مجلة تنمية الرافدين

Research Paper

Measuring and Analyzing the Impact of Macroeconomic Variables on Agricultural Exports in Egypt for The Period 1990-2022

Rihal Subhi Qasim [1] ,Iman Mustafa Rashad[2]

[1]Department of Agricultural Economics, College of Agriculture and Forestry, University of Mosul, Mosul, Iraq.
[2]Department of Economics, College of Administration and Economics, University of Mosul, Mosul, Iraq.

Corresponding author: Rihal Subhi Qasim
rihal.subhy@uomosul.edu.iq

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Abstract

This study aims to examine the impact of some macroeconomic variables on Egyptian agricultural exports, which are characterized by their low relative importance in total export values. The research problem is that Egypt's agrarian exports suffer from several structural imbalances. The study relied on two approaches: the first is descriptive and relies on theoretical research, and the second is quantitative and relies on standard economic methods and techniques. To achieve the study objective, a standard model was adopted that included several variables, including agricultural output values, foreign direct investment, exchange rate, inflation rate, and agricultural support as independent variables. In contrast, the values of agricultural exports were adopted as a dependent variable during the period 1990-2022, based on the hypothesis that several macroeconomic variables play different roles in the values of agricultural exports in Egypt. The study reached several conclusions, the most important of which is that most macroeconomic variables contributed to enhancing agricultural exports in the short and long term. It also made several recommendations, the most important of which is adopting agricultural policies that work to achieve economic efficiency and competitiveness in Egyptian agriculture, especially in the field of producing crops designated for export, because this type of policy leads to increased interdependence between countries, especially in the aspect related to exports, and in a more effective manner.

Keywords:
Agricultural exports, Foreign exchange rate, Macroeconomic

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ورقة بحثية

قياس وتحليل أثر المتغيرات الاقتصادية الكلية في الصادرات الزراعية في مصر للمدة ١٩٩٠ – ٢٠٢٢

رحال صبحي قاسم[1]، ايمان مصطفى رشاد[2]

[1] قسم الاقتصاد الزراعي، كلية الزراعة والغابات، جامعة الموصل، الموصل، العراق.
[2] قسم الاقتصاد، كلية الإدارة والاقتصاد، جامعة الموصل، الموصل، العراق.

المؤلف المراسل: رحال صبحي قاسم (rihal.subhy@uomosul.edu.iq)

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المستخلص

يهدف البحث إلى دراسة تأثير عدد من المتغيرات الاقتصادية الكلية على الصادرات الزراعية المصرية والتي تتميز بانخفاض أهميتها النسبية في إجمالي قيم الصادرات. وتتلخص مشكلة البحث في أن الصادرات الزراعية المصرية تعاني من عدد من الاختلالات الهيكلية. واعتمدت الدراسة على منهجين: الأول وصفي ويعتمد على البحوث النظرية في الموضوع، والثاني كمي ويعتمد على الأساليب والتقنيات الاقتصادية القياسية. ولتحقيق هدف البحث تم اعتماد نموذج قياسي شمل عدد من المتغيرات منها قيم الناتج الزراعي والاستثمار الأجنبي المباشر وسعر الصرف ومعدل التضخم والدعم الزراعي كمتغيرات مستقلة، بينما تم اعتماد قيم الصادرات الزراعية كمتغير تابع خلال الفترة 1990–2022، وذلك انطلاقاً من فرضية مفادها أن هناك عدد من المتغيرات الاقتصادية الكلية التي تساهم بأدوار مختلفة في قيم الصادرات الزراعية في مصر. وتوصل البحث إلى عدد من الاستنتاجات اهمها ان معظم المتغيرات الاقتصادية الكلية ساهمت في تعزيز الصادرات الزراعية في الأمدين القريب والبعيد وعدد من التوصيات اهمها تبني سياسات زراعية تعمل على تحقيق الكفاءة الاقتصادية والتنافسية في الزراعة المصرية ولاسيما في مجال انتاج المحاصيل المخصصة للتصدير لأن هذا النمط من السياسات يؤدي الى تزايد الاعتماد المتبادل بين الدول ولاسيما في الجانب المتعلق بالصادرات وبصورة اكثر فاعلية.

الكلمات الرئيسة:

صادرات زراعية، سعر الصرف الأجنبي، الاقتصاد الكلي

مجلة

تنمية الرافدين

***(TANRA):* مجلة علمية، فصلية، دولية، مفتوحة الوصول، محكمة.**

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1. Introduction

Agricultural exports are a key component of international economic relations as they operate in a single financial and global system, and contribute to the transfer of many countries from consumers and importers to producers and exporters, in addition to their role in achieving transformations structure of their economies by providing consumer and production goods is a measure through which the degree of trade openness to the world can be known. In this regard, economic policymakers in many countries realized the importance of adopting outward-oriented trade and free market policies because of their vital role in raising economic growth rates, which was achieved in Southeast Asian countries. Therefore, Feder 1982 and Krueger 1990 emphasized the importance of exporting for its prominent role in raising economic growth rates.

Macroeconomic variables are one of the most important ways to measure the efficiency of agricultural trade performance, especially agricultural exports, by providing incentives to producers and considering the characteristics and nature of the farming sector. Therefore, studying the impact of these variables helps agrarian policy makers in setting trade policies appropriate to the reality of the agricultural industry, especially in Egypt, which is characterized by a low volume of exports compared to the volume of its agricultural imports, which requires more foreign currencies to the extent that it has caused a deficit in its agrarian trade balance and then in the balance of payments. The continuation of this situation will lead to a decline in agricultural growth rates and exports, which reflects its impact on the inability to achieve agrarian development goals and plans, leading to a widening of the food gap for most crops and a decline in the required growth rate.

1.2.Research Problem

Agricultural exports in Egypt face several structural imbalances, as its exports are concentrated in a limited number of products with low internal demand elasticity. At the same time, its imports of various types of goods are numerous and varied, so they have become net imports of most agricultural products produced by developed countries. This has been accompanied by the impact of several macroeconomic variables (total agrarian output, foreign direct investment in agriculture, foreign exchange rate, inflation rate, agricultural support) on these exports.

1.3.The Study's Importance

The investigation of the relationship between agricultural exports and the variables of macroeconomics is considered crucial, imposed by the contemporary historical stages that the global economy is going through, which proved that the farming sector in developed countries contributes significantly to achieving high rates of economic growth and is characterized by global production characteristics and large agricultural surpluses are concentrated in it, enabling it to excel in its production center and overcome the law of diminishing returns, which created desirable economic effects for exporting countries and undesirable for importing countries. This was reflected in

the adverse impact on the performance of Egyptian agricultural trade, especially in its agricultural exports.

1.4. Study Objectives

The changes in the structure of agricultural exports have a practical impact on the structure of farm costs in the Egyptian economy, in which the export sector plays a significant role in achieving balance and proportionality between production and import activity by providing the foreign exchange resources necessary to implement agricultural development plans. Therefore, the study aims to: Estimating and analysing the effect of some macroeconomic factors on agricultural exports in Egypt during the years 1990-2022.

1.5.The Research Hypothesis

This study is grounded in the hypothesis that the macroeconomic variables contribute differently to the performance of agricultural exports in Egypt, as explained below:

1. There is a direct and significant relationship between (total agricultural output, foreign direct investment, agricultural support) and agricultural exports.
2. There is a significant positive relationship between (foreign exchange rate, inflation rate) and agricultural exports.

1.6.Method

A quantitative approach was adopted, relying on econometric methods and techniques. This involved measuring and analysing the effects of macroeconomic variables on agricultural exports using time series data for the variables in question over the duration of the study.

2. Literature review

Agricultural exports are key part of the most consequential economic domains in implementing agrarian development plans and programs, and their relative importance changes depending on the impact of macroeconomic variables, as exports are one of the principal elements for enhancing growth and economic integration between countries. The development of the economies of developing countries and their growth and increasing the national product represent a fundamental factor contributing to the development of agricultural exports, which developing countries are trying to increase permanently through concluding bilateral and collective trade agreements and implementing agricultural foreign trade financing programs.

Agricultural exports are affected by several macroeconomic variables that were planned by several capitalist countries through the establishment of the United Nations

and its affiliated financial and international institutions, including the International Bank for Recons-truction and Development, the International Monetary Fund, and then the GATT Agreement in 1947, considering that these variables lead to expanding the volume of trade and agricultural exchange, which results in reducing production costs, doubling profits, and enhancing the competitive capabilities of exported agricultural products. In this regard, we decided to present several studies that addressed the subject of our study and rely on them to analyze and discuss the research problem.

In 2018, Al-Khatib explained in her study on the impact of changes effect of changes exchange rate of the Egyptian pound on agricultural exports that the exchange rate is a link between global economies and a measure of the volume of their trade transactions. It plays an essential role in the overall balance of the economy through its relationship with macroeconomic variables. It is considered one of the economic and financial indicators that express the efficiency of the economic performance of any country. Therefore, most countries in the world seek to adopt policies that ensure the stability of their currency exchange rates to avoid sudden fluctuations that occur in currency values from time to time. This variable is of great importance in economically open countries, as the rise in the exchange rate of the local currency leads to a rise in the prices of their exports, which reduces their agricultural exports and reflects this impact on their revenues from foreign currencies. The opposite happens if the exchange rate of the local currency falls against other currencies.

In 2020, Khan et al. explained in their study on the effect of macro variables on Pakistani agricultural exports that the agricultural sector represents the primary sector in the national economy as it contributes to providing the most significant possible amount of foreign currencies through its agricultural exports, which the state relies on to implement its development programs and plans. Therefore, the study strived to analyse the influence of several macro variables on the agricultural exports of the state above during the period 1976-2016 using an autoregressive model. The joint integration test appeared long-term associations for the selected variables and the emergence of a positive significance for several macro variables in the aforementioned exports during the research period. The researchers recommended maximizing the role of macro variables with positive effects and reducing the impact of variables with adverse effects on agricultural exports.

In 2023, Ikenna et al., in their study on the effect of inflation and exchange rate on agricultural exports, explained that these exports are one of the most important channels for providing foreign exchange for Nigeria. This is accompanied by the fact that Nigeria is witnessing a significant population growth that plays a role in supporting the agricultural sector at low costs, in addition to the presence of vast areas of land and large numbers of rivers, streams, lakes, forests and pastures. Therefore, its agricultural exports and trade have become the main channel for generating its national income. According to a report issued in 2015, its agricultural exports constituted 70% of its total exports and 65% of its GDP, and it achieved the largest possible amount of foreign exchange needed to import raw materials, high-yield inputs and capital goods that contributed to strengthening its infrastructure necessary for achieving its economic

and agricultural growth. It is affected by the changes in the inflation rate that appeared during the period 1973-1974, and when the oil sector dominated the economy of the aforementioned state, this was accompanied by fluctuations in the exchange rate of its local currency against the dollar, which gave negative results in its agricultural trade. The researchers concluded that the exchange rate has a positive and important relationship with the values of agricultural exports. As for the inflation rate, its relationship was not positive with the agricultural trade of the aforementioned state

3. The Theoretical Aspect of the Standard Model Used in the Estimation

This section focuses on studying the estimation results of the impact of certain macroeconomic factors on agricultural exports in Egypt. as it was concerned with investigating the estimation results of the effects of some macroeconomic variables represented by (total agrarian output, foreign direct investment in agriculture, foreign exchange rate, inflation rate, and agricultural support) on the dependent variable represented by (Agricultural exports) of the country mentioned above for the period 1990-2022. Accordingly, this will be achieved using standard dynamic models including the Autoregressive Delayed Lag (ARDL) model as well as the Error Correction and Co-Integration model which will give biased and unbiased standard estimates for the study sample by using the program (EViews-12) which is one of the basic programs used in standard economic analyses.

Many modern tests can be used to verify the presence or absence of stability in the time series of the study variables, i.e., to examine the stability property between economic variables. The most important and most common in modern studies is the Dickey & Fuller test, as it is one of the tests widely used to indicate the time series' stability, to prevent autocorrelation issues in the random error limit when the time series data becomes unstable at the level, we will resort to taking the first or second difference, and this test takes three formulas (Gujarati, 2014,816) which are: Formula 1: Having only a fixed limit (Intercept):

$$\Delta Y_t=\alpha + \gamma y_{t-1}+ \sum_{r}^{k}=1 P_i Y_{t-i} +ut \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

The second formula is the existence of a general trend (trend and intercept) and a specified limit:

$$\Delta Y_t= \alpha+\beta t +\gamma y_{t-1}+ \sum_{r}^{k}=1 P_i Y_{t-i} +u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

The third formula: There is no fixed limit and no general direction (None):

$$\Delta Y_t= \gamma y_{t-1}+ \sum_{r}^{k}=1 P_i Y_{t-i} + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Therefore, to ensure that the time series used in the estimation suffers from a unit root or not (in other words, is it stable or unstable)? The following hypotheses will be tested (Dickey, 1981, p. 1057):

Null hypothesis: states that the time series is unstable, i.e., there is a unit root.

1. The alternative hypothesis states that the time series is stable, i.e., no unit root. Time lag periods are determined to ensure that random errors are not correlated. For example, let us take the first difference of one of the study variables. It turns out that the autocorrelation problem has disappeared. We will suffice with this difference, but if it does not disappear, we will resort to the second difference (Gujarati, 2011, pp. 222-224).
2. Determining the optimal lag periods: In this step, the optimal lag periods for the model are determined, through which the problem of autocorrelation of the error term is eliminated. In order to determine the number of lag periods, there is a set of criteria that are used for this purpose, as the Akaike Information Criterion (AIC) was relied upon to identify the optimal lag periods for the model, which eliminates the model of the autocorrelation problem of the error term. Increasing the lag periods will increase missing values and thus decrease degrees of freedom (Hamadi, 2012, pp. 110-111).
3. Cointegration Test: The bounds methodology test is conducted at this stage to determine whether there is a long-run relationship between the study variables. The following assumptions will guide using the Pesaran bounds methodology F test to assess its validity: The null hypothesis (H0) asserts that the variables under investigation do not exhibit a long-run equilibrium relationship. The alternative hypothesis (H1) asserts the opposite. The critical values of the upper and lower bounds are compared with the calculated F test value. (Al-Bajari and Al-Mashhadani, 2019, 173-174).
4. Estimating the Ardle Coefficients Model: The conventional cointegration tests require that the time series to be tested for cointegration are integrated to the same degree and at levels other than their original levels, which explains the limited use of these tests. However, there is an alternative test, as a cointegration approach represented by the ARDL model, and this model has turned into widely utilised in current years. This model was published by Pesaran and Smith (1995), (1999), (1998), Pesaran and Smith (2001), and Pesaran et al (Hussein & Abdullah, 2022, pp. 101-102). One of the notable features of this model is its ability to be applied to variables of the same order (i.e., at the first level or a different level) or a combination of the two, as long as the variables are of the first order only and not the second order. The cointegration methodology has better properties than other methods that require large samples, mainly when used with small samples (Al-Bajari & Al-Mashhadani, 2019, pp. 173-174).
5. Final tests (post-model estimation tests): After completing the estimation of the model parameters, a set of tests will be conducted, which are as follows:

- **Model performance quality testing:** Before the estimated model performance is certified, diagnostic tests must be carried out to guarantee its quality. These tests include the following:
    - Diagnostic tests for residuals in the model.
    - Testing multicollinearity between model variables.
    - Verifying the structural integrity of model parameters.
    - Evaluating the model's ability to predict.
    - Predictive performance, the most important of which are:
        - Thiel's non-equivalence coefficient.
        - Non-equivalence ratio criterion: It consists of three ratios: the bias ratio (BP), the variance ratio (VP), and the covariance ratio (CP).

4. Description the Standard Model

This section deals with the theoretical aspect of the standard study and the model used in this study, as follows:

$Y = F(X1, X2, X3, X4, X5) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$

Where:

Y: The dependent variable was expressed in agricultural exports (million dollars).

X1: Total agricultural output (million dollars).

X2: Foreign direct investment in agriculture (million dollars) is described as an investment that seeks to achieve a lasting management impact (10 per cent or more of voting power) in a company working in a foreign economy .

X3: Foreign exchange rate (the value of local currency in terms of another currency)

X4: Inflation rate Inflation rate is described as the ratio of change in the level of price for a basket of products in an economy through a particular period.

X5: is the monetary worth of gross transfers to agriculture each year from consumers and taxpayers due to government policies benefiting agriculture regardless of their purpose and economic impacts. In order to identify the sources of data for the variables and the temporal and spatial boundaries of the study, we will follow the following methodology in two stages:

4.2. Describing the Model Indicators and Determining their Data Sources

After reviewing many previous studies and conducting a survey on their variables, the most significant number of independent variables that significantly impacted the dependent variable was identified. The data sources for these variables were obtained from the databases of the World Bank (WB), the International Monetary Fund (IMF), the Ministry of Planning/Central Agency for Statistics and Information Technology (COS), and the Food and Agriculture Organization (FAO).

4.3.The Temporal and Spatial Boundaries of the Study

In order to estimate and analyze formula (4), we must determine the spatial and temporal boundaries of the study as follows:

- Temporal boundaries: The study covered annual data for time series ranging from 33 years, 1990 to 2022.
- Spatial boundaries: Egypt was chosen, which reflects the extent of the direct and indirect influence of the independent variables on the dependent variable.

From the above and formula (4), the autoregressive lag model (ARDL) will be estimated according to the following standard formula:

$$Y = \alpha_0 + \beta_1 Y_{t-1} + \beta_2 X1_{t-1} + \beta_3 X2_{t-1} + \beta_4 X3_{t-1} + \beta_5 X4_{t-1} + \beta_6 X5_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots (5)$$

Whereas:

The constant term is α0, whereas the long-term factors β1, β2, β3, β4, β5, and β6 control the long-term relationship between the variables in question. The dependent variable, Y, and the error correction coefficient, ECM, must be negative, less than -1, and statistically significant for error correction to occur and for the possibility of returning to the equilibrium state. The random variable, or εt, includes all variables not part of the model used for estimation.

4.4. Measuring and Analysing the Influence of Some Macroeconomic Variables on Agricultural Exports in Egypt for the years 1990-2022[1]

Unit Root test: Table 1 shows that the first dependent variable appeared stable at the level, meaning it does not contain a unit root. The rest of the study variables (independent) became stable after taking their first differences, which means accepting the null hypothesis. This means that these variables have a unit root due to the probability value for testing them was insignificant.

Table (1). Unit Root Test for Macro Variables in Egypt

Unit Root Test Table by: ADF							
At Level							
Variables		Y1	X1	X2	X3	X4	X5
Intercept	t-Stat.	-0.1286	0.2028	-1.0173	0.4760	-3.2048	-0.4014
	Prob.	0.9375	0.9672	0.7340	0.9831	0.0289	0.8973
	Decision	No	No	No	No	**	No
	t-Stat.	-2.8387	-3.2730	-5.2619	-1.6079	-3.2275	-2.7727

[1] (Note): All tables were prepared by the researchers based on the results of the statistical analysis of the Eviews 12 program.

Trend & Intercept	Prob.	0.1948	0.0930	0.0009	0.7666	0.0971	0.2169
	Decision	No	*	***	No	*	No
None	t-Stat.	1.8697	2.2266	0.5626	1.8979	-1.5653	1.3641
	Prob.	0.9830	0.9918	0.8321	0.9841	0.1090	0.9535
	Decision	No	No	No	No	No	No
At First Difference							
Variables		d(Y1)	d(X1)	d(X2)	d(X3)	d(X4)	d(X5)
Intercept	t-Statist.	-7.2135	-6.1607	-6.7784	-4.0564	-6.6879	-5.3596
	Prob.	0.0000	0.0000	0.0000	0.0037	0.0000	0.0001
	Decision	***	***	***	***	***	***
Trend & Intercept	t-Statist.	-7.1681	-5.8512	-6.6512	-4.2582	-6.6639	-5.2971
	Prob.	0.0000	0.0004	0.0000	0.0113	0.0000	0.0008
	Decision	***	***	***	**	***	***
None	t-Statist.	-6.5992	-6.3925	-6.5919	-3.7528	-6.7906	-5.1006
	Prob.	0.0000	0.0000	0.0000	0.0005	0.0000	0.0000
	Decision	***	***	***	***	***	***

(Note): (***, **, *, No) indicate a significance level (1%, 5%, 10%, no significance) respectively.

2. Optimal slowdown period: The criterion utilised to identify the optimal slowdown periods is the AIC criterion, as the model to be chosen is (1, 2, 2, 2, 0, 2).

3. Co-integration test: Table 2 shows that the computed value of (F) reached (13.404), which is important and larger than the tabular value of (F) at both limits. This implies that the alternative hypothesis will be accepted, and cointegration exists

Table (2). Co-integration Test for Total Variables in Egypt

Bounds test Approach				
Test Stat.	Value	Sign.	I(0)	I(1)
F- Stat.	13.404335	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

4.1. Short-term relationship results:-

The error correction coefficient test predicted the model's return to equilibrium, and its value reached -0.937275 at a significance level below 1%. This implies that, in the long run, it will take Egypt's model imbalance one year and one month to return to

its equilibrium value following the effects of the shocks: 1/(-0.937275) = 1.06 ≅1.1 years.

Total agricultural output has a significant and positive impact on agricultural exports, i.e. increasing agricultural output by one unit leads to increasing agricultural exports by (0.0015) units, and the positive sign of this variable parameter means that agricultural production has covered the needs of the local market with a surplus that was exported to foreign markets. However, in the first slowdown period, the relationship between agricultural output and agricultural exports was inverse, i.e. increasing agricultural output by one unit will lead to reducing agricultural exports by (0.0140) units, as the reason for this is Egypt's loss of a number of its markets in Iraq, Libya and Syria due to the abnormal conditions there, in addition to the scarcity of raw materials used in the exported food industries, which led to a decline in the activity of the aforementioned exports.

Foreign direct investment has a moral and positive impact on agricultural exports, meaning that increasing foreign investment by one unit increases agricultural exports by 0.252 units. This relationship is compatible with the concepts of economic theory that explains the positive relationship between foreign direct investment and exports, as foreign direct investment affects the export system directly through export operations carried out by foreign companies, and can affect indirectly by encouraging companies in the agricultural sectors and providing them with more experience and skills, which results in increased exports. However, in the first slowdown period, the relationship appeared inverse, meaning that increasing foreign investment by one unit leads to a decrease in agricultural exports by (0.322) units due to the problems and obstacles facing exporters, including the lack of information about foreign markets, which is one of the obstacles to the penetration of Egyptian products into global markets, in addition to export and marketing problems, the most important of which are the lack of storage services at various levels and institutional, administrative and financial problems that limit the competitiveness of Egyptian goods, including banking transactions and procedures in credit, financing, export control and agricultural quarantine.

The foreign exchange rate has a moral and positive effect on agricultural exports, meaning that increasing the exchange rate by one unit leads to an increase in agricultural exports by 51,430 units, as it has been shown that an increase in the exchange rate encourages and increases agricultural exports. This relationship is consistent with economic logic because when the exchange rate of the Egyptian pound increases, its external value decreases, so Egyptian agricultural products become cheap in foreign markets, and the quantities demanded from them increase, and exports increase. However, in the first slowdown period, the relationship appeared inverse, meaning that increasing the exchange rate by one unit leads to a decrease in agricultural exports by (124,428) units, due to the impact of the January 2011 revolution on the value of total Egyptian agricultural exports, because the economic changes that occurred in the Egyptian economy after this revolution hurt Egyptian agricultural trade in general. Agricultural support shows no significant effect at 1% and 10% confidence levels. However, it had a direct and moral effect on agricultural

exports in the first slowdown period, meaning that increasing agricultural support by one unit increased agricultural exports by 0.201 units. This means that the support Egypt provides to the agricultural sector is one factor that stimulates agricultural production and contributes to increasing farmers' income, which increases agricultural production and its exports.

4.2. Findings related to the long-term relationship:

Total agricultural output has a significant and positive effect on agricultural exports, meaning that increasing agricultural output by one unit will increase agricultural exports by 0.020 units. This is attributed to the same reason mentioned for the same variable in the short term.

Foreign direct investment significantly and favorably impacts agricultural exports; hence, a one-unit increase in this investment results in a gain in agricultural exports of 0.713 units, which is attributed to the same reason mentioned for the same variable in the short term.

Foreign exchange rate has a positive and significant effect on agricultural exports, meaning that increasing the exchange rate by one unit leads to an increase in agricultural exports by 17.637 units, as the reason for this is attributed to the same reason mentioned for the same variable in the short term.

The inflation rate revealed no significant effect on agricultural exports; this result does not agree with the economic theory concepts because the parameter's probability value is greater than 5%. This may be attributed to the quality of Egyptian goods, which are consistent with the taste of foreign consumers. Agricultural support has an inverse and significant effect, meaning that increasing agricultural support by one unit decreases agricultural exports by 0.434 units. The reason for this is the inability of exports to compete with their counterparts in global markets.

Explanatory power of the model and its significance

- The R^2 value was 89%, which means that 89% of the variations in the model can be explained by the independent variables included in the model. In comparison, 11% of the variations remain unexplained, and this percentage may be due to other variables not included in the model or to random errors.
- The calculated F value reached 80.711 with a significance level of 1%, which indicates the significance of the estimated model as a whole from a statistical point of view.

Table (3). Results of estimating the total variables model in Egypt

ARDL (1, 2, 2, 2, 0, 2)				
Variable	Coeff.	S.E	t- Stat.	Prob.
Long-run Coefficients				
X1	0.020387	0.006895	2.956686	0.0093***

X2	0.712569	0.126216	5.645629	0.0000***
X3	176.3759	16.48303	10.70046	0.0000***
X4	11.93851	14.49585	0.823581	0.4223No
X5	-0.433707	0.120007	-3.614009	0.0023***
Short-run Coefficients				
ECM	-0.937275	0.082517	-11.35855	0.0000***
D(X1)	0.014879	0.003758	3.959205	0.0011***
D(X1(-1))	-0.013983	0.003595	-3.889391	0.0013***
D(X2)	0.251720	0.037669	6.682366	0.0000***
D(X2(-1))	-0.321602	0.042676	-7.535860	0.0000***
D(X3)	51.43037	23.42907	2.195152	0.0433**
D(X3(-1))	-124.4276	25.64384	-4.852143	0.0002***
D(X5)	0.082027	0.115739	0.708726	0.4887No
D(X5(-1))	0.201105	0.112554	1.786741	0.0929*
R^2	0.893422	Adjusted R^2		0.854667
F-stat.	80.71094	Prob.		0.000000
ECM: تشير إلى معامل تصحيح الخطأ.				

5. Post-Estimation test of the model:

5.1. Diagnostic test results for model residuals

Through the statistics of examining the residuals of the model in Table (4), it becomes clear to us that the model is statistically sound in general and that the model has passed all tests for examining the residuals, such as the condition of normal distribution (Jarque Bera) and its absence of serial correlation using the LM test and the absence of a difference in variance using the God-Frey test as well as using ARCH and the absence of a problem of misspecification in the model.

5.2.Multicollinearity test between model variables:

Table (5) clearly shows that the square of the most significant value of the simple correlation coefficient between any two independent variables reached 0.69, less than the coefficient (R2) 's value of 0.89. This indicates that there is no problem of multicollinearity between the model variables.

Table (4). Statistics of Examining the Residuals of the Model

Statistics test	Estimated value	Prob
Normality (Jarque-Bera)	1.264	0.889262
Breusch-God Frey Serial Correlation LM Test	1.197324	0.3311
Heteroscedasticity test BY: (ARCH)	1.738977	0.1717

This indicates that there is no problem of multicollinearity between the model variables.

Table 5: Simple Linear Correlation Matrix Between The Total Variables in Egypt

Correlation Test						
Variables	Y1	X1	X2	X3	X4	X5
Y1	1.000000	0.742000	0.801941	0.869044	0.109209	0.831705
X1	0.742000	1.000000	0.603003	0.522995	-0.207436	0.660661
X2	0.801941	0.603003	1.000000	0.655458	0.127318	0.776818
X3	0.869044	0.522995	0.655458	1.000000	0.270593	0.785719
X4	0.109209	-0.207436	0.127318	0.270593	1.000000	0.110207
X5	0.831705	0.660661	0.776818	0.785719	0.110207	1.000000

5.3. Testing the stability of the estimated model:

Figure 1 clearly shows that the graph of the cumulative sum of recurring residuals test falls within the columns of the critical limits during the study period, which indicates the stability of the model's estimated parameters.

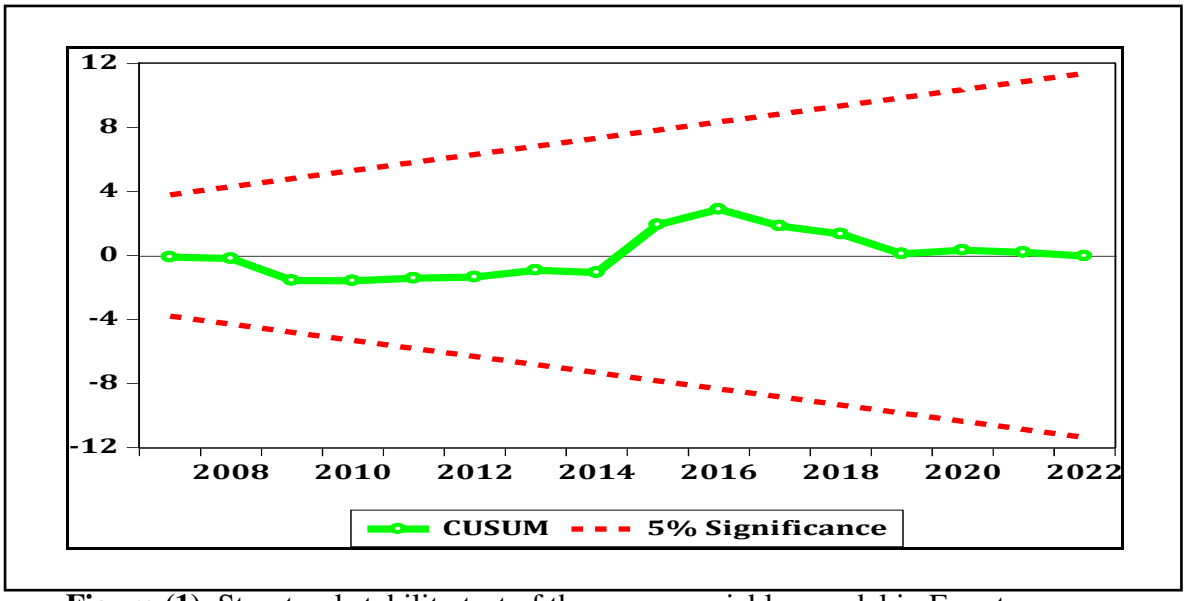

Figure (1). Structural stability test of the macro variables model in Egypt

5.4.Testing the predictive performance of the error correction limit model:

The above test shows that the Thiel coefficient (T) value reached 0.01726. In contrast, the value of the bias ratio (BP) reached 0.000000, while the value of the variance ratio (VP) reached 0.004081, and finally, the value of the covariance ratio (CP) reached 0.995918. These values were less than the correct one and close to zero. Accordingly, we conclude that the estimated model can be used to predict during the study period.

6. Conclusions

1. Most macroeconomic variables have contributed to enhancing agricultural exports in the short and long term.
2. Foreign direct investment in the agricultural sector contributes directly and significantly to increasing agricultural production and creating a suitable environment for increasing exports, making this variable one of the most important contributing to increasing agricultural export values.
3. The practical aspect showed the importance of the variables of agricultural output values X1, foreign direct investment X2, and foreign exchange rate X3 in positively influencing agricultural export values in the short and long term. The intangible effect of the inflation rate X4 appeared positively on agricultural export values in the long term. The importance of agricultural government support X5 appeared in positively influencing agricultural export values in the short term. In contrast, in the long term, the importance appeared with a non-positive effect of this variable.

7. Recommendations:

1. The practical results demonstrated the considerable impact of both variables on Egypt's agricultural exports. Therefore, the exchange rate and foreign direct investment should be activated by creating an environment conducive to attracting businesses that make this kind of investment in the agricultural sector.
2. Adopting agricultural policies that achieve economic efficiency and competitiveness in Egyptian agriculture, especially in producing crops designated for export, because this type of policy leads to increasing interdependence between countries, especially in the aspect related to exports, and in a more effective manner.
3. Adopting a package of effective economic reform policies in Egyptian agriculture in order to amend existing policies and adopt the principle of planning in alternative policies that would move Egypt to a free market economy, in addition to adhering to the organizational and administrative commitments consistent with the rules of the World Trade Organization in order to obtain the necessary scientific support from developed countries and in a manner that serves Iraqi agriculture by benefiting from the experiences of these countries
4. Encouraging private investments in the agricultural sector, consistent with those directed to other sectors, helps establish various agricultural projects that allow the introduction of advanced technologies and improve the efficiency of agricultural production, which increases job opportunities in the agricultural sector.
5. Creating an appropriate investment climate to support and activate agricultural investment in a way that leads to increased production and reduced local debt, which reduces the budget deficit, a large part of which goes to debt service, and results in attracting more local and foreign private investments to the agricultural sector.

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