Agricultural Exports and Agricultural GDP Causal Relationship in Libya

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Abstract: ***The study examines the causal relationship between agricultural export and agricultural GDP in Libya during the period 2000-2018. Augmented Dickey Fuller (ADF) for stationarity test Augmented Dickey Fuller (ADF), Johansen test for Co-integration, and Vector Error Correction Model (VECM) were used. The causality findings show that there is a bi-directional causal relationship between agricultural export and agricultural GDP in long-run. Moreover, in short-run causality show that there is a uni-directional causal relationship flowing from agricultural GDP to agricultural export. The long-run causality result implies that agricultural export policies will boost the agricultural development of Libyan.***

Keywords: Agricultural Export, Agricultural GDP, Causality, Vector Error Correction Model

1. Introduction

Foreign trade is one of the most important parts of foreign economic relationship (Jeniek and Krepl, 2009) and it expresses on the interaction between the domestic economy and foreign economies, including the flow of goods and services from and to the country (Talab, 2020) as well as lean to break the restrictions of the local market (Kubey and Csikszentmihalyi, 2013). Foreign trade is also considered an essential tool for achieving economic growth through diversifying the country's economic activities and creating new added values that are expressed in exports of goods and services (Lusef, 2014). Beside that plays a vital role, especially in the undeveloped countries to steady improvement of the human circumstances through the expansion of people's standard of living and their preferences. (Olagunju et al, 2015).

In the agricultural field, foreign trade is a key component in contributing to food security, whether by providing agricultural needs through imports that local production cannot be provided locally, or by increasing the proceeds from foreign currencies through exports of agricultural commodities (Sulman and Al-Danasori, 2017). It also contributes to raising development rates through earner of foreign exchange which is needed for capital and maintenance imports required in the non-agricultural sector (Mohanty, 2010).

2. Research Problem

In pursuit of achieving self-sufficiency, the agriculture and livestock sector has received a large number of investments that aimed to quickly get rid of the domination of oil sector on national economy as well as, achieve stability and economic balance in an attempt to provide food locally. A part from that, create job opportunities and spread the spirit of vitality in the agricultural sector activating exports and limiting imports. Nevertheless, despite allocating huge investments these goals were not an achieved and still dependence on the outside for the provision of some agricultural commodities. Thus, the research problem was represented in the decline of agricultural exports and their inability to pursue agricultural imports, which means achieving a deficit in the agricultural trade balance by (2887.7) million dollars (Aoad, 2019). Therefore, this research came to answer the research question of what is the role of agricultural exports in stimulating the Libyan agricultural domestic product.

3. Literature Review

Many empirical studies have investigated the causal relationship of agricultural trade and agricultural GDP. For instance,Erdal and Vural (2020) utilize Vecm to determine the direction of the relation between agricultural gross national product and agricultural export during 1998-2017 in Turkey. The finding of study found that, there is a bidirectional relationship between agricultural gross national product and agricultural exports. Next, shah et al (2015) sought in their study to analysis the impact of agricultural export on macroeconomic performance of Pakistan during 1972-2008 in Pakistan. The study result not provides evidence to study result not provides evidence to support the agricultural exports have relationship with economic growth of Pakistan.

In the same vein, Chhikara and Pasricha (2021) empirically examined the relation between agricultural export and economic growth in India. The study employed vector error correction model to determine the study direction of causality between the variables. They found that there is short run causality between the taken variables when GDP is taken as independent ant there is unidirectional causality form domestic product to export of agricultural product. In India, Bala and Sudhakar (2017) showed there is an increase in some agricultural product export such as cereals, guar gum, spices, cotton and its significant impact on the performance of the agricultural product.

For instance, Francis et al (2007) endeavored to test the contributory relation between agricultural export diversification and economic growth in eight selected Caribbean countries over the period (1961-2000). The study results show the agricultural export diversification results economic growth in Barbados and Belize in short run while show the same result in long run in Belize, Costa Rica, Haiti, and Jamaica. Also, the results found non – causality exists in Trinidad and Tobago. Also, Alam and Myovella (2016) studied the direction of causation between agricultural export and GDP in Tanzania during the period 1980 to 2010. The empirical study shows that agricultural exports cause GDP growth. Khan et al (1995) utilizes granger causality test to investigated the direction of causation between exports growth in Pakistan. One of the most important findings of study is total export have bi-directional causality with economic growth.

In same context Siaw et al (2018) aimed to examine the correlation between agricultural export and economic growth during the study period (1990-2011). The most prominent results of this study concluded that cocoa export has appositive and significant impact in economic growth in short and long run and unidirectional causality running from banana to export economic growth. In addition, the study found a bidirectional causal relation between cocoa exports to economic growth. Similarly, Furthermore, Kaur and Sidhu (2014) sought to determine the direction of causality relationship between agricultural gross domestic product (GDP) and exports in India during the period (1970 to 2011). The empirical result study shows there is uni-directional granger causality running from total exports to agricultural GDP. Also, the agricultural exports promotions participate in the gross domestic product in South Africa.

Bulagi et al (2015) aimed to know the causality between agricultural exports and agricultures share of gross domestic product during the period(1994 to 2011) the study concluded that there is a unidirectional causality between exports and GDP. Alimat and Bataineh (2018) uses simple linear regression to study the effect of agricultural exports on Jordan's trade balance over the period (2007-2016). The study results showed that there is appositive and significant impact of agricultural exports on the Jordanian trade balance. In harmony with this, Gutema et al (2015) examined the casual relationship between agricultural exports and economic growth (GDP) during the period 1973 to 2013 by use granger model. The study results revealed that un-directional relationship between coffee export, oilseed export and economic growth whereas unidirectional relationship was found running from pulses export to economic growth.

El-Dayikh et at (2021) targeted to study the role foreign trade in providing the needs of the Libyan consumer of some major agricultural commodities les during the period (1990-2010). The results indicated in a deficit in the Libyan agricultural trade balance. The study done by Pishbahar and Komroudi (2021) investigate the effect of international trade on agricultural trade growth of d8 countries between 1983 and 2007. Their result shows that import significantly improves agricultural added value growth. Finally, El-Rasoul et al (2015) studied the causal relationships among read agricultural exports and economic growth in Egypt. Data was tested by using granger causality test. While their results show that there is a unidirectional causality running from agricultural output to agricultural trade exchange rate.

Research Methodology

The research uses the quantitative method in the analysis, depending on the econometrics analysis method, for the time series data of the variables during the period (2000 - 2018) to determine the co-integration of Johansen, and to determine the direction of the causal relationship to examine the relationship between agricultural export and Agricultural GDP as follows:

$$Y = F(X)$$

$$AGDP = \alpha + \beta_1 AEX_t + \varepsilon t$$

where,
AGDP = Agricultural GDP
AEX = Agricultural Exports

It is clear from the previous equation that AGDP is the dependent variable affected by the AEX which is independent variable. For a test the causal relationship between agricultural exports and agricultural GDP in the short and long term, there are three steps to be followed, which are as follows:

Unit Root

The unit root test is one of the important and basic tests for time series data, meaning that the time series variables must pass this test. Therefore, the variables used in the model to be estimated must be stationary. If not, the data must be transformed in order to be stationary by taking the first difference of the data of the original variables. There are several methods used to test the unit root, including:

Augmented Dickey Fuller (ADF)

It is one of the important tests used in diagnosing the presence of unit roots in time series data. The augmented dickey fullertest can be illustrated by the following equation:

$$\Delta y_t = \beta_1 + \beta_{2t} + \delta\, y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta y_{t-i} + \epsilon_t$$

In order to determine the length of the optimal lag, a criterion such as the Akaike info criterion is used. The null hypothesis ($\delta = 0$) , that means, there is a unit root, is tested by comparing the estimated statistic of the parameter with the tabular values of Dickey and Fuller. If the absolute value of the estimated statistic is less than the value of the tabular value, the null hypothesis of the unit root cannot be rejected, meaning that the series is not stationary, and therefore it takes the first difference test for the series, and so on.

Cointegration Test

The co-integration test is one of the necessary tests to avoid cases of spurious estimation, since any two variables are jointly co-integration only if they have a long-term relationship and this study uses Johansen cointegration testto examine the long-run relationship between all the variables. The null hypothesis is tested against the alternative hypothesis by comparing the statistical values of the trace statistic and the max Eigenvalue statistic with tabular value in terms of the probability value. If statistic values of Trace and Max Eigen are greater than the tabular value. Thus, reject the null hypothesis and accept the alternative hypothesis which indicates that there is a long-term relationship between the variables.

Granger Causality

Granger causality based on vector error correction model are used after the time series variables are co-integrated then the direction of causal relation between the time-series variables can be determined.

The VECM model of the present study has been specified as follow:

$$\Delta y_t = \alpha_1 + \sum_{i=1}^{n} \beta_{1i} Ly_{t-i} + \sum_{i=1}^{n} \delta_{1i} Lx_{t-i} + \lambda_1 ECT_{t-i} + \epsilon_{1t}$$

$$\Delta x_t = \alpha_2 + \sum_{i=1}^{n} \beta_{2i} Ly_{t-i} + \sum_{i=1}^{n} \delta_{2i} Lx_{t-i} + + \lambda_2 ECT_{t-i} + \epsilon_{2t}$$

In this approach, the significance t-statistic on the parameter of error correction term (ECT) indicates that there is evidence of the existence of the long run causality between the variables. Accordingly, the null hypothesis is accepted, which states that there is no causal relationship that exists between the dependent variable with the independent variables, and vice versa.

Data Resource

The research has been conducted based on secondary data during period 2000 to 2018. It has been collected from various published sources such as Statistical annual report of Libyan Central Bank, the Arab Organization for Agricultural Development and Arab Monetary Fund.

Results and Discussion

Unit Root Test Results

The Augmented Dickey-Fuller (ADF) test is employed to analyses the stationarity of all of the variables, the agricultural GDP and the agricultural exportare found stationary at first difference, in the order of I(1) as shown in table (1). Hence, the null hypothesis of non-stationarity at the first difference can be rejected since the test statistics are larger than the critical value at 1% level of significance and thereby, the same integrated orders I(1) of the time series variables allows for the estimation of Vecm approach in this research. The null hypothesis is that series is non-stationary or contains a unit root. The rejection of null hypothesis is based on the critical values and numbers in parentheses indicate number of lags (k) based on AIC.

Table 1: ADF Stationary Test Results

Variables	ADF		Decision
	Level	First Difference	
AGDP	-1.518	-3.945	I(1)
AEX	-2.593	-3.967	I(1)
Critical Values			
1%*	-3.886	-3.920	
5%**	-3.052	-3.065	
10%***	-2.666	-2.673	

Note: AGDP = Agricultural gross domestic products; AEX= Agricultural Export

Determine the Optimal Lag Length

To estimate Vecm model need to select the optimal lag length according to the data interval (year) and estimate unrestricted Var which it was 1.

Table 2: Var Lag Order Selection Criteria Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-30.672	NA	0.129	3.630	3.729	3.643
1	-19.097	19.292*	0.056*	2.788*	3.085*	2.829*

*Note: * 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

Johanson's Cointegration

The Rank Test of (Trace) and (Maximum-Eigenvalue) statistics in Table 3 and Table 4 implies that there is one co-integrating vector between two variables. Thus, H_0 hypothesis that say no co-integration' between the variables is rejected at 1% level of significance.

Table 3: Unrestricted Cointegration Rank Test (TRACE)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No of CE(s)	Eigen value	Trace Statistic	0.05 Critical value	Prob
None*	0.6216	17.32578	15.4947	0.0262
At most1	0.0460	0.8010	3.8414	0.3708

Note: Trace test indicates 1 cointegration eqn(s) at the 0.05 level
**Denotes rejection of the hypothesis at the 0.05 level*
***Mackinnon- Haug – Michelis (1999)) p-values*

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No of CE(s)	Eigen value	Trace Statistic	0.05 Critical value	Prob
None*	0.6216	16.5247	14.2646	0.0216
At most1	0.0460	0.8010	3.8414	0.3708

Note: Max-eigenvalue test indicates 1 cointegration eqn(s) at the 0.05 level
*Denotes rejection of the hypothesis at the 0.05 level
**Mackinnon- Haug – Michelis (1999)) p-values

The results of the table 4 contain two tests: the Trace test and the Maximum Eigenvalue test. It is noted from the above table that the calculated value for the trace test, which is estimated at 17.32, is greater from the scheduled value 15.49 at a significant level of 5% with respect to the first hypothesis (None) and it refers to the existence of a co-integration relationship.

It is also noted that the calculated value of the maximum Eigenvalue test, which is estimated at 16.52, is greater than the scheduled value estimated at 14.26 at the 5% level of significance regarding the first hypothesis (None), which also indicates the existence of a co-integration relationship. Accordingly, it turns out that there is one co-integration relationship between the study variables according to the trace test and the maximum Eigen value test.

Estimation of VECM

After determining optimal lag length, and number of cointegrating vectors, we start estimating the VECM. The VCEM equation for the dependent variable AGDP and AEX is as follows:

D(AGDP) = C(1)*(AGDP(-1) + 0.52455146432*AEX(-1) - 8.25421634054) + C(2)*D(AGDP(-1)) + C(3)*D(AEX(-1)) + C(4)

D(AEX) = C(5)*(AGDP(-1) + 0.52455146432*AEX(-1) - 8.25421634054) + C(6)*D(AGDP(-1)) + C(7)*D(AEX(-1)) + C(8)

where,
AGDP, AEX = Dependents variables
C (1), C (5) = Coefficient of cointegrating equation (long-term causality)
C(3), C(6) = Coefficient of cointegrating equation (short-term causality)

Table 5 shows that long-run causality result for the (AGDP) equation the ECT (-0.3306) is negative and highly statistically significant which C(1) is Coefficient of cointegrating equation (long-run causality). Thus, agricultural export (AEX) causes agricultural GDP in long-run. While, the coefficient of C(5) in the (AEX) equation shows that ECT (-0.6680) is negative and highly statistically significant. That meaning, agricultural GDP cause agricultural Export (AEX) in long-run.

Table 5: Results of Vector Error Correction Model

	Coefficient	Std. Error	t-Statistic	Prob
C(1)	**-0.330668**	**0.154126**	**-2.145435**	**0.0414**
C(2)	0.374374	0.274182	1.365420	0.1838
C(3)	-0.046068	0.144157	-0.319571	0.7518
C(4)	-0.012715	0.085587	-0.148557	0.8830
C(5)	**-0.668049**	**0.184576**	**-3.619367**	**0.0013**
C(6)	1.505831	0.328351	4.586037	0.0001
C(7)	0.026072	0.172637	0.151019	0.8811
C(8)	0.101664	0.102496	0.991878	0.3304

Based on Wald causality test which used to examine the causality in short -run. The results of Wald test in Table 6, 7 indicate there is short-run causality running from Agricultural GDP towards the agricultural export since the probability of $\chi 2$ is less than 5% significant level, meaning that the null hypothesis can be rejected.

Table 6: Results of Wald Test

Wald test statistic	Value	df	Probability
Chi-square	0.1021	1	07493
Null Hypothesis: C(3)=0			
Null Hypothesis Summary			
Normalized Restriction (= 0)		Value	Std.Err.
C(3)		-0.046068	0.1441

Table 7: Results of Wald Test

Wald test statistic	Value	df	Probability
Chi-square	21.0317	1	0.0000
Null Hypothesis: C(6)=0			
Null Hypothesis Summary			
Normalized Restriction (= 0)		Value	Std.Err.
C(6)		1.5058	0.3283

Diagnostic test

To validate the model, the diagnostic test statistics are presented in Table 8 which confirm the absence of serial correlation and conditional Heteroskedasticity. Also, it clears from figure 1 the model is accomplishing stabilities condition.

Table 8: Results of Wald Test

Tests	Probability
Serial correlation Test	0.2292
Heteroskedasticity Test	0.1002

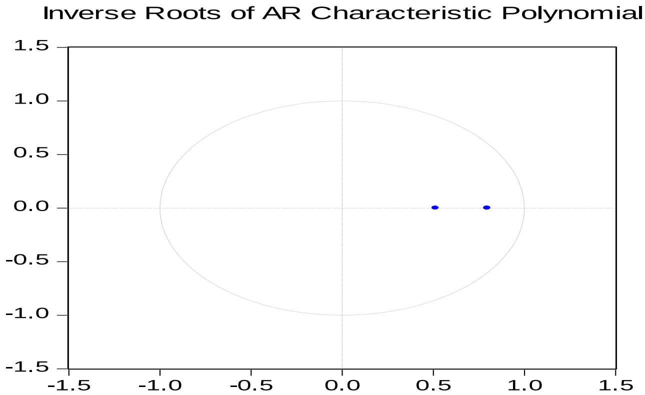

Figure 1: Stability of Model

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