchers based on data from columns (2) and (4).
- Values in parentheses indicate negative growth.

Figure (2) below illustrates the growth rates of foreign reserves and window sales for the period from 2004 to 2023. We observe from the figure that the highest sales growth rate was 267.1% in 2008. This significant increase can be attributed to covering the volume of imports through remittances and cash sales. Subsequently, the growth rates declined gradually and continued to fluctuate. Despite these fluctuations, the exchange rate in the parallel market remained high, even after the official exchange rate was adjusted twice: first in 2020 to 1,450 dinars per dollar, and then in 2023 to 1,300 dinars per dollar.

This sustained high exchange rate is due to the emergence of a new phenomenon in the parallel market known as "parallel sterilization." This unofficial behavior occurs among small traders to cover their imports in the parallel market. One of the main reasons for this phenomenon is the new procedures and restrictions imposed by the U.S. Treasury on traders in Iraq through the electronic platform (FITR) to cover their imports via remittances, letters of credit, and even cash sales. These restrictions led some traders to obtain dollars from the parallel market to ensure speed and security in their transactions, as the platform rejected many remittances and letters of credit due to the traders' submission of unofficial invoices or non-compliant goods. This resulted in a high exchange rate in the parallel market in 2023, averaging 1,531 dinars per dollar.



The figure was prepared by the researchers based on the data from Table (2).

Third: NARDL Model of Nonlinear Autoregressive Distributed Lag

The NARDL (Nonlinear Autoregressive Distributed Lag) model is an extension of the traditional ARDL (Autoregressive Distributed Lag) model. It accounts for potential nonlinearity in the effect of the independent variable on the dependent variable in both the short and long run. The NARDL methodology estimates the asymmetric relationship of parameters in the long run according to the equation below (Ahmed, Abdul Latif, 2022: 60-61):

$$Y_t=\beta^+ x_t^+ + \beta^- x_t^- + u_t \text{ ……..(1)}$$

Here, x is divided into positive and negative values to obtain the following equation:

$$x_t^+=\sum_{j=1}^{t} \Delta x^+_j = \sum_{j=1}^{t}(\Delta xj,0), x_t^- = \sum_{j=1}^{t}\Delta x_j^- = \sum_{j=1}^{t} \min(\Delta x_j,0) \text{ …….(2)}$$

The final application form is:

$$\Delta y_t =\alpha_0+py_{t-1}+ \theta^+ x^+_{t-1}+\theta^- x^-_{t-1}+\sum^{p-1}_{i=1}\phi\Delta y_{t-1} + \sum^{q}_{i=0}(\pi i^+\Delta x_{t-1}^+ + \pi_i^-\Delta x^-_{t-i}) + e_t \text{ ……..(3)}$$

Fourth: Initial Conditions for Applying the NARDL Model

1. Variables must be stable at the level or integrated of order (1) I(1), and none should be integrated of order (2) I(2).
2. The dependent variable must be of order (1) I(1).
3. The number of observations should be at least 30.

General Conditions for the NARDL Model

1. The parameter pp must be negative and significant using the standard values proposed by Pearson (2001), rather than the standard t-distribution values.
2. The mean of errors must be zero.
3. The variance of errors must be constant.
4. Errors must follow a normal distribution.

Fifth: Estimating the NARDL Model

The estimation of the NARDL model involves several steps:

1. **Review the Main Data Characteristics:** This includes conducting unit root tests.
2. **Estimate the Model:** It is preferable to use the third case and consider structural break points.
3. **Test for Cointegration:** This involves the significance and negativity of the error correction term.
4. **Ensure Long-term Relationship:** Using the F-bound test.
5. **Test Long-term Asymmetry:** Using the Wald test.
6. **Test Short-term Asymmetry:** Using the same test.
7. **Conduct Diagnostic Tests:** For estimated errors and model stability.

Sixth: Augmented Dickey-Fuller and Phillips-Perron Tests

Table (3) shows the stability test results using the Augmented Dickey-Fuller (ADF) test at the level and first difference, with constant, constant and trend, and without trend and constant. At the level, there is no stability among the variables, whereas at the first difference, there is significant stability between foreign reserves and the parallel market exchange rate with the trend. This aligns with economic theory and confirms the acceptance of the null hypothesis and rejection of the alternative hypothesis, which states that there is a positive relationship between foreign reserves and the parallel exchange rate in the long run.

Table (3) Augmented Dickey-Fuller (ADF) Test

UNIT ROOT TEST TABLE (ADF)						
At Level						
		EXG	EXM	EXO	FR	WS
With Constant	t-Statistic	-1.4626	-1.0664	-2.0225	-0.2163	-2.0084

	Prob.	***0.5259***	***0.7065***	***0.2755***	***0.9208***	***0.2810***
		n0	n0	n0	n0	n0
With Constant & Trend	t-Statistic	-2.8119	-0.9631	-1.8302	-1.1738	-1.6311
	Prob.	***0.2133***	***0.9258***	***0.6497***	***0.8870***	***0.7412***
		n0	n0	n0	n0	n0
Without Constant & Trend	t-Statistic	-0.8520	0.1326	-0.5359	1.8910	-0.7631
	Prob.	***0.3312***	***0.7128***	***0.4712***	***0.9818***	***0.3722***
		n0	n0	n0	n0	n0
At First Difference						
		d(EXG)	d(EXM)	d(EXO)	d(FR)	d(WS)
With Constant	t-Statistic	-0.9366	-3.0779	-3.2653	-3.1282	-4.6630
	Prob.	***0.7487***	***0.0466***	***0.0325***	***0.0423***	***0.0020***
		n0	**	**	**	***
With Constant & Trend	t-Statistic	-0.4848	-4.0330	-5.1319	-3.0838	-4.9577
	Prob.	***0.9721***	***0.0270***	***0.0040***	***0.1392***	***0.0049***
		n0	**	***	n0	***
Without Constant & Trend	t-Statistic	-0.8237	-3.1679	-3.3519	-2.7128	-4.7987
	Prob.	***0.3433***	***0.0034***	***0.0022***	***0.0097***	***0.0001***
		n0	***	***	***	***

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant

*MacKinnon (1996) one-sided p-values.

Phillips-Perron Test Results

The Phillips-Perron (PP) test results indicate stability of the variables at both the level and first difference across different configurations (with constant, with constant and trend, and without constant and trend). This aligns with economic theory, thus accepting the null hypothesis and rejecting the alternative hypothesis, which suggests there is a positive relationship between foreign reserves and the parallel market exchange rate in the long run.

Interpretation of Phillips-Perron Test Results

The stability of the variables as per the Phillips-Perron test confirms the findings from the Augmented Dickey-Fuller (ADF) test. Both tests indicate that while the variables are not stable at the level, they become stable after taking the first difference. This implies that:

1. **Variables Integration Order**: The variables are integrated of order one, I(1), making them suitable for the NARDL model application.
2. **Long-Run Relationship**: The positive relationship between foreign reserves and the parallel market exchange rate in the long run is validated, consistent with economic theory.

Policy Implications

Given these results, several key implications for monetary policy can be drawn:

1. **Bridging the Price Gap**: There are real monetary policy measures needed to bridge the price gap between the official and parallel market exchange rates.
2. **Achieving Price Stability**: Implementing effective policies can help achieve both price stability and monetary stability in the country.

The findings from both the ADF and PP tests support the stability and integration of the variables at the first difference, validating the use of the NARDL model. Furthermore, the long-run positive relationship between foreign reserves and the parallel market exchange rate suggests that appropriate monetary policies are essential to minimize the exchange rate discrepancy and ensure economic stability.

Table (4) Phillips-Perron (PP) Test

UNIT ROOT TEST TABLE (PP)						
At Level						
		EXG	EXM	EXO	FR	WS

With Constant	t-Statistic	-1.2986	-1.3087	-2.0375	-0.2163	-1.9972
	Prob.	***0.6080***	***0.6033***	***0.2697***	***0.9208***	***0.2853***
		n0	n0	n0	n0	n0
With Constant & Trend	t-Statistic	-2.0000	-0.5191	-1.5955	-1.1738	-1.5880
	Prob.	***0.5644***	***0.9724***	***0.7561***	***0.8870***	***0.7591***
		n0	n0	n0	n0	n0
Without Constant & Trend	t-Statistic	-1.2735	0.0905	-0.5491	1.8910	-0.7084
	Prob.	***0.1796***	***0.6996***	***0.4657***	***0.9818***	***0.3964***
		n0	n0	n0	n0	n0
At First Difference						
		d(EXG)	d(EXM)	d(EXO)	d(FR)	d(WS)
With Constant	t-Statistic	-0.7534	-3.0779	-3.1485	-3.0971	-4.6653
	Prob.	***0.8081***	***0.0466***	***0.0407***	***0.0449***	***0.0019***
		n0	**	**	**	***
With Constant & Trend	t-Statistic	-0.7410	-4.3085	-3.8561	-2.9904	-6.4935
	Prob.	***0.9529***	***0.0163***	***0.0372***	***0.1611***	***0.0003***
		n0	**	**	n0	***
Without Constant & Trend	t-Statistic	-1.2543	-3.1679	-3.2133	-2.6818	-4.8012
	Prob.	***0.1849***	***0.0034***	***0.0030***	***0.0104***	***0.0001***
		n0	***	***	**	***

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Seventh: Estimation of the NARDL Model

This model interprets variables with a nonlinear distribution. As shown in Table (5) below, the Nonlinear Autoregressive Distributed Lag (NARDL) model indicates that the probability value of the F-statistic is 0.016. This means that the foreign currency sale window has a significant impact on official monetary sterilization to achieve monetary stability, compared to the standard value of 0.05. This aligns with the Durbin-Watson statistic of 2.60, indicating a substantial effect in reducing the exchange rate gap through indirect monetary policy tools. Additionally, the continuous updates and measures implemented through the electronic platform (FITR) have contributed to the recent decline in the parallel market exchange rate.

Table (5) NARDL Model

Dependent Variable: WS
Method: NARDL
Date: 04/12/24 Time: 13:08
Sample: 2005 2023
Included observations: 19
Dependent lags: 1 (Automatic)
Automatic-lag linear regressors (0 max. lags): FR EXO EXM EXG
Deterministics: Restricted constant and no trend (Case 2)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 1
Selected model: NARDL(1,0,0,0,0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
WS(-1)	0.366595	0.247611	1.480525	0.1626
FR	0.014636	0.015623	0.936779	0.3660
EXO	48.52663	94.17501	0.515281	0.6150
EXM	-54.40455	92.67217	-0.587065	0.5672

EXG	-732.4905	1332.446	-0.549734	0.5918
C	81586.67	130836.7	0.623576	0.5437

R-squared	0.621695	Mean dependent var	3291.474
Adjusted R-squared	0.476193	S.D. dependent var	1840.023
S.E. of regression	1331.707	Akaike info criterion	17.47840
Sum squared resid	23054778	Schwarz criterion	17.77664
Log likelihood	-160.0448	Hannan-Quinn criter.	17.52888
F-statistic	4.272761	Durbin-Watson stat	2.602868
Prob(F-statistic)	0.016129		

*Note: p-values and any subsequent test results do not account for model selection.

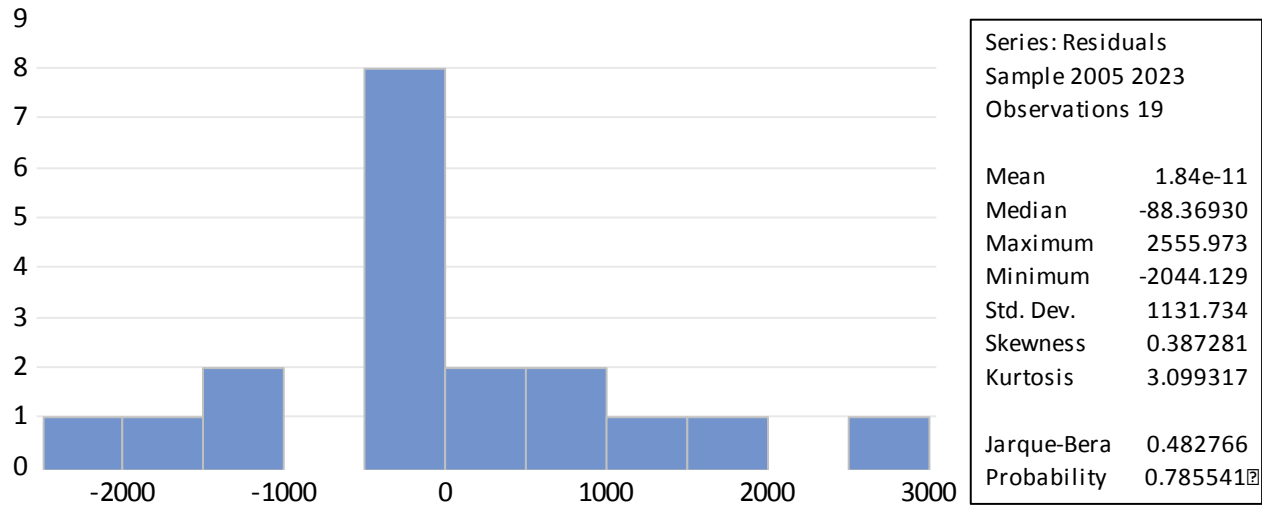
Prepared by the researchers using EView13

Eighth: Graphical Representation of NARDL Model Variables

Figure (3) below graphically illustrates the impact of foreign currency window sales on foreign reserves at the Central Bank of Iraq. The Jarque-Bera statistic of 0.48 indicates a strong effect between the two variables, which in turn influence the parallel exchange rate and impact the money multiplier through currency issued for circulation. This is supported by the probability value of 0.78, indicating a significant relationship.

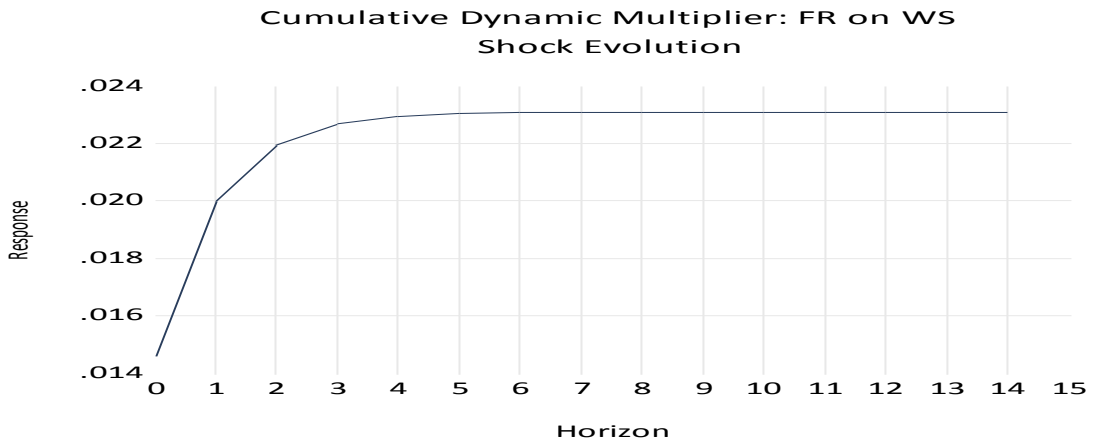
As a result, the currency issued for circulation is expected to decrease, and the increasing government deficit will necessitate the monetary policy to inject a quantity of foreign currency sales through official sterilization. This requires a set of measures to facilitate small traders' entry into the electronic platform, leading to a reduced demand for parallel sterilization.

"Figure (3): The graphical representation of variables in the NARDL model."



Prepared by the researchers using EViews 13

"Figure (4): Evaluation of cumulative dynamic multi-shocks."



Prepared by the researchers using EViews 13

Ninth: Wald Test for Model Safety and Efficiency

The Wald test explains the safety and efficiency of the Nonlinear Autoregressive Distributed Lag (NARDL) model, which achieves the estimation results mentioned earlier. Table (6) below illustrates the alignment of economic theory with the appropriate NARDL model through the Chi-square value of 5.06. This indicates the acceptance of the null hypothesis and rejection of the alternative hypothesis, confirming that the model is robust and efficient in extracting statistical values, demonstrating the presence of a negative relationship between foreign reserves and the parallel exchange rate in the long term.

Table (6): Wald Test for Model Safety and Efficiency

Wald Test:

Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	1.267293	(4, 13)	0.3321
Chi-square	5.069173	4	0.2803

Null Hypothesis: C(2)=0, C(3)=0, C(4)=0, C(5)=0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	0.014636	0.015623
C(3)	48.52663	94.17501
C(4)	-54.40455	92.67217
C(5)	-732.4905	1332.446

Restrictions are linear in coefficients.

Prepared by the researchers using EViews 13

Conclusions:

1. The exchange rate is the dynamic or nominal anchor in Iraq due to the halt of most exports and heavy reliance on oil revenues, which represent 90% of total government budget revenues.

2. It was observed that one of the main reasons for exchange rate stability is the intervention of monetary policy at the macro level of prices, which is one of its primary objectives.

3. Reducing the exchange rate gap through indirect monetary policy interventions in the market, especially in attracting the behaviors of small traders, is significant.

4. The phenomenon of parallel sterilization is temporary due to the monetary policy measures aimed at limiting it, along with government facilitations towards traders, which resulted in a recent reduction in the gap between the two prices.

5. It is noted from Table (5) below the non-linear distributed lag model, where the probability value of F amounted to (0.016), indicating a significant effect of foreign currency sales window in official monetary sterilization to achieve monetary stability compared to the standard value (0.05). This is consistent with the Durbin-Watson statistic, which was (2.60).

6. The Wald Test for the safety and efficiency of the Nonlinear Autoregressive Distributed Lag (NARDL) model, as demonstrated in Table (6) below, aligns economic theory with the appropriate NARDL model through the Chi-square value of (5.06). This indicates the acceptance of the null hypothesis and rejection of the alternative hypothesis, confirming the model's soundness and efficiency in extracting statistical values, showing a negative relationship between foreign reserves and the parallel exchange rate in the long term.

Recommendations:

1. Other policies should play their role and not rely solely on monetary policy in economic stabilization through the exchange rate. There exists a better interest rate than the exchange rate in leading the economies of advanced and emerging countries.

2. There is an inverse relationship between the increase in parallel sterilization on one hand and the decrease in the degree of external monetary base even in its weak form on the other, meaning that the hybrid total liquidity demand function surpasses the growth of the monetary base itself within the components of the monetary base, providing market forces with an influential role in monetary policy, especially in controlling the monetary base.

3. The necessity of the non-linear distributed lag model is highlighted, where the probability value of F amounted to (0.016), indicating a significant effect of foreign currency sales window in official monetary sterilization to achieve monetary stability compared to the standard value (0.05).

4. Taking into account the safety and efficiency model of the Wald Test, which indicates the acceptance of the null hypothesis and rejection of the alternative hypothesis, confirming that the model is sound and efficient in extracting statistical values, demonstrating the presence of a negative relationship between foreign reserves and the parallel exchange rate in the long term.

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