European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol.9, No.23, 2017

Empirical Determinants of Agricultural Exports in Nigeria

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Abstract
The main objective of the paper has been to empirically investigate the determinants of agricultural exports in Nigeria. The research covered the period between 1980 and 2015. The Ordinary Least Squares technique was used to analyze the data. The cointegration and ECM models as well as the granger causality tests were adopted. The ADF result indicates that all the variables are I(1) and the Johansen cointegration test shows a long run equilibrium relationship between agricultural exports and its determinants. The result shows that the immediate past value of agricultural exports has a significant and positive impact on the current level of agricultural exports. The result shows that the one period lagged value of the Nominal Effective Exchange Rate has a significant and positive impact on the level of agricultural exports in Nigeria. The result shows that agricultural output has a significant and positive impact on agricultural exports in Nigeria. The result revealed that oil export has an insignificant and positive impact on the level of agricultural exports in Nigeria. The openness of the Nigerian economy to the outside World through international trade has a significant and positive impact on the level of agricultural exports in Nigeria. The ECM shows a satisfactory speed of adjustment between the short run and long run period. The result recommends amongst others a devaluation of the Nigerian currency and judicious use of oil exports to diversify the agricultural exports in Nigeria.
Keywords: Agricultural exports; Nominal Effective Exchange Rate; agriculture output; cointegration ,

Introduction

Before and immediately after independence, agricultural crops dominants the export sector in Nigeria. Even at the initial stage of the discovery of crude oil, agricultural exports still dominates total exports in Nigeria. Nevertheless, the oil boom that occurred in the beginning of the 1970s changed the situation since petroleum began dominating Nigeria's exports due to huge foreign exchange generated from crude oil exports. Agricultural exports of crops such as cocoa, rubber, palm produce, groundnut etc declined drastically. It fell from an average of 72 percent during the 1955 and 1969 period to 35 percent in the early 1970s (Abiodun and Solomon, 2010). Since most Nigerians reside in the rural areas, the agricultural sector also plays significant role in employment generation in Nigeria as over 70 percent of Nigerians engage in agriculture (Abolegba el al. 2010). The Nigerian government adopted various strategies in an attempt to improve her foreign exchange through increased agricultural exports. The strategies include the Nigerian Agricultural and Cooperative Bank in 1973 to provide credit facilities to farmers, the Agricultural Credit Guarantee Scheme Fund in 1978 to guarantee against loans collected by farmers from banks as well as the liberalization of the economy during the Structural Adjustment Programme that was introduced in 1986. Others include the Nigerian Export Credit Guarantee and Insurance Corporation in 1988 which was later called the Nigerian Export Import Bank, the National Economic Empowerment and Development Strategies (NEEDS) in 2004, the Export Processing Zones Authorities established in 1991, the Abuja Securities and Commodities Exchange established in 1996, the establishment of the marketing boards in 1977 etc (Abiodun and Solomon, 2010).

The Nigerian economy however experienced macroeconomic instability due to the neglect of the non oil sector, particularly the agricultural sector. Despite the huge contribution by crude oil to government revenue, it only accounts for below 25 percent of Real Gross Domestic Product (Solomon and Abiodun, 2013). This shows the danger of relying mainly on crude oil as a source of foreign exchange earnings'. The problem has been complicated by the volatility of crude oil prices which fell below 50 dollar per barrel in some occasions. This is even complicated since crude oil is an exhaustible resources and thus not a sustainable source of economic progress. A major challenge hindering the performance of the Nigerian agricultural exports is not limited to the concentration on mainly the oil sector, but the loss of market share of agricultural products from Nigeria to both emerging and developed economies. The high level of domestic demand for agricultural produce lives little for exports (Usman, 2010). Thus, the exports of agricultural produce fell from 63.00 percent in the 1960s to 28.92 percent and 20.15 percent in 1974 and 1979 periods (Usman, 2010). Despite the decline in agricultural production and exports, it still contributed as high as 41.00 percent of the Real Gross Domestic Product between 2001 and 2007. The contribution of agriculture to total exports declined from 13.50 percent between the 1970 and 1975 period to as low as 0.6 percent in the 2001 to 2008 period. Despite this decline in agricultural

production, the share of agriculture in total employment only declined from 57.80 percent in the 1970 to 1975 period to 53.00 percent in the 2001 to 2008 period. Also, the contribution of agriculture to non oil exports declined from 64.90 percent between 1970 to 1975 period to 25.60 percent in 2001 to 2008 period (Solomon and Abiodun 2013).

The main objective of the study is to empirically assess the determinants of agricultural exports in Nigeria. This is important because despite the decline in agricultural exports, it still contributes significantly to employment generation in Nigeria. This study is also important at this point in Nigeria given the need to diversify the crude oil dominated Nigerian economy which is important to get out of the current economic recession and to prevent future recessions. Improvement in agricultural exports is vital for sustainable economic growth in Nigeria. The research is divided into six sessions: Introduction, Theoretical framework, empirical literature, statistical procedures, results and findings and conclusions and recommendations.

Theoretical Underpinnings

Prebisch (1950) theory is an important model in examining the determinants of agricultural exports in Nigeria. It is a two-country and two-commodity model. The developed or industrialized country (centre) exports manufactured and finished items with income elasticity (Em) of demand >1, whereas the developing or emerging country (periphery) like Nigeria exports primary commodities such as agricultural produce which are mainly raw materials with income elasticity (Ep) of demand <1. The growth rate of exports of commodities and imports of commodities in the developed or industrialized (c) and developing or emerging (p) country is thus:

$$Xc = Gp*Em \quad (1)$$

$$Mc = Gc*Ep \quad (2)$$

Xc is export by the centre or developed country, Mc is the import of the centre, Gp is growth rate of export of the periphery or developing country. Gc is the growth rate of exports of the centre or developed country.

For developing:

$$Xp = Gc* Ep \quad (3)$$

$$Mp = Gp*Em \quad (4)$$

Where Xp is export price of the periphery

The relative growth rates of the industrialized and emerging economies will equal the ratio of the income elasticity of demand of both nations.

$$Gp/Gc = Ep/Em$$

The Em is equivalent to the inclination or propensity to import manufactured or finished goods for the developing or emerging country. A policy to reduce Em would reduce any Balance of Payments disequilibrium.

Drawing form the theory, the model to be estimated thus has agricultural exports as the dependent variable, while the Nominal Effective Exchange Rate represents international prices between Nigeria and her major trading partners. Other variables include agricultural output, oil exports and trade openess

Empirical Literature

Empirical studies on the determinants of agricultural exports have mixed results. David, Boris and John (2014) investigated the determinants of agricultural export trade in Ghana. The study covered the period between 1984 to 2009. The study adopted the Ordinary Least Squares (OLS) technique. The result indicated that fresh pineapple exports from Ghana has competitive advantage and is highly price-driven than volume driven. The result revealed that the volume and value of exports have positive association with production, openness to trade and index of competitiveness. The relationship with domestic demand and net inflow of Foreign Directive Investment is negative. Abiodun and Solomon (2010) analyzed the determinants of agricultural exports in Nigeria. The study covered the 1970 to 2007 period. The study adopted the OLS technique in estimating a parsimonious ECM. The result revealed that the World price for Nigeria's main agricultural commodities, World income and past agricultural output in Nigeria were major determinants of agricultural exports. Solomon and Abiodun (2013) adopted the Error Correction Model in investigating the determinants of agricultural exports in Nigeria. The study covered the period between 1970 and 2008. The analysis revealed that other than international oil prices other external factors do not influence the exports of agricultural produce from Nigeria. Usman (2010) evaluated the determinants of non-oil exports in Nigeria. The study which covered the period between 1988 and 2008 adopted the OLS estimation technique and found that GDP was positively affected by non-oil exports for previous year and consumer price index. Daniel and Sunday (2002) studied the determinants of agricultural exports in Cameroon. The results revealed that producer prices and not exports prices have significant impact on the export supply of cocoa and coffee. An export price was only important for banana exports. Abolegba (2010) assessed the determinants of agricultural exports. The result revealed using the OLS that agricultural exports cannot finance agricultural imports in Nigeria. Yusuf and Yusuf (2007) used the Error Correction Model of the OLS to assess the determinants of exports performance of three (3) major exports crops of Nigeria which include rubber, cocoa and palm kernel. The result revealed that expanding agricultural exports

is a necessary condition for minimizing the burden of relying on crude oil. Using the OLS and data covering the period between 1990 and 2005. Nwachukwu et al. (2010) found that World export volume, exchange rate and cocoa output were determinants of exports from Nigeria.

Statistical Procedures

The parsimonious Error Correction Model was adopted to estimate the determinants of agricultural exports in Nigeria. The OLS was used for this purpose. The time series properties were analyzed using the Augmented Dickey Fuller (ADF) unit root test. The Johansen cointegration methodology was used to analyze the existence or not of a long run equilibrium relationship between agricultural exports and its potential determinants. The overparameterize ECM is that of the form:

$\Delta L(x_t) = \alpha_0 + \alpha_i L(yt) + \alpha_j \Delta L(y_{t-j}) + \alpha_j \Delta L(x_{t-j}) + \alpha_k \mu_{t-1} + v_t$

Where:

α_0 = the constant
α_i = elasticities to be estimated
α_j = elasticity of past values of both dependent and independent variables
α_k = Error correction coefficient
x = dependent variable
y = vector of explanatory variables
v_t = stochastic error term

The model to be estimated is thus stated below:

LAGXP = $\alpha_0 + \alpha_1$ LNEER $+\alpha_2$ LAGRQ $+ \alpha_3$LOEXP $+\alpha_4$ OPEN $+ v_t$

Where:

AGXP = Agricultural exports
NEER = Nominal Effective Exchange Rate which is the weighted average of the naira against the currencies of all major trading partners. It is a multilateral measure of a country's competitiveness.
AGRQ = Agricultural output
OEXP = oil export
OPEN = Degree of openness
v_t = Error term

Results and Discussions

The result of the ADF unit root test result is shown in the table below:

Table1: ADF Unit root test result

LAGEXP Level First Difference	 0.17 -6.01*	I (1)
OPEN Level First Difference	 -2.52 -4.10*	I(1)
LOEXP Level First Difference	 -0.45 -6.40*	I(1)
LNEER Level First Difference	 -1.57 -5.43*	I(1)
AGRQ Level First Difference	 0.20 -3.92*	I(1)

NB: * indicates significant at the 1 percent level, 1% critical value = -3.64

The result of the ADF unit rot test indicates that the variables are I(1). This indicates that the variables were not originally stationary, but became stationary after the first difference was taken. All the variables were stationary at the 1 percent level. The result of the Johansen cointegration test is shown in the table below:

Table 2: Summary f Johansen Cointegration test result

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.536090	70.00970	69.81889	0.0051
At most 1	0.397669	34.66358	47.85613	0.4659
At most 2	0.258639	17.93428	29.79707	0.5709
At most 3	0.199146	8.058462	15.49471	0.4592
At most 4	0.021876	0.729929	3.841466	0.3929

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.536090	38.34612	33.87687	0.0020
At most 1	0.397669	16.72930	27.58434	0.6033
At most 2	0.258639	9.875821	21.13162	0.7562
At most 3	0.199146	7.328533	14.26460	0.4510
At most 4	0.021876	0.729929	3.841466	0.3929

The result from both the trace statistic and the Max-Eigen indicate one cointegrating equation in each case, thus rejecting the null hypothesis of no cointegration. This suggests the existence of a long run equilibrium relationship between agricultural exports from Nigeria and its major determinants. The result of the parsimonious ECM is shown in table3 below:

Table3: Parsimonious ECM Result. Dependent variable: LAGXP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLAGXP(-1)	0.531134	0.181031	2.933934	0.0066
DLAGRQ	0.203273	0.042987	4.728655	0.0001
DLNEER(-1)	0.789091	0.284536	2.773256	0.0111
DLOEXP	0.012155	0.076013	0.159909	0.8741
OPEN	0.427290	0.142107	3.006825	0.0055
ECM(-1)	-0.597877	0.233733	-2.557951	0.0162
C	-0.523072	0.615327	-0.850071	0.4025

$R^2 = 0.87$, AIC = -1.18 SC=-1.49, DW = 2.11

The result of the parsimonious ECM indicates that the immediate past level of agricultural exports has a significant and positive impact on the current level of agricultural exports. An indication that the previous level of agricultural exports is a major determinant of the current level of agricultural exports. The result indicates further that an increase in the immediate past level of agricultural exports by 1 percent will increase the current level of agricultural exports by 0.53 percent which is less proportionate. This indicating a weak performance of the current agricultural exports activities in Nigeria. The result indicates that the immediate past level of the Nominal Effective Exchange Rate has a positive and significant impact on the level of agricultural exports in Nigeria. The result shows that a depreciation of the exchange rate against the currencies of the major trading partners increased the exchange rate by 0.79 percent. An indication that the proposal to devalue the exchange rate might significantly improve the performance of the agricultural exports in Nigeria as it will improve the international competitiveness of agricultural exports. The current agricultural output has a significant and positive impact on the level of agricultural exports in Nigeria. An increment in the current agricultural output by 1 percent increased the level of economic growth by 0.20 percent. This relatively low elasticity is symptomatic that the agricultural output has performed below expectations. This findings confirm the findings of Abiodun and Solomon (2010) who found that agricultural output was a major determinant of agricultural exports in Nigeria. The parsimonious ECM result indicates that the oil export has insignificant and positive impact on the level of agricultural exports. This result shows that the revenue generated from oil exports in the current period has not been used for the expansion of agricultural exports in Nigeria. The low elasticity of oil export which is just 0.01 percent supports this result. This result is related to that of Solomon and Abiodun (2013) who found that apart from international oil prices, other external factors which include oil exports do not influence agricultural export. This result provides an indication that the view that oil export has not meaningfully improved the performance of agricultural exports cannot be rejected. The result also indicates that the openness of the Nigerian economy to the outside World through trade has a significant and positive impact on the level of economic growth in Nigeria.

The result shows that openness of the Nigerian economy to the outside world through international trade has been beneficial to the Nigerian economy. The coefficient of the one period lag value of ECM is -0.60 and it is statistically significant. This indicates a satisfactory speed of adjustment from the short run to the long run since 60 percent of the errors are corrected in each period. This is in favour of cointegration and supports the existence a long run steady state equilibrium between agricultural exports and its determinants.

The result of the Cumulative Sum of Recursive Residuals (CUSUM0 and the Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) stability test shown in the appendix indicates a validation of the null hypothesis that the model is stable. An indication that there has been no structural change in agricultural exports during the period between 1980 and 2015.

The result of the granger causality test at lag 2 is shown in the table below:

Table4: Granger causality at lag 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LAGRQ does not Granger Cause LAGXP	34	2.36025	0.1123
LAGXP does not Granger Cause LAGRQ		0.29724	0.7451
LNEER does not Granger Cause LAGXP	34	0.38935	0.6810
LAGXP does not Granger Cause LNEER		2.29727	0.1185
LOEXP does not Granger Cause LAGXP	34	1.03591	0.3677
LAGXP does not Granger Cause LOEXP		1.83241	0.3334
OPEN does not Granger Cause LAGXP	34	0.06480	0.9374
LAGXP does not Granger Cause OPEN		4.32287	0.0227
LNEER does not Granger Cause LAGRQ	34	0.02210	0.9782
LAGRQ does not Granger Cause LNEER		0.35057	0.7072
LOEXP does not Granger Cause LAGRQ	34	1.19279	0.3178
LAGRQ does not Granger Cause LOEXP		1.16492	0.3261
OPEN does not Granger Cause LAGRQ	34	0.32382	0.7260
LAGRQ does not Granger Cause OPEN		1.05055	0.3627
LOEXP does not Granger Cause LNEER	34	0.07483	0.9281
LNEER does not Granger Cause LOEXP		1.65562	0.2085
OPEN does not Granger Cause LNEER	34	9.19445	0.0008
LNEER does not Granger Cause OPEN		0.05154	0.9498
OPEN does not Granger Cause LOEXP	34	0.33220	0.7200
LOEXP does not Granger Cause OPEN		3.32285	0.0502

The result indicates a validation of the null hypothesis of no causal relationship between agricultural output and agricultural exports in Nigeria. The result also indicates no causal relationship between the Nominal Effective Exchange Rate and agricultural exports in Nigeria. It indicates that changes in agricultural exports was not significantly influenced by the changes in the Nominal Effective Exchange Rate. The result indicates a validation of the null hypothesis that agricultural exports does not granger cause changes in oil exports. The result indicates a bidirectional relationship from agricultural exports to openness of the economy to international trade and not the other way round. The result indicates that no causality exists between the Nominal Effective Exchange Rate and agricultural output. The result indicates no causality between oil exports and agricultural output. The result indicates that the openness of the economy and agricultural output did not granger cause each other. The result also indicates no causality between oil exports and Nominal Effective Exchange Rate. The result indicates a bidirectional causality from the openness of the economy to the Nominal Effective Exchange Rate and not the other way round. The result shows a bidirectional causality from oil exports to the openness of the economy.

Conclusion and Recommendations

The study draws from the Prebisch (1950) two country two commodity model. The agricultural sector constitutes

a dominant part of the Nigerian economy since agriculture plays an important role in the economy. The agricultural sector has however been neglected due to the over concentration on the crude oil sector. The cointegration and ECM models as well as the granger causality tests were used to analyze the determinants of agricultural exports in Nigeria. The result concludes that the immediate past value of agricultural exports is an important determinant of current level of agricultural exports in Nigeria. The result also concludes that although agricultural output is an important determinant of agricultural exports, its contribution has been below expectations. The result shows that the depreciation of the Nominal Effective Exchange Rate in the immediate past period improved the level of agricultural exports and thus it is a major determinant of agricultural exports in Nigeria. The result revealed that oil export is not a major determinant of agricultural exports indicating that the huge revenue from oil exports over the years has not been transformed into improved agricultural exports performance. The result indicates further that the openness of the Nigerian economy to the outside world through international trade is a major determinant of agricultural exports in Nigeria. The result thus recommends an adoption of the policy of exchange rate devaluation as this will improve the output of the agricultural sector and hence agricultural exports in Nigeria. The study recommends further that the revenue from oil exports should be used to expand agricultural productivity as this will improve the level of agricultural exports and hence economic growth in Nigeria. It is further recommended that trade between Nigeria and the rest of the World should be further liberalized since this will increase the earnings from agricultural exports. Incentives such as credit facilities at concessional interest rate, fertilizers and improved seedlings should be made available to farmers to improve the output from the sector and hence agricultural exports.

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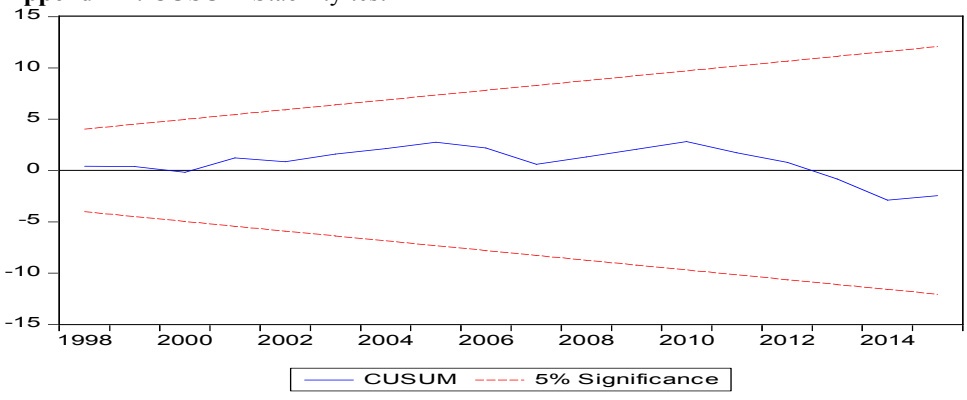
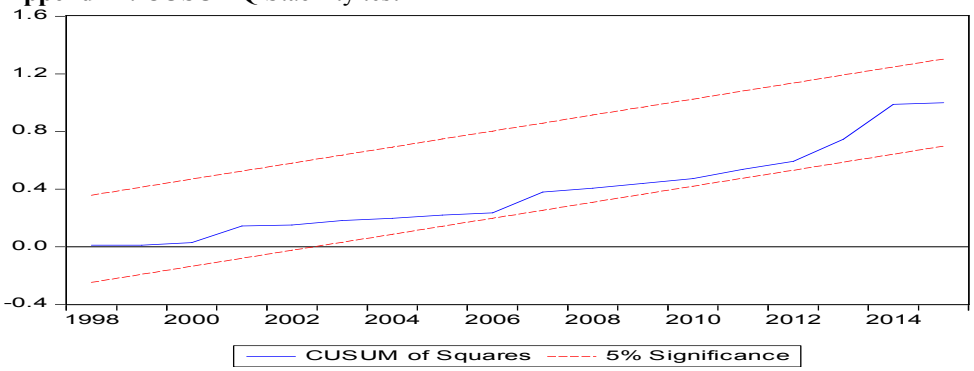
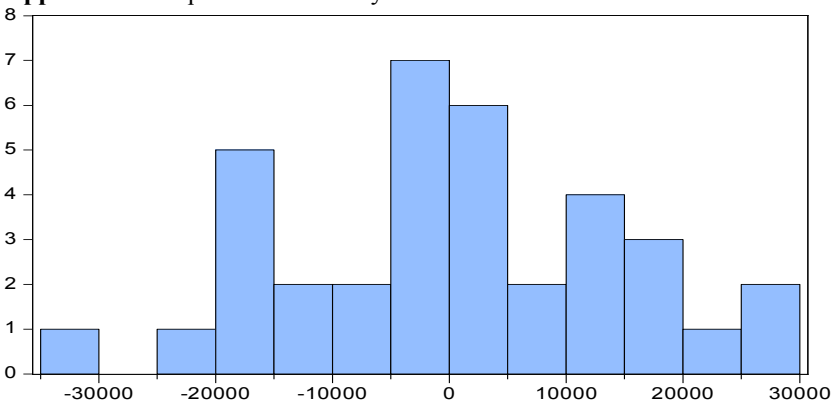
Appendix 1: CUSUM Stability test



Appendix2: CUSUMQ Stability test



Appendix 3: Jarque-bera normality test



Series: Residuals	
Sample 1980 2015	
Observations 36	
Mean	-7.86e-11
Median	-151.9568
Maximum	29343.23
Minimum	-33355.00
Std. Dev.	14455.16
Skewness	-0.068000
Kurtosis	2.640830
Jarque-Bera	0.221248
Probability	0.895275