



Study of the causal relationship of certain economic variables to the growth of agricultural GDP in Iraq and Algeria for the period 1990-2022

Miqdad J Abd ^{1*}, Ali J Abdulhussain ², AF Ahmed ³

¹⁻² Department of Banking and Finance, College Of Administration and Economics, University of Al Muthanna, Iraq

³ Department Agriculture Economics, College Agriculture Engineering Science, University of Baghdad, Iraq

* Corresponding Author: **Miqdad J Abd**

Article Info

ISSN (online): 2582-7138

Volume: 05

Issue: 06

Novembar-December 2024

Received: 05-09-2024

Accepted: 09-10-2024

Page No: 149-156

Abstract

The objective of the study was to analyse some of the economic variables of the exchange rate and money supply as well as the relationship between these economic variables and their impact on agricultural GDP in Algeria and Iraq for the period 1990-2022, after taking an overview of a range of concepts of economic variables as well as an analysis of the economic realities of agricultural GDP. The applied study showed that the impact of the variables (exchange rate, cash supply) on the agricultural GDP of Iraq and Algeria was analysed. The results showed that the exchange rate was negatively related to agricultural GDP because of the impact of other variables on the exchange rate itself. However, the money supply and its inverse relationship emerged, defying economic logic, and this helped to explain the positive supply and impact on the GDP in general and the agricultural domestic product in particular. Over time, however, we observe that the exchange rate and the agricultural domestic product have a positive relationship, and this is because the government was able to obtain control over the exchange rate of the Iraqi dinar, causing fluctuations in the exchange rate. As for the money supply during the period allotted to specialists, this increased the money supply to the gross domestic agricultural product, which in turn increased the amount of money subscription to the GDP. In Algeria, the exchange rate and agricultural domestic product did not seem to have a significant relationship. However, there is a positive direct relationship the higher the foreign exchange rate, the higher the inflation rate, which in turn increases demand for Algerian agricultural exports because they are perceived as being inexpensive by non-residents. Regarding the money supply parameter ratio, there was a relationship directly favorable, and this makes sense according to economic theory. In the long run, the exchange rate lesson was counterproductive to agricultural domestic product, but in terms of money supply, the relationship was counterproductive to agricultural domestic product. This suggests that the increase in the supply of money caused an increase in output in the short term and increased inflation in the long term.

DOI: <https://doi.org/10.54660/IJMRGE.2024.5.6.149-156>

Keywords: exchange rate, money supply, agricultural GDP, ARDL

Introduction

Macroeconomic policy plays a major role in the growth of agricultural output. This can be seen through the role played by these policies in allocating resources and increasing the efficiency of their use. Governments of developing countries have sought to use macroeconomic policies to influence exchange rates and money supply ^[13]. Economic variables occupy a very large place in influencing economic activity as a whole and agricultural GDP in particular, through the effective role they play in creating a more stable economy, by influencing the size of the economic bloc, the exchange rate, and the amount of money that individuals obtain. These variables are of great importance in influencing many economic variables and individuals' decisions and tastes in consumption and investment.

Fluctuations in macroeconomic variables occur as a result of the economy being exposed to various crises that lead to its instability^[12]. The Algerian economy is classified as a rentier economy in view of the characteristics that characterize it in terms of economic diversification and the contribution of oil revenues to the state's general budget. It is also characterized by its strong influence on economic cycles, which can be defined as regular fluctuations in the level of economic activity, or in other words, fluctuations in overall economic activity such as levels of production, employment and prices. Economic fluctuations are characterized by two main characteristics: the characteristic of "cyclicity". Repetition across periods, and the temporal compatibility of a group of economic trends within the economic structure, where economic fluctuations reappear in periods that may not be completely equal in terms of time measurement^[17].

Investment is one of the most important components of aggregate demand because the volume of investments is considered a determinant of the volume of production and income and thus the rate of economic growth, which is a measure of the development of societies. Actual investment represents an important and effective means of changing the structure of the national economy and stimulating it to grow, develop and progress, as it represents either an addition to the current production capacity or compensation for the production capacity that has disappeared as a result of its use, and adopting economic development is a long-term goal that requires expanding investment^[9].

With regard to agricultural investment in developing countries, the state has been interested in developing the agricultural sector for a period that is not recent, as this sector in these countries suffers from difficulties or obstacles that prevent stimulating producers and investors in this sector^[7]. The agricultural sector occupies an important position in the economic structure from the economic and social aspects, and despite the tangible importance of this sector, the shortcomings that characterize the role of the sector are clearly evident through its modest contribution to the gross domestic product^[17]. Exchange rate: The search results indicate that the exchange rate of the Iraqi dinar has had a significant impact on agricultural imports and, by extension, agricultural GDP growth. A higher exchange rate tends to reduce the quantity of agricultural imports, as they become more expensive. Conversely, a fixed or lower exchange rate has allowed the government to import more agricultural goods to meet domestic demand, supporting agricultural GDP growth^[10].

This research aims to estimate the relationship between some of the Iraqi and Algerian most important economic sectors and their agricultural GDPs. Identifying ways to sustainably integrate traditional agricultural activities in the production processes of other industries in countries with abundant natural resources becomes very critical^[15]. Economic growth is a positive sign that the society's needs are met as both output and employment increase; however, economic growth is a vital goal particularly when poverty reduction and sustainable development is proved to be a whole of society process. Therefore, the need for stable growth has always been familiar to the decision makers; and the interest of the economists from different schools^[7].

The focus of this research is on capturing possible channels that contribute not only to economic development, but also to the strength and sustainability of economic growth in the selected countries^[2]. Iraq is a model country with a priority

production structure: where the most infant natural resources are in the oil sector, in addition, the agricultural sector continues to use a large share of the labor force. Wealth can be used in one sector to meet the needs of other sectors. If countries set up and make optimal use of the institutions that collect these supplements, and if they evaluate them, economic diversification will yield results. Economic diversification is not necessarily an easily achievable or sustainable outcome, although it is certainly a desirable strategic goal. Since agriculture absorbs employed workers in other sectors, agricultural GDP is linked to food^[1]. The study aims to study and analyses some of the economic variables of exchange rate and money supply as well as to show the relationship between these economic variables and their impact on agricultural GDP in Algeria and Iraq, The Iraqi and Algerian economies suffer from economic imbalances, particularly in the growth of agricultural domestic product, the uneven instability of some economic variables, particularly the exchange rate of the local currency, and the presentation of cash can be expressed in a series of questions:

1. What is the effect of the exchange rate on agricultural GDP growth?
2. What is the impact on agricultural GDP growth?
3. What is the impact of money supply on agricultural GDP growth?

The study is based on the premise that (some economic variables have an impact on the growth of agricultural GDP in both Iraq and Algeria), Importance of Study Analysis and study of agricultural GDP in Iraq and Algeria for the period 1990-2022. A description of the relationship of economic indicators (exchange rate, cash supply) to agricultural domestic output in Iraq and Algeria, Analysis method: Researcher relied on quantitative analysis using joint integration analysis through EViews13.

Materials and Methods

The money offer: It is the purchasing power of individuals, meaning the amount of money in the national economy, all liquid assets in the economy, used in the exchange of services and goods.

Offering criticism is one of the most important instruments used by economic policy to achieve economic stability, and its direct and indirect impact on economic variables, and that the increase or decrease in the supply of cash determines the way economic policy operates whether it is deflationary or expansionary^[3].

The offer of money has a significant impact on the economy as a whole in all its variables, and the details. The increase in the supply of money may cause inflation, the decline in the supply of money may result in unemployment, deflation and reduced production capacity. Since money is accepted as an easy trade-off or a measure of value, the economists are expanding to discuss the definition of the offer of money and what its components constitute, and how it is calculated. The offer of money is one of the most fundamental factors affecting the economy^[6].

1. The narrow concept of cash supply M1 consists of the net currency in circulation plus the current deposits to the private sector.
2. The broad concept of M2 cash offer includes M1 plus time deposits (future).

The money supply has an impact on agricultural domestic output. When the money supply increases, it will lead to the

amount of money offered, thereby lowering the interest rate, contributing to the expansion of investments and vice versa.

Exchange rate: The main objective of any exchange - rate system is to promote international trade and investment and to address balance - of - payments imbalances.

The exchange rate is the exchange of foreign exchange with domestic currency as expressed by the number of domestic economic units versus one foreign currency unit and is an important tool for influencing economic resources between economic sectors and the total profits obtained from export industries and the cost of imported resources [18]. The exchange rate is the mirror that reflects the state's commercial position with the outside world, linking the domestic economy to the global economy, through the interrelationships between different countries' currencies. The use of the exchange rate instrument through the interest rate leads to a decline in the supply of money and hence a rise in the real interest rate in the domestic economy relative to its external counterpart. The relationship between the interest rate and the exchange rate can be explained by the increase in the demand for a country's currency, when the interest rate is high, thus making the exchange rate the currency of

this country tend to increase and its value rises and vice versa [4].

There are exchange regimes that control the local currency exchange rate, the most important of which are [5]:

1. Fixed exchange system: It is intended that the State shall determine the exchange rate of its domestic currency on the basis of a common weight and criterion, as applied in some Arab Gulf States.
2. The free exchange system (floating) here leaves the determination of the exchange rate to the forces and factors that govern the supply and demand of the local currency and foreign currency within the local economy.

Descriptive analysis of study variables for the period 1990-2022

1. Iraq: The table below refers to the results of the analysis of the time series of variables (agricultural domestic product, exchange rate, cash supply) for the period 1990-2022, which averaged 329684.4, 2016.48, 6.49 and 43701833, respectively, as well as some variables among the lowest and highest values shown in the table below.

Table 1: Of descriptive analysis of variables (exchange rate, cash supply) in Iraq for the period 1990-2022

	Y	X1	X2
Mean	329684.4	2016.485	43701833
Median	148445.0	1469.000	21080000
Maximum	1125954.	3108.000	1.54E+08
Year	2014	1990-2002	2022
Minimum	6406.000	1182.000	64314.00
Year	2018	2016	1992
Std. Dev.	339736.7	904.0867	47745155
Sum	10879584	66544.00	1.44E+09

Rescore: Output program EViews 13

2. Algeria: The table below refers to the results of the analysis of the time series of variables (agricultural domestic product, exchange rate, cash supply) for the period 1990-2022, with average (agricultural domestic product, exchange rate, cash supply) of 11038.13, 68.27419 and 61.581 respectively, as well as some variables among the lowest and highest values shown in the table below.

Table 2: Of descriptive analysis of variables (exchange rate, cash supply) in Algeria for the period 1990-2022

	Y	X1	X2
Mean	11038.13	68.27419	61.58106
Median	8032.000	73.36000	62.72400
Maximum	21966.60	107.1300	96.01100
Year	2014	2015	2021
Minimum	4008.000	8.950000	33.00500
Year	1994	1990	1993
Std. Dev.	6700.361	24.77793	16.83280
Sum	342182.2	2116.500	1909.013

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Analytical aspect of the study Standard Model Description (Iraq, Algeria)

Before the model is assessed for the relationship between agricultural GDP as a follow-on variable and the exchange rate, the cash is presented as separate variables for both countries in the model:

This section includes the description of the economic relationship between the dependent variables and the independent variables, as well as conducting the standard analysis of the time series after conducting dormant tests on the time series of the studied variables and verifying the presence or absence of the unit root in the variables, so that we can determine the method of analysis based on the results, and then estimate the mathematical model, analyze and interpret it as a standard and economically and conduct the necessary tests to verify the quality of the model [8].

Table 3: Standard Model Description

Variable name	Code	Variable type
Exchange rate	X1	independent
Cash offer	X2	independent
Agricultural output growth rate	Y	dependent

Source: By research

1. Silence test for time series (Iraq, Algeria)

Table 4: Results of testing for stability (static) variables at level I(0) and first difference I (1) using the ADF test

	Variables	ADF		PP	
		Level	1" Difference	Level	1" Difference
Iraq	X1		-4.2622 ***	-4.4828	
	X2		-5.2174 ***		-3.2891
	Y	-4.1725 **			-4.9169 ***
Algeria	X1		-11.7105 ***	-3.9202 ***	
	X2	-3.8344 ***			-5.8677 ***
	Y		-7.8187 ***		-6.5992 ***

Source: Prepared by the researcher based on EViews 13 program outputs
 ***: moral at the level of 10%, **: significant at the level of 5%, *: significant at the level of 1%.

2. Measuring the impact (exchange rate, cash supply) of agricultural domestic product (Iraq, Algeria)

Economic study of the impact of Exchange rate, money supply on Agricultural domestic product in Iraq:

1-The effect of independent variables (Exchange rate, money supply) on Agricultural domestic product in Iraq for the pried 1990-2022.

Table 5: ARDL Joint Integration Analysis

Dependent Variable: Y				
Method: ARDL				
Date: 07/17/24 Time: 17:29				
Sample (adjusted): 4 26				
Included observations: 23 after adjustments				
Maximum dependent lags: 3 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (3 lags, automatic): X1 X2				
Fixed regressors: C				
Number of models evaluated: 192				
Selected Model: ARDL(3, 0, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Y(-1)	1.147673	0.093010	12.33928	0.0000
Y(-2)	-1.669923	0.148080	-11.27719	0.0000
Y(-3)	1.887953	0.217908	8.663995	0.0000
X1	-51.84609	13.89744	-3.730623	0.0025
X2	3.357892	2.083564	1.611609	0.1310
X2(-1)	2.615066	2.102509	1.243783	0.2355
X2(-2)	3.757181	2.101970	1.787457	0.0972
X2(-3)	-15.79460	2.304283	-6.854454	0.0000
C	449503.0	198758.9	2.261549	0.0415
R-squared	0.968134	Mean dependent var		192216.0
Adjusted R-squared	0.946073	S.D. dependent var		556789.7
S.E. of regression	129298.7	Akaike info criterion		26.67666
Sum squared resid	2.17E+11	Schwarz criterion		27.17035
Log likelihood	-296.7816	Hannan-Quinn criter.		26.80082
F-statistic	43.88435	Durbin-Watson stat		1.771707
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model select

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Table (5) shows the results of the estimation of the impact of the independent variables with their slowing periods on the dependent variable, as well as the impact of the slowing down periods of the dependent variable itself, and it was found that the value of the coefficient of determination amounted to (0.96), meaning that 96% of the fluctuations in the dependent

variable (Agricultural domestic product) are caused by the variables shown in the model, and that (0.0%) of the fluctuations were not included in the model or were absorbed by the random variable, and it was found that the value of the F statistic amounted to (43.88), which is significant at the level of (1%).

Table 6: ARDL Error Correction Regression

ARDL Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	0.001568	0.000689	2.277278	0.0269
D(X1)	-0.016990	9.78E-05	-173.8087	0.0000
D(X2)	-3.576802	0.006516	-548.8929	0.0000
D(X2(-1))	0.001730	0.000764	2.264417	0.0277

CointEq(-1)*	-0.243579	0.050612	-4.812655	0.0000
R-squared	0.965400	Mean dependent var	620.7391	
Adjusted R-squared	0.955224	S.D. dependent var	534342.3	
S.E. of regression	113068.4	Akaike info criterion	26.32883	
Sum squared resid	2.17E+11	Schwarz criterion	26.62505	
Log likelihood	-296.7816	Hannan-Quinn criter.	26.40333	
Durbin-Watson stat	1.771707			
* P-value incompatible with t-Bounds distribution.				

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Error Correction Regression: The line correction limit (-0.24) was negative and moral at 1%, indicating a common integration relationship on Agricultural domestic product Development Index and independent variables (**Exchange rate, money supply**), and the R² identification factor value was 0.96, the model has a high interpretive strength, From the table above, we notice that the exchange rate has a negative relationship with the agricultural GDP due to the impact of other variables on the exchange rate itself. For example, increasing government spending or increasing the money supply has an impact on the exchange rate and has a negative impact, meaning that the Iraqi government spends a low total expenditure relative to its agricultural GDP, which makes the exchange rate negatively affect the agricultural GDP. Also, the inappropriate determination of the exchange rate may have negative effects on the agricultural GDP, as the exchange rate works as an international tool to determine the competitiveness of agricultural products and price competition. As for the money supply, we notice from the table above an inverse relationship, which is contrary to the logic of economic theory, which states that the money supply has a positive effect on the gross domestic product in general and the agricultural domestic product in particular. The reason is that the increase in the money supply in the Iraqi economy is a result of the monetary effects of fiscal policy and the increase in government operational spending, salaries and wages, and economic exposure due to the lifting of customs restrictions and dumping policies practiced by neighboring regional countries, which led to the stagnation of the Iraqi agricultural sector.

Bounds Test

The value of F for the test of limits appears by (12.629) and it is not significant at the level of 1% and as shown in the table, as the test contains two upper and lower limits and if the calculated F value comes between the lower and upper limit, then we reject the null hypothesis that there is no long-term relationship between the set of interpreted variables and the dependent variable and accept the alternative hypothesis.

Table 7: Bounds Test

F-Bounds Test				
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	12.62997	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

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The long-term equation of the joint integration between the dependent variable (Agricultural domestic product) and the independent variables (Exchange rate money supply).

Table 8: Levels Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	0.041131	0.000187	220.2864	0.0000
X2	5.031090	0.021962	229.0863	0.0000
EC = Y - (0.0411*X1 + 5.0311*X2)				

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In the long term, we notice that the exchange rate is positively related to the agricultural GDP. This is due to the measures taken by the monetary authority on the Iraqi dinar exchange rate, which caused fluctuations in the exchange rate up and down, as well as the heavy reliance on crude oil prices as the sole financier of the Iraqi budget, and due to the increase in large agricultural investments as a result of what the state did to protect these projects by preventing the import of some goods or increasing customs barriers on them. As for the money supply, the relationship was direct, meaning that an increase in the money supply causes an increase in the agricultural GDP, and this is consistent with the logic of economic theory, meaning that an increase in the money supply has positive effects. The more the money supply increases, the more income increases, and thus the total demand for goods and services increases, and this is reflected in an increase in the gross domestic product in general and the agricultural GDP in particular.

Model testing

As for the standard problem tests and to ensure that the model is free, a test was conducted for the remaining model, including the Heteroskedasticity Test: Breusch-Pagan-Godfrey: F-statistic, the Breusch-Godfrey Serial Correlation LM Test: and the Q-statistic probabilities test, and all tests indicated that there was no standard problem in the model as shown in the analysis results shown in the annex.

Table 9: Model testing

	Statistics value	Prob.
Normality Test: Jarque-Bera	1.3347	0.513
Serial Correlation LM Test: F-statistic	0.779834	0.4823
Heteroskedasticity Test: Breusch-Pagan-Godfrey: F-statistic	0.225481	0.9844

Rescore: output program EViews 13

2. The effect of independent variables (Exchange rate, money supply) on Agricultural domestic product in Algeria for the period 1990-202.

Table 10: Joint Integration Analysis ARDL

Dependent Variable: Y				
Method: ARDL				
Date: 07/17/24 Time: 17:51				
Sample (adjusted): 5 33				
Included observations: 29 after adjustments				
Maximum dependent lags: 3 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (4 lags, automatic): X1 X2				
Fixed regressors: C				
Number of models evaluated: 375				
Selected Model: ARDL (2, 4, 4)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Y(-1)	0.913247	0.110373	8.274190	0.0000
Y(-2)	-0.169357	0.126672	-1.336972	0.2060
X1	0.127173	24.37755	0.005217	0.9959
X1(-1)	-32.00617	37.41464	-0.855445	0.4091
X1(-2)	-72.34655	42.38200	-1.707011	0.1135
X1(-3)	148.9583	38.85396	3.833800	0.0024
X1(-4)	-99.17535	33.06352	-2.999540	0.0111
X2	0.009793	0.003949	2.479709	0.0290
X2(-1)	-0.017446	0.005590	-3.120596	0.0088
X2(-2)	0.001257	0.005201	0.241784	0.8130
X2(-3)	0.031146	0.005524	5.637995	0.0001
X2(-4)	-0.028763	0.003914	-7.349311	0.0000
C	202107.5	110639.3	1.826724	0.0927
R-squared	0.997085	Mean dependent var		362903.4
Adjusted R-squared	0.993198	S.D. dependent var		349873.2
S.E. of regression	28855.29	Akaike info criterion		23.66800
Sum squared resid	9.99E+09	Schwarz criterion		24.46952
Log likelihood	-326.1860	Hannan-Quinn criter.		23.91902
F-statistic	256.5314	Durbin-Watson stat		2.564625
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.

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Table (10) shows the results of the estimation of the impact of the independent variables with their slowing periods on the dependent variable, as well as the impact of the slowing down periods of the dependent variable itself, and it was found that the value of the coefficient of determination amounted to (0.99), meaning that 99% of the fluctuations in the dependent

variable (Agricultural domestic product) are caused by the variables shown in the model, and that (0.01%) of the fluctuations were not included in the model or were absorbed by the random variable, and it was found that the value of the F statistic amounted to (256.53), which is significant at the level of (1%).

Table 11: Short-term equation

ARDL Error Correction Regression				
Dependent Variable: D(Y)				
Selected Model: ARDL(2, 4, 4)				
Case 2: Restricted Constant and No Trend				
Date: 07/17/24 Time: 17:52				
Sample: 1 33				
Included observations: 29				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	0.169357	0.045003	3.763210	0.0027
D(X1)	0.127173	19.24473	0.006608	0.9948
D(X1(-1))	22.56358	20.45274	1.103206	0.2916
D(X1(-2))	-49.78297	20.86318	-2.386164	0.0344
D(X1(-3))	99.17535	21.70296	4.569669	0.0006
D(X2)	0.009793	0.001275	7.678882	0.0000
D(X2(-1))	-0.003640	0.002527	-1.440330	0.1754
D(X2(-2))	-0.002383	0.001946	-1.224441	0.2443
D(X2(-3))	0.028763	0.001385	20.76413	0.0000
CointEq(-1)*	-0.256111	0.015600	-16.41691	0.0000
R-squared	0.985788	Mean dependent var		-1927.828
Adjusted R-squared	0.975129	S.D. dependent var		158457.7
S.E. of regression	24989.41	Akaike info criterion		23.39214
Sum squared resid	9.99E+09	Schwarz criterion		24.00506

Log likelihood	-326.1860	Hannan-Quinn criter.	23.58410
Durbin-Watson stat	2.564625		
* p-value incompatible with t-Bounds distribution.			

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Error Correction Regression:- The line correction limit (-0.25) was negative and moral at 1%, indicating a common integration relationship on Agricultural domestic product Development Index and independent variables (Exchange rate, money supply), and the R^2 identification factor value was 0.98, the model has a high interpretive strength, Although the relationship between the exchange rate and agricultural domestic product in Algeria is unethical, there is a positive correlation, which is consistent with the logic of economic theory, the higher the foreign exchange rate, the higher the levels of inflation and thus the higher the demand for Algerian agricultural exports as cheap for non-residents. By contrast, the money supply teacher had a positive exotic relationship, which is consistent with economic theory.

Bounds Test

The value of F for the test of limits appears by (40.427) and it is not significant at the level of 1% and as shown in the table, as the test contains two upper and lower limits and if the calculated F value comes between the lower and upper limit, then we reject the null hypothesis that there is no long-term relationship between the set of interpreted variables and the dependent variable and accept the alternative hypothesis.

Table 12: Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	40.42725	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

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The long-term equation of the joint integration between the dependent variable (Agricultural domestic product) and the independent variables (Exchange rate money supply).

Table 13: Levels Equation

Levels Equation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1	-212.5742	95.90563	-2.216494	0.0467
X2	-0.015667	0.007257	-2.158798	0.0518
C	789140.7	290264.6	2.718695	0.0187
EC = Y - (-212.5742*X1 - 0.0157*X2 + 789140.7049)				

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In the long term, however, the exchange rate lesson was counterproductive to agricultural domestic product. This was due to the reform measures taken by Algeria in 1986 because of the crude oil crisis and its low prices. Algeria undertook very large reforms, resulting in the trend towards the adoption by the Algerian economy of the market economy, which had been forced to reform the exchange rate system, which was a cornerstone of any economy.

In terms of money supply, however, the relationship with agricultural GDP was counterproductive This corresponds to the theoretical economic logic of the Money School, according to which increased money supply caused output in the short term and increased inflation in the long term.

Model testing

As for the standard problem tests and to ensure that the model is free, a test was conducted for the remaining model, including the Heteroskedasticity Test: Breusch-Pagan-Godfrey: F-statistic, Serial Correlation LM Test: and the Q-statistic probabilities test, and all tests indicated that there was no standard problem in the model as shown in the analysis results shown in the annex.

Table 14: Model testing

	Statistics value	Prob.
Normality Test: Jarque-Bera	1.3347	0.513
Serial Correlation LM Test: F-statistic	7.251238	0.0113
Heteroskedasticity Test: Breusch-Pagan-Godfrey: F-statistic	0.413017	0.9497

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Conclusions

1. The existence of a one-way causal relationship from the exchange rate to agricultural GDP, indicating that exchange rate changes affect agricultural growth in Iraq.
2. Lack of a one-way causal relationship from per capita income to agricultural GDP, indicating that changes in per capita income do not directly affect agricultural growth in Iraq.
3. The existence of a one-way causal relationship from per capita income to agricultural GDP, indicating that changes in per capita income affect agricultural growth in Algeria.
4. The absence of a one-way causal relationship from the exchange rate to agricultural domestic product indicates that exchange rate changes do not directly affect agricultural growth in Algeria.

Recommendations

1. The need for economic policies aimed at stabilizing the exchange rate, given its impact on agricultural growth in Iraq.
2. Economic policies focus on stimulating per capita income without relying on it as a means of advancing the agricultural sector in Iraq.
3. The need to develop economic policies aimed at stimulating per capita income, given its impact on agricultural growth in Iraq.
4. Not relying heavily on the exchange rate as a tool to stimulate agricultural growth in Iraq.
5. Strengthening investments in the agricultural sector through the provision of incentives and appropriate support and the development of agricultural infrastructure and services to enhance the productivity and efficiency of the sector in Iraq and Algeria.

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