The Exchange Rate and its Impact on Egyptian Agricultural Exports and Imports

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ABSTRACT

The research aimed mainly at studying the impact of the exchange rate on the value of Egyptian agricultural exports and agricultural imports during the period (2000-2022). The research used the vector auto regression model (VAR) through using the Dickey Fuller test and Granger causality test to examine a causal relationship among these variables. The results showed that is a significant direct relationship between the exchange rate and agricultural exports which an increase by 10% in the exchange rate will leads to an increase by 13.4% in the value of agricultural exports. However, the results proved that there is no cointegration relationship between these two variables, and the results also showed that there is no causal relationship between them. Also, the results shows there is a significant direct relationship between the exchange rate and agricultural imports, and this isn't consistent with the economic theory because imports are inflexible, and most of the production inputs are imported from abroad, and there is no cointegration relationship or a causal relationship between these two variables.

Keywords: Cointegration relationship – VAR Model - Exchange rate – Lag period - Agricultural Exports.

INTRODUCTION

Given that Egypt is a net importer of food and most of the intermediate, final and industrial consumer goods and products, it is necessary to provide more foreign currencies to meet the needs of the country and the foreign trade sector in terms of these currencies. For a long time, Egypt has been suffering from a crisis in the exchange rate of foreign currencies due to the Egyptian pound deterioration against these currencies and as a result of the increase in demand for these foreign currencies over the supply. This crisis affects the economic sectors, in particular the agricultural sector, such as the foreign trade of food and agricultural commodities. As a result of the previous years, the country liberalized the exchange rate of the Egyptian pound against foreign currencies at the beginning of November 2016, to be determined according to the mechanisms of supply and demand, passing through its liberalization in October 2022 (Egypt has adopted a policy of reduction the Egyptian pound to correct the imbalance in the trade balance, in line with the recommendations of the International Monetary Fund and donor international financial institutions, in case of applying for loans from these international institutions) (Ali et al., 2016), and the economic crises at this period included as a result of the Corona pandemic and its impact on the world's economies, in addition to climate changes and their impact on the agricultural sector and finally the Russian-Ukrainian crisis. All of this led to an unprecedented rise in global and domestic prices of agricultural and food commodities, which was accompanied by a significant rise in inflation rates (Rehan et al., 2009).

WHAT JUSTIFICATIONS DO I HAVE TO SEARCH ABOUT? (Search problem)

The problem of the research is the occurrence of fluctuations in both of the agricultural trade balance and agricultural trade as a result of the liberalization of the exchange rate. The agricultural trade balance fluctuations are due to the rise in the value of agricultural imports at a rate greater than the value of agricultural exports, which led to a rise in the prices of imports of agricultural intermediate and final commodities because of the liberalization of the exchange rate.

WHY DO I CONDUCT THIS RESEARCH? (Objectives)

The research aims to study the impact of the exchange rate on the value of Egyptian agricultural exports and agricultural imports, through the econometric model during the period (2000-2022).

DATA SOURCES AND TIME BOUNDRIES

The research depends on secondary data published by the National Bank of Egypt (NBE) (https://www.nbe.com.eg), the Central Agency for Public Mobilization and Statistics (CAPMAS) (https://www.capmas.gov.eg), Central Bank of Egypt (CBE) (https://www.cbe.org.eg), in addition to studies, scientific books, a number of research papers and theses, related to the subject.

The data from the period 2000-2022 was used to measure the effect of liberalizing the exchange rate on agricultural foreign trade (the value of Egyptian agricultural exports and imports).

HOW WAS THE RESEARCH HYPOTHESIS MEASURED? (Measurement procedure)

The regression model approach was used to explain the impact of the exchange rate liberalizing on agricultural foreign trade, the value of Egyptian agricultural exports and imports, the model used here is the vector auto regression model (VAR). In our case, several steps are taken to estimate this model. First, it is necessary to conduct unite root test by using the Dickey Fuller test to examine the stationary of the time series of the variables (Shrestha and Bhatta, 2018). Second, we run a Granger causality test was conduct to determine whether there is a regression, cointegration, or causal relationship between (x) that explains changes in variable y in at least one way or opposite. Then Phillips-Perron Test, Akaike Information Criterion (A.I.C), Bayesian Criterion are conducted to determine the lagged periods.

MODEL SPECIFICATION

The regression method was used to explain the effect of liberalizing the exchange rate on agricultural foreign trade during the period (2000-2022) (Saleh, 2018). The method of Ordinary Least Squares (OLS) was used because it is the best because it is based on minimizing the sum of squares error at a significant level of 0.05. And the model is formulated as follows:

$\hat{Y}_i = f(x)$
$\hat{Y}_i = \alpha + \beta\, x_i + e$
Where,
$\hat{Y}_1$ is value of Egyptian agricultural exports.
$\hat{Y}_2$ is value of Egyptian agricultural imports.
X= The exchange rate.

α= constant., β = coefficient or slope.

e = Random error.

Results of Estimating

1. Concepts and indicators development

Data in Table (1) shows Egypt's total value of agricultural exports during 2000-2022 averages to US$ 2724 million ranging between of US$ 510 million as a minimum in 2000 and US$ 6436 million as a maximum in 2021. Table (2) presented the results of regression analysis of the value of Egypt's total agricultural exports, reveal that it proven a significant increasing, amounting to US$ 0.13 million and an annual growth rate of 13%.

As for Egypt's total value of agricultural imports during 2000-2021, data presented in Table (1) reveal that Egypt's total agricultural imports reached an average of US$ 9561 million, ranging between US$ 2262 million as a minimum in 2003 and US$ 19142 million as a maximum in 2021. Table (2) shows the regression equation analysis; reveal a significant increasing, amounting to US$ 0.11 million and an annual growth rate of 11%.

Turning to Egypt's agricultural balance, data presented in Table (1) reveal that it realized deficits over the period 2000-2022 reached an average of US$ 6837 million, ranging between US$ 1378 million as a minimum in 2004 and US$ 12705 million as a maximum in 2021. Results of regression analysis reveal that the deficits of Egypt's agricultural balance followed a statistically significant increasing amounting to US$ 0.10 million and an annual growth rate of 10%.

Table 1. Agricultural exports, imports and agricultural balance During the Period 2000-2022

Indicators	Aver.	Mini. Value		Max. Value	
		Value	Year	Value	Year
Agricultural Exports (US$ Million)	2724	510	2000	6436	2022
Agricultural Imports (US$ Million)	9561	2262	2003	19142	2022
Agricultural balance (US$ Million)	(6837)	(1378)	2004	(12705)	2022

() Negative value.
Source (data collected and calculated): https://www.capmas.gov.eg

Table 2. Simple Regression Equations for indicators of Agricultural exports, imports and agricultural balance During the Period 2000-2022

Indicators	Equation	R^2	F_{test}	Change rate (%)
Agricultural Exports (US$ Million)	$\widehat{LnY}_i = 6.18 + 0.13\, X_i$ $(19.93)^{**}$	0.95	397.37**	13
Agricultural Imports (US$ Million)	$\widehat{LnY}_i = 7.68 + 0.11\, X_i$ $(11.84)^{**}$	0.88	140.13**	11
Agricultural balance (US$ Million)	$\widehat{LnY}_i = 7.41 + 0.10\, X_i$ $(8.25)^{**}$	0.77	67.98**	10

Notes: ** : significance at 1% .
Source (data collected and calculated): https://www.capmas.gov.eg

Estimation of the impact of the exchange rate on each of agricultural exports & imports and the agricultural balance

- Time series stability test:

Augmented Dickey-Fuller Test was conducted to determine the studied variables stability. Table (3) shows the instability of studied variables at order of I(0) which mean these variable has unite root. After obtaining First differences, the variable is stable, and integrated at order I (1). This results consistent with the standard theory Which assumes that most of the economic variables are unstable at the zero level I(0), but become stable when the first difference is obtaining for them.

Thus, the results show an long run relationship between variables and all variables have the same degree of integration, therefore, OLS will be used for its preference to relate the values of these variables in short run and their equilibrium path in the long run. These variables cannot move independently of one another.

1- The relationship of the exchange rate and the agricultural exports by using (OLS):

- Model results:

Results presented in Table (4) reveal that the coefficient of determination was reached 0.7, which means that the exchange rate explains about 70% of the fluctuations in the agricultural exports value, and this indicates the strength of the impact of the exchange rate.

The sign of the dependent variable coefficient shows, there is a significant direct relationship between the exchange rate and agricultural exports, and this is consistent with the economic theory. The explanation for this is the higher the value of exchange rate, the lower value of the Egyptian pound, result leads to a decrease in the costs of the local production elements from the point of view of abroad, which leads to a decrease in local prices compared to international prices, which leads to an increase in the demand for local commodities and then an increase in the agricultural exports value. As an increase in the exchange rate by 10% will leads to an increase in the agricultural exports value by 13.4%.

The Augmented Dickey-Fuller Test was tested to determine the residual stability for agricultural exports. Table (5) shows that T-statistic lowers than tabulated critical values at different significant levels. This means the instability of the residual series, which confirms the absence of a co-integration relationship between the exchange rate and agricultural exports.

Table 3. Unit root Test for studied variables using the Augmented Dickey–Fuller test

Variable	Order	With intercept	With intercept and trend	Without intercept and trend	case of integration
Agricultural exports	Level	-0.875	-3.24	3.51	Not stable
	Difference	-3.24**	-3.15**	-2.98**	stable I(1)
Agricultural imports	Level	-0.834	-2.72	1.66	Not stable
	Difference	-4.62**	-4.16**	-1.24	stable I(1)
Exchange rate	Level	-0.97	-1.32	2.16	Not stable
	Difference	-2.94*	-3.14	-2.84*	stable I(1)

** 0.01 significance level.
Source: Author's results by using EViews 9.5.

Table 4. OLS results for Agricultural exports During the Period 2000-2022

Indicators	Equation	R^2	F_{test}	P-Value
Agricultural Exports	$\widehat{LnY}_i = 4.9 + 1.34\ LnX_i$ $(6.96)^{**}$	0.71	48.44	**

Notes: ** : significance at 1% .
Source: Author's results by using EViews9.5.

Table 5. ADF test results for Residual of Agricultural exports

	Level	t-Statistic	Porb.*
ADF test statistic		-1.1254	1.1583
	1%	-2.347	
Test critical values	5%	-1.6891	
	10%	-1.2156	

Source: Author's results by using EViews9.5.

Table 6. VAR Lag Order Selection Criteria for agricultural exports

Lag	LogL	LR	FPE	AIC	SC	HQ
0	8.351	NA	0.00241	-0.7915	-0.73201	-0.7532
1	35.292	39.378*	5.36e-05*	-4.172*	-3.6541*	-4.0514*
2	37.253	1.2363	6.24e-05	-3.413	-3.2146	-3.3566
3	38.6221	1.5841	0.000112	-2.9412	-2.7963	-2.875

* indicates lag order selected by the criterion.
LR: sequential modified LR test statistic (each test at 5% level).
FPE: Final prediction error.
AIC: Akaike information criterion.
SC: Schwarz information criterion.
HQ: Hannan-Quinn information criterion.
Source: Author's results by EViews9.5.

Reviewing the results of lag exclusion for VAR model based on criteria values of (AIC), (SBC) and LR test statistic as criteria for excluding unsuitable lag period which obtained in Table (6), reveal that the best lag period is one lag period, that means the exchange rate in the previous year affect the agricultural exports this year.

The test of Granger Causality indicated that the changes in exchange rate isn't responsible for the changes in agricultural exports (Table 7). Also, the change in agricultural exports does not cause changes in the exchange rate, meaning there is no causal relationship between the two variables.

Table 7. Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
Exch. does not Granger Cause Ag.exp		0.1294	0.7832
Ag.exp. does not Granger Cause Exch,	21	1.6396	0.2186

Source: E-Views9 results.

2- The relationship of the exchange rate and the agricultural imports by using (OLS):

- Model results:

Results presented in Table (8) reveal that the coefficient of determination was reached 0.53, which means that the exchange rate explains about 53% of the fluctuations in the value of agricultural imports.

The sign of the dependent variable coefficient shows, there is a significant direct relationship between the exchange rate and agricultural imports, and this isn't consistent with the economic theory and this is due to the fact that the decrease in imports is not equal to the increase in the exchange rate, which is led to an increase in the value of imports, and that most of the production requirements are imported from abroad. The increase in the exchange rate by 10% will leads to an increase in the agricultural imports value by 10.5%.

The Augmented Dickey-Fuller Test was tested to determine the residual stability for agricultural imports. Table (9) shows that T-statistic bigger than tabulated critical values at different significant levels. This means the stability of the residual series, which prove the existence of a co-integration relationship between the exchange rate and agricultural imports.

Reviewing the results of lag exclusion for VAR model based on criteria values of (AIC), (SBC) and LR test statistic as criteria for excluding unsuitable lag period which obtained in Table (10), reveal that the best lag period is one lag period, that means the exchange rate in the previous year affect the agricultural imports this year.

Table 8. OLS results for Agricultural imports During the Period 2000-2022

Indicators	Equation	R^2	F_{test}	P-Value
Agricultural Exports	$\widehat{LnY}_i = 6.81 + 1.05\, LnX_i$ $(4.72)^{**}$	0.53	22.24	**

Notes: ** : significance at 1% .
Source: Author's results by using EViews9.5.

Table 9. ADF test results for Residual of Agricultural imports

	Level	t-Statistic	Porb.*
ADF test statistic		-3.8167	0.0011
	1%	-2.9515	
Test critical values	5%	-2.1796	
	10%	-1.8373	

Source: Author's results by using EViews9.5.

Table 10. VAR Lag Order Selection Criteria for Agricultural imports

Lag	LogL	LR	FPE	AIC	SC	HQ
0	7.6186	NA	0.003515	-0.5814	-0.4589	-0.5482
1	40.3754	52.4936*	7.756e-05*	-4.2656*	-3.8422*	-4.1532*
2	42.3657	5.68169	7.9514e-05	-4.1552	-3.6112	-4.1225
3	48.2189	4.8454	8.1541 e-05	-4.2935	-3.2581	-4.14025

* indicates lag order selected by the criterion.
LR: sequential modified LR test statistic (each test at 5% level).
FPE: Final prediction error.
AIC: Akaike information criterion.
SC: Schwarz information criterion.
HQ: Hannan-Quinn information criterion.
Source: Author's results by using EViews9.5.

Turning to the Granger Causality test, results indicate that the changes in exchange rate isn't responsible for the changes in agricultural imports (Table 11). Also, the change in agricultural imports does not cause changes in the exchange rate, meaning there is no causal relationship between the two variables.

Table 11. Granger Causality Tests Agricultural imports

Null Hypothesis:	Obs	F-Statistic	Prob.
Exch. does not Granger Cause Ag.imp	21	0.4825	0.5146
Ag.imp. does not Granger Cause Exch,		0.3736	0.5246

Source: E-Views9 results.

CONCLUSION

From previously reviewed, results can be summarized:

First: In spite of a significant direct relationship between the exchange rate and agricultural exports, the reality of the results proved that there is no cointegration relationship between these two variables, and the results also showed that there is no causal relationship between them.

Second: a significant direct relationship between the exchange rate and agricultural imports is inconsistent with the economic theory, because imports are inflexible, and most of the input requirements are imported from abroad, and there is no cointegration relationship or a causal relationship between these two variables.

Recommendation

- Devoting high attention to evaluate the exchange rate of the Egyptian pound according to a different of foreign currencies.

- According to the increase in agricultural exports matching to the increase in the exchange rate, global markets for Egyptian agricultural commodities must be studied and Devoting high attention to improving the quality of commodities that are consistent with consumer demand in importing countries.

- Act to rationalize and reduce consumption to reduce the imported quantity and thus reduce the value of imports.

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الملخص العربي

سعر الصرف وأثره على الصادرات والواردات الزراعية المصرية

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يهدف البحث بشكل رئيسي إلى دراسة تأثير سعر الصرف على قيمة الصادرات والواردات الزراعية المصرية خلال الفترة (2000 – 2022). استخدم البحث نموذج الانحدار التلقائي المتجه (VAR) من خلال استخدام اختبار ديكي فولر وكذلك اختبار مدي وجود علاقة سببية أو تبادلية بين تلك المتغيرات باستخدام اختبار جرانجر للسببية. أظهرت النتائج وجود علاقة طردية ذات دلالة إحصائية بين سعر الصرف والصادرات الزراعية، حيث تؤدي زيادة سعر الصرف بنسبة 10% إلى زيادة قيمة الصادرات الزراعية بنسبة 13.4%، إلا أن النتائج أثبتت عدم وجود علاقة تكامل مشترك بين هذين المتغيرين، كما أظهرت النتائج عدم وجود علاقة سببية بينهما. كما أظهرت النتائج وجود علاقة طردية ذات دلالة إحصائية بين سعر الصرف والواردات الزراعية حيث أن زيادة سعر الصرف بنسبة 10% تؤدى إلى زيادة قيمة الواردات الزراعية بنسبة 10.5%، وهذا لا يتفق مع النظرية الاقتصادية ويرجع ذلك إلى أن الواردات غير مرنة، كما أن معظم مستلزمات الانتاج مستوردة من الخارج، وأوضحت النتائج عدم وجود علاقة تكامل مشترك أو علاقة سببية بين هذين المتغيرين.

الكلمات المفتاحية: علاقة التكامل المشترك – نموذج VAR – سعر الصرف – فترة الابطاء – الصادرات الزراعية.