Applied Economics and Finance; Vol. 11, No. 1; 2024
ISSN 2332-7294 E-ISSN 2332-7308
Published by Redfame Publishing

Estimating the Impact of Monetary Stability and Commercial Exposure on the Agricultural Sector's Production of Vegetable Oils in Iraq for the Period 2003-2020

Saad A. Hammad[1], Noor Yousif Outhman[1], Thakir Hadi Abdullah[2], Hasnaa Rafea Ahmed[1], Ali Abd Ulkareem[3]

[1] University of Anbar, Department of Agricultural Economics, Iraq

[2] Ministry of Education, Iraq

[3] Economic Researcher, Iraq

Correspondence: Saad A. Hammad, University of Anbar, Department of Agricultural Economics, Iraq.

Received: January 24, 2024 Revised: February 20, 2024 Accepted: February 27, 2024

Available online: February 27, 2024 URL: https://doi.org/10.11114/aef.v11i1.6772

Abstract

This manuscript aims to estimate the impact of monetary stability and commercial exposure on the agricultural sector's production of vegetable oils in Iraq for the period 2003-2020. We assume that monetary stability and commercial exposure impact the quantity of vegetable oil production. Use descriptive analytical approach and use econometric techniques estimate the impact utilizing unit root testing with the extended Dickey-Fuller (ADF) time series test. The variables became stationary after taking their first difference. According to Johansen, co-integration was observed when co-integration was tested as the vector error correction model (VECM) was applied. There is a long-term equilibrium relationship between the independent monetary stability variable (X1), the independent trade exposure variable (X2), and the dependent variable of the quantity of vegetable oil production (Q). That is, there is a long-term equilibrium relationship that goes from (X1) and (X2) to (Q). The results indicate that there is a significant positive relationship (positive effect) between monetary stability (X1) and the agricultural production of vegetable oils (Q) in the long term. There is an inverse significant relationship (reverse effect) of commercial exposure (X2) on agricultural production of vegetable oils (Q) in the long term. The quality of the model's performance and its safety from standard problems were confirmed. The manuscript recommends that the government of Iraq get up prioritize supporting the vegetable oils sector by developing a strategy that works to increase production and includes providing financial and in-kind support and preparing infrastructure for the agricultural sector to reflect the increase in the production of vegetable oils because they are considered a cash crop and essential for achieving food security.

Keywords: monetary stability, commercial exposure, vegetable oils, VECM

JEL: F11, C22, E51.

1. Introduction

Vegetable oils are considered one of the main components of the diet and critical economic commodities. Since 1980, there has been a global growth in the usage of vegetable oils across a range of businesses and consumer demographics, which has boosted economic activity. Millions of people throughout the world rely on the vegetable oil business for their employment and lives, which is crucial since it boosts the economies of many different nations. The growth in vegetable oil production due to high demand has attracted much attention, resulting in higher incomes, job creation, and poverty reduction among farmers and non-farm individuals (Khaled, 2020). Vegetable oils are an essential element in the diets of all countries and a primary source of fat, as they represent 10% of daily dietary calories, making them the second most crucial food group after grains. The types of vegetable oils traded in global markets in 2019 were palm oil 58%, soybean oil 14%, sunflower oil 13%, and rapeseed oil 7%, while the remaining 8% represented various vegetable oils such as olive oil and seed oil, cotton, peanut oil, safflower oil, palm kernel oil. Indonesia and Malaysia contribute 92% of total palm oil exports. Argentina contributes 46% of global soybean oil exports, Brazil 10%, the European Union 8%, and the United States of America 8%. Canada is the leading exporter of rapeseed oil at a rate of 58%, Russia at 13%, the European Union at 8%, and Belarus at 7% in 2019 (Glauber, 2022).

The production of vegetable oils in Iraq is considered one of the essential economic activities within the basic commodities of the national economy, which constitute part of the gross domestic product. Its role in achieving

self-sufficiency and food security, as the products of this industrial branch plays an essential role in providing food products to the population, in addition to contributing. This sector employs the workforce and contributes to foreign trade. It is raw materials and inputs for the industrial sector that are used to produce a large number of manufactured goods, which requires attention to production quantities and work to increase them and improve their quality to push economic development towards progress. The vegetable oil industry is gaining tremendous importance because of its contribution to supporting the economy due to the financial resources it achieves that contribute to increasing the real incomes of individuals. The production quantities from vegetable oils contribute to a balance in the trade balance and food security. The most important sources of vegetable oil production in Iraq are olive oil, cottonseed, soybean, sunflower, sesame, pistachio, flax, palm, corn, pine, castor, rape, and other oilseeds. The production of vegetable oils is used in various fields, including food consumption, medicine, and industry, such as cosmetics, perfumes, paint, plastics, inks, and others. Studying this industry is therefore a crucial objective to know the development and size of its role in fostering economic expansion, to enable government officials, planners, and scholars to determine the capacity of this industry to formulate economic measures to boost growth and strengthen the regional economy.

The monetary stability factor is also known as the inflationary pressure factor, and it is a measure with a composite calculation used to measure the dimensions of the inflation process in the economy. This standard is based on some analysis of the theory of the quantity of money within a relative framework, as comparing the development of the money supply with the development of the demand for money takes place (Hussein, 1988). The monetary stability factor is calculated by calculating the rate of change in the broad money supply (currency with the public + current deposits + time deposits + savings deposits) over the rate of change in real GDP, and according to the following mathematical formula (Manahi, 2018):

$$B = \frac{\Delta M/M}{\Delta Y/Y} = \geq 1 \text{ or } \leq 1 \text{ or} = 1 \ldots \quad (1)$$

Where: B = monetary stability factor, $\Delta M/M$ = the rate of change in the broad money supply, and $\Delta Y/Y$ = the rate of change in real GDP. Suppose the result of the monetary stability factor is greater than one. In that case, this indicates the presence of inflation (inflationary pressures). If the result is less than one, this indicates the presence of economic contraction. However, if the result is equal to one, this indicates that monetary stability has been achieved.

Inflationary pressure directs capital to economic activities that do not achieve economic renaissance in its early stages due to rising prices, wages, and profits in the productive sectors designated for producing consumer and investment goods, which are the basis for economic growth. Despite this, it is no wonder that inflation is a goal of economic policies. This is the case during crises in which their economies witness stagnation, as economic growth decreases significantly in these periods, which makes raising inflation a stimulating matter for the economy. If countries record a recession, this prompts the competent authorities to take policies and measures to raise the demand for goods and services, leading to higher prices and, thus, increased demand levels (Taha, 2021).

The trade exposure (trade liberalization) index is a crucial measure that gives a clear picture of the economic situation and the extent of its dependency, independence, and needs for other economies. A high percentage of this index indicates an increase in this economy's dependence on the outside, and a low percentage indicates this economy's dependence on the inside because of its need. To international markets to sell its products and import the goods and services it needs. The high rate of commercial exposure indicates the depth of the economy's dependency and the imbalance in its trade relations in favor of the world's countries. The high rate of this indicator is due to the weak flow of foreign investment and a deficit in food production, the adoption of a single-product export policy, weak industrial and agricultural production and dependence on imports, weak local savings, mismanagement of external debt, the inability of economic development policies, imbalance in the monetary system, internal conflicts and disputes, and the spread of administrative and financial corruption (Farhan, 2013). The economic effects resulting from the high trade exposure index are the deterioration of the terms of trade, the lack of a protection structure for local products, and their inability to compete, so production decreases in favor of increased imports from other countries. It is calculated according to the following formula:

$$\text{Trade exposure indicator} = \frac{\text{Value of exports} + \text{value of imports}}{\text{GDP}} * 100\% \ldots \quad (2)$$

The exposure index reflects the degree of trade liberalization and the relationship it has with the growth of the economy, and many economic studies confirm that it has a positive impact on economic well-being, as it enables local production to go for export in global markets, and real incomes rise as a result of increased production. It enables us to obtain imported goods. Liberalization of foreign trade could also have a negative impact, as liberalization of imports affects the local production base (Saouli, 2020). Trade liberalization puts local producers in front of the challenge of price competition with relatively cheap imported products, which prompts local producers to improve the quality of their

products and increase production. This is reflected in the rise in internal and external prices, which loses the ability to compete in price, so the imported product becomes more in demand, leading to stopping the production of many Goods and services. The cost structure of production elements and many locally produced goods often does not allow prices to be reduced. Therefore, with a policy of liberalizing imports, foreign goods become cheaper, leading to stopping local production or not increasing it.

The reality of the Iraqi economy shows the fluctuation of monetary stability and high exposure indicators towards other countries. This results from the country's circumstances, represented by political imbalance, weak implementation and formulation of economic policies, and widespread financial and administrative corruption. Iraq has suffered from the continuous waste of its wealth, and Iraq is leading the way in countries classified as having high rates a corrupt environment. The Corruption Perceptions Index Transparency International's report shows that we rank highly among countries in corruption (Niam, 2022). This circumstance that the economy is suffering from was reflected in the weakness of the production base, as exports of manufactured goods for all sectors of the economy amounted to 0.2% of total exports for the year 2020. This percentage is deficient for limited products, compared to crude oil exports at a rate exceeding 99% of total exports. The decline affects industry productivity in the private and public sectors on the trade balance by increasing imports to finance consumers' needs for goods (Hammad, 2023).

This research uses the descriptive analytical approach and econometric tests and models to obtain a quantitative estimate of the economic variables affecting all economic phenomena and to determine the equilibrium relationships between the variables. Using econometrics enables us to estimate the factors that affect the costs and quantity of production. Through this tool, decisions are made according to the results of estimating the standard relationship that has been carried out. The results are often accurate and ideal, as the model is considered an unambiguous as well as quantitative abbreviation of the connection between monetary stability and commercial exposure and the amount of vegetable oil production in the agricultural sector. Econometrics enables us to exclude errors in researchers' estimations and measures the natural relationship and the extent of the actual relationship, not just the apparent relationship between variables (Hammad, 2023).

2. Previous Studies

A study by Abdul Karim (2023) aims to measure food gap rates and estimate self-sufficiency rates in dietary vegetable oils in Iraq by adopting time series data (1990-2020). The results showed that the annual growth rates of economic indicators (area and production) of the primary raw material for manufacturing vegetable oils represented by essential oil field crops had taken a decreasing path during the study period, which resulted in a deficiency in meeting the individual and local industry demand for vegetable oils, and that there was a sizeable negative food gap. Between the production of vegetable oils and the consumer need for them, an annual average of 225 thousand tons was recorded during the study period. The results also indicated that Iraq could not achieve self-sufficiency in vegetable oils, as self-sufficiency rates during the study period recorded an annual average of 40%, less than half of the total self-sufficiency rate (Abdul Karim, 2023). A study by Wahhab (2022) analyzed the geographical distribution of the vegetable oil industry in the Kalar and Khanaqin districts. The research dealt with a general definition of the vegetable oil industry and its geographical distribution and conducting an S.O.W.T strategic analysis of the capabilities existing in the region, which aims to analyze the internal and external environment and the strengths, weaknesses, opportunities, and challenges of the factories established in the region. The study results showed that the natural, economic, and demographic capabilities in the region enable us to rely on a development strategy to grow and develop vegetable oil factories in the Kalar and Khanaqin districts (Wahab, 2022).

Nasuri's study (2012) aimed to evaluate the efficiency of the economic performance of the General Company for the Manufacture of Vegetable Oils in Iraq for the period (2003-2007). The results showed many obstacles facing the food industry, especially the General Company for the Manufacture of Vegetable Oils, including a lack of primary resources. Alternatively, its scarcity and irregular supply during the period specified in the study and due to the economic and security instability of the country and competition from imported products are also among the most critical problems facing the company (Nassouri, 2012). A study by Rahim (2020) aimed to use the MOTAD model to determine efficient production plans in the vegetable oils sector under risk conditions for the period 2011-2018, using the linear programming (LP) and MOTAD method using the statistical program (QSB) to achieve elevated production levels. Moreover, elevated profitability levels are obtained By optimizing the goal function's value, raising the revenue of the vegetable oil sector, and deriving efficient production plans under conditions of risk. The study produced a number of findings, the most significant of which may be that it demonstrated the viability of the hypothesis through the attainment of high production and profit margins and the most efficient use of the resources at hand. Specifically, the production jumped by an estimated 106.4% for the year 2018 from 472 tons in the actual production plan to 974 tons in the plan that employed the (LP) method (Rahim, 2020).

Al-Satouri study (2021) aimed to determine the level of performance of vegetable oil production in Iraq and determine the number of deviations, if any, for the period (2010-2016), as the research reached many conclusions, including that most of the values associated with the added value (negative) represent a continuous decline case because it is initially hostile, is caused by the superiority of production requirements over the value of production. The research recommended the necessity of regularly providing raw materials and production requirements to support the production of vegetable oils, which supports the local industry (Al-Satouri, 2021). In her study from 2021, Resti Prastika sought to examine how Indonesia's primary export good—crude oil and vegetable oils—were priced integrated between 2002 - 2019. The pricing integration of vegetable and crude oils was investigated. A correction model employing Vector (VECM) between log crude oil price (LCOP), palm oil price (LPOP), soybean oil price (LSOP), sunflower oil price (LSFOP), and rapeseed oil price (LROP) is applied to monthly time series data. The model indicates strong long-term correlations between variables as well as significant levels of short-term integration between data on oil prices. (Resti, 2021). A study by Yasutomo Kojima (2016) analyzes the global demand for vegetable oils for food and industrial use from 1991 - 2011. A fixed effects model was used. Compared to food use, income elasticity is much higher for industrial use, indicating that demand for non-edible vegetable oils is expected to increase as global wealth grows (Yasutomo, 2016).

3. Data

In this Manuscript, the impact of monetary stability and commercial exposure on the agricultural sector's production of vegetable oils in Iraq is estimated. Data on economic variables will be reviewed to reach the research goal of presenting developments and estimating the impact between the variables. Information was gathered from a number of sources, including the Ministry of Planning in Iraq (Directorate of National Accounts), the Arab Organization for Development and Agriculture, and the Iraqi Central Bank. Table 1 shows the number of exports, imports, and local production in thousands of tons and the percentage of self-sufficiency in vegetable oils during the period 2003-2020.

Table 1. Quantity of exports, imports, and local production in thousands of tons and the percentage of self-sufficiency in vegetable oil production for the period 2003-2020

Years	Exports (thousand tons)	Imports (thousand tons)	Local production (thousand tons)	Self-sufficiency rate
2003	0.00	286.7	107.50	27.2
2004	0.00	286.7	102.05	26.2
2005	0.00	175.36	153.95	46.7
2006	0.00	168.26	94	35.8
2007	0.00	168.26	76	31.1
2008	0.00	43.58	56.14	56.3
2009	0.00	93.22	57.99	38.3
2010	0.00	32.89	65.50	66.5
2011	0.02	184.55	78	29.7
2012	0.02	184.55	57.55	23.8
2013	0.02	184.55	46	19.9
2014	0.00	45.14	16.27	26.5
2015	0.10	197.10	13.16	6.2
2016	0.88	238.01	8.76	3.5
2017	0.92	694.28	13.01	1.8
2018	0.27	655.53	24.87	3.5
2019	0.12	713.83	13.62	1.8
2020	0.29	807.77	12.76	1.5

Source:

- Arab Organization for Agricultural Development(2003-2020)Annual Report.

- Central Bank of Iraq (2003-2020) Directorate of Statistics and Research.

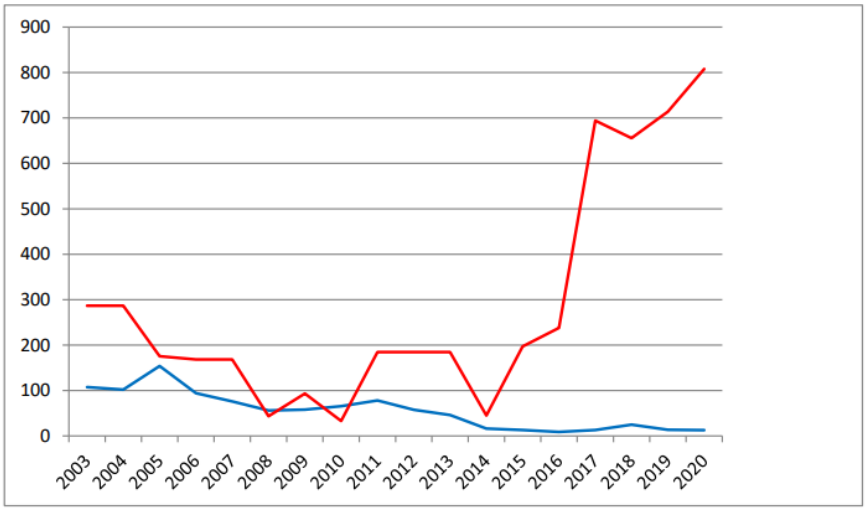

Figure 1. Developments in the quantity of production and import of vegetable oils (thousand tons) in Iraq

Source: The work of the researcher.

The Table and Figure show that the growth of the production of vegetable oils industry has yet to reach a level that suits the size of local demand due to many problems and obstacles that the industrial sector in general and the vegetable oil production sector in particular suffer. The supply of this product depends on the import of raw and manufactured materials for vegetable oils. Exports are almost non-existent, local production is low and shows a significant decline during the study period, and the number of imports is high. The self-sufficiency rate in the vegetable oil crop is very low and falls within the risky food security category, as it is insecure. It is 1.5% in 2020. Table 2 shows the monetary stability factor and the proportion of commercial exposure in Iraq.

Table 2. Monetary stability factor and trade exposure ratio in Iraq for the period 2003-2020

Years	Monetary stability factor*	Commercial exposure
2003		129
2004	0.9	118
2005	-0.9	94
2006	3	78
2007	37	66
2008	2.4	76
2009	1	72
2010	5.3	67
2011	2.1	66
2012	1	71
2013	0.09	64
2014	15	60
2015	-3	56
2016	1.1	45
2017	0.03	51
2018	1	58
2019	13.3	63
2020	-1.3	69

Source:

- Central Bank of Iraq (2003-2020) Directorate of Statistics and Research.

- Iraqi Ministry of Planning(2003-2020) Directorate of National Accounts, Iraq.

* It was calculated by researchers.

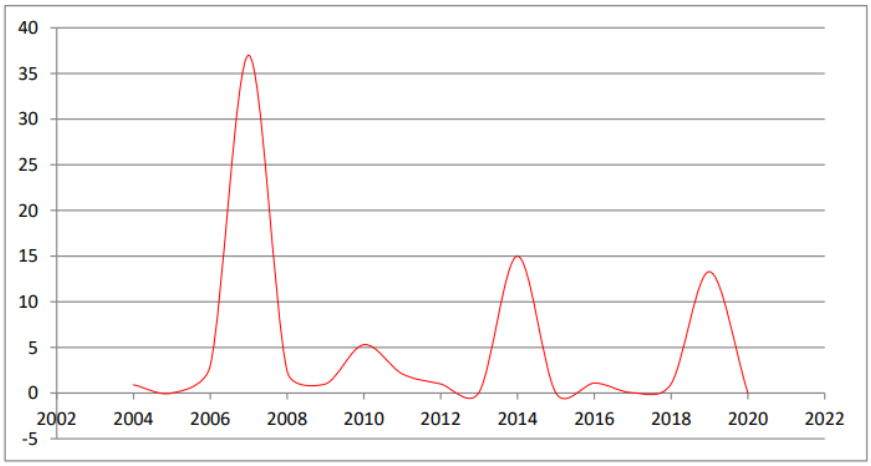

Figure 2. Developments in the monetary stability factor in Iraq

Source: From reliable work based on Table (2).

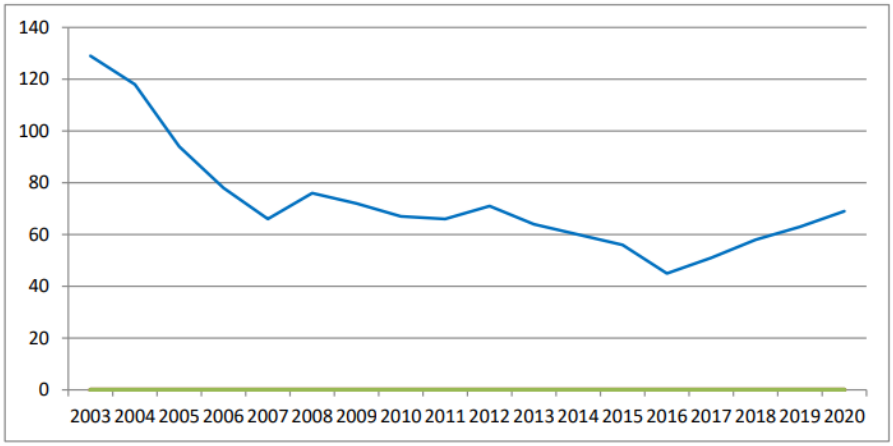

Figure 3. Developments in the proportion of commercial exposure in Iraq

Source: From reliable work based on Table (2).

It is noted from the Table (2) and Figure (3) that monetary stability in the Iraqi economy is dominated by fluctuations between balance, stagnation, and inflationary pressures during the study period. The years 2009, 2012, and 2018 achieved monetary stability because the monetary stability coefficient reached one correct point. For the years 2004, 2005, 2013, 2015, 2017, and 2020, the monetary stability factor reached less than one, indicating the presence of recession. As for the rest of the years, the monetary stability factor reached greater than one, indicating the presence of inflationary pressures. As for the trade exposure index, which reflects trade liberalization, the average rate during the study period was 72%, which is a very high percentage that indicates this economy's loss of stability, a decrease in domestic production, and an increase in dependence on abroad to provide the goods and services it needs.

4. Experimental Model

To obtain an economic model to estimate the impact of monetary stability and commercial exposure on the agricultural sector's production of vegetable oils in Iraq for the period 2003-2020, the standard vector error correction model (VECM) was used. It determines the economic relationships between the variables. Vegetable oils are the dependent variable. They are represented by the quantities of vegetable oil production. Monetary stability (inflationary pressures) is an independent variable, and it is represented by the monetary stability factor. The trade exposure is an independent variable. The economic model is formulated through the following:

$$Q_t = \beta_o + \beta_1 X1_t + \beta_2 X2_t + u_t \ldots \quad (3)$$

Where: (Q_t) is the production of vegetable oils, (βo) is the intercept, (X1) is monetary stability, (X2) is trade exposure, (u_t) is the random variable, and (t) is time.

To apply the econometric model, the time series 2003-2020 was used, and we converted the annual data for economic variables into quarterly data with a number of 68 observations to obtain the results more accurately. We first used the Extended Dickey-Fuller (ADF) unit root test to determine the consistency of the time series, then it was decided what the best lag time for the lagging times was. Then, we tested the co-integration's existence utilizing the Johansson-Julius test, and finally, "a vector error correction model (VECM) was prepared to analyze the short and long-term economic variables". The soundness of the model is tested through the homoscedastisity of variance invariance (ARCH) test to find out that the model does not suffer from the problem of heteroscedasticity problem of variance. The sequential autocorrelation (LM) test was used to determine that the model is accessible from the autocorrelation problem. The suitability test of the correctness of the functional form and the structural stability test were utilized. The model parameters are estimated through the Cumulative Sum of the Residuals (CUSUM) test and the Cumulative Sum of Squares of the Residuals (CUSUM OF SQUARE) test.

5. Results

5.1 Unit Root Tests

The Extended Dickey-Fuller (ADF) test unit root findings for the stability of a time series of variables with a fixed term, a constant term with a general trend, and without a constant term and a general trend at the level and first difference are displayed in Table 3. Once they take their first difference, the variables become stationary.

Table 3. ADF test for the stability of time series of variables.

UNIT ROOT TEST TABLE (ADF)				
At Level				
		Q	X1	X2
With Constant	t-Statistic	0.0463	-0.8508	-1.9885
	Prob.	0.9593	0.7984	0.2913
		n0	n0	n0
With Constant & Trend	t-Statistic	-2.4979	-2.0369	-1.8447
	Prob.	0.3284	0.5717	0.6729
		n0	n0	n0
Without Constant & Trend	t-Statistic	1.21	1.4169	-0.9007
	Prob.	0.941	0.96	0.3228
		n0	n0	n0
At First Difference				
		d(Q)	d(X1)	d(X2)
With Constant	t-Statistic	-3.5327	-8.9374	-8.4906
	Prob.	0.0100	0.0000	0.0000
		***	***	***
With Constant & Trend	t-Statistic	-3.7373	-8.8763	-8.4941
	Prob.	0.0265	0.0000	0.0000
		**	***	***
Without Constant & Trend	t-Statistic	-2.8629	-8.544	-8.544
	Prob.	0.0048	0.0000	0.0000
		***	***	***

Source: Outputs of the econometrics program Eviews9.

5.2 Analyze the Results of the Optimal Lag Period"

Given that it yields the lowest scores for most of the assessed criteria, Table 4's results show that the first Lag period is the one that should be chosen.

Table 4. Optimal lag period test

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-760.0436	NA	4553876	23.84511	23.94631	23.88498
1	-622.1548	258.5414*	81161.56*	19.81734*	20.22213*	19.97681*
2	-619.5702	4.603969	99391.51	20.01782	20.7262	20.29689
3	-615.6895	6.548614	117231.8	20.1778	21.18977	20.57647
4	-609.114	10.4797	127659.3	20.25356	21.56913	20.77183

Source: Outputs of the econometrics program Eviews9.

5.3 Co-Integration Test Results

After ensuring that the time series for the study variables contain a unit root and are unstable at their original level, they become stable after taking the first differences, that is, they are integrated of the first degree I (1) (all variables are stable at the same level), which means the possibility of applying Johansen co-integration test and the error correction

vector model to reveal the nature of the balanced relationship between the research variables. The value of the trace factor (Trace) is displayed in Table 5, and the highest value (Max) is displayed in Table 6.

Table 5. Trace coefficient test according to Johansen

Hypothesized	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None *	0.324973	50.232	29.79707	0.0001
At most 1 *	0.200875	24.68686	15.49471	0.0016
At most 2 *	0.144064	10.1114	3.841466	0.0015

Source: Outputs of the econometrics program Eviews9.

The trace test indicates two complementary equations at a less than 5% significance level. This entails adopting the alternative hypothesis (H1), which states that there are a greater number of co-integration vectorsthe null hypothesis, which claims that there isn't a co-integration vector (r = 0), is rejected. This shows a long-term equilibrium connection between the variables starting at zero (r = 1).

Table 6. Max value test according to Johansen

Hypothesized	**Eigenvalue**	**Max-Eigen Statistic**	**Critical Value**	**Prob.****
None	0.324973	25.54513	21.13162	0.1112
At most 1 *	0.200875	14.57546	14.2646	0.0446
At most 2 *	0.144064	10.1114	3.841466	0.0015

Source: Outputs of the econometrics program Eviews9.

The results of the maximum values test were identical to the impact test results, that is, given that the result obtained for the maximum values test surpasses the critical values at a significance level lower than 5%, there are two co-integration links between the variables.

5.4 Analysis of the Results of the Vector Error Correction Model (VECM)

After ensuring co-integration between the variables according to Johansen tests, the long-term and short-term relationships between the independent variables (X1, X2) and the dependent variable (Q) are estimated, as in Table 7.

Table 7. VECM test results

Co-integrating Eq:	**CointEq1**		
Q(-1)	1		
X1(-1)	2.25800		
	-1.07042		
	[2.10946]		
X2(-1)	-4.309094		
	-0.59258		
	[-7.27180]		
C	227.5071		
Error Correction:	**D(Q)**	**D(X1)**	**D(X2)**
CointEq1	-0.082451	-0.035254	0.054345
	-0.03435	-0.02068	-0.0127
	[-2.40034]	[-1.70470]	[4.27784]
D(Q(-1))	-0.023217	-0.00257	-0.005264
	-0.12757	-0.0768	-0.04718
	[-0.18200]	[-0.03347]	[-0.11157]
D(Q(-2))	-0.023217	-0.00257	-0.005264
	-0.12757	-0.0768	-0.04718
	[-0.18200]	[-0.03347]	[-0.11157]
D(X1(-1))	0.123894	0.061127	-0.104455
	-0.24157	-0.14544	-0.08934
	[0.51288]	[0.42030]	[-1.16916]
D(X1(-2))	0.123894	0.061127	-0.104455
	-0.24157	-0.14544	-0.08934
	[0.51288]	[0.42030]	[-1.16916]
D(X2(-1))	-0.088344	-0.011324	-0.015716
	-0.33851	-0.2038	-0.1252
	[-0.26098]	[-0.05556]	[-0.12553]
D(X2(-2))	-0.088344	-0.011324	-0.015716
	-0.33851	-0.2038	-0.1252
	[-0.26098]	[-0.05556]	[-0.12553]
C	-1.572199	-0.018734	-0.790717
	-1.54464	-0.92996	-0.57127

	[-1.01784]	[-0.02014]	[-1.38413]

Source: Outputs of the econometrics program Eviews9.

From the outcomes of the equations of the error correction vector model above, it is clear that there is a long-term equilibrium relationship between the variables. There is a long-term equilibrium relationship that goes from monetary stability (X1) and commercial exposure (X2) to agricultural production of vegetable oils (Q). This is due to the fact that the t-test indicates that "the error correction parameter" assumes a negative sign and is significant (p>0.05), as the error correction factor was equal to (0.082451). It means that it is possible to interpret about (0.082451) shocks in "the long term", and this supports the effect of the independent variables (monetary stability, exposure Commercial) on the dependent variable (agricultural production of vegetable oils). The outcomes indicate the existence of a positive noteworthy relationship (positive effect) for monetary stability (X1) on agricultural production of vegetable oils (Q) in the short term for the first and second slowdown periods. The results indicate the presence of an inverse significant relationship (inverse effect) for commercial exposure (X2) on the production of agricultural crops for vegetable oils (Q) in the short term for the first and second slowdown periods.

Analysis of the results of the relationship between monetary stability (X1) and agricultural production of vegetable oils (Q) indicates the existence of a positive noteworthy relationship (positive effect) of monetary stability (X1) on agricultural production of vegetable oils (Q) in the long term. The parameter of agricultural production of vegetable oils reached, in terms of monetary stability (2.25800), which means that increasing monetary stability by one unit leads to an increase in agricultural production of vegetable oils by (2.25800). Conversely, decreasing monetary stability by one unit leads to a decrease in agricultural production of vegetable oils by (2.25800), assuming the factors remain constant. The other result is consistent with the logic of the economic theory, meaning that monetary stability has a positive impact on the agricultural production of vegetable oils, assuming other factors remain constant, and this result is consistent with the logic of the economic theory.

Analysis of the results of the relationship between commercial exposure (X2) and agricultural production of vegetable oils (Q) indicates the existence of an inverse significant relationship (reverse effect) of commercial exposure (X2) on agricultural production of vegetable oils (Q) in the long term. The parameter of agricultural production of vegetable oils reached plants relative to commercial exposure is (-4.309094) in the long term. It means that increasing commercial exposure by one unit leads to a decrease in agricultural production of vegetable oils by (4.309094), and conversely, decreasing commercial exposure by one unit leads to an increase in agricultural production of vegetable oils by (4.309094), assuming ceteris paribus, and this result is consistent with the logic of economic theory.

5.5 Econometric form Quality Tests

through the use of the following tests:

5.5.1 ARCH Heteroscedasticity Test

According to the computed (F) value, which is 0.279965 at the probability level of 0.5986 and not significant at the 5% level, the estimated model is devoid of the heterogeneity of variance issue. Table 8 makes it evident that the estimated model does not suffer from this issue.

Table 8. ARCH test

"F-statistic"	0.279965	Prob. F(1,61)	0.5986
"Obs*R-squared"	0.287823	"Prob. Chi-Square(1)"	0.5916

Source: Outputs of the econometrics program Eviews9.

5.5.2 Autocorrelation test for LM series

The test results amply demonstrated the accuracy and validity of the estimated model, as evidenced by the calculated (F) value reaching (0.42274) at the probability level (0.6573), which was insignificant at the (5%) level (Table 9).

Table 9. LM test

"F-statistic"	0.42274	Prob. F(2,56)	0.6573
"Obs*R-squared"	0.966765	"Prob. Chi-Square(2)"	0.6167

Source: Outputs of the econometrics program Eviews9.

5.5.3 Ramsey Test

It is evident from Table 10 through the calculated t-statistic value of (1.03942) and its probability value (0.3032), which was not significant at the level of (5%), as well as the (F) value that was computed of (1.080395) and its probability value (0.3032), that was it is not significant at the level of (5%), which indicates that the functional form of the estimated model is correct.

Table 10. Testing the suitability of the correctness of the semantic form

	Value	Df	Probability
t-statistic	1.03942	55	0.3032
F-statistic	1.080395	(1, 55)	0.3032

Source: Outputs of the econometrics program Eviews9.

5.5.4 Testing the Structural Stability of the Estimated Model Parameters

The two tests listed below were employed:

Testing the Cumulative Sum of Recursive Residual Test (CUSUM)

Testing the Sum of Squares Recursive Residual Test (CUSUM OF SQUARE)

These tests indicate that if the graph lines for the CUSUM and CUSUM OF SQUARE tests fall between the upper and lower bounds of the critical limits at a significance level of 5%, then the hypothesis is accepted and the structural stability of the estimated parameters of the VECM model is achieved. The following Figure illustrates the null, which claims that all calculated parameters are fundamentally stable:

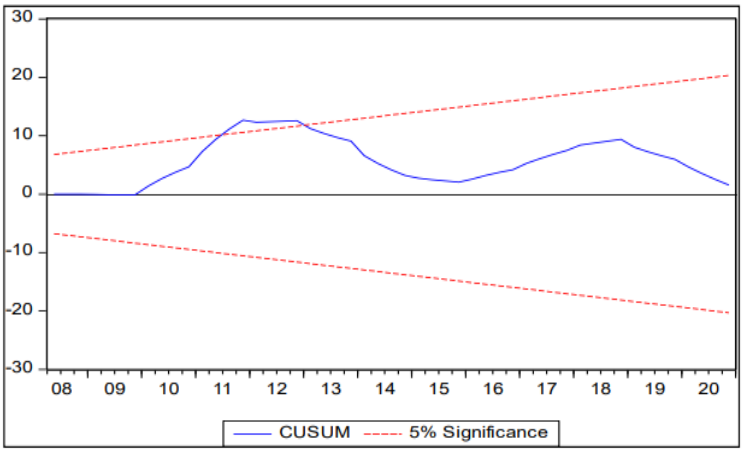

Figure 4. Cumulative Sum of Recursive Residual

Source: Outputs of the econometrics program Eviews9.

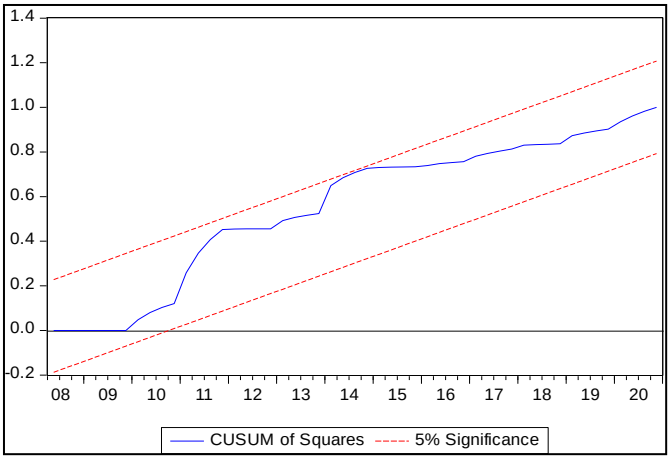

Figure 5. Cumulative Sum of Squares Test for Recursive Residuals

Source: Outputs of the econometrics program Eviews9

6. Conclusions

Vegetable oils are one of the main components of the food system and essential economic commodities. They contribute to increasing economic activity as they provide job opportunities, reduce poverty, and complement other non-food industries. The reality of vegetable oil production in Iraq during the study period was below the level that suited the size of local demand due to the structural imbalance and economic distortions that the industrial sector in

general and the vegetable oil production sector in particular suffered. The display of this product in the local market relied on the import of raw materials and manufactured vegetable oils. Exports of this product are almost non-existent, local production is low, with a significant decline, and the amount of imports is high. The study of the factors affecting the production of vegetable oils remains of interest to economists and researchers. Our review of previous studies by several researchers in different economies and with multiple research methods found that the results vary, and the economic variables affecting production differ from one study to another. Studying the impact of the monetary stability variable and the commercial exposure variable on the agricultural production of vegetable oils is one of the relationships that attract the attention of economists because the calculation of the two variables implicitly depends on several other economic variables (broad money supply, actual gross domestic product, exports, imports), which are variables that give an accurate description of the economic impact on vegetable oil production. The Monetary Stability Index describes the extent of inflationary pressures and their impact on production processes, and the Trade Exposure Index describes trade liberalization and the extent of our economy's openness and independence with the outside world. In this manuscript, we tested the estimate of the impact of monetary stability and commercial exposure on the agricultural sector's production of vegetable oils in Iraq for the period 2003-2020. We used the analytical approach and the standard approach to obtain an estimate of the equilibrium relationships, as the results of the unit root tests using the expanded Dickey-Fuller (ADF) test for series stability indicate temporal variables are not stationary at the original level of the data, and they became stationary after taking their first difference. The results of using the Vector Error Correction Model (VECM) showed a long-term equilibrium relationship between the variables. That is, there is a long-term equilibrium relationship that goes from monetary stability (X1) and commercial exposure (X2) to agricultural production of vegetable oils (Q). This is because, while the error correction factor was equal to (0.082451), the t-test ($p>0.05$) indicates that the error correction parameter in the negative sign is equally significant, which means that it is possible to explain about (0.082451) shocks in the long term. This supports the effect of the independent variables (monetary stability, commercial exposure) on the dependent variable (agricultural production of vegetable oils). The results indicate that there is a significant positive relationship (positive effect) between monetary stability (X1) and the agricultural production of vegetable oils (Q) in the short term for the first and second slowdown periods. The parameter of agricultural production of vegetable oils about monetary stability reached (0.123894). It means that stability increases monetary stability by one unit, leading to an increase in agricultural production of vegetable oils by (0.123894), and a one-unit drop in financial stability causes a (0.123894) drop in vegetable oil agricultural production. The results indicate that a substantial inverse exists relationship (reverse effect) of commercial exposure (X2) on agricultural production of vegetable oils (Q) in the short term for the first and second slowdown periods. The parameter of agricultural production of vegetable oils concerning commercial exposure reached (0.088344) in the long term, and this means that increasing commercial exposure by one unit leads to a decrease in agricultural production of vegetable oils by (0.088344), and conversely, decreasing commercial exposure by one unit leads to an increase in agricultural production of vegetable oils by (0.088344). The results of the relationship between monetary stability (X1) and agricultural production of vegetable oils (Q) indicate the existence of a positive significant relationship (positive effect) of monetary stability (X1) on agricultural production of vegetable oils (Q) in the long term. The parameter of agricultural production of vegetable oils reached about monetary stability (2.25800). It means that increasing monetary stability by one unit leads to an increase in agricultural production of vegetable oils by (2.25800) and vice versa, decreasing monetary stability by one unit leads to a decrease in agricultural production of vegetable oils by (2.25800), meaning that Monetary stability has a positive impact on agricultural production of vegetable oils. Analysis of the results of the relationship between commercial exposure (X2) and agricultural production of vegetable oils (Q) indicates the presence of an inverse significant relationship (reverse effect) of commercial exposure (X2) on agricultural production of vegetable oils (Q) in the long term. In the long term, the agricultural production parameter reached for vegetable oils concerning commercial exposure (-4.309094) means that increasing commercial exposure by one unit leads to a decrease in agricultural production of vegetable oils by (4.309094). Conversely, a decrease in commercial exposure by one unit leads to an increase in agricultural production of vegetable oils by (4.309094). Assuming ceteris paribus, these results (short term, long term) are consistent with the logic of economic theory. It was verified that the model operated well and was safe from common issues. This manuscript recommends the need to support monetary stability to reduce inflationary pressures through monetary policy tools, as it is a factor affecting production in general and the production of vegetable oils in particular, and work to reduce the trade exposure index, support economic independence, and reduce its dependency on the global economy through the import substitution policy (imports). The Iraqi government must give priority to supporting the vegetable oils sector by developing a strategy that works to increase production and includes providing financial and in-kind support and preparing the infrastructure for the agricultural sector to reflect the increase in the production of vegetable oils because they are considered a cash crop and essential for achieving food security.

Acknowledgments

I thank Anbar University for providing moral support, and I also thank my fellow researchers for their contribution to

the completion of the paper**.**

Authors contributions

Dr. Saad A.Hammad and Noor Yousif Outhman were responsible for study design and review. Dr. Thakir Hadi Abdullah was responsible for drafting the manuscript. Hasnaa Rafea Ahmed and Ali Abd Ulkareem collected and analyzed the data. All authors approved the final manuscript. All authors contributed equal effort.

Funding

Not applicable**.**

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could appear to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

References

Abdul Karim, S., & Ahmed, M. (2023). Estimating self-sufficiency rates for food vegetable oils in Iraq for the period .(1990-2020). *Journal of Management and Economics, Special Issue*, 98-116.

Al-Satouri, K. (2021). *Evaluating the efficiency of the economic and financial performance of the General Company for Vegetable Oil Manufacturing in Iraq for the period (2010-2016).* Dinanir Magazine, No. 21, 687-710.

Arab Organization for Agricultural Development .(2003-2020). Annual Report .

Central Bank of Iraq .(2003-2020). *General Directorate of Statistics and Research.*

Farhan, S. (2013). Analysis of the relationship of interdependence between the Iraqi economy and the international economy for the period 2003-2010. *Anbar University Journal of Economic and Administrative Sciences, 5*(10), 96-117.

Glauber, J. (2022). The Impact of the Ukrainian Crisis on the Global Vegetable Oil Market. *International Agricultural Policy Research Institute, 31*, 1-8. https://doi.org/10.2499/9780896294394_06

Hammad, S. (2023). The Impact of Private Sector Investment in the Manufacturing Industry on Growth and Unemployment in Iraq for the Period 2004-2021. *Economics, 12*(3), 83-92.

Hammad, S. (2023). The Impact of Value-Added Tax of Wholesale and Retail Trade and Hotels on Economic Activity: An Econometric Study in the Economy of Iraq Between 2006-2021. *Business Management and Strategy, 14*(2), 128-143. https://doi.org/10.5296/bms.v14i2.21368

Hussein, S. (1988). Monetary Stability Coefficient in the Saudi Economy for the Period 1997-2002. *King Abdulaziz University Journal, 1*, 159-176.

Iraqi Ministry of Planning .(2003-2020). *Directorate of National Accounts, Iraq.*

Khaled, O. (2020). Contribution of Vegetable Oils towards Sustainable Development Goals: A Comparative Analysis. *Policy Analysis and Development Agency Ministry of Foreign Affairs of The Republic of Indonesia*, 1-149.

Manahi, I.(2018). Monetary stability factor in the Iraqi economy for the period 2004-2017. *Iraqi Administrative Sciences Journal, 2*(1), 183-206. https://doi.org/10.33013/iqasj.v2n1y2018.pp183-206

Nassouri, R. (2012). Evaluating the efficiency of the economic performance of the General Company for Vegetable Oil Manufacturing in Iraq for the period (2003-2007). *Journal of Economic and Administrative Sciences, 18*(69), 135-154 .

Niam, A. (2022). Political stability, corruption and its impact on the development of public debt and economic growth: a case study of Iraq for the period 2004-2020. *Social Science journal, Res Militaris, 12*(2), 411**5**-4127.

Rahim, R. (2020). Using the MOTAD model to determine efficient production plans in the vegetable oil sector under risk conditions 2011-2018. *Al-Kout Journal of Economic and Administrative Sciences, 12*(38), 1-39.

Resti, P., & Ahmad, S.(2021). Price Integration Analysis of Crude Oil and Vegetable Oils. *HABITAT, 32*(2), 82-92. https://doi.org/10.21776/ub.habitat.2021.032.2.10

Saouli, M. (2020). Analysis of the relationship of trade liberalization and economic growth rates in Algeria, an econometric study using the Autoregressive Distributed Lags Model (ARDL) during the period 1974-2016. *Journal of Regional Studies, 44*, 35-63 .

Taha, R.(2021). Inflation, its causes, causes and ways to address it. *Arab Monetary Fund, 18*, 1-34.

Wahab, M. (2022). Analysis of the geographical distribution of the vegetable oil industry in Kalar and Khanaqin districts. *Diyala Journal for Humanitarian Research, 92,* 81-108.

Yasutomo, K. (2016). A Global Demand Analysis of Vegetable Oils for Food and Industrial Use: A Cross-Country Panel. Data Analysis with Spatial Econometrics, 1-30. AgEcon Search http://ageconsearch.umn.edu aesearch@umn.edu