Measuring the Relationship Between the Exchange Rate and the Balance of Trade Using the VECM Error Correction Vector Model in Iraq for the Duration 2004_2023

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Abstract

The research aims to examine the role of the exchange rate and its ability to influence the trade balance in the Iraqi economy during the period (2004-2023) as well as the use of the analytical curriculum descriptive of the variables adopted in research and using the standard programme Using a VECM model to analyze and measure variables and research data, the research reached a range of conclusions, including a long-term relationship between the exchange rate and the trade balance, and an influential and prominent role in the long-term balance of trade, but in the short term the relationship was relatively weak.

Keywords: Emotions, Education, Humanities, Machine Learning, OpenBCI.

1. Introduction

The exchange rate and trade balance relationship are among the most important in any country because the exchange rate represents the strength of the domestic currency as compared to foreign currencies. The trade balance is net of export and revenue values and may be negative or positive. The aim is always to balance the balance, especially in developing countries, including Iraq. Iraq's economy has undergone significant transformations over the period 2004-2023 as a result of economic and political changes, such as fluctuations in oil prices, monetary policies and trade liberalization after being besieged. This requires understanding and analysing the impact of the exchange rate on the balance of trade using the error correction vector model (VECM) is an appropriate tool for examining the dynamic relationships between variables that manifest a common integration relationship. The research aims to examine the long-term and short-term relationship between Iraq's exchange rate and trade balance in order to determine the effectiveness of the economic policy pursued and make decisions that are conducive to economic stability .

1.2.Research problem: The problem of research can be summarized in tracking the impact of exchange rate stability on Iraq's economy during the period 2004-2023

Research hypothesis: Research is based on the long-term positive relationship between the exchange rate and the trade balance in Iraq's economy for the period 2004-2023

1.3.Research Objective: The research aims to measure and analyze the long-term relationship between exchange rate and trade balance in the Iraqi economy using the "VECM" error correction vector model

1.4.Research curriculum: The research attempted to combine two or two methods of the first curriculum with the standard quantitative approach by applying the "VECM" model of assessment and conducting tests for analysis 1.5.Research structure: Research section into two main axes :-

Axis I: Theoretical and conceptual framework for exchange rate and trade balance

Axis II: Analysis of the impact of the exchange rate relationship on the balance of trade using the "VECM" error correction vector model in Iraq for the duration 2004-2023

2. Theoretical and conceptual framework for exchange rate and trade balance

2.1.Theoretical and conceptual framework of the exchange rate

2.1.1.Exchange rate concept: The exchange rate is an important element in international economic relations and a basis part of the daily work of economic units. As a result of the expanding volume of international economic relations among different countries of the world, the importance of regulating foreign exchange transactions and determining the exchange rate of each currency against other foreign currencies, on the basis of which the value of foreign goods is determined in local currency. International exchange raises the problem of calculating the value of the exchange and the problem of a payment, requiring a process whereby the local currency is replaced in foreign currency (Khabazi, 2013: 21), This is what we call the foreign exchange process, and the exchange rate is defined as the rate at which the local currency is valued in relation to the foreign currency (Al Obaidi, 2013: 91), has also been defined as (foreign currency rate for local currency (.Sammuelsson, 2006: 595), thus arguably the exchange rate is a currency in another currency. The exchange rate can also be defined as: the amount of the ratio on which the exchange is made between the local currency and the foreign currency In other words, the exchange rate represents the number of monetary units in which the local currency is exchanged with foreign currency or any other currency and thus is an important means of allocating available resources to economic sectors reflecting on the profit of export-based industries and thereby reducing the total cost of resources imported from abroad (Khalil, 2007: 51) It can also be defined as: the price that expresses the relative price of two States' currencies foreign currency ", since it represents the price of a particular currency for another foreign currency, In other words, the number of cash units of a given currency versus one unit of another currency and therefore the exchange rate is the currency price, as money as well as an exchange, a value store and a measurement tool is a commodity that has its own price and market through the exchange rate. (Amr and Ahmed, 2011:6.(

2.1.2.The importance of the exchange rate: the importance of the exchange rate as a tool for linking the values of goods, services and capital assets in domestic and foreign markets as well as linking the financial markets of domestic assets to global financial assets That it plays an important role in guiding investments in domestic and external assets and that the exchange rate plays an important role in the allocation of domestic economic resources. The exchange rate also has a standard function, representing the link between global prices on the one hand and domestic prices on the other. In particular, the domestic product relies on the exchange rate with the aim of comparing and measuring foreign (global) and domestic prices (Sadiq et al., 1997:5). The exchange rate exercises a function that is developmental by using the exchange rate to develop exports to different regions and that it discards industrial branches and replaces them with revenues that are less than the local rate. And the exchange rate has a role and influence on geographical composition and on foreign trade of commodity composition, Another exchange rate function is an international distribution function of the economy because it is linked to external trade through the process of intra-country trade through prices. (Narrator and others, 1985:7) .

2.2.Conceptual and conceptual framework of the trade balance

2.2.1. The trade balance concept: It can be defined as the difference between the value of the country's exports and revenues. The trade balance is an important indicator and measure at the level of the economy. It is also one of the inputs to the domestic product of countries. Its value lies in the analysis of components rather than in absolute value. Here, it is necessary to know the quality of all components. (Hamam and Omar, 2002:24) .

2.2.2.Trade balance cases: The trade balance represents two situations that can be explained as follows (Secretary 2013:54) .

- Surplus status: when exports are larger than imports, i.e. the output is positive.
- Deficit situation when exports are less than imports, i.e. the output is negative .

2.2.3. Types of trade balance: Consists of two types: (Husam et al., 2002:28)

- Trade balance is appropriate: many countries pursue trade policies that bring about a trade surplus in their products. Hence, they prefer to sell a lot of products for capital that are employed by their populations. This will be reflected in the evolution of the individual's living standard as well as the creation of a competitive advantage between domestic companies within the country, especially in the short term, in order to maintain the trade surplus achieved .
- Inappropriate trade balance: trade deficits may be unfavourable for a State, especially countries whose economy is heavily dependent on the export of raw materials. In general, these countries import many consumer goods and services countries whose economy is heavily dependent on the export of raw materials and in general, This type of country imports a lot of consumer products, its economy is dependent on the prices of the world's commodities, which are highly variable. Therefore, its domestic business does not acquire the necessary expertise to make value-added products

2.3.Analysis of the relationship between Iraq's exchange rate and trade balance for the period 2004-2023

Notes from table 1 that the exchange rate of the Iraqi dinar has risen very significantly in general (2004) as it reached (1454) owing to the replacement of the old currency with a new currency and its entry into circulation, which increased the demand for the new Iraqi dinar as a good treasury of value as well as the application of the currency auction, after which the exchange rate of the Iraqi dinar reversed in general (2005) to reach (1473) due to security conditions in that period inflationary pressures in the economy, and then the exchange rate of dinars went back up and then improved in a continuous direction during the period (2006 – 2008) as the application of the auction policy played an important role in stabilizing the exchange rate during the period (2009 - 2011) So this period is important for the central bank because of the stability of the exchange rate and economic stability .

Table 1. Evolution of Iraq's balance of payments and exchange rate for the period 2004-2023

Years	Parallel market exchange rate (1)	Annual Rate of Change of Exchange Rate % (2)	Balance of Trade)IQD 1 billion((3)	Annual Balance of Trade Change Rate % (4)
2004	1454	-	26533828	-
2005	1473	1.3	15422502	- 41.87
2006	1475	0.13	23618382	53.14
2007	1266	- 14.16	24653286	4.34
2008	1203	- 4.97	33960790	37.7
2009	1182	- 1.7	1170180	- 96.55
2010	1185	0.25	9308914	695.51
2011	1196	0.92	38126093	309.56
2012	1233	3.09	43405299	13.84
2013	1232	- 0.08	38158736	- 12.08
2014	1214	- 1.46	38227764	0.18
2015	1274	4.94	43337708	13.36
2016	1253	- 1.64	7045311	- 83.74
2017	1274	1.67	29283877	315.65
2018	1210	- 5.02	35878143	22.51
2019	1225	1.23	38279444	26.69
2020	1250	2.04	39288664	2.63
2021	1475	18.22	41442812	5.48
2022	1471	- 0.27	40372284	- 2.58
2023	1315	-10.6	42132165	4.35
2023-2004		-0.50		2.33

Source: -

- Statistical Bulletins of the Central Bank of Iraq, Various Years

- Columns (2), (4) were calculated by the researcher

- Simple growth rate calculated according to the following formula:- $R = \frac{P_t - P_{t-1}}{P_{t-1}} * 100$

- The composite growth rate is calculated according to the following formula :- $R = \left[\left((PT/P0)\hat{}(1/N)\right) - 1\right] * 100$

In 2012, the exchange rate rose as a result of increased demand for the United States dollar in the Iraqi market, owing to U.S. sanctions on Iran and the resulting currency smuggling into Iran through the Iraqi market, as well as the expansion of money laundering operations in Iraq through foreign currency auction. The period between 2012 and 2016 saw a marked stabilization in the exchange rate of the Iraqi dinar in the official and parallel markets. The stability and improvement in the value of the Iraqi dinar increased people's confidence relatively and narrowed the phenomenon of dollar afflicting the Iraqi economy. (2004 - 2019) in 2020 due to the Central Bank's monetary policy and its stabilization of the exchange rate. The Iraqi dinar and its value storage capacity began to return, which in turn encourages investment to Iraq. In 2021 and 2022, the exchange rate rose to 1475 and 1471, respectively, owing to the Bank's policy of raising the exchange rate against the dollar to cover the volume of expenditures formed as a result of the epidemiological crisis and subsequently to an increase in the general budget deficit rate, which affected the performance of monetary policy, In 2023 the exchange rate fell to (1315) by the monetary authority to try to reduce the balanced deficit ratio; the composite full-term exchange rate growth was (0.50-%) The trade balance was 2.33%, and it can be concluded that the annual rate of change for both the exchange rate and the trade balance experienced a clear fluctuation during the period of the research, owing to the increased volume of oil revenues reflected in the Iraqi economy.

3. Analysis of the impact of the exchange rate relationship on the balance of trade using the "VECM" error correction vector model in Iraq for the period 2004-2023

3.1.Search and description variables

VECM is one of the important models that measures and demonstrates the impact of the long-term relationship between economic variables, and the use of this model requires that all variables be static at the first difference, i.e. they are integrated from one degree. I (1) In order to test the research hypothesis and achieve its objectives, the independent variable has been determined at the parallel market exchange rate following the trade balance and as follows :-

Exchange rate = Pr

Balance of trade = Tr

Based on the theoretical framework of the research, it is assumed to test the following dual relationship :-

$Tr=a+bpr+ui$

It symbolizes (Pr) the exchange rate, and (Tr) the balance of trade and using (Eviews 13) not due to standard tests

3.2. Test results

3.2.1.Unit root test: which is a stable test of model variables and determination of the rank of joint integration of the time series and know whether the variables are stable or not and this is done by applying unit root test (PP).

Table 2 Unit root test (PP) in Iraq for 2004-2023

UNIT ROOT TEST RESULTS TABLE (PP) Null Hypothesis: the variable has a unit root			
At Level			
		TR	PR
With Constant	t-Statistic	-2.7866	-2.1606
	Prob.	0.0789	0.2255
		*	n0
With Constant & Trend	t-Statistic	-3.6689	-1.845
	Prob.	0.0504	0.6425
		*	n0
Without Constant & Trend	t-Statistic	-0.3958	-0.5356
	Prob.	0.5275	0.4713
		n0	n0
At First Difference			
		d(TR)	d(PR)
With Constant	t-Statistic	-12.6818	-3.1101
	Prob.	0	0.0438
		***	**
With Constant & Trend	t-Statistic	-12.0771	-2.7144
	Prob.	0	0.2426
		***	n0
Without Constant & Trend	t-Statistic	-8.1948	-3.0943
	Prob.	0	0.004
		***	***

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After conducting the unit root test using Phelps Peron method for research variables and through Table 2 we show that the variable (TR) did not stabilize at the level and the variable is residual at the first difference with a definite or conclusive and general trend. The variable (PR) also did not settle at the level, but was still at the first difference with a definite or conclusive and general trend .

3.2.2. Joint Integration Test: A test showing the long-term balancing relationship between variables and joint integration will be tested in Johansen Method

Table 3 Joint Integration Test for Johansen in Iraq for 2004-2023

Critical Value	Statistic Value	Alternative hypothesis	Null hypothesis
Trace test			
15.49471	17.98272*	r>1	r=0
3.841465	4.619305*	r>2	r≤1
Maximum Eigen value test			
14.26460	13.36341*	r=1	r=0
3.841465	4.619305*	r=2	r=1

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After conducting the joint integration test of the model variants and using the Johansen Method test and through a table 3 showing that there is more than one vector for joint integration according to the Trace impact test and then rejecting the nowhere hypothesis and accepting the

alternative hypothesis that there is a common integration at a morale level (5%) Johanson's Maximum value test shows more than one vector at a morale level (5%). This confirms a long-term balance between the two variables .

We must determine the optimal slowing period as follows:-

Table 4 Slowing Period Limitation

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-378.0768	NA*	1.47E+18	47.5096	47.60617*	47.51454
1	-373.5676	7.327391	1.39E+18	47.44595	47.73567	47.46079
2	-370.3987	4.357229	1.60E+18	47.54984	48.03271	47.57457
3	-364.3981	6.750714	1.36E+18	47.29976	47.97578	47.33438
4	-357.2291	6.27291	1.08e+18*	46.90363*	47.77279	46.94814*

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Through table 4 we show that the optimal slowing period of the model is Lag 4.

3.2.3.Test Vector Model Error Correction

Table 5 Vector Error Correction Results

Variable	Coefficient	Standard error	t-Statistic
Cointegrating Equation			
TR(-1)	1		
PR(-1)	-14299.46	21566.8	-0.663
C	-13823677		
Error Correction			
COINTEQ1	-1.799423	1.58885	-1.133
D(TR(-1))	0.749433	1.09574	0.684
D(TR(-2))	0.750223	0.8127	0.923
D(TR(-3))	0.39497	0.5669	0.697
D(TR(-4))	0.372716	0.40125	0.929
D(PR(-1))	-10397.02	83193.8	-0.125
D(PR(-2))	88129.17	54829.6	1.607
D(PR(-3))	109928.8	126594	0.868
D(PR(-4))	-80647.11	135116	-0.597
C	-1507209	4264851	-0.353
R-squared	0.746	Log likelihood	-259.975
Adjusted R-squared	0.289	Akaike AIC	35.997
F-statistic	1.634	Schwarz SC	36.469

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It is clear to us through the results table (5) through Cointegrating Equation that there is a stable relationship between TRB and PR exchange rates in the long term, while the Error Correction Correction error indicates that the value is -1.799423. Short-term dynamic estimates show that D (TR) takes a positive effect from TR (-1) but is relatively weak, and F-statistic and Log likelihood demonstrate the model's relevance. But the values are low, and in summary, there is a long-term relationship between the exchange rate and the balance of trade, and in the short gel it was weak .

3.2.4.Self-correlation test for guards

Table 6 Self-association

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	3.259905	4	0.5153	0.919339	(4, 4.0)	0.5315
2	2.949335	4	0.5663	0.803749	(4, 4.0)	0.5813
3	1.12943	4	0.8896	0.253433	(4, 4.0)	0.8939
4	4.373537	4	0.3578	1.398174	(4, 4.0)	0.3766
5	3.954443	4	0.4122	1.205355	(4, 4.0)	0.4304
6	6.160974	4	0.1874	2.428746	(4, 4.0)	0.2056
7	10.82806	4	0.0286	7.719938	(4, 4.0)	0.0364
8	6.076516	4	0.1935	2.371316	(4, 4.0)	0.2118
9	5.329123	4	0.2552	1.903232	(4, 4.0)	0.2742
10	3.836246	4	0.4286	1.153833	(4, 4.0)	0.4465
11	10.0169	4	0.0401	6.414071	(4, 4.0)	0.0497
12	10.90529	4	0.0276	7.855671	(4, 4.0)	0.0354

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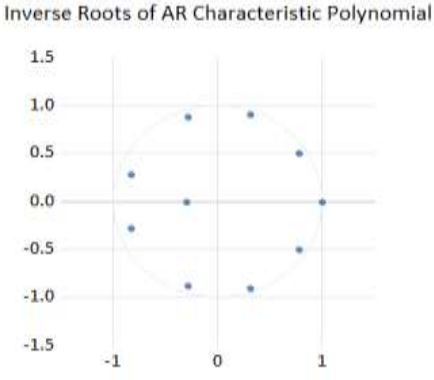
Through Table 6 it is clear that the variables are free of the self-correlation problem and as shown in Form 1 .

Shape 1 Reverse roots



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3.2.5.The variation test after the test and through table 7 shows us the variability effects in 10 years to come

Table 7 Variation Test

Variance Decomposition of TR:			
Period	S.E.	TR	PR
1	14104987	100	0
2	14148563	99.49029	0.509711
3	18164130	84.2659	15.7341
4	20238740	78.95906	21.04094
5	22654328	64.56091	35.43909
6	24713215	69.68386	30.31614

7	24863862	69.51516	30.48484
8	25080078	68.78224	31.21776
9	25412032	69.10181	30.89819
10	25477452	69.24767	30.75233

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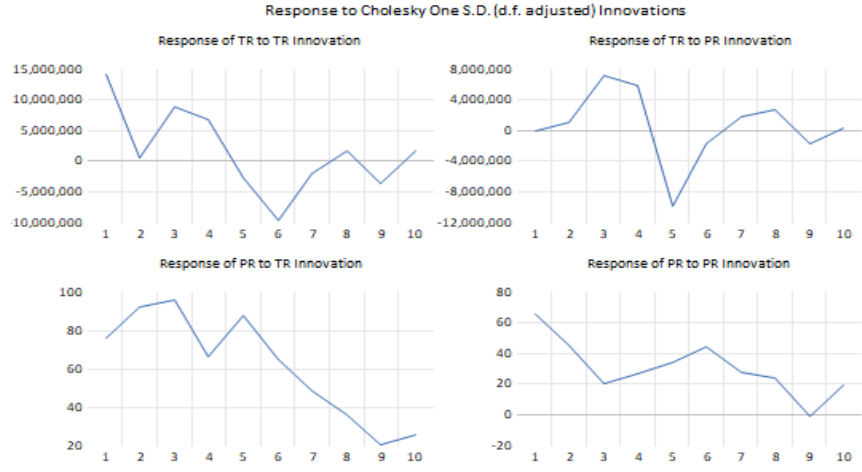
3.2.6. Post-test trauma test shows us the impact of future shocks of variables as in

figure 2

Figure 2 Trauma



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4. Conclusions

1- Exchange rate is an important tool in linking the domestic and global economy by virtue of fiscal and commodity exchanges between countries

2-There is a positive exponential effect of the exchange rate on the short-term and long-term trade balance, as a result of Iraq's weak exports and its dependence on a single source, oil exports.

3-Exchange rate shocks have a significant impact on Iraq's trade balance.

5. Recommendations

1-To promote the development of non-oil sectors of the Iraqi economy in order to reduce external shocks and not to rely on a single source of public revenues for a greater role in economic activity.

2-It is necessary to control the exchange rate and outlets that pledge to sell and buy it with the aim of supporting GDP and preventing currency leakage abroad and thereby achieving the country's economic stability.

3-Work to raise the value of the local currency and reduce the exchange rate without compromising the internal stability of the economy, as well as not adhering to a fixed exchange rate, and that this rate emulates the economic reality.

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