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Analysis of the Relationship between Indebtedness and Some Macroeconomic Variables in Iraq

Adnan Mohammed Hasan[1]

[1]Department of Economics. College of Administration and Economics. The University of Thi-Qar. Iraq
adnan-m@utq.edu.iq

Sadq Zwer Lglag[2]

[2]Department of Economics. College of Administration and Economics. The University of Thi-Qar. Iraq
dr.sadq@utq.edu.iq

Abdul Hussien Oudah[3]

[3]Department of Economics. College of Administration and Economics. The University of Thi-Qar. Iraq
aqeel.eltai@utq.edu.iq

Abstract

The unit root test of Augmented Dicky Fuller and the Phillips-Peron test were used to test the stability of time series and to find out the degree of integration between indebtedness and some macroeconomic variables in Iraq. As a result, the model used does not have a self-correlation between residues. The null hypothesis states that there is no sequential correlation between residues. In conclusion, the ratio of external debt to exports in Iraq was within the limits allowed by international comparisons.

Keywords: External, Indebtedness, Macroeconomic, Variables, Iraq.

Análisis de la relación entre el endeudamiento y algunas variables macroeconómicas en Iraq

Resumen

La prueba de raíz unitaria de Dicky Fuller Aumentado y la prueba de Phillips-Peron se usaron para probar la estabilidad de las series de tiempo y para determinar el grado de integración entre el endeudamiento y algunas variables macroeconómicas en Irak. Como resultado, el modelo utilizado no tiene una autocorrelación entre residuos. La hipótesis nula establece que no existe una correlación secuencial entre los residuos. En conclusión, la relación entre la deuda externa y las exportaciones en Iraq estaba dentro de los límites permitidos por las comparaciones internacionales.

Palabras clave: Externo, Endeudamiento, Macroeconómico, Variables, Iraq.

1. INTRODUCTION

External indebtedness is one of the most important economic problems that have imposed itself in the international arena, especially in developing countries. It is mainly responsible for most of the world's debt as well as some international institutions such as the International Monetary Fund and the World Bank. Creditor countries and international institutions have tried to reduce this problem after analyzing all the effects of this indebtedness on the economy in the short and long run, and it appeared that the huge external debt would reduce economic growth (AHMAD BRIHI, 2015).

In the Iraqi economy, the problem of external indebtedness was clearly manifested by the economic and political circumstances that the country went through. The deficit continued to accumulate external debt and the complexity of interactions between them and macroeconomic variables, especially the general budget, which depends on the concentration of oil exports to a high degree of unwillingness and ability to reduce public and private expenditures to the level of available resources (HUSSEIN & AQIL, 2017).

2. RESEARCH METHODOLOGY

The research relies on the descriptive and analytical approach to present the development of external indebtedness in Iraq after 2003, as well as adopting the standard method for measuring and analyzing the relationship between external indebtedness and some economic variables (YALGINFATEH, 2013).

Spatial and Temporal Boundaries of Research

- Spatial borders: Republic of Iraq

- Time limits: The time frame for the study is derunined by the duration (2003-2017).

While the owners of the innovative school theory, including that external financing, leads to the disruption of the process of growth and sabotage the economies of developing countries, as well as the emergence of new trends towards the independence of debt management as a macroeconomic policy with its tools and objectives

(MUDHER, 2012). This trend began in New Zealand and Europe in the 1980s with the European Covenant on Growth and Stability for fear of overstepping debt expenditures. In this context, and for the purpose of reaching the goal of research and verification of the hypothesis, this axis deals with the study of the development of the volume of indebtedness and analysis of indices and the reasons for their increase, as follows:
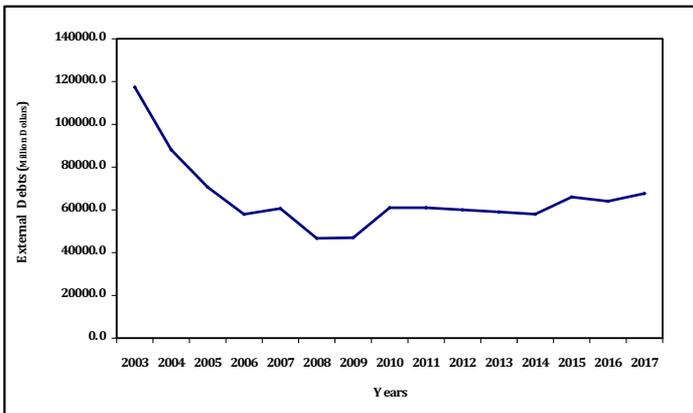

Figure 1: Evolution of the volume of external debt in Iraq for the period (2003-2017)

Source: The work of researchers based on data:

1. Ministry of Planning, Central Statistical Organization, National Accounts Directorate, sporadic years.

2. Central Bank of Iraq, Department of Statistics and Research Economic reports and statistical bulletins for several years.

These loans were characterized by a long repayment period and a period of grace of not less than three years, so the total external public debt increased after the addition of inherited debts to the new debts to reach (67.639) billion dollars in 2017 due to economic pressures and the war against terrorism is expected to continue to decline The fiscal position is expected to reach $ 73.8 billion in 2024 unless there is a change in public economic policies, although the level of external debt will remain within sustainable limits. The analysis of external indebtedness involves several indicators, some of which will be addressed as follows:
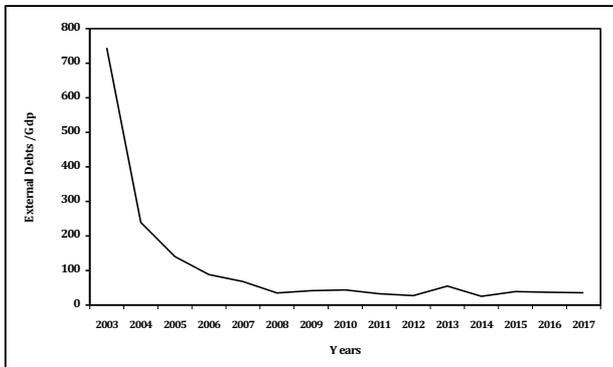

Figure 2: Evolution of the external debt index to the GDP in Iraq for the period (2003-2017)

Source: The work of researchers based on data:

1. Ministry of Planning, Central Statistical Organization, National Accounts Directorate, sporadic years.

2. Central Bank of Iraq, Department of Statistics and Research Economic reports and statistical bulletins for several years (ZAIRIBELKACEM, 2008).

Figure (3) shows that the ratio of external debt to exports in Iraq has decreased from (1208.5%) in (2003) to (63.6%) in (2012). This is related to the increase in the volume of oil exports and the increase in their prices, after that, the percentage rose to (117.5%) in (2017) due to the decline in Oil prices from ($ 103) per barrel in 2013 (to ($ 49.3) in (2017), but it can be said that the ratio of external debt to exports in the Iraqi economy was within the limits allowed by international comparisons of this indicator (Araújo et al, 2018).
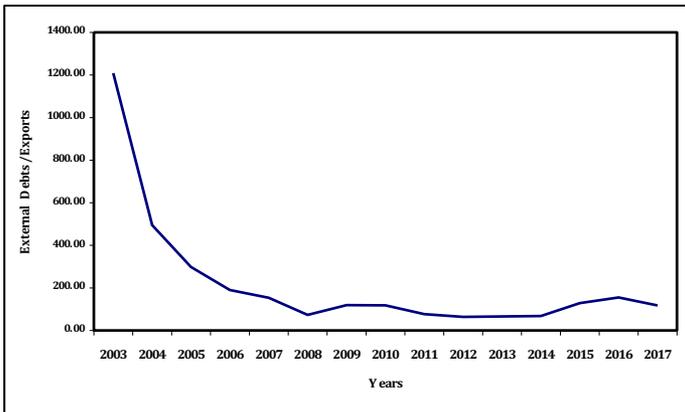

Figure 3: Evolution of the External Debt to Export Ratio in Iraq for the period (2003-2017)

Source: The work of researchers based on data

This indicator shows the relationship between foreign reserves and total external debt and those countries with a sound foreign reserves position can face the problem of external indebtedness more safely than those with low reserves. (40%) is an indicator to measure the country's ability to finance its foreign debt based on its foreign currency reserves (ASHRAF MOHAMED, 2016: Ruangvanich & Piriyasurawong, 2019).

Figure (4) shows that this ratio was low from 2003 to 2006 due to the decrease of the country's balance of foreign reserves, but this reserve increased after 2007 and reached (77) billion dollars in 2013, where it reached It is covered by foreign reserves of foreign debt (131.7%), which is higher than the rate adopted in economic studies and international comparisons (EMAD MOHAMMED, 2017).
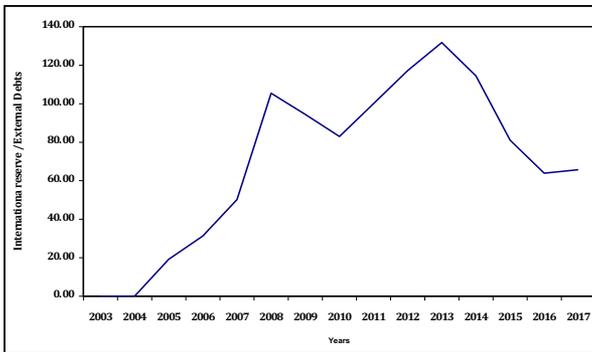

Figure 4: Evolution of Foreign Reserves Coverage of Foreign Debt in Iraq for the Period

Source: The work of researchers based on data: Central Bank of Iraq

Axis II: Measuring the relationship between external indebtedness and some macroeconomic variables in Iraq for the period (2017–2003)

The quantitative analytical framework deals with the study of the relationship between external indebtedness and two macroeconomic variables in Iraq based on economic measurement. In particular, the study model was chosen by representing mathematical equations in order to derunine the type and direction of the relationship.

$$Deb = F(Gdp, \operatorname{Re} s)..........(1)$$

Then:

Deb: External debt. GDP: Gross domestic product at constant prices (2007)

Res: Foreign reserves.

The logarithmic formula has been used because it is a commonly used formula for the ease of its computational treatments and to address the problem of heterogeneity of variance on the one hand and the economic implications of its estimated parameters on the other, And international reserve algorithms (lnRes).

$$\ln Deb = \beta_o + \beta_1 \ln Gdp + \beta_2 \ln \operatorname{Re} s + u_t..........(2)$$

Each of the three variables is used to be the dependent and other variables interpreted or independent to detect the existence of the long-run relationship of each equation, for example, denoted as (Deb) is the dependent variable F (Deb / Gdp, Res) and then tested the relationship F (Gdp / Deb, Res) and F (Res / Deb, Gdp).

Before beginning to describe these relationships, it is necessary to conduct a unit root test of the data series adopted in the study to derunine its stability, and then choose the appropriate application to study the relationship between those variables.

Firstly. Test the Stability of Time series of Variables

The time series stability test requires the derunination of the appropriate slowdown periods as each variable is subjected to a self-regression and a slowdown period one by one until the optimal duration is obtained. The AIC standard is used and obtained with the lowest value, as shown in Table 1:

Table 1: Appropriate Deceleration Periods According to AIC Standard

lnDeb		lnGdp		lnRes	
L	**AIC**	**L**	**AIC**	**L**	**AIC**
0	-1.286492	**0**	-0.126265	**0**	0.316045
1	-1.303939*	**1**	-3.492937	**1**	-0.516232
2	-1.141771	**2**	-3.325936	**2**	-0.565939*
3	-0.969178	**3**	-3.875733*	**3**	-0.412250
4	-0.927778	**4**	-3.762511	**4**	-0.232927

Source: Prepared by researchers based on the program (Eviews10).

Based on the unit root test of Augmented Dicky Fuller (ADF) and Phillips-Peron (PP) test in time series stability test and the degree of integration of variables (lnDeb), lnGdp, lnRes, the results of the test as shown in Tables (2) and (3)).

The results of the ADF test show that the calculated (τ) value of the variable (lnRes) is greater than the tabular value (τ) at a significant level (5%) and at the level (10%) of the variables (lnDeb, lnGdp), so we refuse to impose nothing The existence of the root of the unit and accept the alternative hypothesis, that is, the time series are static or stable at the level, that is, they are integrated from the level (0) and symbolized by I (0).

Table 2: Results of the Time Series Stationary Test for the Study Variables Using (ADF)

Level			
	lnDeb	**lnGdp**	**lnRes**
ADF Statistics	-2.8531	-2.7996	-3.2702
t-Statistic	-2.7011	-2.7289	-3.1449
Prob	0.0780	0.0897	0.0408
First Deference			
ADF Statistics	/	/	/
t-Statistic	/	/	/
Prob	/	/	/
Integrated	I(0)	I(0)	I(0)

Source: Prepared by researchers based on the program (Eviews10).

Table 3, which contains the results of the P.P test for the silence of time series, shows the validity of the ADF results.

Table 3: Results of the Time Series Stationary Test for the Study Variables Using Phillips-Perron Test

Level			
	lnDeb	**lnGdp**	**lnRes**
P.P Statistics	-3.8390	-6.7352	-10.9258
t-statistic	-3.0988	-4.8000	-4.8000
Prob	0.0135	0.0005	0.0000
First Deference			
P.P Statistics	/	/	/
t-statistic	/	/	/
Prob	/	/	/
Integrated	I(0)	I(0)	I(0)

Source: Prepared by researchers based on the program (Eviews10).

We conclude from the foregoing that the time series of all the variables of the study are static and I (0) and there are no integrated variables of the ranks (1) I or I (2), so you can use the distributed gap self-regression model (ARDL) to show the equilibrium relationship autoregressive Distributed Lag Model presented by PESARAN, SHIN & SMITH (2001) this method is based on the estimation of the

Unrestricted Error Correction Model (UECM), and according to this methodology the time series is a function of slowing down its values and the values of explanatory variables.

Second. Joint Integration Testing using ARDL.

To implement ARDL, we are required to:

1. Choosing the optimal deceleration period for the variables:

The optimal slow-down period for the first variances of the values of the variables together in the UECM is chosen using an Autoregressive Model Unrestricted Vector Model. The following estimation results were obtained:

Table 4: Optimum Slow Durations for UECM

Lag	AIC	SC	HQ
0	-0.754879	- 0.634506	-0.781677
1	-4.986507	-4.465016	-5.093697
2	- 6.755411*	- 5.842801*	- 6.942994*

Source: Prepared by researchers based on the program (Eviews10).

From the above results, we note that the appropriate delay time is (Lag = 2) according to all the criteria adopted in the study and for all variables together.

2. Testing for Co-integration using the Boundary Approach for time Gaps Distributed:

ARDL is one of the most suitable models and the size of samples or small-time series. This model can derunine the integral relationship between the dependent variable and the independent variables in the short and long run in the same equation, ie separating the short-run effects from the long-run. On the other hand, the results of the model are more consistent (efficient and unbiased) than those in other methods such as the Angel and Granger method. The model gives the result of the error correction model, which measures the ability of the model to return to equilibrium situation after an imbalance or disturbance as a result of an emergency, the model can be written as follows:

$$d(\ln Deb_t) = c + \lambda \ln Deb_{t-1} + \beta_1 \ln Gdp_{t-1} + \beta_2 \ln \mathrm{Re}\, s_{t-1}$$
$$+ \sum_{i=1}^{m} \alpha_{1,i} d(\ln Deb_{t-i}) + \sum_{i=0}^{k} \alpha_{2,i} d(\ln Gdp_{t-i}) + \sum_{i=0}^{k} \alpha_{3,i} d(\ln \mathrm{Re}\, s_{t-i}) + \varepsilon_t$$

$(\lambda, \beta_1, \beta_2)$ are dependent variable information and one-time slow-independent variables, ie long-run information, while the first difference parameters reflect the short-run relationship. Bounds Testing Approach is used to test the existence of a long-run equilibrium relationship between the dependent variable and the independent variables of the model. The statistic (F) is used to test the null hypothesis, which states that all parameters of the independent variables lagging for one period are equal to zero, that is:

$$H_o = \beta_1 = \beta_2 = \beta_3 = \cdots = \beta_{k+1} = 0$$

That is, there is no long-run equilibrium relationship between the variables (lack of co-integration) versus the alternative hypothesis that the parameters of the decelerating variables are not zero, ie:

$$H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \cdots \neq \beta_{k+1} \neq 0$$

That is, there is no long-run equilibrium relationship between the variables (lack of co-integration) versus the alternative hypothesis that the parameters of the decelerating variables are not zero, ie: That is, there is a long-run equilibrium relationship (the existence of common integration) between the variables. In order to test the existence of a long-run equilibrium relationship between the dependent variable and independent variables, the test was conducted and the results are as shown in the following table:

Table 5: Results of Cointegration Test Using Bounds Test

Relationship	F-test	Error Co	Result
LnDeb/lnGdp, lnRes	15.016 *	-1.449	Cointegration
LnGdp/lnDeb, lnRes	1.582	-0.478	Non Cointegration
LnRes/lnDeb , lnGdp	9.762 **	0.231	Non Cointegration

Source: Prepared by researchers based on the program (Eviews10).

Table (5) shows the existence of co-integration when (lnDeb) is the dependent variable, i.e. rejecting the null hypothesis and accepting the alternative hypothesis, i.e. there is a co-integration relationship and

hence a long-run equilibrium relationship between external indebtedness and independent variables. There is no co-integration when lnGdp) and (lnRes) dependent variables. Based on the results of the lnDeb co-integration test using the Bounds Test, the long-run relationship is estimated.

In Table (6), it is found that the error correction coefficient (Cointeq (-1)) which is the coefficient of the dependent variable (ex which is slow for one (-1.475) is statistically significant at the level of (1%) and takes the expected negative signal. It implies that there is a long-run co-integral relationship between variables, and it means that (147.5%) of short-run errors can be corrected during the unit of time in order to return to the long-run equilibrium situation, ie there is a co-integral relationship between the variables, in other words, that The study variables have had an impact on the external indebtedness in Iraq during the period (2003-2017), therefore we reject the imposition of the world M that there is no long-run relationship is moving from independent variables to the dependent variable.

Table 6: Results of Error Correction Model Estimation (Dependent Variable: D

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNDEB)
Selected Model: ARDL(2, 2, 2)
Case 2: Restricted Constant and No Trend
Date: 09/06/19   Time: 10:57
Sample: 2003 2017
Included observations: 13

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.669006	2.252091	2.517219	0.0656
LNDEB(-1)*	-1.475595	0.224681	-6.567523	0.0028
LNGDP(-1)	1.097346	0.205171	5.348453	0.0059
LNRES(-1)	-0.202513	0.085647	-2.364520	0.0773
D(LNDEB(-1))	0.064071	0.161643	0.396373	0.7121
D(LNGDP)	0.279581	0.460868	0.606640	0.5768
D(LNGDP(-1))	-2.944893	0.638054	-4.615431	0.0099
D(LNRES)	0.469249	0.169190	2.773501	0.0502
D(LNRES(-1))	0.393029	0.082108	4.786712	0.0087

* p-value incompatible with t-Bounds distribution.

| Levels Equation | | | | |
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	0.743663	0.103337	7.196519	0.0020
LNRES	-0.137242	0.048733	-2.816196	0.0480
C	3.841844	1.255693	3.059540	0.0377

EC = LNDEB - (0.7437*LNGDP -0.1372*LNRES + 3.8418)

Source: Prepared by researchers based on the program

The results of the estimation in the table above show that the error correction equation took the following form:

$$EC = LNDEB - (0.7437*LNGDP\ -0.1372*LNRES + 3.8418\ )$$

Estimates of the long-run parameters have a positive and significant impact of GDP, where the value of partial elasticity (0.743) and at a significant level of less than (1%), which means that increasing by (100%) leads to an increase in external indebtedness (74.3%) This may be due to two main reasons: the increase in the volume and high prices of oil exports, which contribute significantly to GDP, and secondly because of the increase in debt after 2009 to reach (61) billion dollars in 2010.

As for the international reserves (lnRes) had a negative and significant in the long run as the value of partial resilience of about (-0.137) at a level of significance less than (5%), which means that the increase of (100%) leads to reduce external indebtedness. After evaluating the parameters of the model for the long and short run, and in order to ensure the quality of the estimated model before its adoption, diagnostic tests or so-called model-fit tests were carried out as follows:

As shown in Table (7), the model used does not have a self-correlation between residues. The null hypothesis states that there is no sequential correlation between residues. The alternative hypothesis is that there is a self-correlation between residues if P-Value is significant at (5%).

Table 7: Results of Autocorrelation Test for Residues

Date: 09/06/19 Time: 11:57
Sample: 2003 2017
Included observations: 13
Q-statistic probabilities adjusted for 2 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.227	-0.227	0.8406	0.359
		2	-0.330	-0.402	2.7693	0.250
		3	0.248	0.064	3.9645	0.265
		4	-0.133	-0.218	4.3499	0.361
		5	-0.331	-0.402	7.0276	0.219
		6	0.165	-0.273	7.7860	0.254
		7	0.188	-0.108	8.9401	0.257
		8	-0.074	-0.053	9.1563	0.329
		9	-0.001	-0.143	9.1564	0.423
		10	0.010	-0.283	9.1629	0.517
		11	-0.011	-0.161	9.1737	0.606
		12	-0.002	-0.051	9.1748	0.688

*Probabilities may not be valid for this equation specification.

Source: Preparation of the researchers based on the output of the program (Eviews10).

To illustrate the suitability of the model used with the present study and the absence of a sequential correlation between the residues we use the test. The sequence between residues at a level less than (5%).

Figure 5: CUSUM Test Results
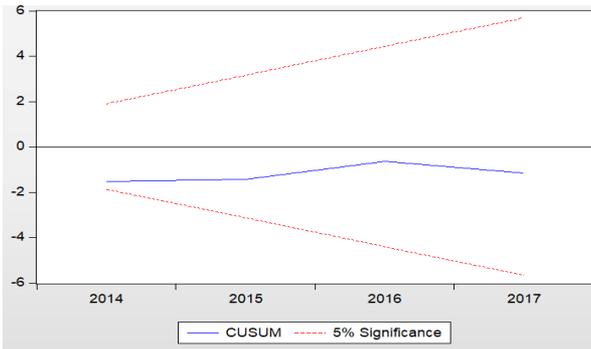
Source: Prepared by researchers based on the program (Eviews 10).

3. CONCLUSIONS

1. The ratio of external debt to GDP was within acceptable limits and shows Iraq's ability to repay, sustain external debt and meet creditors' benefits.

2. The ratio of external debt to exports in Iraq was within the limits allowed by international comparisons.

3. Increased foreign reserves after (2007) as the coverage of foreign reserves of foreign debt was high and exceeded the ratios adopted in economic studies and international comparisons.

4. Based on the unit root test of Augmented Dicky Fuller (ADF) and Phillips-Peron (PP) test in time series stability test and the degree of integration of lnDeb variables (lnGdp, lnRes), the test results showed that time series are static or stable at the level, ie It is integrated from rank (0) and is symbolized by I (0).

5. The results of the Bounds Test show the existence of co-integration when the lnDeb is the dependent variable, ie rejecting the null hypothesis and accepting the alternative hypothesis, ie, there is a common integration relationship and hence a long-run equilibrium relationship between external indebtedness and independent variables, and there is no co-integration when (lnGdp) and (lnRes) are dependent variables.

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