

AN ECONOMIC STUDY OF THE IMPACT OF FOREIGN AGRICULTURAL TRADE AND SOME MACROECONOMIC VARIABLES ON THE EXCHANGE RATE IN IRAQ USING THE FMOLS MODEL FOR THE PERIOD (1990 -2015)

B. N. Jubair *

Researcher

Dept. of Agric. Economics – College of Agricultural – University of Baghdad

Bilal.najah89@gmail.com

A. D.K. Alhiyali

Professor

adk_1966@yahoo.com

ABSTRACT

Since the establishment of the global monetary system, economic relations have been intertwined as well as the high rates of trade and the multiplicity of currencies traded as the economies of the world are linked to each other in such a way that monetary policies applied in certain countries affect the economic policies of other countries. The objective of this paper is to investigate the impact of foreign agricultural trade and some macroeconomic variables on the behavior of exchange rate whose effect is reflected on the structure of foreign agricultural trade. To fulfill paper requirement data were collected from secondary sources and one source was depended in collecting data which is ministry of planning – central statistics organization. The research reached a number of results, the most important of which is the absence of an impact on both the agricultural exports and the interest rate on the exchange rate, while the agricultural imports and the inflation rate and the GDP significantly affected the Exchange rate fluctuations, and recommended the need to diversify the sources of financing the balance of public payments perhaps the agricultural sector is one of the important sources after the oil sector to obtain hard currency as Iraq's dependence on the export of oil only makes it vulnerable to fluctuations in oil prices globally, at an exchange rate level commensurate with the nature of the Iraqi economic life and the use of the managed exchange rate (administratively controlled).

Keywords, Exchange rate, Iraqi agricultural foreign trade, FMOLS model.

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جبير والحيالي

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دراسة اقتصادية لآثار التجارة الخارجية الزراعية وبعض متغيرات الاقتصاد الكلي في سعر الصرف في العراق باستعمال نموذج FMOLS للمدة (1990 – 2015)

علي درب كسار الحيالي

استاذ

قسم الاقتصاد الزراعي – كلية الزراعة – جامعة بغداد

bilal.najah89@gmail.com

بلال نجاح جبير *

باحث

adk_1966@yahoo.com

المستخلص

ان تشابك العلاقات الاقتصادية وارتفاع معدلات التبادل الخارجي ادى الى تأسيس النظام المصرفي ، اذ أصبحت اقتصاديات العالم مرتبطة بعضها البعض بطريقة تجعل من السياسات النقدية التي يتم تطبيقها في دول معينة تؤثر في السياسات الاقتصادية للدول الأخرى، وهدف البحث الى دراسة أثر التجارة الخارجية الزراعية وبعض متغيرات الاقتصاد الكلي في سلوك سعر الصرف من اجل معرفة مدى تأثير هذه المتغيرات في سعر الصرف والذي ينعكس اثره على هيكل التجارة الخارجية الزراعية، ولإيفاء بمتطلبات البحث تم الحصول على البيانات من مصادرها الثانوية وتم اعتماد جهة واحدة للحصول على البيانات وهي وزارة التخطيط/ الجهاز المركزي للإحصاء، وتوصل البحث الى جملة من النتائج، اهمها عدم وجود تأثير لكل من الصادرات الزراعية وسعر الفائدة على سعر الصرف، في حين أثرت الاستيرادات الزراعية ومعدل التضخم والنتاج المحلي الاجمالي تأثيراً معنوياً على تقلبات سعر الصرف، واوصى البحث بضرورة تنويع مصادر تمويل ميزان المدفوعات العام ولعل القطاع الزراعي يعد من المصادر المهمة بعد قطاع النفط للحصول على العملة الصعبة اذ ان اعتماد العراق على تصدير النفط فقط يجعله عرضة لتقلبات اسعار النفط عالمياً، لذلك من الضروري تجاوز متلازمة احادية الاقتصاد العراقي، اذ يجب المحافظة على مستوى سعر صرف يتناسب وطبيعة الحياة الاقتصادية العراقية واستخدام سعر الصرف المدار (المسيطر عليه ادارياً).

كلمات مفتاحية : سعر الصرف، التجارة الخارجية الزراعية العراقية، نموذج FMOLS.

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INTRODUCTION

Exchange rates play a key role in daily economic life, which makes it impossible for any society or economy to live without being affected by changes in the exchange market. The most effective exchange rate is the global nature of exchange markets, on this basis, the economies of countries have undergone transformations in monetary systems, which has made the exchange rate an important indicator and a fundamental variable that has a profound impact on the prosperity of a particular country, that is why it has become a tool linking open economy with the other world's economies, it also plays a prominent role in the competitiveness of the economy and hence in the balance of payments, inflation and real growth. Most modern theories have revealed the impact of the exchange rate on the stability of the economy(2). Exchange rates play a key role in daily economic life, meaning that no society is immune to changes in the exchange market, on this basis, the economic community has undergone changes in the monetary systems, where the gold exchange rate has moved to exchange rate fixed and floating system, Thus, the exchange rate is an important indicator and a fundamental variable that has a significant impact on many macroeconomic variables, including the poles of foreign trade (imports and exports). The agricultural foreign trade sector may be the most affected by the exchange rate after the oil sector, the importance of foreign agricultural trade is that agriculture is the main sector in most non-oil economies, this is illustrated by the World Trade Organization (WTO) statistics, which show that agricultural export earnings account for more than one-third of the export earnings of 49 developing countries (4). This topic was addressed by a group of researchers (8, 10, 16) The importance of research comes from the importance of the agricultural trade sector, especially after the recent events that hit the oil sector and as long as Iraq depends heavily on the oil sector, because this sector is heavily influenced by global events, it was necessary to pay attention to the agricultural sector because it affects the social and economic life of the members of the community, hence the interest in the structure of foreign agricultural trade and the correlation

with exchange rates and degree of impact. Exchange and trade liberalization policies have reduced growth in the agricultural sector and reduced its share of GDP, and consequently low self-sufficiency in local agricultural products causing the local market to be flooded with imported agricultural food commodities, as well as the impact on crop composition and food security, which has a burden on development and expansion of unemployment and poverty and increases the volume of indebtedness and increase the prices of some agricultural products. The research assumes that some macro-economic variables such as inflation, GDP, interest rate, and foreign trade structure affect the exchange rate and its impact on the agricultural sector. The study aims to study how the exchange rate of the Iraqi dinar versus V.S \$ is affected by the foreign agricultural trade of Iraq and some variables of the economy and thus the reflection of these effects on economic life, especially the agricultural sector. The data for the study were obtained from the ministries and government departments, and the master's thesis and the relevant papers. Foreign trade data were obtained from the Iraqi Ministry of Planning / Central statistic organization (CSO), while we obtained exchange rate data from the Central Bank of Iraq. The method of analysis has adopted modern methods in the analysis of time series, including stability tests and causality tests to ensure the existence of causal relationship between explanatory variables and dependent variable.

MATERIALS AND METHODS

I. Structure of Foreign Agricultural Trade in Iraq
Iraq's foreign agricultural trade, in both exports and imports, is highly volatile due to its many factors, political and economic and their association with the economic conditions of the major rowers, making them susceptible to the effects of extreme fluctuations in the prices of international commodities and the volatility of the world economy. The structure of foreign agricultural trade can be clarified in both exports and imports as follows:

1) Iraqi agricultural exports:

Iraq's exports of agricultural commodities consist primarily of dates, meat of all kinds, dairy products, eggs, and some types of grains and sugar, wool and skins according to the

International Standard Classification of Trade (6). Iraqi agricultural exports for the period 1990-2015 can be reviewed in the light of Table 1, The value of Iraqi agricultural exports in 1990 was worth (30988) thousand Iraqi dinars, representing (14%) of the total Iraqi commodity exports, and then took these exports to rise and decline during the years of study, as it declined during the last years of the study until it reached in 2015 about (16946) thousand Iraqi dinars, Thus, the percentage of total commodity exports decreased by (%0.007) during 2014. The highest value of agricultural exports in 2012 was the value of (51852014) thousand Iraqi dinars, representing (15.1%) of the total commodity exports, while the lowest value of agricultural exports in 1994 (about 688 thousand ID) which represented (5.4%) of the total commodity exports.

2) Iraqi agricultural imports

Iraqi agricultural imports constitute an important part of Iraq's foreign trade structure. Iraq can not be imported during the period of the blockade (excluding private sector imports), however, the agreement with the United Nations led to Iraq being able to obtain its basic needs of food commodities and medical materials by importing from abroad as well as supplying it with the, requirements of

agricultural production(9). By noting table 1 we note that Iraqi agricultural imports were characterized by large fluctuations during the study period, in addition, agricultural imports were low during the pre-2003 period compared to the period that followed, which was characterized by the openness of Iraq to the outside world. Table 1 shows that Iraq's imports of agricultural commodities in 1990 were valued at (418740) thousand dinars, representing (27.8%) of the total commodity imports of Iraq, while the value of these imports were (657809000) thousand Iraqi dinars in 2015, and was the highest value of agricultural imports in 2012 about the value of (5299120000) thousand dinars, representing 23.6949% of the total commodity imports, while the lowest value of agricultural imports in general in (1997) amounted to (12000) thousand Iraqi dinars, although it was the least value for agricultural imports, but it represented the highest contribution rate for total imports, which amounted to (90.8%) of total Iraqi imports commodity, this is due of imported the decrease in the total imports during the mentioned year. Also, the table shows that Iraqi agricultural imports registered a positive growth rate of about (0.524 %) as shown in table (1), and figures 1,2,3

Table 1. Total imports and agricultural imports of Iraq for 1990-2015(1000 I.D)

Year	The value of total commodity exports	Value of agricultural and food exports	Percentage of agricultural exports from Total exports%	The value of total commodity imports	Value of agricultural and food imports	Percentage of agricultural imports from Total imports%
1990	212861	30988	14.5576	1502646	418740	27.8668
1991	35056	16011	45.6723	186358	42104	22.5933
1992	15049	4773	31.7152	206193	55404	26.8697
1993	14214	3474	24.4382	415033	285152	68.7060
1994	12663	688	5.4324	276498	174887	63.2508
1995	16942	4270	25.2062	287883	192153	66.7470
1996	35013	16787	47.9444	231591	135424	58.4756
1997	36670	17848	48.6722	13211	12000	90.8334
1998	69383	39661	57.1627	247368	24494	9.9017
1999	103727	58563	56.4590	432272	40794	9.4372
2000	83056	35364	42.5790	721395	46233	6.4089
2001	93936	57265	60.9617	1364991	39263	2.8765
2002	63330	42524	67.1461	1328024	41563	3.1297
2003	56896	*41042	72.1351	19037514000	157344	0.0008
2004	36222	27268	75.2802	27900506000	227044	0.0008
2005	34097	10081	29.5657	31224064000	*1116923364	3.5771
2006	49781	26922	54.0809	29281700000	*1116923364	3.8144
2007	218383880	19663642	9.0042	5736933874	487287160	8.4939
2008	240362400	17025636	7.0833	2589193900	85402409	3.2984
2009	164324600	14188030	8.6341	183770418816	572689569	0.3116
2010	235134700	14706101	6.2543	30433627500	327785000	1.0770
2011	261829600	38459381	14.6887	54039634223	1439130000	26.6310
2012	343835000	51852014	15.0805	22363948400	5299120000	23.6949
2013	402216800	16175	0.004	33289483100	3068480000	9.2176
2014	241548400	16245	0.007	37930176100	1914330000	5.0470
2015	34076097	16946	0.049	31224064000	657809000	2.1067
معدل النمو	-	0.242	-	-	0.524	-

Source: Ministry of Planning / CSO / Foreign Trade Statistics / unpublished data The value of agricultural imports for the years 2005-2006 and exports for 2003 was estimated by the researcher because lack of data

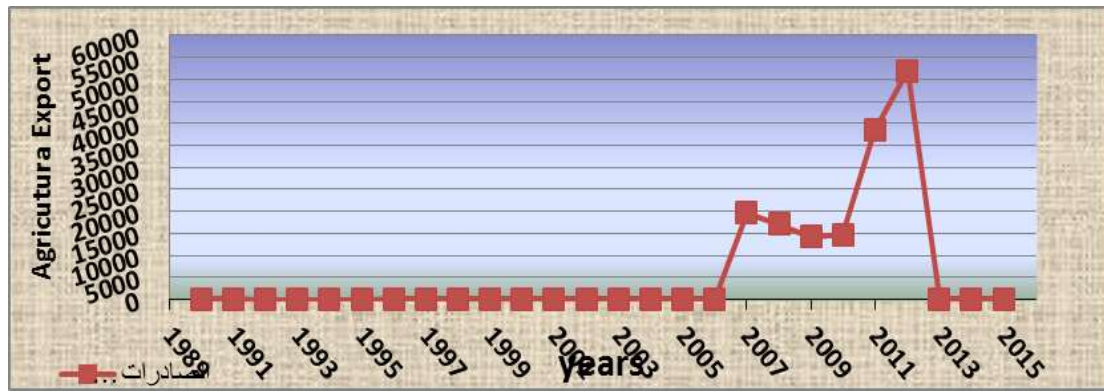


Figure 1. Iraqi Agricultural Exports during the Period 1990 – 2015

Source: table 1

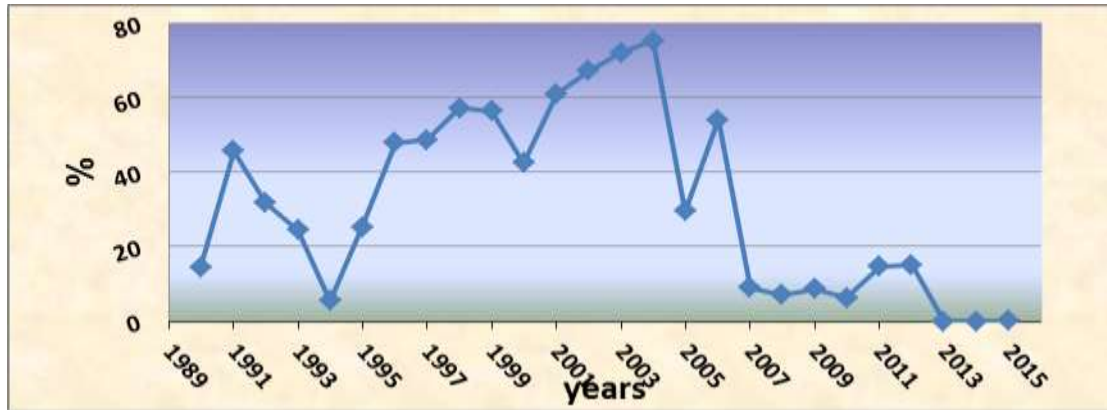


Figure 2 Contribution of Iraqi agricultural Exports to total Exports excluding petrol for 1990-2015

Source: table 1

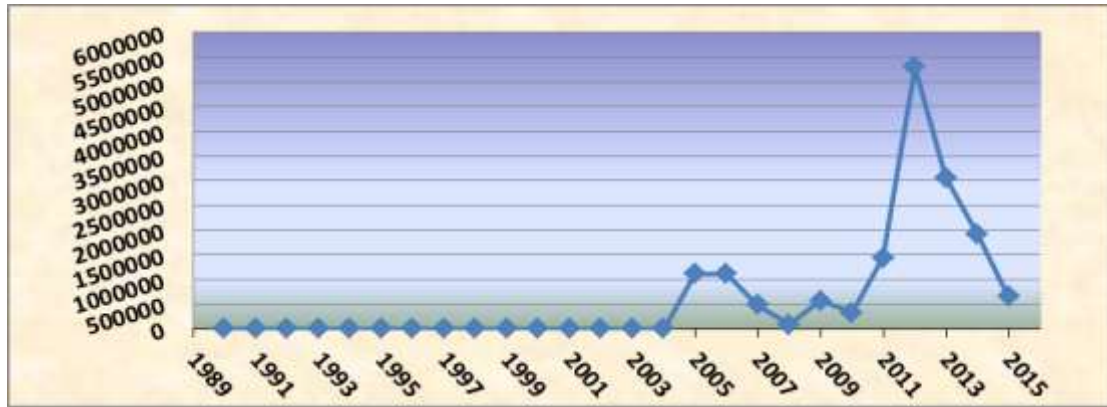


Figure 3. Iraqi agricultural imports during the period 1990 - 2015

Source: table 1



Figure 4. Contribution of Iraqi agricultural imports to total imports for 1990-2015

Source table: 1

THEORETICAL AND ECONOMETRICAL SIDES

Before entering the statistical aspect and the econometrical analysis, a simple concept about the stability characteristic that must accompany the time series should be explained by giving an indication of what stable and unstable time series as follows :

1) Stable time series: The stable time series is defined as that whose levels do not change over time, ie, the absence of a general direction or a quarterly variations (seasonal variations), whose arithmetic mean and variance are constant over time(1). A time series is static if two characteristics are present: the stability of the average values over time as well as the persistence of variance over time $(Y_t) = \mu$, $\text{var}(Y_t) = \text{var}(Y_{t-1}) = E(Y_t - \mu)^2 = \delta^2$ (5)

2) Unstable time series: These are the general trend time series and there are two types of unstable time series, the first of which are the unstable time series (Trend stationary), while the second type is the Difference Stationary (15). Causality tests: On the theoretical level, determining the relationship between economic variables provides elements that lead to a good understanding of economic phenomena, and the knowledge of causality is necessary for the proper formulation of economic policies. Knowing the direction of causality is also important to emphasize the relationship between economic variables ,There are several tests for causation, including the Granger causality test, Granger (1969) proposed the concept of causation that y_{2t} is the cause (affecting y_{1t}) if predictive value of y_{1t} improves when y_{2t} information is integrated into the analysis(14), This means that Granger's causality shows us who influences who? Does the independent variable affect the dependent or opposite, causal tests are shown in (Appendix b). The modern analysis of time series, which is the tests of the stability (unit root tests) of the time series, which is the necessary condition to choose the econometrical model of the most important tests that take us to the next stage, which is the choice of a model commensurate with the stability of data, The use of the OLS method without taking into account the stability tests may produce shaded and

inaccurate results, although there may be a significant relationship, but this relationship is an illusory, inaccurate relationship that cannot be adopted for interpretation(7), Therefore, the FMOLS(Fully Modified ordinary least square) method was adopted because the variables in the study were not all stable at the level, the results of the analysis showed (in Appendix a) that both the variable exchange rate, GDP and inflation are stable at the level, while it was found that the variables of agricultural imports and exports are not at the level but they stable after taking the first difference by adopting the ADF (Augmented Dickey - Fuller) Fit for large and small samples (12), Thus, the FMOLS (Fully Modified ordinary least square) method was used to analyze the relationship between variables. This method developed by Pedrony (13) is one of the methods of joint integration in the estimation and does not require standard conditions or restrictions as in the OLS method; this method also has the ability to solve the problem of autocorrelation and the bias of the parameters (3). The regression equation is obtained according to the FMOLS method through the following formula (11):

$$(\delta T^{-1} Y' X)' (X' X)^{-1} = \beta^*$$

Where :

y^* = is the transformed endogenous variable
 δ = is a parameter for autocorrelation
 T = is the number of time periods.

Through the equation above we will obtain consistent and unbiased parameters. The impact of foreign agricultural trade and some macroeconomic variables on exchange rate (results of analysis) In this section, the effect of exports, agricultural imports, GDP, inflation rate and interest rate on the exchange rate was studied. The econometrical model for the regression equation was formulated as follows:

$$\text{Lnr} = b_0 + b_1 \text{lnim} + b_2 \text{lnx} + b_3 \text{lngdp} + b_4 \text{lnin} + b_5 \text{lnit} + e_i$$

Where:

Lnr = The natural logarithm of the exchange rate of the volume of Iraqi agricultural imports in one million dinars for the period (1990 - 2015). Lnx = The natural logarithm of the size of Iraqi agricultural exports in one million dinars for the period (1990 - 2015).

$Lngdp$ = natural logarithm of GDP for the period (1990 - 2015).

$Lnin$ = Natural logarithm of the inflation rate for the period (1990 - 2015).

$Lnit$ = The natural logarithm of the interest rate for the period (1990- 2015).

ei = random variable

Table 2. Estimation function based on the FMOLS method

variable	coefficient	S.E	t.statistics	P.value
constant	-10.126	3.22	-3.138	0.0054
lnim	-0.177	0.022	-7.836	0.0000
lnx	-0.050	0.045	-1.119	0.276
lngdp	0.818	0.062	13.161	0.0000
lnin	-0.187	0.080	-2.328	0.0311
lnit	-0.070	0.647	-0.108	0.914
		$R^2 = 0.88$	$R^2 = 0.84$	

Source: prepared by the researcher accredited program Eviews 9.

$$Lnr = -10.126 - 0.177lnim - 0.050lnx + 0.818lngdp - 0.187lnin - 0.070lnit + ei$$

The constant value (-10.126) means the value of the dependent variable when it is the independent variables are zero. The coefficients of the independent variables represent partial elasticities as long as the function is a double logarithm. The value of the agricultural import (lnim) factor is about -0.177 which means that if the agricultural imports change by 1%, the exchange rate changes the opposite direction by 0.177 , When other variables were stable at the mean and came with a negative signal to confirm the inverse relationship between the imports and the exchange rate, which corresponds to the economic logic, and was significant with a significant level of 1%. The coefficient of agricultural exports (lnx) came in value equal to -0.050 and a negative sign to reflect the inverse relationship between the exchange rate and agricultural exports, which is contrary to the economic theory that assumes a positive relationship between the variables, as the parameter was not significant to confirm what we reached previously in the function of exports estimated, The lack of significance of the export variable here means that there is no balance relationship between the two variables, which is the same result that we reached previously, Thus, we can say that the two variables do not affect each other in the short term at least, and in the long term there may be a relationship in the theoretical side, but this relationship could not be proven so far in this study, this may be a research result we reached in Iraq only and means the lack of relationship between the two variables in other countries and according to other circumstances

different from the situation in Iraq. The coefficient of GDP (LNGDP) was about 0.818 and its positive sign was to impose a positive relationship between the GDP and the exchange rate. It is not in line with the economic theory. It means that by increasing GDP by 1%, the exchange rate increases by 0.0818, and was significant at the level of 1%. The variable inflation parameter has a negative sign to show an inverse relationship between the exchange rate and the inflation rate, which is identical to the economic logic, explaining that the inflation in Iraq is an imported inflation resulting from the rise in international commodity prices, as well as internal inflation, since Iraq is a large importer of various commodities, in global prices the effects are reflected on the variables of the local economy, including the value of the currency, and its value was significant at a significant level of 5%.coefficient significance. The variable interest rate has a value equal to 0.070 and a negative sign to reflect the inverse relationship between the variable interest rate and the exchange rate, which is identical to the economic theory, meaning that an increase in the interest rate by 1% leads to a decrease in the exchange rate by 0.070, although the sign and the size of the parameter correspond to the economic theory, the significance of the parameter indicates that there is no correlation between the two variables, and that the short term is reached, which means that there is a relationship in the short term, but no guarantee for the continuation of this relationship. The value of coefficient of determination was 0.88 means that 88% of the exchange rate fluctuations were caused by the explanatory variables included in the model, while 22% of

the fluctuations are due to other factors not included in the model.

Validation tests:

As noted earlier, the FMOLS method is used in the case of different levels of stability of variables, and it helps us to get rid of the econometric problems, and there are some

diagnostic tests used in this method in order to know the validity of the model. Among the tests that illustrate the validity of the model is that the estimated values of the dependent variable correspond to the real values. This is illustrated in the following table and figure:

Table 3. Actual, estimated and residual values of the exchange rate function

obs	Actual	Fitted	Residual	Residual Plot
1991	2.30259	2.48596	-0.18337	
1992	3.04452	3.48514	-0.44062	
1993	4.30407	4.22380	0.08027	
1994	6.12249	5.67177	0.45072	
1995	7.42297	6.11873	1.30424	
1996	7.06476	6.16274	0.90202	
1997	7.29370	7.17928	0.11442	
1998	7.39018	7.11002	0.28016	
1999	7.58680	7.52906	0.05774	
2000	7.56528	7.94154	-0.37627	
2001	7.56476	7.81702	-0.25226	
2002	7.57917	7.92016	-0.34099	
2003	7.57199	7.36289	0.20910	
2004	7.28139	7.87298	-0.59159	
2005	7.29438	6.75792	0.53645	
2006	7.29641	6.82053	0.47588	
2007	7.14441	6.80937	0.33504	
2008	7.09257	6.98834	0.10424	
2009	7.06476	6.76689	0.29787	
2010	7.06476	6.98006	0.08470	
2011	7.06476	7.22986	-0.16510	
2012	7.06133	6.63024	0.43109	
2013	7.05618	7.01603	0.04015	
2014	7.06133	7.15428	-0.09295	
2015	7.06219	7.96074	-0.89855	

Source: Prepared by the researcher by using EVIEWS program

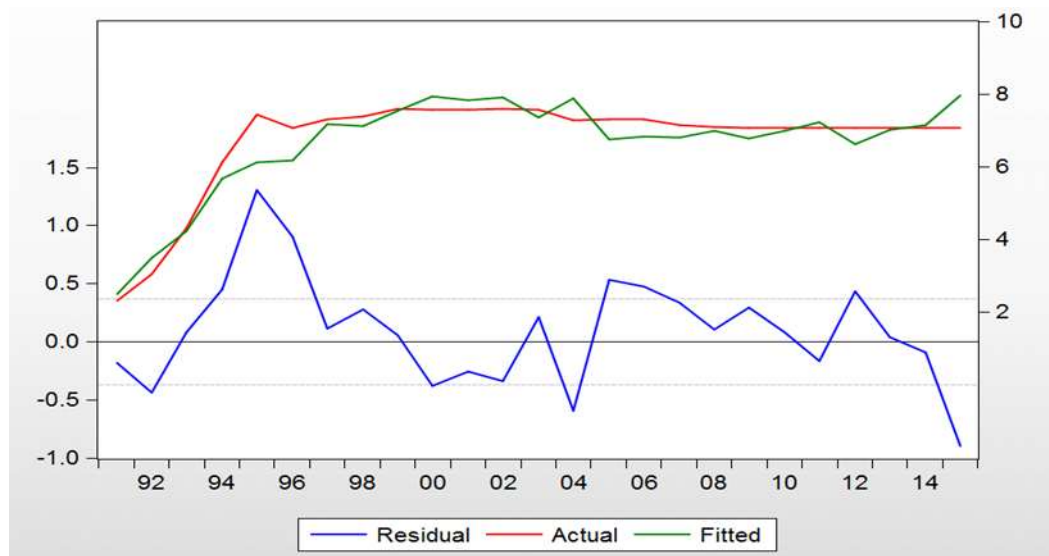


Figure 5. Real estimated and residual values of the exchange rate function

Source: Prepared by the researcher by using EVIEWS program

Table 3 and Figure 5 show that the estimated values of exchange rates are not far from actual values except in 1994 and 1996, meaning that the model was very expressive of the relationship between variables and there

were no very large deviations in the interpretation of exchange rate fluctuations. To detect autocorrelation problem a test followed is (*Q-STATISTIC CORRELOGRAM*), when applied the table 4 explains the case

Table 4. Test Q-STATISTIC for autocorrelation

Date: 07/24/17 Time: 21:44 Sample: 1990 2015 Included observations: 25						
Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
		1	0.345	0.345	3.3408	0.068
		2	0.102	-0.019	3.6487	0.161
		3	-0.167	-0.223	4.4995	0.212
		4	-0.173	-0.054	5.4646	0.243
		5	-0.320	-0.254	8.9219	0.112
		6	-0.306	-0.190	12.258	0.056
		7	-0.091	0.066	12.570	0.083
		8	-0.169	-0.310	13.710	0.090
		9	-0.080	-0.128	13.978	0.123
		10	0.105	0.118	14.474	0.152
		11	0.304	0.064	18.917	0.063
		12	0.114	-0.184	19.590	0.075

*Probabilities may not be valid for this equation specification.

Source: Prepared by the researcher by using EViews program

test shows that all levels of significance are greater than %5 and that the autocorrelations of the residuals were within the limits of the confidence, meaning that the residuals were stable for the model, the distribution of

residuals should also be known, since the residuals should be distributed in a normal distribution. This is based on the JARQUE-BERA test for normal distribution, shown in Fig. 6:

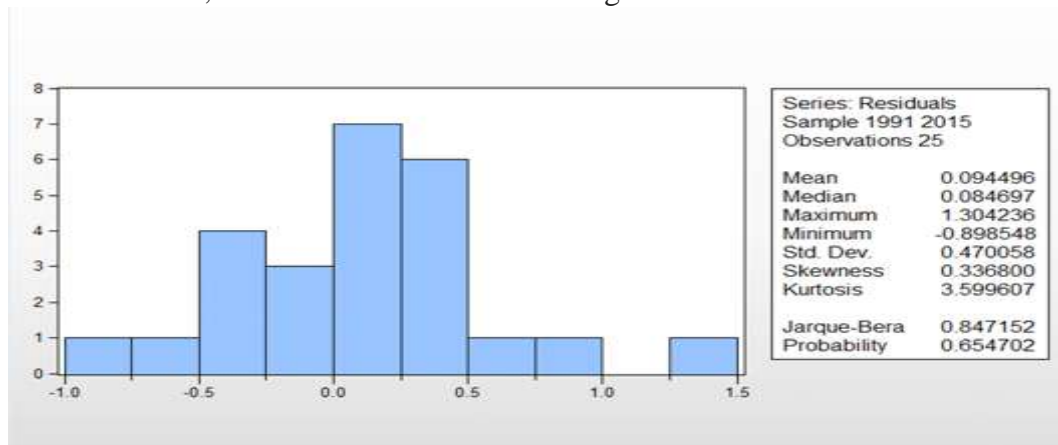


Figure 6. Normal distribution test for exchange rate bunkers

Source: Prepared by the researcher by using EViews program

Note that the significance of the JARQUE-BERA coefficient is greater than % 5, which means that the residuals are distributed normally, Thus, the estimated model is devoid of econometric problems that may produce shaded results, the resulting results that can be adopted and the building of research recommendations on them. The research concluded that agricultural exports have not contributed significantly to the supply of the Iraqi balance of payments, while a large part of the balance of payments balance goes towards importing agricultural commodities and Iraq's agricultural exports were small and did not meet the excessive exchange rate, which constituted an indirect tax on Iraqi agricultural exports, and the coverage of agricultural exports to imports was very weak. In addition, Iraqi agricultural imports are large and respond slightly to the changes that take

place in the exchange rate since most of the Iraqi agricultural imports are raw materials that enter into agricultural production and final goods are indispensable, Therefore, we find that agricultural imports grow very large and are affected by the excessive exchange rate, which makes their prices low, due to several reasons, including the exchange rate and dumping policy pursued by the major countries, which finance the Iraqi market with low-priced agricultural goods. Also the relationship between the exchange rate and the gross domestic product (GDP) is not consistent with the economic logic. When the exchange rate rises, the gross Domestic product (GDP) rises, which is the result of the consensus of many studies conducted inside and outside Iraq for developing countries that have the same conditions in Iraq. And agricultural exports did not have a significant impact on

the exchange rate due to the overall decline in export values, while imports were adversely affecting the exchange rate, and the impact of inflation on the exchange rate showed that any major change in world prices is withdrawn in most prices in Iraq, including the exchange rate. Research recommends that Iraq's dependence on oil primarily in financing its balance of payments makes it a hostage to the fluctuations in international oil prices. Therefore, it is necessary to diversify sources of financing the trade balance and sources of local currency. Investment in the agricultural sector is the best way. In addition, restriction is necessary in the presence of the excessive exchange rate and the existence of the dumping policy pursued by some countries, which allow the entry of global goods coming to Iraq and the cheap import prices made which leads to the Iraqi farmers to leave agriculture and switching to another work, and must impose direct taxes on the import of some varieties of agricultural goods that are produced within the country in a manner suited to the size of domestic demand or the tendency to impose import quotas on goods that need to be, and the choice between quotas and taxes according to studies recommended by the researcher in this field. Also developing a real strategy to diversify the structure of Iraqi agricultural exports and imports and to shift from the import of agricultural raw materials to their local development and to encourage local industries. Also expanding the movement of dealing in foreign currency and reducing the difference between the official and equilibrium exchange rate by avoiding the resorting to the parallel market as long as there is a better and more secure alternative, which is the official bodies that control the exchange rate. Finally, many experiments have proven that the local currency is floating in developing countries especially in developing countries that are similar to Iraq's conditions such as Egypt. Therefore, the researcher recommends using the controlled float method taking into account the appropriate exchange rate for the local economy.

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