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THE EFFECT OF SOME MACROECONOMIC VARIABLES ON THE FOREIGN RESERVES INDEX OF THE IRAQI ECONOMY: ECONOMETRICS STUDY FOR THE PERIOD 2008-2019

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Abstract: The countries are trying to maintain foreign reserves and take means to prevent their decline because this is associated with political and economic considerations as well as its direct relationship to the stability of the financial and economic situation, as well as being a mainstay of international credit and the reliability of local currencies associated with those reserves. This paper go off from analysis variables studies (money supply, inflation and unemployment) and its effect on foreign reserves, and analyzing the long and short-run equilibrium co-integrative relationships, the paper uses the econometrics approach to represent the reality of the relationships contained within the elected model, and based on pre-tests represented by stationary tests, They are of two types, the graph and the ADF and PP, which later confirmed that the degrees of stationary for the studied variables are a mixture between the level stationary at the level and at the first difference, and this requires choosing the ARDL model. The results of the model reached that the optimal combination of lags is (4, 3, 0, 1) This was selected based on the AIC test, which represents the lowest value. As for the economic relationship which that link the variables (under research) were identical to the economic logic and hypotheses, as well as the tests of the model (the bound test, coefficient of integration equation) that proved their validity, on the one hand, and on the other hand, the post tests of the model also proved the integrity of the model from Econometrics problems, namely, the problem of serial correlation between error residuals, the problem theatricality, and tests of the cumulative sum and its squares, which mostly show that the model does not suffer from structural changes over time.

Keywords: foreign reserves, international credit, equilibrium co-integration relations, stationary, inflation, bound test, serial correlation between error residuals.

Introduction

The foreign reserves index affects all economic policies, and plays a role in influencing macroeconomic variables according to the assumptions of economic theory in general, The ability of the foreign reserves index to influence stability and the economic situation is given increasing attention by countries at the level of developing and developed countries, on this one hand, On the other hand, when dealing with the details of economic relations, it is noted that the relationships are clear between the reserves index and inflation or the price index, As the reserves index can control the increase in the supply of the local currency or not, which ultimately leads to the withdrawal of part of the monetary in circulation, But this policy has consequences that harm the economy, Including that dispensing part of the foreign reserves in the central bank, which will work to weaken the strength of the local currency, The same applies to the money supply, which also operates within the policies that curb inflation through the use of deflationary monetary policy and so on, In a related aspect to the Iraqi economy, which is characterized by excessive rentiers and reliance on financing annual budgets through oil revenues, whose value is obtained in dollars according to international prices, and therefore it is assumed that this will positively affect foreign reserves in conjunction with monetary policy tools, i.e. regulating the money supply that slowed inflation and unemployment Here it must be said that the aforementioned macroeconomic indicators have a direct or indirect impact.

The Data

In order to delve into the analysis and knowledge of the impact of the relationships between the studied variables, it is necessary to use the quarterly data of the macroeconomic variables with the foreign reserves, and it begins with a step describing them according to the economic logic and the nature of their relation to the dependent variable, as follows:

TABLE (1)
Discerption of Variables

Variables	Discerption
FRQ	dependent
INF	Independent
M2	Independent
UNEM	Independent

As well as with regard to the series of quarterly data for the aforementioned variables, it was divided into quarterly data in order to expand the number of observations and thus the possibility of analyzing them econometrical and subjecting them to statistical tests so that we know the nature of the real relationships and to move away from false regression and the data table as follows:

TABLE (2)
THE DATA: FRQ, INF, M2 & UNEM from 2008Q1- 2019Q4 (Million Dinar, %)

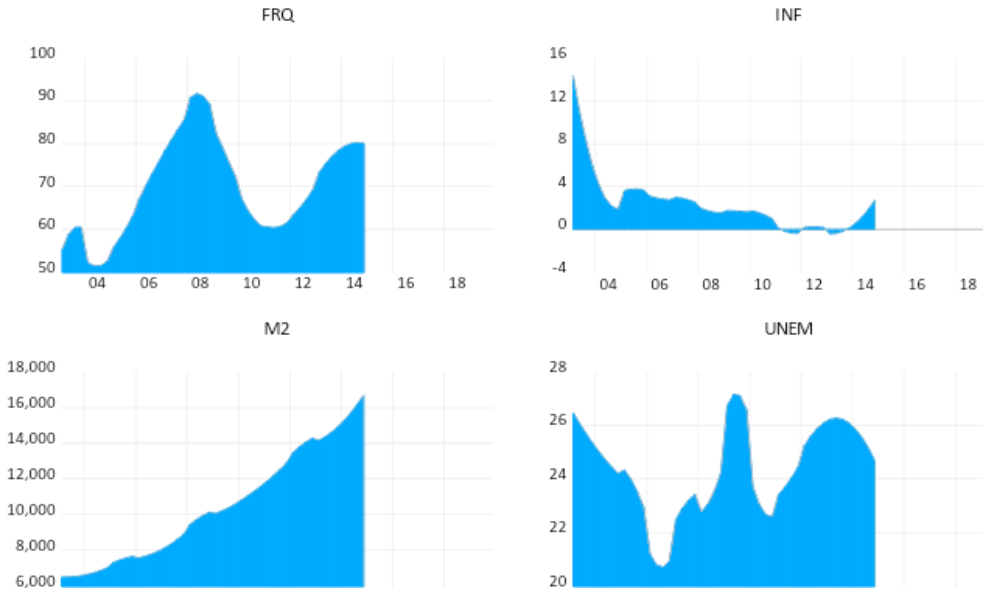
YEARS	FRQ	INF	M2	UNEM	YEARS	FRQ	INF	M2	UNEM
2008Q1	55.30309	14.3125	6499.128	26.475	2014Q1	82.43441	1.746875	10064.13	26.74375
2008Q2	58.71916	11.0375	6497.897	26.075	2014Q2	79.07734	1.728125	10212.77	27.15625
2008Q3	60.42603	8.2625	6521.184	25.7	2014Q3	75.68447	1.690625	10386.12	27.10625
2008Q4	60.42372	5.9875	6568.991	25.35	2014Q4	72.25578	1.634375	10584.18	26.59375
2009Q1	52.22019	4.2125	6641.316	25.025	2015Q1	66.96722	1.715625	10824.57	23.7125
2009Q2	51.39631	2.9375	6738.159	24.725	2015Q2	64.19653	1.559375	11065.01	23.0375
2009Q3	51.46006	2.1625	6859.522	24.45	2015Q3	62.11966	1.321875	11323.12	22.6625
2009Q4	52.41144	1.8875	7005.403	24.2	2015Q4	60.73659	1.003125	11598.9	22.5875
2010Q1	55.71544	3.628125	7305.319	24.33438	2016Q1	60.51656	0.0875	11881.9	23.42188
2010Q2	57.85606	3.746875	7448.431	23.99063	2016Q2	60.33344	-0.1875	12197.2	23.70313
2010Q3	60.29831	3.759375	7564.256	23.52813	2016Q3	60.65644	-0.3375	12534.35	24.04063
2010Q4	63.04219	3.665625	7652.794	22.94688	2016Q4	61.48556	-0.3625	12893.35	24.43438
2011Q1	67.09034	3.090625	7565.481	21.18438	2017Q1	63.36941	0.175	13470.73	25.22813
2011Q2	70.03641	2.934375	7658.869	20.79063	2017Q2	64.99134	0.225	13794.82	25.59688
2011Q3	72.88303	2.821875	7784.394	20.70313	2017Q3	66.89997	0.225	14062.14	25.88438
2011Q4	75.63022	2.753125	7942.056	20.92188	2017Q4	69.09528	0.175	14272.71	26.09063
2012Q1	78.33313	2.99375	8124.7	22.47813	2018Q1	73.23572	-0.39375	14153.74	26.23125
2012Q2	80.85938	2.90625	8349.5	22.89688	2018Q2	75.34103	-0.35625	14359.88	26.26875
2012Q3	83.26413	2.75625	8609.3	23.20938	2018Q3	77.06966	-0.18125	14618.37	26.21875
2012Q4	85.54738	2.54375	8904.1	23.41562	2018Q4	78.42159	0.13125	14929.2	26.08125
2013Q1	90.83225	1.940625	9450.072	22.76563	2019Q1	79.39684	0.58125	15292.38	25.85625
2013Q2	91.62325	1.734375	9728.403	23.05938	2019Q2	79.99541	1.16875	15707.9	25.54375
2013Q3	91.0435	1.596875	9955.266	23.54688	2019Q3	80.21728	1.89375	16175.76	25.14375
2013Q4	89.093	1.528125	10130.66	24.22813	2019Q4	80.06247	2.75625	16695.97	24.65625

Source: Central Statistical Organization, various bulletins, [1]Iraq. Available: www.cosit.gov.iq

Stability[2]

To find out whether the data (under study) is still or not, the series observations were subjected to the graph as a proactive illustrative measure, and it became clear that all data suffer from a state of non-stable at the level as following:

FIGURE (1)
DATA STAIONARY



Source: Depend on output of the Eviews 12.0

In a context related to stability tests, the data were subjected to the PP tests [3] and the ADF test [4], and it was found that the inflation variable is stable at the level, whether with the constant and with the constant and the trend and without them, while the other variables were unstable at the level and stabilized at this first difference. According to the Phillips-Beron test, it can be said that all the variables were not stable at the level and stabilized at the first difference and for all cases, whether with the constant or with the constant and direction or without them, and the results are recorded in the following table:

TABLE (3)
PP AND ADF TEST

UNIT ROOT TEST (PP)									
At Level	With Constant				**At First Difference**	With Constant			
		t-Statistic	***Prob.***				t-Statistic	***Prob.***	
	FRQ	-1.1534	***0.6896***	n0		d(FRQ)	-4.075	***0.0020***	***
	INF	-6.417	***0.0000***	***		d(INF)	-3.9683	***0.0035***	***
	M2	3.0827	***1.0000***	n0		d(M2)	-2.9857	***0.0437***	**
	UNEM	-2.2981	***0.1768***	n0		d(UNEM)	-4.1936	***0.0018***	***
	With Constant & Trend					With Constant & Trend			
		t-Statistic	***Prob.***				t-Statistic	***Prob.***	
	FRQ	-2.739	***0.2249***	n0		d(FRQ)	-3.8867	***0.0180***	**
	INF	-5.3046	***0.0004***	***		d(INF)	-3.8532	***0.0224***	**
	M2	-1.321	***0.8704***	n0		d(M2)	-3.9172	***0.0191***	**
	UNEM	-2.5364	***0.3101***	n0		d(UNEM)	-4.1587	***0.0103***	**
	Without Constant & Trend					Without Constant & Trend			
		t-Statistic	***Prob.***				t-Statistic	***Prob.***	
	FRQ	-0.1058	***0.6436***	n0		d(FRQ)	-4.0146	***0.0001***	***
	INF	-5.5342	***0.0000***	***		d(INF)	-4.312	***0.0001***	***
	M2	8.7564	***1.0000***	n0		d(M2)	-0.8805	***0.3293***	n0
	UNEM	-0.4097	***0.5305***	n0		d(UNEM)	-4.2303	***0.0001***	***
UNIT ROOT TEST (ADF)									
At L	With Constant				**At Fi**	With Constant			
		t-Statistic	***Prob.***				t-Statistic	***Prob.***	

evel	FRQ	-2.0186	***0.2784***	n0	**rst Difference**	d(FRQ)	-4.0971	***0.0019***	***
	INF	-1.5827	***0.4824***	n0		d(INF)	-4.175	***0.0021***	***
	M2	2.2203	***0.9999***	n0		d(M2)	-2.9083	***0.0521***	*
	UNEM	-2.3203	***0.1705***	n0		d(UNEM)	-2.4727	***0.1292***	n0
	With Constant & Trend					With Constant & Trend			
		t-Statistic	***Prob.***				t-Statistic	***Prob.***	
	FRQ	-2.4709	***0.3412***	n0		d(FRQ)	-3.9121	***0.0169***	**
	INF	-0.5688	***0.9758***	n0		d(INF)	-4.4563	***0.0050***	***
	M2	-1.7949	***0.6880***	n0		d(M2)	-5.4906	***0.0003***	***
	UNEM	-3.2161	***0.0955***	*		d(UNEM)	-2.3647	***0.3918***	n0
	Without Constant & Trend					Without Constant & Trend			
		t-Statistic	***Prob.***				t-Statistic	***Prob.***	
	FRQ	0.2259	***0.7488***	n0		d(FRQ)	-4.0295	***0.0001***	***
	INF	-1.1055	***0.2397***	n0		d(INF)	-4.3624	***0.0001***	***
	M2	2.5744	***0.9969***	n0		d(M2)	0.9213	***0.9015***	n0
	UNEM	-0.1257	***0.6345***	n0		d(UNEM)	-2.5068	***0.0134***	**

Source: Depend on output of the Eviews 12.0

The Model

In view of the previous tests (the graph, Phillips-Peron and the extended Dickey Feller) and as a final outcome, it became clear that the data is a mixture of static, some of which are at the first difference, and what is static at the level, and based on the foregoing, the ARDL model can be used [5].] and as below:

TABLE (4)

ARDL MODEL

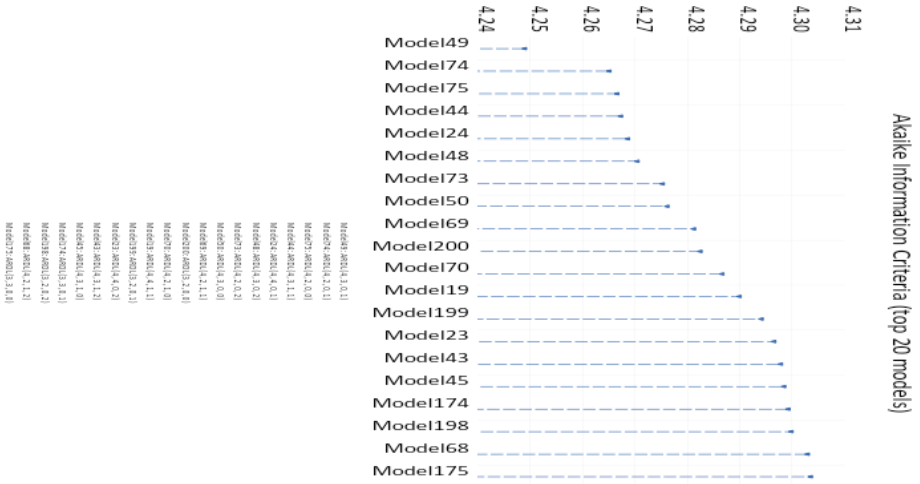
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
FRQ(-1)	1.230407	0.159152	7.731002	0.0000
FRQ(-2)	-0.131844	0.261020	-0.505112	0.6168
FRQ(-3)	0.094585	0.258151	0.366393	0.7164
FRQ(-4)	-0.301644	0.151521	-1.990771	0.0548
INF	-0.567733	0.767822	-0.739406	0.4649
INF(-1)	0.529723	1.222949	0.433152	0.6677
INF(-2)	0.088696	1.185782	0.074799	0.9408
INF(-3)	-0.789293	0.624673	-1.263529	0.2153
UNEM	-0.153280	0.230427	-0.665200	0.5105
M2	0.003708	0.002460	1.507193	0.1413
M2(-1)	-0.004071	0.002560	-1.590146	0.1213
C	15.92155	5.444708	2.924225	0.0062
R-squared	0.980586	Mean dependent var		70.56933
Adjusted R-squared	0.974114	S.D. dependent var		11.37233

S.E. of regression	1.829708	Akaike info criterion	4.269368
Sum squared resid	110.4784	Schwarz criterion	4.751144
Log likelihood	-84.06078	Hannan-Quinn criter.	4.448969
F-statistic	151.5239	Durbin-Watson stat	1.995144
Prob(F-statistic)		0.000000	

Source: Depend on output of the Eviews 12.0

Looking at the above table, it turns out that the appropriate model for the data under study is (4, 3, 0, 1), that is, four lags for the foreign reserves variable and three lags for the inflation variable, and the unemployment variable was without lags, and one lag for the money supply variable, and the table also indicates the close relationship that The investigated variables are linked by about 98% of this on the one hand, and on the other hand, the F-statistic test indicated the significance of the model as a whole, as well as the decrease in the values of Schwarz[6], Akaike[7] and Hannan, and in relation to the above table it is possible to look at the shortest elongation Bitmap of the chosen model (4, 3, 0, 1) based on the Akaike schematic indicator and as below:

FIGURE (2)
OPTIMAL AKAIKE MODEL (4, 3, 0, 1)



Source: Depend on output of the Eviews 12.0

From Table (5), which shows the long-run relationships as well as the structural error correction model and the error correction equation at the bottom of the table. Inflation is related to an inverse relationship with foreign reserves, and this is in line with economic assumptions, as an increase in inflation by one unit will reduce reserves by 6.8076 units, as well as unemployment and display Criticism and that this does not contradict the economic perspective. The details of this can be noted from the following:

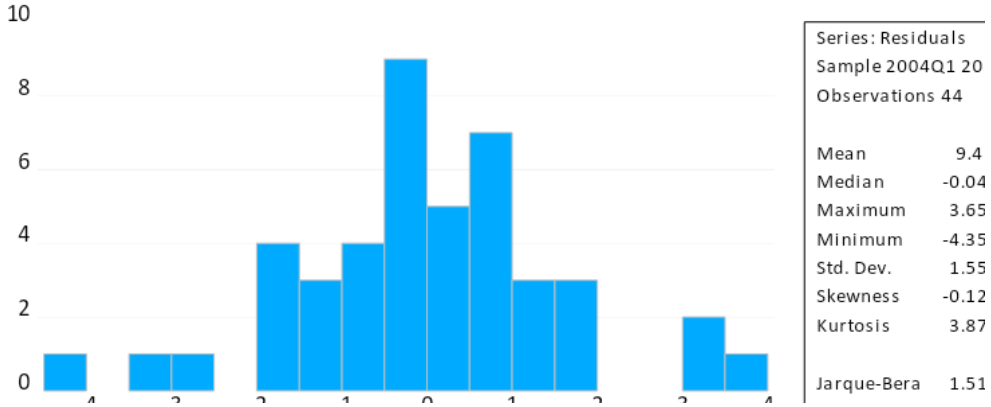
TABLE (5)
ARDL Long Run Form Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.92155	5.444708	2.924225	0.0062
FRQ(-1)*	-0.108497	0.030277	-3.583453	0.0011
INF(-1)	-0.738607	0.340212	-2.171019	0.0372
UNEM**	-0.153280	0.230427	-0.665200	0.5105
M2(-1)	-0.000364	0.000209	-1.735720	0.0919
D(FRQ(-1))	0.338904	0.149331	2.269481	0.0299
D(FRQ(-2))	0.207059	0.157446	1.315114	0.1975
D(FRQ(-3))	0.301644	0.151521	1.990771	0.0548
D(INF)	-0.567733	0.767822	-0.739406	0.4649
D(INF(-1))	0.700598	0.733367	0.955317	0.3464
D(INF(-2))	0.789293	0.624673	1.263529	0.2153
D(M2)	0.003708	0.002460	1.507193	0.1413

Source: Depend on output of the Eviews 12.0

To prove what was previously interpreted, the JARQUE BERA TEST test was used [8], which also showed that the random errors are normally distributed as follows:

FIGURE (3)
JARQUE BERA TEST



Source: Depend on output of the EViews 12.0

In succession to move forward, the bound tests [9] are used, which indicates that there is a joint integration between the variables (under study) under the significance of 10% by means of F-statistic, which is the largest upper bound. Here, the null hypothesis that states that there is no joint integration and Table (6) Shows what we went to:

TABLE (6)
F-Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.827917	10%	2.56	3.428
k	3	5%	3.078	4.022
Finite Sample: n=45		1%	4.27	5.412
N-Hypothesis: No levels relationship				

Source: Depend on output of the Eviews 12.0

In order to continue the dimensional tests and to ensure the integrity of the model, the short-run ECM error correction model can be used, as the test showed that the error correction significance is negative and significant under 1%, This confirms that it conforms to the assumptions of the ARDL model and my agencies:

TABLE (7)
ARDL Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FRQ(-1))	0.338904	0.139127	2.435937	0.0204
D(FRQ(-2))	0.207059	0.146850	1.410009	0.1679
D(FRQ(-3))	0.301644	0.139774	2.158079	0.0383
D(INF)	-0.567733	0.649371	-0.874280	0.3883
D(INF(-1))	0.700598	0.689770	1.015698	0.3172
D(INF(-2))	0.789293	0.545318	1.447400	0.1572
D(M2)	0.003708	0.001145	3.239384	0.0027
CointEq(-1)*	-0.108497	0.023421	-4.632444	0.0001
R^2	0.685643	Mean dependent var		0.436365
Adjusted R^2	0.626170	S.D. dependent var		2.826184
S.E. of regression	1.727976	Akaike info criterion		4.091590
Sum squared resid	110.4784	Schwarz criterion		4.412774

Log likelihood	-84.06078	Hannan-Quinn criter.	4.211324
Durbin-Watson stat		1.995144	

Source: Depend on output of the Eviews 12.0

The serial correlation test [10] shows that the model is free of this problem based on F-statistic [11] as it is not significant according to the following table:

TABLE (8)
LM Test

F-statistic	0.026613	Prob. F(2,31)	0.9738
Obs*R-squared	0.077131	Prob. Chi-Square(2)	0.9622

Source: Depend on output of the Eviews 12.0

[12] With regard to the Hetero Test, which also showed that the model is free from the problem of heterogeneity and variance:

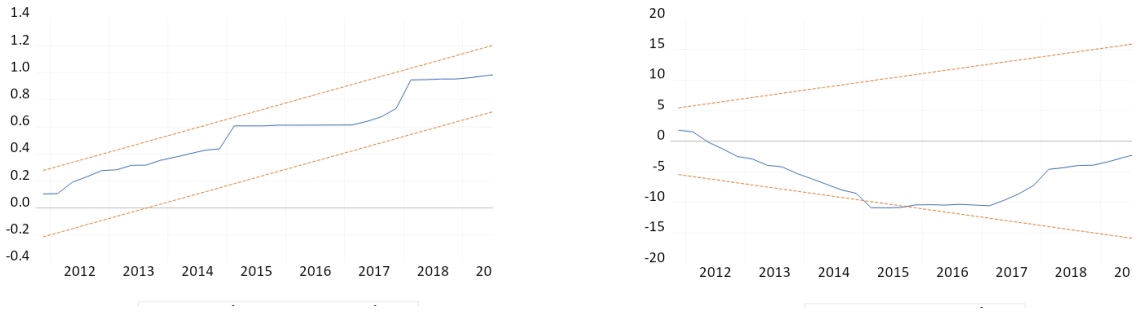
TABLE (9)
Hetero Test: Breusch-Pagan-Godfrey

N-Hypothesis: Homoskedasticity			
F-statistic	1.498718	Prob. F(11,33)	0.1789
Obs*R-squared	14.99145	Prob. Chi-Square(11)	0.1829
Scaled explained SS	19.86767	Prob. Chi-Square(11)	0.0472

Source: Depend on output of the Eviews 12.0

Finally, with the cumulative squares test and its sum [13] [14], it is most likely that the studied phenomenon does not suffer from structural imbalances over time, which is an indication of the existence of long and short-run equilibrium relationships between the studied variables, as follows:

FIGURE (4)
CUSUM AND CUSUM OF SQUARES TEST



Source: Depend on output of the Eviews 12.0

Discuss the results

The nature of the data necessitates the use of the ARDL methodology, and the model has passed all the tests related to the previously mentioned model, econometrical, statistical and economic, Hence, the behavior of the studied variables showed us a pattern in line with the economic theory and its assumptions, As the foreign reserves were associated with inverse relationships with the influencing variables, and they are fully compatible with the logic, The results indicated the relationship that when inflation increases, it is associated with a decrease in foreign reserves, and it is unreasonable that an increase in inflation is associated with a decrease in the dependent variable, as well as with unemployment. negatively on the reserves according to the following form of dependency:

EC = FRQ - (-6.8076*INF -1.4128*UNEM -0.0034*M2 + 146.7462)

The model was also able to explain the long and short-run relationships according to the bound test, The obtained results also confirmed that the model does not suffer from the problem of sequential correlation with the random residuals, The problem of the inconsistency of hetroscacity is the fact that Prob, More than 5% for the two tests together, and in a related aspect, it became clear that the model suffers from structural changes within the short run, but these changes disappear in the long run and this is very normal because the Iraqi economy suffers from a syndrome of various shocks with a scarcity in sources of financing the public budget, except for resources The oil sector, which is also suffering from fluctuations from one period to another, depends on global demand and supply and other geopolitical factors.

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