AN ECONOMIC ANALYSIS OF THE IMPACT OF TRADE OPENNESS ON AGRICULTURAL OUTPUT GROWTH IN IRAQ FOR THE PERIOD 1990-2020

A. S. Bashar **R. T. Al-Wasity**
Researcher **Assist. Prof.**
Dept. of Ag. Economics / Coll. of Ag Eng. Sciences / University of Baghdad
akad.saadoun1108a@coagri.uobaghdad.edu.iq raja.t@coagri.uobaghdad.edu.iq

ABSTRACT

This research aimed to measure the impact of trade openness and changes in the terms of trade on the growth of agricultural domestic product in Iraq for the period 1990-2020. The independent variables were represented by indicators (trade openness, agricultural exports, the rate of trade of agricultural crops, and the exchange rate). The Autoregressive Distributed Lag Model (ARDL) measures the relationship between variables, in addition to the PP test for the stability of the time series. After the estimated model passed the bounds test, the short-run and long-run functions were estimated. The results of the estimation in the short run showed the existence of a positive effect of both terms of trade and the exchange rate on the growth of agricultural domestic product. As for the rate of trade openness, its effect was negative, and the results did not prove significant for the agricultural export index. In the long term, it was significant. As for trade openness, its effect became positive due to the growth of exports in the long term. The results indicated that the terms of trade are not in the country's favor, due to the small volume of agricultural exports.

Key words: Trade flows, Exchange rate, Agricultural exports, ARDL.
***Part of Ph.D. dissertation of the 1st author.**

تحليل اقتصادي لأثر الانفتاح التجاري على نمو الناتج الزراعي في العراق للمدة 1990–2020

اكد سعدون بشار **رجاء طعمة الواسطي**
باحث **استاذ مساعد**
قسم الاقتصاد الزراعي / كلية عاوم الهندسة الزراعية/ جامعة بغداد

المستخلص

استهدف البحث بيان اثر الانفتاح التجاري ومعدل التبادل التجاري في نمو الناتج المحلي الزراعي في العراق للمدة 1990–2020 وقد تمثلت المتغيرات المستقلة بمؤشرات(الانتفاح التجاري ، والصادرات الزراعية ، معدل التبادل التجاري للمحاصيل الزراعية وسعر الصرف) وتم استخدام اختبار انموذج الانحدار الذاتي ذي الابطاء الموزع ARDL في قياس العلاقة بين المتغيرات ، بالاضافة الى اختبار PP لاستقرارية السلاسل الزمنية . وبعد اجتياز الانموذج المقدر اختبار الحدود تم تقدير دالة الاجل القصير والطويل وقد بينت نتائج التقدير في الاجل القصيروجود تاثير ايجابي لكل من التبادل التجاري وسعر الصرف في نمو الناتج المحلي الزراعي اما معدل الانفتاح التجاري فكان تاثيره سلبيا ولم تثبت النتائج معنوية مؤشر الصادرات اما في الاجل الطويل فقد كانت معنوية اما الانفتاح التجاري فقد اصبح تاثيره موجبا وذلك لنمو الصادرات في الاجل الطويل وقد اشارت النتائج الى ان معدل التبادل التجاري ليس لصالح البلد وذلك لضآلة حجم الصادرات الزراعية لذا توصي الدراسة تبنى ستراتيجية مناسبة لتطوير وتنويع الصادرات الزراعية .

كلمات المفتاحية: التدفقات التجارية، سعر الصرف، الصادرات الزراعية، الانحدارالذاتي ذي الابطاء الموزع.
البحث جزء من اطروحة الدكتوراه للباحث الاول.

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INTRODUCTION

The rate of trade openness expresses the importance of foreign trade in forming GDP (33) (18). It measures the degree of correlation with the outside world and economic dependence on it (22). The importance of exports differs from imports when calculating the trade openness index (4). Exports stimulate economic growth and are considered one of the important indicators of foreign trade that are used to determine the country's capability because they are linked to improving the balance of payments in addition to improving the level of employment and income (37, 26). It expresses the extent of the global market's dependence on those exports (5). On the contrary, imports express the state's degree of dependence on foreign products (40). However, both play a major role in providing food commodities to confront the deficit in agricultural products, and the expansion of importing modern technology contributes to increasing agricultural investment and improving the quality and quantity of production (21). As for the terms of trade, it is used to indicate the impact of foreign trade on the economic sectors of countries (28). It refers to the ratio of the unit price index of exports to the unit price index of imports. The higher the ratio is above 100, the more it is in the country's favor and vice versa (20). Iraq suffers from a decline in the growth rate of agricultural output of (3%) during the study period, and this has led to the adoption of an import policy for most food crops (29). Iraq became dependent on international markets to provide agricultural goods to meet local demand (2). This resulted in a double problem represented by the shortage of food necessary to achieve food security on the one hand, and the depletion of large amounts of to import food from abroad on the other hand (27). The great openness of Iraq to the outside world, especially after 2003, is a logical result of the decline in the contributions of good sectors, especially agriculture, to GDP (36). The volume of agricultural exports in Iraq does not rise to the level of the capabilities that Iraq possesses (13). The rise in imports of agricultural commodities reflects the decline in agricultural production and the increase in the food gap (16). The development of exports is one of the basic requirements for the agricultural development process (10). As export revenues contribute to financing development programs (19). The increasing agricultural exports will accelerate growth more than expanding demand in the domestic market, especially in countries with a smaller urban population (35). The exchange rate is very important because it affects export and import prices as it determines the value of goods, services and financial assets that can by purchased in the local currency (12, 17), as foreign currency is used in dealing with companies at home and abroad where imported goods (3) (40). Thus the exchange rate is an important mean of influencing the profitability of export industries and the cost of imported resources fluctuations (14). The exchange rate has a significant impact on the agricultural sector (7). The stability of the exchange rate has a positive impact on the volume of imported quantities (25). This research aimed at measuring the impact of the policy of the trade openness for agricultural crops on the growth of the agricultural sector. The variables: trade openness index, trade exchange rate, agricultural export index and exchange rate were used as independent variables, while the dependent variable is the local agricultural output, and reliance was placed on time series data for the period 1990-2020 that were obtained from secondary sources in the Ministry of Planning and the Center of Statistics.

MATERIALS AND METHODS

The quantitative method was adopted in building the econometric model according to the Eviews12 statistical program using the Autoregressive Distributed Lag (ARDL) model. The Philips-Perron test was conducted to detect the presence of a unit root in the time series data (32). It is clear that the variables were not integrated in their three forms at level, but they are integrated at the first difference. After the estimated model passed the Bounds test, the short-run and long-run functions were estimated (23). A unit root test is very important in applied studies that use time series data when estimating functions to show the extent of stability of variables and determining the degree of integration for each variable, as the character of stationarity is

assumed for the time series in order to avoid obtaining a spurious regression and the non-stationary series is transformed to a static series by means of the first difference and the second difference etc. (24). The unit root is detected according to augmented (expanded) Dickey-Fuller test and the Phelps-Perron test (6) (30). The null hypothesis means that the variable has a unit root (H_0:P=1). As for the hypothesis. Alternatively, it means the time series is stationary (H_1:P<1) (24). ARDL is a modern methodology developed by Pesaran et al. in 2001 (38). It has several characteristics, including the possibility of estimating short- and long-term parameters with one equation (8) (30). It takes a sufficient number of lags to obtain more consistent estimators, and it has the possibility of allowing explanatory variables to have different time lags (15). Where Autoregressive Distributed Lags Model for the dependent variable is combined with models of distributed lags for the independent variables into one model in which the dependent variable is a function of the value of the dependent variable itself and the values of the independent variables are lagged for one period of time and are also a function of the mass of lags of the dependent variable and the independent variables in the first difference (31). Thus the model shows the time period for the response movement of the dependent variable to the independent variables, as it shows the effect of dynamic models for cases in which variables are related to the previous values of other variables (18). This procedure is important in economics, especially in the long run because there is a period of time between the economic decision and the final effect to change the economic policy variable (9). ARDL model means automatic regression of YT, and DL means that the dependent variable will be described through its own lag period and the lag period of the independent variables (1). The Bounds Test approach was conducted to determine the existence of co-integration between the variables, whereby F statistic is compared with two tabular values representing the value of the upper limit for the integrated variables of order I(1) and the lower limits of the integrated variables of order I(0) (11). When the calculated F value is higher than the minimum value, we reject the null hypothesis and accept the alternative hypothesis, which means the existence of long-term cointegration between the variables (27) (34). Thus, the econometric model was described using Semi-logarithmic form :

LAP=F (ME, MT, EX, ER).

Whereas:

LAP= Logarithm of Agricultural GDP for the period 1990-2020.

ME= The rate of agricultural openness is measured by (agricultural exports + agricultural imports / agricultural domestic product at current prices * 100).

MT= The rate of trade is measured by (agricultural export price index / agricultural import price index *100).

ER= The exchange rate for the above period.

EX= Agricultural exports index, measured by (agricultural export prices / GDP at current prices * 100).

RESULTS AND DISSCUTION

First. Test the stability of time series: The PP test was conducted to demonstrate the stability of the variables used in the model. It was found that the variables were not stable according to their three formulas at the level, but they were stable at the first difference (Table1).

Table 1. The unit root PP test

UNIT ROOT TEST RESULTS TABLE (PP)
Null Hypothesis: the variable has a unit root

		LAP	ME	MT	EX	ER
At Level						
With Constant	t-Statistic	-9.1576	-1.4582	-2.2490	-3.6463	-5.6117
	Prob.	*0.0000* ***	*0.5405* n0	*0.1943* n0	*0.0106* **	*0.0001* ***
With Constant & Trend	t-Statistic	-5.0054	-2.7212	-2.5428	-4.2793	-5.7975
	Prob.	*0.0018* ***	*0.2357* n0	*0.3070* n0	*0.0104* **	*0.0003* ***
Without Constant & Trend	t-Statistic	1.3457	-1.0250	-1.9053	-3.1797	0.3657
	Prob.	*0.9517* n0	*0.2678* n0	*0.0552* *	*0.0025* ***	*0.7838* n0
At First Difference						
		d(LAP)	d(ME)	d(MT)	d(EX)	d(ER)
With Constant	t-Statistic	-2.8678	-7.5018	-5.6623	-6.6754	-4.1698
	Prob.	*0.0615* *	*0.0000* ***	*0.0001* ***	*0.0000* ***	*0.0228* **
With Constant & Trend	t-Statistic	-3.6910	-9.9044	-5.5481	-6.2861	-5.6481
	Prob.	*0.0392* **	*0.0000* ***	*0.0005* ***	*0.0001* ***	*0.0034* ***
Without Constant & Trend	t-Statistic	-2.5105	-6.9353	-5.7684	-6.8545	-2.3240
	Prob.	*0.0140* **	*0.0000* ***	*0.0000* ***	*0.0000* ***	*0.0218* **

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

Source. Eviews12 software output

Second: Estimating econometric model using the ARDL model

The econometric model for the relationship between the variables was estimated according to the ARDL test. Table 2 shows the estimation results of the effect of the explanatory variables with their lag periods on the dependent variable, as well as the effect of the lag periods on the dependent variable as well. The formula (2,1,4,2,3) was Chosen , which means two lagged periods for the dependent variable (agricultural output) on itself, one lagged period for the variable (terms of trade openness of the agricultural sector), four lagged periods for periods for the variable (agricultural export index), and finally three lagged periods for for the variable (exchange rate). The calculated F value was (137.83), which is significant at the (1%) level, which means the significance of the model as a whole. for the variable (terms of trade), two lagged

Table 2. The ARDL test for the relationship between variables

Dependent Variable: LAP
Method: ARDL
Date: 10/13/23 Time: 11:14
Sample (adjusted): 5 31
Included observations: 27 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): ME MT EX ER
Fixed regressors: C
Number of models evalulated: 2500
Selected Model: ARDL(2, 1, 4, 2, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LAP(-1)	0.908426	0.130833	6.943427	0.0000
LAP(-2)	-0.386676	0.127573	-3.031029	0.0127
ME	-0.016020	0.006075	-2.636689	0.0390
ME(-1)	0.030630	0.006041	5.069597	0.0005
MT	-0.041580	0.011470	-3.625108	0.0046
MT(-1)	0.010420	0.009361	1.113128	0.2917
MT(-2)	-0.040446	0.009671	-4.304828	0.0015
MT(-3)	0.059790	0.009640	6.202282	0.0001
MT(-4)	-0.040446	0.010102	-4.003761	0.0022
EX	0.159989	0.255188	0.626945	0.5447
EX(-1)	0.019100	0.283185	0.067448	0.9476
EX(-2)	0.555176	0.271167	2.047360	0.0678
ER	0.598312	0.165259	3.620444	0.0047
ER(-1)	-0.247717	0.157654	-1.571273	0.1472
ER(-2)	-0.418383	0.136522	-3.064594	0.0120
ER(-3)	0.540676	0.090927	5.946261	0.0001
C	4.074201	1.036753	3.929768	0.0028

R-squared	0.995486	Mean dependent var	15.30528
Adjusted R-squared	0.988263	S.D. dependent var	0.898542
S.E. of regression	0.097344	Akaike info criterion	-1.555124
Sum squared resid	0.094759	Schwarz criterion	-0.739226
Log likelihood	37.99417	Hannan-Quinn criter.	-1.312515
F-statistic	137.8311	Durbin-Watson stat	2.260327
Prob(F-statistic)	0.000000		

Source. Eviews12 software output

Third. Testing the short-term function (ECM).: The results showed that the value of the error correction factor coint Eq (-1), which amounted to (-0.47), showed a negative and significant sign at the level of (1%). This means that the necessary condition and sufficient condition for the estimated model are met, and it also means that (47%) of the imbalances that occur in the short term can be addressed in the same year, thus returning to equilibrium in the long term. Table 3 shows that the value of the coefficient of determination R^2 reached (0.98). This means that 98% of the fluctuations in the value of the dependent variable (agricultural output growth) due to the influence of independent variables. The value of the coefficient of the trade openness variable reached (-0.016) at a level of significance (5%). This means that there is a negative effect of trade openness on the growth of agricultural output, as 1% of the increase in the rate of trade openness leads to a decrease in the growth of agricultural output. at (0.016%), its effect is relatively weak, and this is consistent with the reality of the agricultural sector in Iraq. As terms of trade, it had a negative and significant relationship at the level of (1%) and consistent with the meaning of economic theory, as the value of its parameter reached (-0.041). This means that the increase by 1% leads to a decrease in the agricultural growth rate by (0.041%). For the agricultural exports index, it did not prove significant in the short term, which is a logical result that reflects the small volume of Iraqi agricultural exports and their confinement to specific products. The value of the exchange rate coefficient reached (0.59) and was significant at the level of (1%), and a change in the exchange rate by 1% contributes to an decrease in the agricultural growth rate by (0.59%) in the short term

Table 3. Estimating the short-run fanction

ARDL Error Correction Regression
Dependent Variable: D(LAP)
Selected Model: ARDL(2, 1, 4, 2, 3)
Case 2: Restricted Constant and No Trend
Date: 10/13/23 Time: 11:37
Sample: 1 31
Included observations: 27

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LAP(-1))	0.386676	0.078391	4.932681	0.0006
D(ME)	-0.016020	0.004540	-3.529074	0.0054
D(MT)	-0.041582	0.006630	-6.270945	0.0001
D(MT(-1))	0.026501	0.005401	4.906683	0.0010
D(MT(-2))	-0.030153	0.008910	-3.384175	0.0085
D(MT(-3))	0.020464	0.003084	6.713910	0.0000
D(EX)	0.159989	0.177610	0.900786	0.3889
D(EX(-1))	-0.555176	0.197323	-2.813539	0.0184
D(ER)	0.598312	0.053365	11.21175	0.0000
D(ER(-1))	-0.122292	0.086190	-1.418870	0.1863
D(ER(-2))	-0.540676	0.060084	-8.998666	0.0000
CointEq(-1)*	-0.478250	0.051188	-9.342977	0.0000

R-squared	0.983578	Mean dependent var	0.206423
Adjusted R-squared	0.971535	S.D. dependent var	0.471096
S.E. of regression	0.079481	Akaike info criterion	-1.925494
Sum squared resid	0.094759	Schwarz criterion	-1.349567
Log likelihood	37.99417	Hannan-Quinn criter.	-1.754241
Durbin-Watson stat	2.260327		

Fourth: Results of the F-Boned Test. The results of the bounds test, as shown in table 4, showed the existence of a cointegration relationship and long-term equilibrium between the variables, as the calculated F value reached (9.69), which is greater than the upper limit at a significant level (1%).

Table 4. Bound test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.699025	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

FiFTH: Results of the long-run function test: The long-run function was estimated and the results in table 5 showed that the parameter of the rate of trade openness reached (0.021) and was positive and significant at the level of (5%) ,which is contrary to the assumptions of economic theory, which stipulates that there is a negative relationship between the two variables, which indicates that the change occurring in the rate trade openness at a rate of 1% results due to increase in agricultural growth by (0.021) in the long term. As for the variable terms of trade, it reached (0.012) at a level of significance (1%), which is consistant to the meaning of economic theory, which states that there is a positive relationship between the two variables. The agricultural exports index parameter was (1.53) has a positive and significant sign at the level of (5%), which indicates a positive relationship with the agricultural output variable in the long run, and that 1% of the change in the agricultural exports index leads to the growth of agricultural output by (1.53%), The exchange rate is (0.98) with a significance level of 1%, which indicates that a change in the exchange rate by 1% leads to an increase in the growth of agricultural output by (0.98). The function also indicates that there is a difference in the relationship of variables between the two terms.

Table 5. Results of the long-run function test

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ME	0.020999	0.008016	2.619635	0.0217
MT	-0.012057	0.002815	-4.283993	0.0016
EX	1.535316	0.550866	2.787097	0.0192
ER	0.988786	0.262466	3.767284	0.0037
C	8.518979	1.881578	4.527573	0.0011
EC= LAP- (0.0210*ME- 0.0121*MT+ 1.5353*EX+ 0.9888*ER+ 8.5190)				

Source. Eviews12 software output

Sixth: Standard test results: Third-order tests were conducted on the model and it was found that the function is free of standard problems, as shown in Table 6. The model is free of the autocorrelation problem according to the LM test, and there is no hetero problem according to the ARCH test, in addition to the validity of the model and the absence of error in the description. and the Ramsey test, as the probability value for all tests was greater than (0.05) it was showed adapting the functional which used in the model to explain the relationship.=

Table 6. Results of standard problems tests and model validity tests

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.548175	Prob. F(2,8)	0.5983
Obs*R-squared	3.254211	Prob. Chi-Square(2)	0.1965

Heteroskedasticity Test: ARCH

F-statistic	0.079050	Prob. F(1,24)	0.7810
Obs*R-squared	0.085356	Prob. Chi-Square(1)	0.7702

Ramsey RESET Test
Equation: EQ02
Omitted Variables: Squares of fitted values
Specification: LAP LAP(-1) LAP(-2) LME LME(-1) MT MT(-1) MT(-2) MT(-3) MT(-4) LE LE(-1) LE(-2) LER LER(-1) LER(-2) LER(-3) C

	Value	df	Probability
t-statistic	0.745428	9	0.4750
F-statistic	0.555664	(1, 9)	0.4750
Likelihood ratio	1.617555	1	0.2034

Source Eviews12 software output

Seventh. Normal distribution test: The normal distribution test for the model was conducted using the Jarque-Bera test to determine that the residuals are distributed normally. The results of the test were shown in figure 1. The Jarque-Bera value reached (0.296) at a significant level (0.862), which is not significant, which means that the residuals of the model are distributed normally

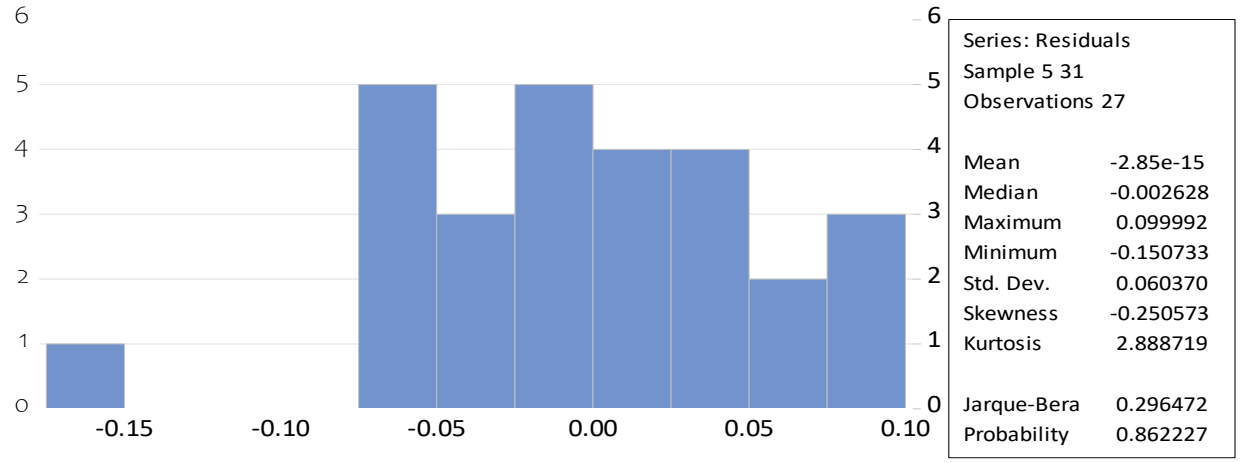

Figure 1. Normal distribution of residuals

Source: Eviews12 software outputs

Eighth. Structural stability testing: The CUSUM test was conducted to determine whether or not the model coefficients were stable over the time period, and the results showed, as in Figure 2, that the cumulative sum of the residuals falls within the critical limits at a significant level (5%).

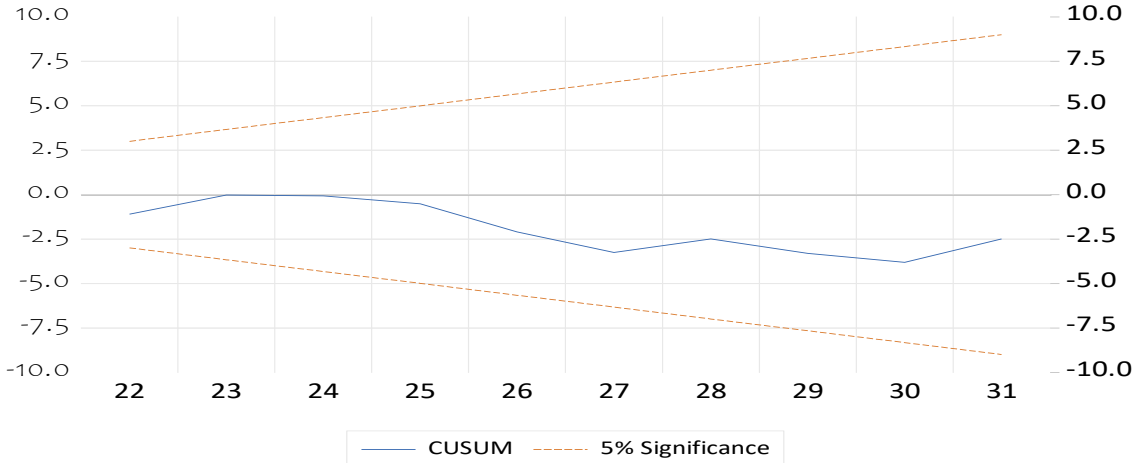

Figure 2. CUSUM test for stability of parameters. From Eviews12 software output

As for Figure 3, it shows the cumulative sum of squares. The residuals are also noted to be within the critical limits and at a significance level (5%). The results of the two tests mean that the model data did not experience structural changes during the study period

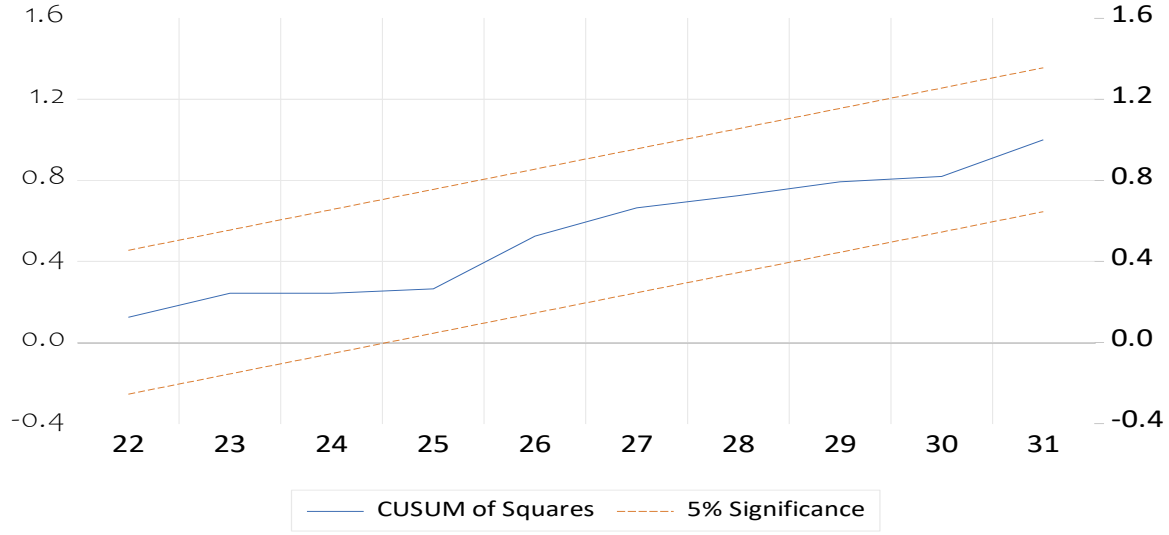

Figure 3. CUSUM of Squares test

Soures. Eviews12 software output

This study was found that the rate of trade openness affects the growth of agricultural output in the short term, but the direction of this effect changes in the long term so that the relationship becomes positive, and this matches the reality of the agricultural sector in Iraq, which is characterized by a decline in the growth rate of agricultural output and a steady rise in the volume of imports.The agricultural terms of trade in Iraq is not in favor of the country as a result of the small volume of exports compared to the volume of imports, and the ratio is less than 100. As for agricultural exports, there is no significant impact on the growth of agricultural domestic product in the short term. It showed a significant and positive impact in the long term. The study recommends. It is necessary to adopt an appropriate strategy to develop the foreign trade sector for agricultural products and contribute to the development of exports through expanding the production of export goods and diversifying them by introducing other goods into the field of export with the aim of raising the rate of terms of trade for the benefit of the country. Organizing the import process to protect the local market from the policy of dumping of agricultural crops and moving towards importing high-tech production inputs that would raise production growth rates and productivity in the agricultural sector. Following a balanced, moderate exchange rate policy to enable it to play its real role in the growth of agricultural outputs.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

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