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THE IMPACT OF PARALLEL MARKET EXCHANGE RATE FLUCTUATIONS ON THE PERFORMANCE OF THE IRAQ STOCK EXCHANGE: AN ECONOMETRIC STUDY FOR THE PERIOD (2020–2025)

Mohammed Abdulkareem Ahmed
College of Management and Economic, mohammed_alaanizy@tu.edu.iq

Abstract. The objectives of this study are to measure the effect of fluctuation of the US dollar exchange rate in the parallel market on the performance of Iraq Stock Exchange Index (ISX60) from January 2020 to December 2025. During this time, there were three significant monetary shocks: the official devaluation of the Iraqi dinar by the Central Bank of Iraq from IQD 1,182 to IQD 1,450 per US dollar in December 2020; tightening of controls on dollar transfers, starting in November 2022; and the revaluation of the Iraqi dinar to IQD 1,300 per US dollar in February 2023, coupled with an increase in the gap between the official and parallel exchange rates, which reached more than 23% in November 2023.

The study used 72 monthly observations, where the index closing value was taken from the official reports issued by the Iraq Stock Exchange and the Iraqi Securities Commission, the exchange rate of the US dollar in the Baghdad markets was taken from the Central Statistical Organization reports and the price of the crude oil was used as a controlled variable for the study. The models used were the Linear Autoregressive Distributed Lag (ARDL) model and the nonlinear model (NARDL) which was used to distinguish between the effects brought about by increases and decreases in the dollar exchange rate. Monte Carlo simulation was used to calculate the critical values for the bounds test.

The results indicated that the linear model was not able to find the long run equilibrium relation, while the nonlinear model showed that the long run equilibrium relation does exist at the 1% level of significance. In the long run, an 1% depreciation of the US dollar exchange rate in the parallel market was correlated with a corresponding 1.85% appreciation of the index, and the negative depreciation of the dollar exchange rate was not statistically significant. The Wald test showed that the effect was asymmetric, at a 1% level of significance. About 50% of the deviation from the equilibrium is corrected within one month. The results indicate that investors rely on stocks as a hedging tool against depreciation of the dinar, and that looking at the relationship between the two variables as a linear relationship is confusing.

Keywords: Parallel exchange rate, Iraqi dinar, Iraq Stock Exchange, asymmetry, NARDL, bounds test

Introduction

The exchange rate occupies a central position in the Iraqi economy because the state receives its revenues in US dollars from oil exports and spends them in Iraqi dinars, while the Central Bank of Iraq sells dollars to the market at an official exchange rate. However, Iraq also has a second exchange rate, determined by currency exchange offices, known as the parallel market exchange rate, which is the rate at which most individuals and investors actually conduct their transactions.

The period 2020–2025 witnessed the most severe exchange rate fluctuations in two decades. In December 2020, the Central Bank of Iraq devalued the official exchange rate from IQD 1,182 to IQD 1,450 per US dollar, representing a depreciation of approximately 20%, to finance public-sector salaries following the collapse in oil prices [1]. Beginning in November 2022, the Federal Reserve Bank of New York tightened controls on dollar transfers by Iraqi banks, causing the dollar exchange rate in the parallel market to rise to approximately IQD 1,690. This prompted the government to raise the value of the dinar to IQD 1,300 per US dollar on February 7, 2023 [2]. Nevertheless, the gap between the two exchange rates persisted, averaging approximately IQD 194 per USD 100 in 2024 [3].

In Iraq, the fluctuations were accompanied by a significant rise in the Iraq Stock Exchange Index from 413.52 points in April 2020 to 1,073.84 points in December 2024, reaching almost double the levels seen in April 2020. But this coincidence invites a basic question: did the rising stock market markets react to the depreciation of the dinar, and was the reaction in the stock market to an increase in the dollar rate change symmetrical to the reaction in the stock market to a reduction in the dollar rate change?

Second: Research Problem

The research problem is that Iraqi studies dealing with the relationship between exchange rates and the stock market have been based on a small number of observations annually and have adopted the linear and symmetrical relationship. That is, they have made the assumption that any rise or decrease in the exchange rate of the dollar has the same effect on the market but in opposite directions. The research problem may be stated in the following questions:

1. Is there a long-run equilibrium relationship between the parallel exchange rate and the Iraq Stock Exchange Index?
2. Does the effect of an increase in the dollar exchange rate on the market differ from the effect of a decrease?
3. Does the assumption of linearity obscure the actual relationship between the two variables?
4. How quickly does the market return to equilibrium following exchange rate shocks?

Third: Significance of the Research

1. Scientific significance: The study uses the actual parallel exchange rate rather than the fixed official rate and applies a nonlinear model that distinguishes between the effects of increases and decreases in the dollar exchange rate. To the researcher's knowledge, this approach has not been addressed by Iraqi studies.
2. Practical significance: The findings may help the Central Bank of Iraq assess the implications of exchange rate policy decisions for the financial market and help investors understand the role of stocks as a hedging instrument against currency risk.
3. Temporal significance: The study covers the three most significant monetary shocks experienced by Iraq since 2003.

Fourth: Research Objectives

1. To test for the existence of a cointegrating relationship between the parallel exchange rate and the ISX60 Index using both linear and nonlinear models.
2. To measure the separate short-run and long-run effects of increases and decreases in the dollar exchange rate.
3. To estimate the speed of adjustment following deviations from equilibrium.
4. To provide recommendations for monetary policy and investors.

Fifth: Research Hypotheses

The main hypothesis is that parallel market exchange rate fluctuations have a statistically significant effect on the performance of the Iraq Stock Exchange during the study period.

The following hypotheses are derived from the main hypothesis:

1. H1: There is a statistically significant cointegrating relationship between the parallel exchange rate and the ISX60 Index.
2. H2: An increase in the dollar exchange rate in the parallel market has a statistically significant positive effect on the index.
3. H3: A decrease in the dollar exchange rate has a statistically significant effect on the index.
4. H4: The effect of the exchange rate on the index is asymmetric; that is, the effect of an increase differs from the effect of a decrease.

Sixth: Research Limitations

1. Geographical scope: The Iraq Stock Exchange, represented by the ISX60 Index, and the US dollar exchange rate in Baghdad markets.
2. Temporal scope: January 2020 to December 2025 (72 monthly observations).
3. Thematic scope: The study is limited to the overall market index because official sectoral indices are not published. The overall index largely reflects the performance of the banking sector, as banks accounted for 76.3% of trading value in 2023 [4].

Section Two: Theoretical Framework

First: Theories Explaining the Relationship Between Exchange Rates and Stock Prices

The economic literature presents two main approaches to explaining the relationship between exchange rates and stock prices, which differ in the direction of causality [5], [6]:

1. Flow-oriented approach: This approach proceeds from exchange rates to stock prices. Exchange rate changes affect firms' competitiveness, the costs of imported inputs, and the value of their foreign-currency assets and liabilities. These effects, in turn, influence corporate profits and cash flows and, consequently, stock prices.
2. Portfolio-balance approach: This approach proceeds in the opposite direction. Rising stock prices attract capital inflows, increasing demand for the domestic currency and causing it to appreciate.

This study assumes that the first approach is more appropriate for the Iraqi context because the Iraq Stock Exchange is too small to influence the exchange rate. Purchases by non-Iraqi investors account for only a small proportion of trading, whereas the exchange rate is determined by much larger macroeconomic factors, such as oil revenues and the Central Bank's dollar sales.

Second: Stocks as a Hedging Instrument Against Currency Depreciation

The stock is not the same as cash and deposits in the domestic currency since it is a certificate of ownership of real assets. So when the currency that most investors hold loses value, they seek to "hedge" the real value of their wealth by buying real assets, which they can then sell at a higher price in their home currency. [7] concluded that the depreciation of the Egyptian pound leads to a significant and immediate rise in the share prices while its appreciation does not lead to the opposite effect.

The channel in particular is vital in Iraq where banks are the leading players on the stock market. There are significant dollar denominated assets in Iraqi banks and foreign currency sales. Therefore the dollar value of their assets and their profits goes up as the dollar exchange rate goes up.

Third: Asymmetry in the Relationship

In the traditional studies, one anticipates that gains or losses in exchange rates have equal impact on stocks, but in opposite directions. But, new research has shown this may not be the true relationship. Linear models were not able to capture a long run relationship for the Group of Seven countries, while nonlinear models showed that four countries had a long run relationship. [5] [8] verified that the foreign exchange and stock markets are asymmetrically related in 14 economies.

Behavioral and structural causes for asymmetry. When a currency degrades, investors easily buy real assets because they are afraid of it further depreciating, but when a currency appreciates, they do not sell real assets at the same rate as they did when it depreciated because they believe that the improvement is not sustainable. The impact of a shock is also dependent on its intensity. Odionye and Chukwu (2023) discovered that only large exchange rate shocks significantly affected the stock prices in Nigeria.

Fourth: Exchange Rate Duality in Iraq

Iraq operates an administratively managed fixed exchange rate system, determined by the Central Bank, which defends the rate by selling dollars generated from oil exports. Because access to dollars at the official rate is subject to restrictions, a parallel market has emerged in which the exchange rate is determined by supply and demand. The gap between the two rates has widened over the past two decades, from approximately IQD 5 per USD 100 to IQD 194 in 2024 [3].

The widening gap is linked to the Federal Reserve Bank of New York's curbs on the transfer of dollars from Iraqi banks that were introduced in November 2022 [2]. At this time, international transfers were done via an electronic platform that required the disclosure of the ultimate beneficiary. Consequently, the market supply of dollars decreased and the parallel exchange rate went up despite the official exchange rate's decrease in February 2023.

Therefore, the parallel exchange rate is the true rate from the investors' point of view, and is thus used as the main independent variable in this study.

Section Three: Recent Previous Studies and the Research Gap

First: Foreign Studies

1. Nusair and Olson (2022): The aim of this study is to explore the relationship between exchange rates and stock prices of the Group of Seven (G7) countries using both linear and nonlinear approach of ARDL model. The linear models didn't show a long run relationship in any country, while the nonlinear models did show a long run relationship of the stock prices with exchange rates in four countries. In these advanced economies, the study revealed no evidence that exchange rates have a long-term effect on stock prices. The findings show that the assumption of linearity can result in the wrong inference that there is no relationship.
2. [7]: This research tested the symmetry of the AR (exchange rate), AI (interest rate), and APL (general price level) effects on Egyptian stocks price in the period from January 2000 to June 2022 using ARDL and NARDL models. The results revealed that depreciation of the Egyptian pound results in significant rise in the stock prices while appreciation does not have the opposite effect. The study is relevant to the Iraqi context since both economies have had/experienced multiple currency shocks and the parallel market is present.
3. Odionye and Chukwu (2023): The study used the NARDL approach that introduces multiple thresholds to the Nigeria data for the period 1999 to 2021. It revealed that depreciation of the naira had a negative impact on the stock prices and that only shocks above the 25th percentile had a statistically significant effect. This finding indicates that the impact depends on the magnitude of the shock and the characteristics of the economy.
4. This study employed daily data of 14 economies and NARDL model. It has established the existence of asymmetric relationships between stock prices and exchange rates in most countries, in some of which the effects are positive, and in others negative, and the weights of these effects differ between countries.
5. In this study, Moussa and Delhoumi (2021) examined the asymmetric impact of interest rates and exchange rates on stock market index within Middle East and North Africa (MENA) region during the years 1998–2018 using NARDL model. The results showed that there was a long run relationship between variables with asymmetry only in the short run.

Second: Arab Studies

1. [9]: The study aimed to examine the impact of exchange rate fluctuations on the market capitalization index in the Iraq Stock Exchange during the years 2005-2021, using annual data. The bounds test failed to reject the null hypothesis of no cointegration and the stability tests showed that the parameters were unstable. This may be because there were only a few observations per year and the assumption of linearity may have influenced this study.
2. The 2019–2024 period was examined in this study to examine the impact of the exchange rate on the market index and the inflation rate. It came up with a F statistic of 7.84, and a bounds-test F statistic of 0.72 with the ISX60 index. The study was based on six data for the annual observations, which are too few to estimate an ARDL model, and the ambiguity of the direction of the effect.
3. [10]: This study examined the effect of exchange rate changes on the stock price index of the Iraq Stock Exchange using quarterly data for the period 2007–2021, with particular emphasis on the devaluation of the dinar in December 2020. It employed impulse response functions and found that the index responded negatively to an exchange rate shock during the first three quarters, after which the response became positive beginning in the fourth quarter.
4. [11]: This study examined the effect of fluctuations in the Iraqi dinar–US dollar exchange rate on the general index of the Iraq Stock Exchange over the period 2004–2020 using Markov-switching models and Bai–Perron structural break tests. It found a negative and statistically significant relationship between the exchange rate and the market index in the first regime.
5. [12]: This study analyzed the effect of exchange rate fluctuations on the indices of the Iraq Stock Exchange using annual data for the period 2004–2020 and a descriptive-analytical approach. It concluded that the stock market responds to the exchange rate rather than influencing it, owing to the rentier nature of the Iraqi economy and the dependence of the currency's strength on oil exports.

Third: Research Gap and Contributions of the Present Study

The previous review shows that nonlinear models have been used in the past few years in foreign research, since it has been shown that a linear model can mask the actual model. The impact of exchange rates on the stock market is confirmed through the general agreement in most of the studies conducted in Iraq, except for some of these studies, their results were contrary in the direction of the impact. Most of these studies, however, are based on the official exchange rate and data are available at an annual or quarterly level, and their study period is limited to before the two big shocks in 2022 and the revaluation in 2023. The present study will be a valuable addition to the literature in the following ways:

1. Data: It consists of 72 observations (for each month) rather than annual or quarterly data used by most studies on Iraq before, which gives the tests more statistical power. It employs the current parallel exchange rate published by the Central Statistical Organization (not the official exchange rate which was pegged for long periods, and failed to reflect the real exchange rate fluctuations).
2. Model: It uses the NARDL model to separate the impact of the dollar exchange rate increases and decreases and highlights the result of the NARDL model and the linear model to show what the linear model might mask.
3. Critical values: It evaluates the bounds test critical values with Monte Carlo simulation that is appropriate for the sample size and model specification, not only based on critical values stored in the table for large samples.
4. Study period: In-Model Devaluation shock from 2020, Federal Fed restrictions from 2022, and revaluation in 2023.

Section Four: Developments in the Official and Parallel Exchange Rates and Stock Market Performance, 2020–2025

First: Stages of Exchange Rate Development

The study period can be divided into four stages according to the behavior of the official and parallel exchange rates [13]:

1. The official exchange rate in 2020 in the pre-devaluation period (January–November 2020) was IQD 1,182 per US dollar, while the parallel exchange rate was between IQD 1,210 and IQD 1,249, with the difference not exceeding around 6%. It was during this time that oil prices plunged, with the price of Brent crude dropping to USD 18.38 per barrel in April 2020, the lowest point in the study period.
2. Devaluation and stabilization stage (December 2020 – October 2022): The rate of the parallel exchange market rose up to IQD 1,342 in December 2020 in preparation for the decision of devaluation. It then moved into a range of IQD 1,444-1,487 since the new official rate of IQD 1,450 was introduced. The gap was the lowest in January 2021 (−0.41%), and even became slightly negative.
3. The parallel exchange rate increased to IQD 1,598 in January 2023, after the electronic platform was adopted for transfers, which was followed by dollar restrictions and the revaluation stage (2022-2023). Although the official exchange rate has fallen to IQD 1,300 in February 2023, the parallel exchange rate has continued to rise and peaked in November 2023 at IQD 1,603, marking a gap of 23.31%, which was the highest during the study period.
4. Downward stage (2024–2025): The parallel exchange rate has decreased from IQD 1,527 in January 2024 to IQD 1,406 in July 2025. The average annual exchange rate gap closed from 15.31% in 2024 to 11.09% in 2025, but did not eliminate the gap.

Second: Developments in the Performance of the Iraq Stock Exchange

The ISX60 Index more than doubled during the study period, rising from 413.52 points in April 2020 to a peak of 1,073.84 points in December 2024. Most of this increase occurred in 2023, when the index rose by 52.43%, the same year in which the largest gap between the two exchange rates was recorded. The index continued to rise in 2024, increasing by 20.23%, before declining by 8.43% in 2025, coinciding with the appreciation of the dinar in the parallel market.

Table 1. Annual Exchange Rate and Market Performance Indicators (2020–2025)

Year	Official Rate (IQD/ USD)	Parallel Rate Average	Min – Max Parallel Rate	Average Gap (%)	Peak Gap (%)	ISX60 Year-End	ISX60 Annual Change (%)	Brent Average (USD)
2020	1182	1239.9	1210 – 1342	4.90	13.54	508.03		41.76
2021	1450	1470.9	1444 – 1487	1.44	2.55	569.20	12.04	70.68
2022	1450	1481.7	1471 – 1512	2.18	4.28	585.95	2.94	100.78
2023	1300*	1531.3	1455 – 1603	16.74	23.31	893.15	52.43	82.47
2024	1300	1499.1	1464 – 1527	15.31	17.46	1073.84	20.23	80.53
2025	1300	1444.2	1406 – 1515	11.09	16.54	983.31	−8.43	69.10

Source: Prepared by the researcher based on the Central Statistical Organization (2026), the quarterly and annual reports of the Iraq Stock Exchange and the Securities Commission, and the U.S. Energy Information Administration (EIA). The gap = (Parallel Exchange Rate ÷ Official Exchange Rate − 1) × 100. The official exchange rate remained at IQD 1,450 in January 2023. The official exchange rate for December 2020 was considered to be IQD 1,182 because the devaluation decision was implemented on the 20th of that month.

Third: Preliminary Assessment of the Relationship

Table (1) reveals a clear coincidence between the widening of the exchange rate gap and the rise in the stock market in 2023 and 2024, followed by a narrowing of the gap and a decline

in the market in 2025. The correlation coefficient between the logarithm of the index and the logarithm of the parallel exchange rate was 0.58. However, correlation does not imply causation. Moreover, the parallel exchange rate is correlated with the Brent crude oil price, with a coefficient of 0.80. Therefore, the correlation between the index and the parallel exchange rate may partly reflect the effect of oil prices. Accordingly, econometric analysis is required to test the relationship while controlling for the effect of oil prices and to distinguish between the effect of an increase in the dollar exchange rate and that of a decrease.

Methods

Section Five: Econometric Methodology

First: Data and Sources

The study employed 72 monthly observations covering the period from January 2020 to December 2025:

1. ISX60 Index: These indexes are calculated from the closing price of the last trading day of each month, and are provided by quarterly and annual reports by the Securities Commission and Iraq Stock Exchange and from daily bulletins of the market for months not covered by these reports. Five values were received from a secondary media source (Shafaq News) which were confirmed as being consistent with percentage changes from official data (October 2023, October and November 2024, October and November 2025). Three values were not available (October 2022, November 2022 and November 2023), so they were obtained by logarithmic linear interpolation between the neighbouring months. Robustness tests were employed to study their effects on the results.
2. Parallel Exchange rate: the average selling price of the US dollar in the markets of Baghdad in the previous month, which has been obtained from the 2025 annual report on dollar price by the Central Statistical Organization (Tables 13 and 14). The researcher confirmed that the annual averages calculated are the same averages reported in the report.
3. Spot price of Brent crude oil: This is a monthly average price from the U.S. Energy Information Administration (EIA), as a control variable because oil revenues have an impact on the supply of dollars and investor sentiment.

Second: Model Variables

Table 2. Research Variables and Definitions

Symbol	Variable	Type	Definition
LISX	Market Index	Dependent	Natural logarithm of the ISX60 index monthly closing rate
LPFX	Parallel Exchange Rate	Independent	Natural logarithm of the average USD to IQD exchange rate in Baghdad markets
$LPFX^{+}$	USD Exchange Rate Increase	Independent	Cumulative sum of positive changes in LPFX (depreciation of the Iraqi Dinar)
$LPFX^{-}$	USD Exchange Rate Decrease	Independent	Cumulative sum of negative changes in LPFX (appreciation of the Iraqi Dinar)
LBRENT	Oil Price	Control	Natural logarithm of monthly average Brent crude oil price (USD/barrel)
D_DEV	Devaluation Period	Dummy	1 from December 2020 to January 2023 (Official Rate: 1450 IQD/USD), and 0 otherwise
D_PLAT	Electronic Platform	Dummy	1 from November 2022 onwards, and 0 otherwise

Third: Linear Model (ARDL)

The Autoregressive Distributed Lag (ARDL) model ([14] is employed because it is suitable for variables integrated of order zero or one, or a combination of both, and is appropriate for small samples. The Unrestricted Error Correction Model (UECM) is specified as follows:

$\Delta LISX_t = \alpha_0 + \rho \cdot LISX_{t-1} + \theta_1 \cdot LPFX_{t-1} + \theta_2 \cdot LBRENT_{t-1} + \Sigma \varphi_i \cdot \Delta LISX_{t-i} + \Sigma \pi_j \cdot \Delta LPFX_{t-j} + \Sigma \psi_j \cdot \Delta LBRENT_{t-j} + \delta_1 \cdot D_DEV_t + \delta_2 \cdot D_PLAT_t + \varepsilon_t$ … (1)

where (ρ) is the error-correction speed coefficient. The long-run parameters are calculated using the formula $\beta = -\theta/\rho$, their standard errors are estimated using the Delta method, and the half-life of the deviation is calculated using the formula $\ln(0.5)/\ln(1+\rho)$.

Fourth: Nonlinear Model (NARDL)

To distinguish between the effects of an increase in the dollar exchange rate and those of a decrease, LPFX is decomposed into two partial sums ([15]:

$LPFX^+_t = \Sigma \max(\Delta LPFX_j, 0)$ and $LPFX^-_t = \Sigma \min(\Delta LPFX_j, 0)$ … (2)

The model is then estimated as follows:

$\Delta LISX_t = \alpha_0 + \rho \cdot LISX_{t-1} + \theta^+ \cdot LPFX^+_{t-1} + \theta^- \cdot LPFX^-_{t-1} + \theta_2 \cdot LBRENT_{t-1} + \Sigma \varphi_i \cdot \Delta LISX_{t-i} + \Sigma \pi^+_j \cdot \Delta LPFX^+_{t-j} + \Sigma \pi^-_j \cdot \Delta LPFX^-_{t-j} + \Sigma \psi_j \cdot \Delta LBRENT_{t-j} + \delta_1 \cdot D_DEV_t + \delta_2 \cdot D_PLAT_t + \varepsilon_t$ … (3)

The long-run effect of an increase in the dollar exchange rate is measured by $\beta^+ = -\theta^+/\rho$, while the long-run effect of a decrease is measured $\beta^- = -\theta^-/\rho$. Since $^-$LPFX is the sum of negative values, a positive $^-\beta$ coefficient implies that a decrease in the dollar exchange rate reduces the index.

Fifth: Tests Employed

1. Unit root tests: The Augmented Dickey–Fuller [16] and Phillips–Perron [17] tests were conducted using the critical values of MacKinnon (2010), in addition to the Zivot–Andrews test, which allows for one internally determined structural break and has been used in recent studies [18], [19]. The necessary condition is that none of the variables is integrated of order two.
2. Lag length selection: The Akaike Information Criterion (AIC) was used, with a maximum of four months of lags for each variable, while maintaining a common estimation sample across all comparative specifications (68 effective observations).
3. Bounds test: The F-test was used to test the null hypothesis $\rho = \theta = 0$, and the t-test to test the null hypothesis ($\rho = 0$), under Case III (unrestricted intercept and no deterministic trend). Since the critical values of [14] were calculated for large samples, the study followed the approach of [20] and calculated sample-specific critical values using a Monte Carlo simulation with 20,000 replications, maintaining the same sample size, lag lengths, and model-specific dummy variables under the null hypothesis. The lower bounds represent the case in which the independent variables are stationary, I(0), while the upper bounds represent the case in which they are integrated of order one, I(1).
4. Asymmetry tests: The Wald test was used to test the hypothesis of equality between the long-run effects ($\theta^+ = \theta^-$ ،wich $\beta^+ = \beta^-$), and the short-run ($\Sigma\pi^+ = \Sigma\pi^-$)
6. Diagnostic tests: The Breusch–Godfrey test for serial correlation; the Breusch–Pagan and ARCH-LM tests for heteroskedasticity; the Jarque–Bera test for normality; the Ramsey RESET test for functional form specification; and the CUSUM and CUSUMSQ tests for parameter stability ([21].

All estimations were conducted in Python using the NumPy and SciPy libraries through a program developed by the researcher, which is available along with the data to enable the reproduction of the results.

Results and Discussion

First: Descriptive Statistics

Table 3. Descriptive Statistics for Research Variables (72 Observations)

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera (p-value)
LISX	6.531	6.414	6.979	6.025	0.287	0.089	1.647	5.59 (0.061)
LPFX	7.273	7.296	7.380	7.098	0.073	−1.341	3.715	23.12 (0.000)
LBRENT	4.263	4.322	4.810	2.911	0.324	−1.600	6.685	71.46 (0.000)

Source: Outputs of the analysis.

The mean level of the ISX60 Index was 714.36 points, while the mean parallel exchange rate was IQD 1,444.5 per US dollar, with a minimum of IQD 1,210 in February 2020 and a maximum of IQD 1,603 in November 2023. The average gap between the two exchange rates was 8.61%, and the mean Brent crude oil price was USD 74.22 per barrel. The negative skewness of LPFX reflects the effect of the low exchange rates observed during the months of 2020 before the devaluation, while that of LBRENT reflects the collapse in oil prices in April 2020. Normality is not required for the variables themselves, but rather for the model residuals, which will be tested later.

Second: Stationarity Tests

Table 4. Unit Root Test Results

Variable	ADF Level (Constant & Trend)	ADF First Difference	PP Level	PP First Difference	Zivot-Andrews (Break Date)	Decision
LISX	−2.575	−9.163***	−2.654	−9.228***	−3.613 (2023-06)	I(1)
LPFX	−1.552	−7.099***	−1.707	−7.159***	−4.073 (2021-08)	I(1)
LBRENT	−1.760	−6.331***	−1.972	−6.114***	−6.920*** (2022-06)	I(1), or I(0) with structural break

Source: Outputs of the analysis. *** indicates significance at the 1% level. The 5% critical values for ADF and PP at levels are −3.474 and, at first differences, −2.904 [22]. The 5% critical value for Zivot–Andrews is −5.08.

The results show that LISX and LPFX are non-stationary at levels but stationary at first differences, indicating that they are integrated of order one, even when allowing for a structural break. LBRENT is integrated of order one according to the ADF and PP tests; however, the Zivot–Andrews test rejects the unit-root hypothesis in the presence of a structural break in June 2022, the month in which oil prices peaked following the Russian–Ukrainian war. Since none of the variables is integrated of order two, the condition for applying the bounds test is satisfied. This combination of integration orders justifies the use of the ARDL methodology.

Third: Bounds Test Results

The AIC selected the ARDL(3,3,0) specification for the linear model and the NARDL(1,1,3,3) specification for the nonlinear model, using a common estimation sample of 68 observations.

Table 5. Bounds Test Results for Both Models

Statement / Statistic	Linear ARDL (k=2)	Nonlinear NARDL (k=3)
F-statistic	2.022	7.208
Monte Carlo F-bounds at 10%	4.22 – 5.22	3.51 – 4.73
Monte Carlo F-bounds at 5%	5.09 – 6.20	4.17 – 5.58
Monte Carlo F-bounds at 1%	7.00 – 8.42	5.68 – 7.42
Pesaran et al. (2001) F-bounds at 1%	5.15 – 6.36	4.29 – 5.61
t-statistic	−2.256	−5.036
Monte Carlo t-bounds at 5%	−3.44 – −3.92	−3.43 – −4.24
Monte Carlo t-bounds at 1%	−4.12 – −4.65	−4.13 – −4.97

Statement / Statistic	Linear ARDL (k=2)	Nonlinear NARDL (k=3)
Decision	No equilibrium relationship (No Cointegration)	Cointegration exists at 1% level

Source: Outputs of the analysis. Bounds obtained through Monte Carlo simulation with 20,000 replications (lower bound I(0) – upper bound I(1)).

The F-statistic for the linear model (2.022) falls below the lower bound even at the 10% significance level; therefore, the null hypothesis of no cointegration cannot be rejected. The linear model also exhibits weak diagnostic performance, as the Breusch–Godfrey test at 12 lags rejects the null hypothesis of no serial correlation ($p = 0.031$), and the CUSUMSQ curve moves outside the 5% confidence bounds.
In contrast, the F-statistic for the nonlinear model (7.208) exceeds the upper bound at the 5% significance level according to the Monte Carlo simulation, and the upper bound at the 1% significance level according to the tables of [14]. The t-statistic (−5.036) confirms this result by exceeding the upper bound at the 1% significance level. The F-statistic lies between the Monte Carlo bounds at the 1% level (5.68–7.42); however, the fact that the t-statistic exceeds the upper bound resolves the result. This indicates that an equilibrium relationship exists, but it is nonlinear, and that the assumption of symmetry conceals this relationship. This is the same finding reported by Nusair and Olson (2022).

Fourth: Long-Run Parameters and the Test of Asymmetry

Table 6. Long-Run Coefficients for the NARDL (1,1,3,3) Model

Variable	Coefficient	Std. Error	t-Statistic	Probability (p-value)
LPFX⁺ (USD Increase)	1.850	0.432	4.283	0.0001
LPFX⁻ (USD Decrease)	0.054	0.469	0.116	0.908
LBRENT	−0.082	0.089	−0.916	0.364
Long-Run Asymmetry Wald Test ($^{-}\beta^{+} = \beta$)	F = 15.50			0.0003

Source: Outputs of the analysis. Standard errors were calculated using the delta method. For comparison, the long-run coefficient of LPFX in the linear model was 0.751 ($p = 0.790$), while that of LBRENT was 0.462 ($p = 0.434$).

The results show the following:

a. Effect of an increase in the dollar exchange rate: The effect is positive and statistically significant at the 1% level. A 1% increase in the parallel exchange rate is associated with a long-run increase of approximately 1.85% in the ISX60 Index. This is consistent with the hedging hypothesis, whereby investors turn to stocks as real assets that preserve the value of their savings when the Iraqi dinar depreciates. It is also consistent with the findings of [7] in Egypt. The coefficient exceeds unity, indicating that the market overreacts, which is consistent with the dominance of banks with dollar-denominated assets in the index.
b. Effect of a decrease in the dollar exchange rate: The effect is not statistically significant in the long run ($p = 0.908$), meaning that an improvement in the value of the Iraqi dinar does not return the index to its previous level. This explains why the index remained at relatively high levels in 2025 despite the decline in the parallel exchange rate.
c. Asymmetry: The Wald test rejects the hypothesis that the two effects are equal at the 1% significance level ($F = 15.50$), indicating that the relationship is asymmetric in the long run.
d. Oil prices: The long-run effect of oil prices is not statistically significant, which is consistent with the weak direct linkage between the Iraqi stock market and the oil sector, as major oil companies are not listed on the market.

Fifth: Short-Run Parameters and the Speed of Adjustment

Table 7. Short-Run Dynamics for the NARDL Model (Dependent Variable: Delta LISX)

Variable	Coefficient	Std. Error	t-Statistic	Probability (p-value)
Constant	3.057	0.609	5.018	0.000
LISX(−1) Error Correction Term	−0.477	0.095	−5.036	0.000
Delta LPFX⁺	0.443	0.481	0.920	0.362
Delta LPFX⁺(−1)	−0.793	0.461	−1.721	0.091
Delta LPFX⁻	−0.368	0.549	−0.670	0.506
Delta LPFX⁻(−1)	0.790	0.490	1.611	0.113
Delta LPFX⁻(−2)	1.098	0.503	2.184	0.034
Delta LPFX⁻(−3)	1.196	0.498	2.400	0.020
Delta LBRENT	0.122	0.077	1.572	0.122
Delta LBRENT(−1)	0.019	0.051	0.367	0.715
Delta LBRENT(−2)	0.075	0.045	1.683	0.099
Delta LBRENT(−3)	0.066	0.044	1.489	0.143
D_DEV	−0.036	0.025	−1.454	0.152
D_PLAT	0.013	0.033	0.406	0.686
Model Diagnostics & Stats:	**R^2 = 0.476**	**Adjusted R^2= 0.312**	**text{DW} = 2.03**	**Half-life = 1.07 months** (n=68)
Short-Run Asymmetry Wald Test ($\Sigma\pi^+ = \Sigma\pi^-$)	F = 6.64			0.013

Source: Outputs of the analysis.

The error-correction coefficient is negative and statistically significant (−0.477), indicating that the market corrects approximately 48% of the deviation from equilibrium each month, with half of the deviation dissipating in approximately one month. In the short run, the coefficients of the dollar exchange rate decreases lagged by two and three months are positive and statistically significant at the 5% level. Since changes in LPFX⁻ are negative, this means that a decrease in the dollar exchange rate reduces the index after two to three months. However, this effect remains temporary and does not persist in the long run. In contrast, an increase in the dollar exchange rate exerts its effect primarily through the equilibrium relationship, with a weakly significant negative coefficient after one month (p = 0.091), which may reflect temporary profit-taking. The Wald test also rejects short-run symmetry at the 5% significance level. Neither of the two dummy variables has a statistically significant effect, indicating that the impact of monetary policy decisions was transmitted to the market through the parallel exchange rate itself rather than independently of it.

Sixth: Diagnostic Tests

Table 8. Diagnostic Tests for Both Models

Test	Linear ARDL (p-value)	NARDL (p-value)
Breusch-Godfrey (Lag 1)	0.602	0.747
Breusch-Godfrey (Lag 2)	0.223	0.773
Breusch-Godfrey (Lag 12)	0.031	0.375
Breusch-Pagan	0.108	0.443
ARCH-LM (Lag 1)	0.402	0.324
Jarque-Bera	0.344	0.062
Ramsey RESET	0.061	0.228
CUSUM	Within Bounds	Within Bounds
CUSUMSQ	Outside Bounds	Within Bounds

Source: Outputs of the analysis. The bounds are set at the 5% significance level.

The NARDL model passed all diagnostic tests at the 5% significance level: there was no serial correlation or heteroscedasticity, the residuals were normally distributed, the functional form was appropriate, and the parameters were stable according to the CUSUM and CUSUMSQ tests. In contrast, the linear model exhibited serial correlation at the twelfth lag and instability in the variance of the parameters. This provides further evidence of model misspecification due to the assumption of linearity.

Seventh: Robustness Tests

Table 9. Robustness Checks for the NARDL Model

Specification	n	F-Statistic	Long-Run LPFX+ Coefficient	Long-Run LPFX− Coefficient	Long-Run Asymmetry Wald Test (p-value)
Baseline Model (Max Lag 4)	68	7.21	1.850***	0.054	0.0003
Max Lag 3	69	5.55	2.123***	0.343	0.0015
Max Lag 6	66	8.93	1.926***	0.193	0.0001
Adding Geopolitical Risk Index (GPR)	68	5.58	1.897***	0.123	0.0003
Excluding Devaluation Months (2020-11 to 2021-02)	64	8.27	2.048***	0.478	
Excluding Observations Affected by Lags	57	6.15	1.049 (Insig.)	−0.155	

Source: Outputs of the analysis. *** indicates significance at the 1% level.

The main results remained stable when the maximum lag length was changed, when the geopolitical risk index was added [23], and when the devaluation months were excluded. The coefficient of an increase in the dollar exchange rate ranged between 1.85 and 2.12 and remained statistically significant at the 1% level, while the coefficient of a decrease remained statistically insignificant across all specifications.

However, scientific integrity requires acknowledging an important limitation: when all observations directly involving the three interpolated months, or involving them through lagged terms, were excluded (i.e., 11 observations), the F-statistic remained high (6.15), and the error-correction coefficient remained statistically significant (−0.473, t = −3.64). However, the coefficient of an increase in the dollar exchange rate fell to 1.05 and lost statistical significance. This is attributable to the fact that the excluded months occurred around November 2022 and November 2023, the two periods of the largest increases in the parallel exchange rate. Excluding these observations therefore removes a substantial portion of the variation that determines the coefficient. Accordingly, the numerical value of the elasticity (1.85) should be interpreted with caution, while the qualitative finding the existence of cointegration and the positive effect of an increase in the dollar exchange rate remains the more robust result. Re-estimation is recommended once official closing values for those months become available.

Eighth: Hypothesis Testing

Table 10. Summary of Hypothesis Testing Results

Hypothesis	Evidence / Statistical Result	Decision
H1: Cointegration between the parallel exchange rate and ISX60	NARDL: F = 7.21، t = −5.04 (Significant at 1%); Linear ARDL: F = 2.02	Accepted in non-linear specification only
H2: Positive effect of USD rate increase	β^{+} = 1.85 (p = 0.0001)	Accepted

Hypothesis	Evidence / Statistical Result	Decision
H3: Significant effect of USD rate decrease	β^{-} = 0.05 (p = 0.908); Lags 2 and 3 coefficients are significant in the short run	Rejected in the long run, partially accepted in the short run
H4: Asymmetry of the effect	Long-run Wald p = 0.0003; Short-run Wald p = 0.013	Accepted

Thus, the first hypothesis is accepted which states that the fluctuations in the exchange rates have statistically significant impact on the performance of the Iraq Stock Exchange. This effect, however, is one-sided; it is only observable if the increases and decreases in the exchange rate of the dollar are separated.

Conclusions and Recommendations

First: Conclusions

1. The study period saw a distinct dual exchange rate system with an average of 1.44% between the official and parallel exchange rates in 2021, rising to 16.74% in 2023, to as high as 23.31% in November 2023. The gap has closed, but not closed, at the end of 2025.
2. The linear model does not show an equilibrium relationship between the parallel exchange rate and the ISX60 Index while the nonlinear model shows the equilibrium relationship at the 1% significance level. This implies that some studies that assumed linearity may have come to a false conclusion that there is no relationship.
3. The increase in the dollar exchange rate in the parallel market by 1% is related to an increase in the index by approximately 1.85% in the long run, which shows that Iraqi investors consider stocks as a hedging tool against the depreciation of the Iraqi dinar. The number value of this elasticity is however very sensitive to the three interpolated months and therefore interpreted with caution.
4. A lower exchange rate of the dollar has not been found to have a statistically significant long-run effect on the index, but it lowers the index temporarily after 2-3 months. The Iraqi dinar depreciation has caused a permanent response from the market and the appreciated one has caused a temporary response. This asymmetry, which was observed in the long run and in the short run, was confirmed by the Wald test.
5. The market corrects about 48% of the deviation from the equilibrium each month and half of this will be dissipated in about a month. This suggests that the process of passing on exchange rate effects into the market is relatively fast.
6. The devaluation decision and the electronic platform did not directly have any impact on the market but had an impact through the parallel exchange rate. This is to heighten the investors' awareness of the variable being observed in the parallel exchange rate.
7. The exchange rate was separated from the oil market as there was no statistically significant direct effect of oil prices on the index after controlling for the exchange rate.

Second: Recommendations

For the Central Bank of Iraq:

1. Reduce the gap between the official and parallel rate of exchange by ensuring that the improvement in corporate performance is not matched by asset price inflation, which is measured by the gap between the two exchange rates; and 3. Improve the credibility and effectiveness of the official rate of exchange by ensuring that the market is able to access US dollars at the official exchange rate through legal channels.
2. Understand asymmetry in making decisions about exchange rates, since the effect of an increase in the exchange rate of the dollar on the market is permanent and cannot be offset by a subsequent reduction in the exchange rate of the dollar.

3. Improve transparency of exchange rate policy to limit hedging incentives that encourage savings into stocks which are not consistent with the underlying value of the firms.
4. Security Commission, Iraq Stock Exchange:
5. Release the complete and official list of ISX60 Index and sectoral index closing values monthly in one file which can be made available to researchers. The researcher had to gather data from a number of reports, and he did not have data for three months.
6. Increase the number of listed companies other than banking institutions, since the banking sector dominates the index and the index is very sensitive to exchange rate changes.

For investors:

1. Understand that price surges due to the downfall of the Iraqi dinar do not always reflect real growth and that the real downfall of prices comes after 2-3 months as a result of the rise in the value of the Iraqi dinar.

For researchers:

1. Apply the non-linear models and monthly data in the study of the impact of exchange rate in Iraq and adopt the parallel exchange rate instead of the official exchange rate.
2. Re-estimate the model when official closing values of the interpolated months are published, and add indices for the sectors, trading volume and non-Iraqi investors' purchases in order to directly test the channels of effect transmission.

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