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ESTIMATING AND ANALYZING THE IMPACT OF FLUCTUATIONS IN THE IRAQI DINAR/US DOLLAR EXCHANGE RATE ON THE REAL PER CAPITA INCOME OF IRAQIS (2010–2025)

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Abstract:
This paper seeks to estimate and discuss the effect of exchange rate fluctuations between Iraqi dinar and US dollars on the real per capita income in Iraq during the period 2010-2025. In the discussion part, it will be shown that this topic is considered in the context of Iraqi economy rentier nature, which is defined by the fact that Iraqi economy depends on selling its oil abroad and gains more than 90% of all the revenues from this process. The theoretical basis of this research is the descriptive and analytical approach, whereas the empirical basis includes econometrics analysis using official statistics of the Central Bank of Iraq, Central Statistical Organization, and World Bank. The methodology of the study includes the use of ARDL (autoregressive distributed lag) modeling and bounds testing. First of all, the integration properties of variables are examined using Augmented Dickey-Fuller test. As a result, it was found that exchange rate fluctuations negatively affect real per capita income in Iraq. Furthermore, the rentier nature of the economy means that the country imports almost all products, which results in the loss of purchasing power of the Iraqi currency and negative influence on real per capita income in Iraq. The conclusions of the paper include some policy recommendations, especially the necessity of the development of exchange rate policy and social protection package for poor people.

Keywords: Exchange rate, real income, individual standard of living.

THE INTRODUCTION

Economic policies have to take into consideration the role played by the exchange rate because it is an important monetary tool, influencing the price level, the buying power, and the structure of household spending. Since oil represents 90% of Iraq's total income, the exchange rate becomes a major channel linking domestic spending with foreign income. Besides, as the domestic market depends largely on imports for both consumer goods and intermediate goods, the influence of the foreign currency on the price level is quite large and noticeable, especially when it comes to elastic exchange rates. The exchange rate had an official depreciation in December 2020, when the Iraqi dinar was set at 1,450 per US dollar, marking the end of its stability in the range of 1,170-1,190. Then came another official change in February 2023 that appreciated the dinar to 1,320 per US dollar.The study focuses on the relationships between the exchange rate, Gross Domestic Product (GDP), and inflation, as well as their impact on real per capita incomea key indicator of economic well-being.

First: The importance of the research

The importance of this research stems from the significance of real income for the standard of living and well-being of both the individual and society, given that changes in the general price level directly impact the economy and production, Given that the Iraqi monetary authority resorted to using the exchange rate as a tool to address fiscal imbalances in 2020 and 2023, estimating the real cost of this tool on per capita income is a necessary approach to evaluating its effectiveness. The study gains further significance from its coverage of the period following the decision to revalue the dinar (2023–2025), a period not yet addressed in most published econometric studies.

Second: The research problem

The research problem is defined by the following main question: Does the fluctuation in the exchange rate of the Iraqi dinar against the US dollar have a significant impact on the real income of the Iraqi individual for the period (2010–

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2025)? Two questions branch out from it: Does the impact of the exchange rate level differ from the impact of its fluctuation? And does this impact vary between the long and short term in light of the rentier nature of the Iraqi economy?

Third: Research Objectives

1. Establishing the theoretical framework for the transmission channels of exchange rate fluctuations to real income in rentier economies.
2. Tracking the trajectory of the official and parallel exchange rate and the real per capita income in Iraq for the period (2010–2025) and interpreting its fluctuations economically.
3. Constructing a quantitative index of exchange rate volatility and estimating its impact on real per capita income using the ARDL model.
4. Distinguishing between long-term and short-term effects, and measuring the speed of correcting the imbalance towards equilibrium.
5. Formulating practical recommendations in the field of exchange rate management in a way that protects the purchasing power of income.

Fourth: Research hypotheses

- First hypothesis: There is a long-term equilibrium relationship (co-integration) between the real income of the individual, the exchange rate of the dinar, and the price of crude oil.
- Second hypothesis: Exchange rate fluctuations have a statistically significant negative impact on the real income of the Iraqi individual.
- Third hypothesis: The effect of the decline in the value of the dinar on the real income of the individual is negative, and its strength varies between the long and short term.

Fifth: Research Methodology

The research adopted a descriptive-analytical approach for presenting concepts and analyzing the trajectory of variables, and a standard approach for estimation. The Autoregressive Distributed Lag (ARDL) model and the bounds-testing methodology developed by Pesaran, Shin , and Smith (2001) were used because of their suitability for small sample sizes, the mixing of integration orders between 0 and 1, and because they allow for the estimation of both long-term and short-term parameters in a single equation. The estimation was preceded by the extended Dickey-Fuller unit root test (ADF) and followed by a series of diagnostic tests and structural stability tests (CUSUM and CUSUMSQ.

Sixth: Scope of the research

Spatial Scope: This study is limited to analyzing the significance of fluctuations in the Iraqi dinar exchange rate against the US dollar within the Iraqi economy.
Temporal Scope: The study covers the period from 2010 to 2025.

Seventh: Research Structure

This research is divided into three parts. The first chapter is where the theoretical framework is presented; a review of the existing literature on the subject matter is done; and a gap is identified. The second chapter centers on the analysis and econometrics, involving data description, dynamics of variables, and estimation of econometric models. The third chapter contains the results and bibliography.

Chapter One: Theoretical Framework and Previous Studies

First: The concept of exchange rate fluctuations and their measurement

The nominal exchange rate is defined as the number of units of local currency required to purchase one unit of foreign currency, whereas the real exchange rate is calculated by multiplying the nominal exchange rate by the foreign price level and dividing the result by the domestic price level. Fluctuations in the exchange rate arise from irregular movements over a one-year period; a change in the exchange rate level, however, is a different matter, as a country might alter the value of its currency without necessarily experiencing exchange rate volatility (Issa 2016:12).

In the practical application of volatility measures someresearchers following the study by(Kenen and Rodrik 1986) rely on the moving standard deviation of logarithmic changes; others utilize the coefficient of variation, while some employ conditional variance models. Sample sizes are determined based on annual data. This study adopts the first criterion: the square root of the mean squared logarithmic exchange rate changes serves as the volatility indicator over a three-year period. This measure is characterized by transparency and replicability, though it involves limited degrees of freedom (Aghion and others:2009:498)

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Another metric is the percentage difference between the official exchange rate and the parallel market rate; this gap reflects the impact of the exchange market on the costs of acquiring foreign currency outside the official sales window situation that mirrors the reality in Iraq and the actual conditions faced by small importers and consumers (Al-Husayni: 2022:8).

Second: Channels through which the impact of exchange rate fluctuations is transmitted to real income

The effects of exchange rate fluctuations are transmitted to an individual's real income through four main channels. The first channel is the transmission of the exchange rate effect to domestic prices (Exchange). Rate Pass-Through: A currency devaluation raises domestic prices for imported goods and reduces the purchasing power of monetary income. This elasticity is most pronounced in highly import-dependent economies like Iraq's (Bleaney, M., & Greenaway, D. :2001:494).

The second channel is the balance sheet effect and the shift in spending; reductions raise the relative prices of imported goods and theoretically stimulate alternative domestic production. However, this channel remains practically ineffective when the domestic production system is inflexible, which makes the reduction contractionary rather than expansionary, according to the thesis of .(Krugman & Taylor, :1978:448)

The third channel is that of rentier income; a depreciation of the currency in an oil-producing economy leads to an increase in the dollar value of oil revenues, thus expanding the government's fiscal space and raising public spending and nominal GDP. This channel operates in the opposite direction to the first channel and exerts a positive effect; the net impact is determined by the forces acting between the two channels (Aghionetal:2009:503).

As for the fourth channel (the uncertainty channel), exchange rate volatility distinct from the exchange rate's directional trend delays contracting and investment decisions. This, in turn, affects income growth and capital accumulation (Serven:2003:215). Since the investment response to uncertainty is not immediate, this channel operates with a time lag; this justifies including the volatility indicator with a time lag in the estimated model.

Third: Previous Studies

At the Arab level, Issa (2016) examined the impact of the exchange rate on Iraq's GDP for the period 2003–2012, concluding that there was a significant relationship between them, with the oil sector dominating the trajectory of output. Aziz et al. (2017) measured the relationship between the exchange rate and inflation rates in Iraq for the period 1990–2016, finding a significant positive correlation that reflects a high rate of transmission of the exchange rate to prices. Mohammed and Aziz (2019) used the VAR model to measure fiscal sustainability in Iraq for the period 2003–2017, highlighting the sensitivity of public finances to oil shocks. Al-Husseini (2022) investigated the requirements for the impact of the dinar's devaluation on stimulating GDP after the 2020 decision, concluding that the stimulating effect was limited due to the weakness of the production sector and the market's dependence on imports.

On the international level, a study by Serven (2003) of a sample of developing countries showed that real exchange rate instability has a significant negative impact on private investment, an effect that is amplified when coupled with weak financial development and high trade openness. Aghion demonstrated this. et Al (2009) found that exchange rate volatility reduces productivity growth in countries with shallow financial markets. Bleaney and Greenaway (2001), in their study of sub-Saharan Africa, concluded that real exchange rate volatility reduces investment, and commodity price volatility reduces growth—a finding closely related to the situation in rentier economies.

It can be concluded from this presentation that the literature agrees on the negative impact of volatility, but it differs in estimating the impact of the exchange rate level depending on the structure of the economy under study; where rentier income denominated in foreign currency predominates, the usual deflationary effect of devaluation is weakened.

Fourth: The research gap

The research gap is defined in three aspects: First, most Iraqi studies have addressed the impact of the exchange rate level without separating the effect of its volatility with an independent quantitative indicator. Second, real per capita income—as a direct indicator of well-being—has rarely been used as a dependent variable, with the overall gross domestic product being the predominant metric. Third, published studies have not yet encompassed the period following the decision to raise the value of the dinar in February 2023 and the accompanying expansion of the parallel market premium. This research aims to bridge this gap in all three aspects.

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Chapter Two: The Analytical and Standard Aspect

First: Describing the variables and data sources

outcome variables were taken in logarithmic form to interpret the parameters as elasticities and to minimize the effect of scale variance between series. Table (1) presents the description of the variables, their symbols , and their sources.

Table (1): Description of model variables and data sources

Source	unit of measurement	Variable	The symbol
Central Statistical Organization and Ministry of Planning	One thousand dinars at 2010 prices	logarithm of real per capita income	LRY
Central Bank of Iraq	Dinar/Dollar	Official exchange rate logarithm	LER
Researcher's accounts	Percentage (3-year window)	Exchange rate volatility index	VOL
World Bank	Dollars/barrel	The logarithm of the price of crude oil (Brent)	LOIL

Source: Prepared by the researcher.

Real per capita income is calculated by dividing the gross domestic product (GDP) at current prices by the population and then by the consumer price index (2010 = 100), thus expressing the domestic purchasing power of income. The volatility index is calculated using the following formula:

$$VOL_t = \sqrt{[\ (1/3)\ \Sigma_{i=0}^{2}\ (\Delta \ln ER_{t-i})^2\ ]}$$

The parallel market rate was used in calculating this index because it is the most accurate reflection of the uncertainty faced by the actual trader, while the official rate was adopted in measuring the effect of the level as the variable controlled by the monetary authority.

Second: The evolution of key variables

Table (2) shows the annual trajectory of the basic variables for the period under study, and the entire subsequent analysis is based on it.

Table (2): The evolution of the exchange rate, real per capita income and supporting variables (2010–2025)

Inflation %	oil price	Income growth %	real income per capita	Volatility index	Bonus %	Parallel market price	Official price	Year
2.4	79.5	—	5246	0.031	1.4	1186	1170	2010
5.6	111.3	21.3	6491	0.011	2.2	1196	1170	2011
6.1	111.7	7.0	6962	0.018	5.7	1233	1166	2012
1.9	108.7	2.7	7152	0.018	5.7	1232	1166	2013
2.2	99.0	−7.5	6636	0.020	4.1	1214	1166	2014
1.4	52.4	−32.8	4782	0.018	6.9	1247	1167	2015
0.4	43.7	−4.6	4566	0.022	7.9	1275	1182	2016
0.2	54.2	10.8	5085	0.022	6.3	1258	1184	2017
0.4	71.3	14.4	5875	0.028	2.2	1208	1182	2018
−0.2	64.2	0.3	5891	0.025	1.2	1196	1182	2019
0.6	41.8	−26.2	4534	0.030	3.5	1234	1192	2020
6.0	70.9	23.5	5732	0.103	1.4	1470	1450	2021
5.0	100.9	14.2	6610	0.103	1.7	1475	1450	2022
4.4	82.5	−9.4	6016	0.105	16.1	1545	1331	2023
3.5	80.5	−4.7	5742	0.039	12.2	1470	1310	2024

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Inflation %	oil price	Income growth %	real income per capita	Volatility index	Bonus %	Parallel market price	Official price	Year
3.0	70.0	−4.8	5474	0.046	7.8	1412	1310	2025

Source: Prepared by the researcher based on data from the Central Bank of Iraq, the Central Statistical Organization, the Ministry of Planning, and the World Bank. Data for 2025 is.

Third: Analysis of exchange rate developments

Figure (1) below shows that the exchange rate has undergone three phases. The first phase spanned from 2010 to 2019, a period characterized by the near-total stability of the official exchange rate, which ranged between 1,166 and 1,184 Iraqi dinars per US dollar. During this time, the parallel market rate showed a premium ranging from 1.2% to 7.9%, with the highest margin occurring in 2016 due to the collapse of global oil prices and the corresponding increase in military spending. The second phase began with the decision issued in December 2020 decision to devalue the dinar to (1450) dinars, a decrease exceeding (21%), which came in response to severe financial pressure resulting from the collapse of oil revenues to (41.8) dollars per barrel in 2020.

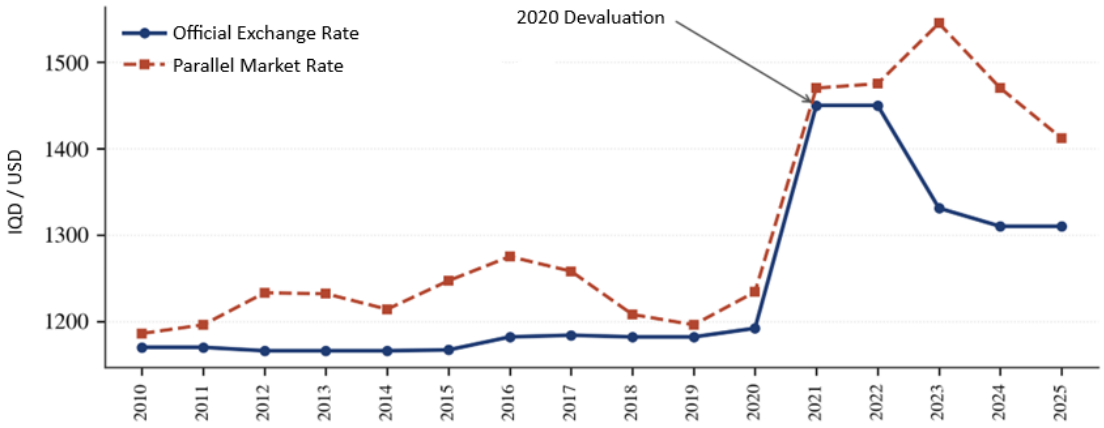


Figure (1): Changes in the official exchange rate and the parallel market rate (2010–2025)
Source: Prepared by the researcher based on the data in Table (2).

The third phase began with the decision in February 2023 to revalue the Iraqi dinar to (1320)against the US dollar. Initially, this caused the parallel market rate to rise to (16.1%) widening rather than narrowing the gap between the official and parallel market rates before gradually declining to (7.8%) in 2024. This development occurred alongside improvements in availability of access to the window where the official currency is available as well as an increase in the number of correspondent banks. The above developments demonstrate that the official rate as set by the government does not always match the market rate, and changing the official exchange rate alone is insufficient to stabilize the markets (Mohammed et al., 2009: 15).

Fourth: Analysis of the evolution of real per capita income

From Figure (2), it is clear that the pattern of per capita income growth for Iraq is unstable and fluctuating rather than increasing over time. The highest value of per capita income was recorded at 7,152 thousand dinars in 2013 and the

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lowest value was recorded at 4,534 thousand dinars in 2020. There is a perfect association between the variation in oil prices and the per capita income growth.

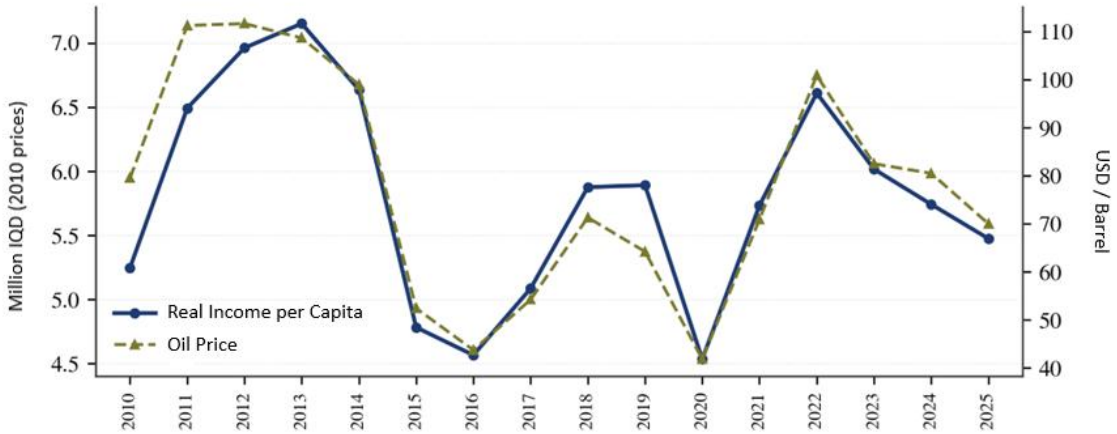


Figure (2): Fluctuations in the path of real per capita income in Iraq versus the global crude oil price for the period (2010–2025).

Source: Prepared by the researcher based on the data in Table (2) above.

Real per capita income in Iraq has suffered three setbacks. The first occurred in 2015, when real per capita income dropped by (32.8%) following the collapse of global oil prices falling from ($99) to ($52.4) per barrel. The second setback took place when global oil prices fell by (26.2%)due to the COVID-19 pandemic, which caused a decline in global demand, factory shutdowns, and supply chain disruptions. The third setback involved a nearly continuous decline in global oil prices between 2023 and 2025 averaging approximately (6.3%) coinciding with a rise in the parallel market rate. The data also reveals a (23%)drop in real per capita income in 2013, despite a notable increase in nominal output; this reflects the impact of cumulative inflation and rapid population growth.

Fifth: Analysis of exchange rate fluctuations and changes in the parallel market.

As seen in Figure 3 below, changes in the exchange rate took place in the narrow range, with a maximum of 0.031 for the period of 2010-2020. The index then jumped to 0.131 in 2021 and then moved to 0.046 in 2025, which is an indication of the changing exchange rate regime.

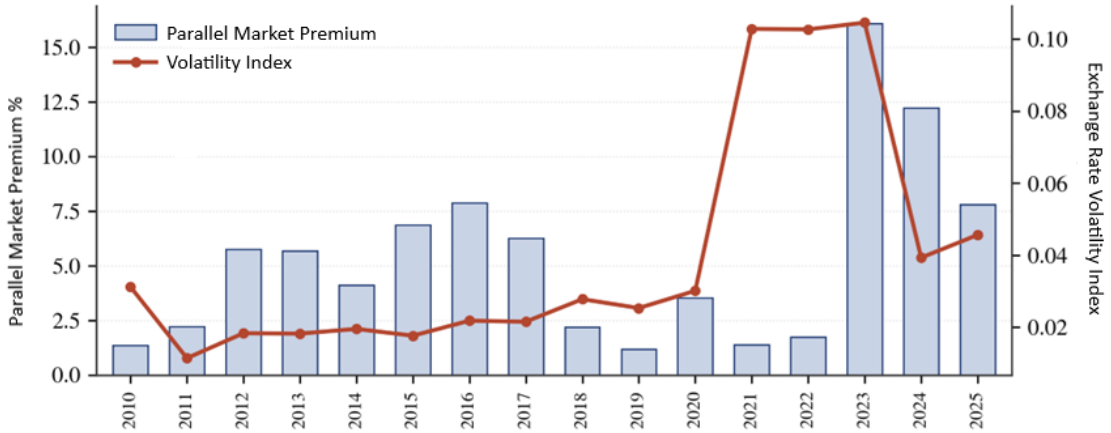


Figure (3): The figure above shows the exchange rate volatility index and the parallel market premium (2010–2025).

Source: Prepared by the researcher based on the data in Table (2).

In 2023, the parallel premium was at its highest while the volatility index was beginning to fall, but on the other hand, in 2021 and 2022, the premium was at its lowest while the volatility index was at its peak. This shows that there is no direct correlation between the two variables. What this tells us is that the two indices measure different forms of

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instability since one measures fluctuations in price over time, while the other measures the disruption in the market at a particular time.

Sixth: Descriptive statistics and correlation matrix

Table (3): Descriptive statistics for model variables and correlation matrix

possibility	JB	Flattening	twist	deviation	Lowest	top	The mediator	Middle	variable
0.673	0.79	1.989	−0.202	0.144	8.419	8.875	8.667	8.656	LRY
0.154	3.74	2.893	1.182	0.078	7.061	7.279	7.075	7.117	LER
0.083	4.97	3.175	1.362	0.033	0.011	0.105	0.027	0.040	VOL
0.634	0.91	2.064	−0.350	0.320	3.733	4.716	4.321	4.306	LOIL
Correlation matrix									
VIF	**LOIL**	**VOL**	**LER**	**LRY**					
—	0.944	0.128	0.124	1,000	**LRY**				
6.76	0.128	0.923	1,000	0.124	**LER**				
6.75	0.122	1,000	0.923	0.128	**VOL**				
1.02	1,000	0.122	0.128	0.944	**LOIL**				

Source: Calculator output based on data from Table (2).

Table (3) shows that the volatility index is the most relatively dispersed variable, with a standard deviation of (0.033) compared to a mean of (0.040), meaning its coefficient of variation is approximately (82%). This reflects the intermittent nature of exchange rate adjustments in Iraq. The normality hypothesis for either variable is not rejected at the (5%) level, based on Garcke-Pera statistics. The most significant observation is the high correlation between the LER and VOL, which is (0.923). This is an inevitable consequence of the fact that volatility in a fixed system arises only at the moment of level adjustment. The inflation coefficient for both variables reached approximately (6.75) when included together in a single equation, a level that threatens the accuracy of the estimate. Therefore, the estimation relied on separating the two variables into two complementary equations: an equation for the long-term equilibrium relationship that includes the exchange rate level, and a short-term equation that includes the volatility index, which theoretically operates through a short-term uncertainty channel.

Seventh: Unit Root Tests

The use of the boundary testing methodology requires that none of the variables be a second-order integral. To test this, the extended Dickey-Fuller test was used in its two forms (with a constant) and (with a constant and a general trend), and the lag order was determined according to the Akaiqui criterion, and the critical values extracted from the distribution functions of (MacKinnon , 1996) corrected for the sample size were adopted.

Table (4): Results of the extended Dickey-Fuller test for the root of the unit

Rank	decision	Critical 5%	t for the first team	Decision	Critical 5%	t at level	Formula	variable
I(1)	stable	−3.104	−3.395	Unstable	−3.104	−3.083	With a fixed	**LRY**
	—	—	—	Unstable	−3.787	−3.005	With a fixed direction	
I(1)	stable	−3.104	−3.305	Unstable	−3.085	−1.351	With a fixed	**LER**
	—	—	—	Unstable	−3.757	−2.192	With a fixed direction	

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Rank	decision	Critical 5%	t for the first team	Decision	Critical 5%	t at level	Formula	variable
I(1)	stable	−3.104	−3.683	Unstable	−3.085	−1.573	With a fixed	**VOL**
	—	—	—	Unstable	−3.757	−2.168	With a fixed direction	
I(1)	stable	−3.127	−3.631	Unstable	−3.104	−2.666	With a fixed	**LOIL**
	—	—	—	Unstable	−3.787	−2.482	With a fixed direction	

Source: Calculator output. Critical values according to (MacKinnon , 1996) at a significance level of (5%).

The results show that all four variables are unstable at the level and stabilize at the first difference, meaning they are first-order integrals (I(1)), with none of them being second-order integrals. This fulfills the requirement for using the bounds testing methodology. It should be noted that the unstableness of the volatility index at the level should be interpreted with caution, as the index is theoretically constrained by a zero lower bound and a mean regression due to its construction. Furthermore, the limited power of the ADF test in small samples makes this result more of a statistical effect than a structural characteristic.

Eighth: Model estimation and cointegration testing

The estimated relationship was formulated within the framework of the following conditional error correction model:

$$\Delta LRY_t = \alpha_0 + \delta_1 LRY_{t-1} + \delta_2 LER_{t-1} + \delta_3 LOIL_{t-1} + \Sigma \beta_i \Delta LER_{t-i} + \gamma_0 \Delta LOIL_t + \varepsilon_t$$

The hysteresis order was chosen according to the Bayesian Schwartz criterion , balancing the quality of the fit with the economy of degrees of freedom. The formula ARDL(1, 2, 1) was selected. The boundary test examines the null hypothesis, which states that the equilibrium relationship does not exist ($\delta_1 = \delta_2 = \delta_3 = 0$), against the alternative hypothesis, which states that it does exist.

Table (5): Results of estimating the ARDL(1,2,1) model, boundary testing, and long-term parameters

possibility	Calculated t	standard error	Factors	teacher
A. Conditional Model Estimation				
0.0163	3.141	2.0022	6.2894**	fixed limit
0.0352	−2.604	0.2486	−0.6473**	LRY(−1)
0.0747	−2.093	0.1306	−0.2734*	LER(−1)
0.0304	2.705	0.1092	0.2954**	LOIL(−1)
0.2608	−1.223	0.2055	−0.2513	ΔLER
0.6883	0.418	0.1688	0.0706	ΔLER(−1)
0.0000	12,741	0.0403	0.5132***	ΔLOIL
R^2 = 0.979 | Adj. R^2 = 0.961 | F = 54.346 | DW = 2.480 | n=14				
b. Limit testing for cointegration				
Upper limit I(1)	Minimum I(0)	Morale level	**3.570**	Calculated F
3.350	2.630	10%		
3.870	3,100	5%		

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possibility	Calculated t	standard error	Factors	teacher
5,000	4.130	1%		
C. Long-term parameters				
0.1335	−1.697	0.2489	−0.4223	LER
0.0000	9.032	0.0505	0.4563***	LOIL
—	—	—	9.7160	fixed limit

Source: Calculator output. Critical values according to (Pesaran, Shin , & Smith , 2001) Case 3, k = 2. (***) Significant at 1%, (**) at 5%, (*) at 10%.

The calculated F-value (3.570) is greater than the upper limit of the critical values at a significance level of 10% (3.350), which means rejecting the null hypothesis and accepting the existence of a long-term equilibrium relationship between real per capita income, the exchange rate, and the price of oil. This confirms the first hypothesis of the research. This conclusion is further supported by the fact that the lag parameter for the dependent variable was negative and significant at the 5% level, a necessary condition for interpreting the relationship as cointegrating.

Long-run parameters indicate that the elasticity of real per capita income with respect to the oil price is (0.456) and statistically significant at the (1%) level. This means that if global oil prices increased by 10%, then the per capita income would experience a growth of 4.56%. Despite the negative and insignificant exchange rate elasticity coefficient (-0.422) at the traditional level of p value ($p > 0.134$), it meets theoretical predictions; that is to say, there is a counterbalance between the two opposite channels rather than non-effectiveness. First, it relates to the appreciation of the dinar and thus growing oil revenues denominated in US dollars and, consequently, greater expenditures. Second, it refers to the transmission of expenditure effect into price effect and, therefore, weakening of income purchasing power. This is typical of the rentier country which uses imports for its consumption and is the basis of the statistical insignificance of the coefficient despite its correct sign.

Ninth: Error correction model and volatility impact measurement

After the emergence of cointegration, the error correction model was applied to estimate short-term behavior and the rate of adjustment. As per the underlying assumption that adjustments to decisions made amid uncertain situations are not instant, a second equation was developed for real income with reference to growth rates using a volatility proxy with a lag of one year.

Table (6): This table presents the results of estimating the error correction equation and the equation augmented with the volatility index.

Equation (b): Enhanced by volatility		Equation (A): Error correction		variable
t (probability)	Factors	t (probability)	Factors	
2.601 (0.025)	0.0386**	—	—	fixed limit
−2.062 (0.064)	−0.3960*	−1.681 (0.127)	−0.2513	ΔLER
—	—	0.478 (0.644)	0.0706	ΔLER(−1)
16.135 (0.000)	0.5445***	16.722 (0.000)	0.5132***	ΔLOIL
−2.468 (0.031)	−0.7126**	—	—	VOL(−1)
—	—	−3.711 (0.005)	−0.6473***	ECT(−1)
0.958		0.970		Rate R^2
107.69 (0.0000)		104.81 (0.0000)		F (probability)
2.568		2.480		DW

Source: Prepared by the researcher using statistical analysis, where (***) indicates significance at the 1% level, (**) at the 5% level, and (*) at the 10% level. The constant term in Equation (A) is subsumed within the error correction term, which exhibited the highest variance inflation factor in Equation (B), reaching 1.57.

The stability of the adjustment process is confirmed by the error correction coefficient, which is negative (-0.647) and statistically significant at the (1%) level. Its value falls within the acceptable range, indicating that approximately (64.7%) of the deviation from the equilibrium path is corrected within a single year. The time required for the adjustment

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half-life is less than one year; this finding is supported by the statistical significance of the relevant parameter and the results of the bounds test. Furthermore, the volatility coefficient in Equation (B) determines the study's pivotal result: the coefficient stands at(-0.713)and is statistically significant at the 5% level. This implies that a one-percentage-point increase in the exchange rate volatility rate leads to a decline of approximately (0.71)percentage points in the growth rate of real per capita income for Iraqis in the following year. To practically estimate the magnitude of this effect, the increase in the index from (0.030) in 2020 to (0.103) in 2021 corresponds according to the estimated parameter to a negative impact of approximately (5.2) percentage points on real per capita income growth, which was offset at the time by the rise in oil prices. Thus, the second hypothesis of the research is accepted. The exchange rate coefficient was (-0.396) and statistically significant at the (10%) level, indicating that a 10% depreciation of the dinar is associated with a decrease in real per capita income of approximately (3.96%) in the short term. This means that the transmission channel to prices precedes the oil revenue channel and is dominant in the short term before they reach equilibrium in the long term. Thus, the third hypothesis is partially accepted: the effect is negative and statistically significant in the short term, and negative but not statistically significant in the long term. The oil price coefficient remained the most statistically significant in both equations, confirming the dominance of the rentier channel.

Tenth: Diagnostic tests and structural stability tests

Table (7): Results of diagnostic tests for the two models

decision	Model (B)		Model (A)		Test
	possibility	Statistics	possibility	Statistics	
The null hypothesis is not rejected	0.195	1.678	0.232	1.427	Brooch – Godfrey for Self-Attachment
The null hypothesis is not rejected	0.232	4.290	0.912	2.077	Broche-Began for Contrast Harmony
The null hypothesis is not rejected	0.615	0.252	0.437	0.603	ARCH for homogenization of conditional variance
The null hypothesis is not rejected	0.618	0.962	0.108	4.454	Jark-Bira Natural Distribution
The null hypothesis is not rejected	0.323	1.082	0.288	1.357	Ramsey RESET for the functional formula

Source: Calculator output. Model (A) is ARDL(1, 2, 1), and model (B) is the equation enhanced with the volatility index.

Table (7) shows that both models passed all the diagnostic tests, as all the probability values were greater than (0.05), which means that there is no autocorrelation problem, or heterogeneity in the variance, or error in the

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functional formula, and that the residuals are normally distributed.

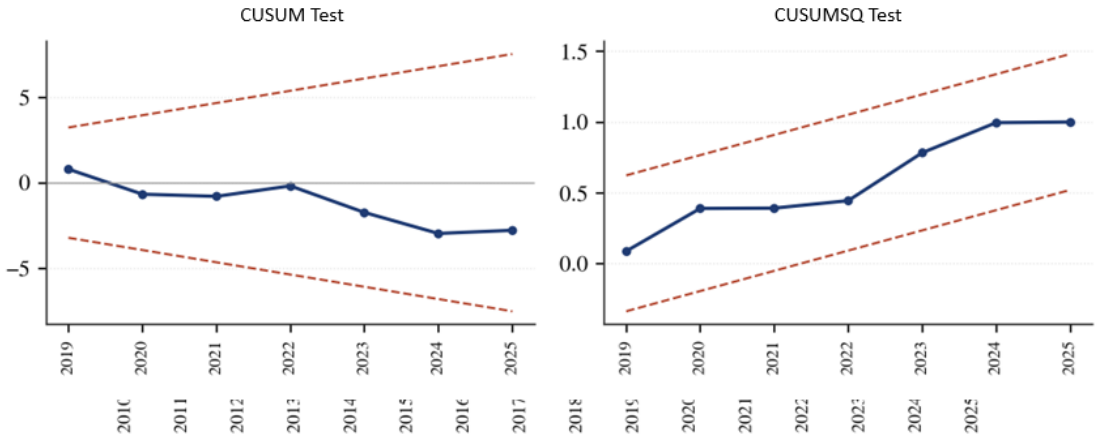


Figure (4): CUSUM and CUSUMSQ structural stability tests

Source: Calculator output. Dashed lines represent critical limits at a significance level of (5%).

Figure (4) shows that the two curves of the cumulative sum of the recurring residuals and their squares fall within the critical limits at a significance level of (5%) throughout the period, which confirms the structural stability of the model parameters and its lack of unexplained structural changes, despite the two major adjustments in the exchange rate in 2020 and 2023. This carries an important implication that these two adjustments did not change the structure of the relationship between the variables, but rather moved the variables within the same structure.

Eleventh: Durability Tests

To verify the robustness of the results, the estimate was re-estimated using two alternative formulas. The first replaced the official exchange rate with the parallel market rate in the long-term relationship, and the second added the parallel market premium as an explanatory variable to the short-term equation.

Table (8): Durability Test Results

Result	Calculated t	Factors	variable	alternative formula
F = 4.141 (integration at 5%)	−1.995	−0.2869	LER (Long Term)	(a) By adopting the parallel market price
The signal and volume are stable.	3.316	0.4683	LOIL (Long Term)	
It remains significant at 5%	−2.504	−0.8669**	VOL(−1)	(b) By adding the parallel market premium
immaterial	0.836	0.0025	PREM	

Source: Calculator output.

Formula (a) confirms the robustness of the results and even enhances confidence in the equilibrium relationship, as the value of (F) of (4.141) exceeds the upper limit at the (5%) level, while the exchange rate parameter remains negative and the oil price parameter remains positive and significant. Model (B) shows that the volatility index coefficient remains significant at the (5%) level and its absolute magnitude increases, while the parallel market premium is statistically insignificant. This supports the conclusion that the impact on real income stems from exchange rate volatility over time rather than from the widening gap between the two rates at a given moment a point addressed in paragraph (Fifth).

CHAPTER THREE: RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

First: Results

1. The boundary test confirmed the existence of a long-term equilibrium relationship between the real per capita income, the dinar exchange rate, and the price of crude oil, as the calculated value of (F) reached (3.570), exceeding the upper limit of critical values at a significance level of (10%), and this was reinforced by the significance of the error correction parameter at a level of (1%).

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2. The error correction parameter reached (−0.647), which is negative and significant at the (1%) level, meaning that about (64.7%) of the imbalance is corrected within one year, and that the half-life of the adjustment is less than a full year.
3. The effect of the exchange rate volatility index was negative and significant at the (5%) level with a value of (−0.713), meaning that an increase in the index by one percentage point is associated with a decrease in the real per capita income growth rate by about (0.71) percentage points in the following year.
4. The results demonstrated that the short-term impact of the Iraqi dinar's depreciation was negative at a (10%)significance level with an elasticity(0.396-), whereas the long-term impact was negative with an elasticity of(0.422-) but statistically insignificant at conventional levels.
5. The results indicate that the crude oil price is the dominant determinant of the trajectory of real income in Iraq; the long-run elasticity of Iraqi per capita real income with respect to the crude oil price is (0.456)and this figure is statistically significant at the (1%) level.
6. The results demonstrated the structural stability of the model parameters, as the model passed all diagnostic tests regarding autocorrelation, normality, heteroscedasticity, and functional form validity; furthermore, the (CUSUMSQ) and (CUSUM) curves fell within the critical bounds at the (5%) significance level.

Second: Conclusions

1. Exchange rate instability harms the real income of the Iraqi individual; this conclusion stems from the negative impact of exchange rate volatility, contrasted with the lack of a significant long-term impact from the exchange rate level itself.
2. There is a balance between two opposing channels: the oil revenue channel through which the dinar value of revenue rises, thereby increasing public spending and the price-impact channel, through which the purchasing power of the Iraqi dinar declines. This dynamic is a characteristic of a rentier economy that relies on oil as its primary source of income.
3. The results demonstrate that the exchange rate in Iraq is a variable driven more by the dominance of oil price dynamics than by its role as an independent tool directly influencing the real income of the Iraqi individual; its effectiveness is not determined solely by the decisions of the monetary authority, but also by trade and the structure of production.
4.The results demonstrated that improvements in the mechanisms for accessing the official currency sales window had a greater impact on local market stability than the decision to adjust the official exchange rate; this was evidenced by the parallel market premium widening to its peak before gradually narrowing in 2023.
5. The equilibrium path of oil revenue is governed by the magnitude of the revenue itself, allowing it to rapidly return to that path following economic shocks; this indicates a high speed of correction, yet such speed does not render it immune to economic shocks.

Third: Recommendations

1. Working to narrow the parallel market premium by simplifying access procedures to the currency sales window and expanding the network of correspondent banks, instead of merely adjusting the announced official rate.
2. Link any future decision to adjust the exchange rate to an accompanying package to protect low-income groups, because the transmission of the impact to prices in the Iraqi economy is rapid and highly elastic.
3. Directing the financial space achieved from the increase in the dinar value of oil revenues towards productive investment spending, not operational spending, to activate the spending transformation channel that is currently disrupted by the weakness of the productive apparatus.
4. Building an official and publicly available monthly database of the parallel market price, which would allow the use of conditional variance models (GARCH) to measure volatility with greater accuracy in subsequent studies.
5. Diversifying sources of public revenue to reduce the elasticity of real income in relation to the price of oil, since this high elasticity makes the well-being of the individual dependent on an external variable over which local policy has no control.

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