FACTORS AFFECTING THE EXPORT VALUE OF NIGERIAN CASHEW NUT: A TIME SERIES ANALYSIS

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ABSTRACT
The study investigated the factors affecting the export value of cashew nut in Nigeria using a time series model. The study adopted the Autoregressive Distributed Lag (ARDL) framework and Bounds co-integration test to identify the factors affecting the value of cashew nut in the short run and long run. The trend analysis showed that cashew nut export value in Nigeria peaked in the year 2012 to 447 million dollars. Although there was a sharp fall in the value in 2013 to ca. 60 million dollars, the value has remained largely unstable since then oscillating between 100 and 300 million dollars. The result of the inferential time series analysis showed that cashew production and exchange rate have a positive significant impact on cashew nut export value while growth in gross domestic product (GDP) has a negative impact on cashew nut export value in the long run. In the short run, production and exchange rate have a positive effect on cashew nut export value while inflation and GDP growth have a negative effect on cashew nut export value. The study recommended provision of incentives for cashew farmers to improve cashew nut production as this will result in a growth in export value in the short and long run. Policies aimed at improving exchange rate and reducing the inflation rate should be pursued by government so as to further improve the export value of cashew nut in Nigeria.

Key words: cashew trade, ARDL, trend analysis, short run, long-run

INTRODUCTION

Cashew (*Anacardium Occidentale* L.), a tree crop whose origin can be traced back to the Amazon Basin in Brazil is one of the most traded crops in the world today. The crop was introduced to Africa and by extension Nigeria around the 15th and 16th century (Adeigbe *et al.,* 2015). Côte d'Ivoire is the largest producer of cashew in Africa. Tanzania, Benin, and Nigeria are the next three largest producers of cashews in Africa (Mordor Intelligence, 2023). The Nigerian government has made significant efforts to promote the export of agricultural commodities, including cashew, in order to meet the increasing input demand of cashew processing industry and enhance non-oil export earnings. This includes reducing export restrictions or taxes and devaluing the exchange rate to reduce overvaluation. Commodity marketing boards were also dissolved by the government to create price incentives for farmers. Additionally, international agencies and non-governmental organizations have implemented programs to further develop the production and export of cashew nuts in Nigeria (Oni, 2023).

According to Nigerian Export Promotion Council (NEPC, 2021), the Nigerian cashew industry has achieved a 10% annual production growth rate over the past decade. The industry yields between 300-800 kg per hectare and is consistently improving the quality of its crops, including the notable "Ogbomosho" variety weighing 21-22 kg per 190 nut count and "Nigerian" variety weighing 19-21 kg per 195-205 nut count. The early cashew crop season runs from February to April. With a production of 220-240,000 tonnes of in-shell cashew nuts from 22 states involving both smallholder and commercial farmers, Nigeria is the 6th largest producer of cashew in the world and the 3rd largest in Africa (FAO, 2021).

Cashew nut is often considered as the most valuable part of the cashew tree. This explains why it remains the most traded aspect of the cashew tree in the international market. Nigeria has been exporting cashew nut before its independence and is still exporting the crop. There are two types of cashew nuts being traded in the global market; they are the shelled cashew nut and the unshelled cashew nut (Tola and Mazengia, 2019). Although the shelled cashew nut commands a greater value than the unshelled cashew nut due to the value added, Nigeria, is predominantly an unshelled cashew nut exporting country.

There has been an unwavering clamour for economic diversification in Nigeria with particular emphasis on the agricultural sector (Tonuchi and Onyebuchi, 2019). This calls for a stringent look into the major agricultural exports in Nigeria.

According to Eze *et al.* (2022), cashew nut is the third largest agricultural export commodity in Nigeria. Cashew nut alongside cocoa has also been considered as one of the most important agricultural export overtime, thus it deserves a serious consideration by all stakeholders. In order to analyse this sub sector there is the need to consider the factors that affects its value in the short and long run. In line with the above the specific objectives of the study are to examine the trend of cashew export value, analyse the factors driving cashew export value in the short run, and determine the factors affecting cashew nut export in the long run.

MATERIALS AND METHODS

This study adopted annual secondary data from the year 1976 to 2020. The data for the variables considered were sourced from Food and Agriculture Organisation (FAO, 2021) database and the World Development Indicators (WDI, 2021). The period is suitable for this study because it absorbs periods of economic boom and recession.

Econometric Model

The study employed the Autoregressive Distributive Lag (ARDL) model by Pesaran *et al.* (2001) in this study. The choice of this model is due to its advantages over other models. The ARDL model estimates both long run co-integration and short run relationship within the same econometric framework, the model is suitable for variables with mixed order of integration i.e., $I(0)$ and $I(1)$ and it is also suitable for small sample datasets.

Model Specification

The ARDL equation is specified as thus:

$$CEXV = \alpha_0 + \sum_{i=1}^{m} \beta_{1i} CEXV_{t-i} + \sum_{i=1}^{n^1} \beta_{2i} CPR_{t-i}$$
$$+ \sum_{i=1}^{n^2} \beta_{3i} GDPG_{t-i} + \sum_{i=1}^{n^3} \beta_{4i} INF_{t-i} + \sum_{i=1}^{n^4} \beta_{5i} REER_{t-i}$$
$$+ \lambda_1 CEXV_{t-1} + \lambda_2 CPR_t + \lambda_3 GDPG_t + \lambda_4 INF_t + \lambda_2 REER_t + \varepsilon_t \cdots (1);$$

where CEXV is cashew nut export value (USD), CPR denotes cashew production (tonnes), GDPG is GDP growth rate, INF denotes inflation rate, REER stands for real effective exchange rate, and ε_t is the error term. α_0 is the intercept term; while β_1, $\beta_2 \ldots \beta_5$ are the short run coefficients; $\lambda_1, \lambda_2 \ldots \lambda_5$ are the long run coefficients of the model. The selection of these variables was based on availability of data for the period under study.

The Error Correction Model (ECM) is specified as:

$$\Delta CEXV = \varrho_0 +$$
$$\sum_{i=1}^{m} \varrho_{1i} \Delta CEXV_{t-i} + \sum_{i=1}^{n^1} \varrho_{2i} \Delta CPR_{t-i} +$$
$$\sum_{i=1}^{n^2} \varrho_{3i} \Delta GDPG_{t-i} + \sum_{i=1}^{n^3} \varrho_{4i} \Delta INF_{t-i} +$$
$$\sum_{i=1}^{n^4} \varrho_{5i} \Delta REER_{t-i} + \phi ECT_{t-1} + \varepsilon_t \ldots \ldots \ldots (2);$$

where Φ is the speed of adjustment toward equilibrium.

RESULTS AND DISCUSSION

Trend of Cashew Nut Export Value

Depicted in Figure 1 is the trend of the value of Nigeria's cashew nut export for 45 years (1976-2020). From these data, it was observed that the export value of cashew nut in Nigeria was below 50 million USD for periods preceding year 2012. According to Kolliesuah *et al.* (2020), cashew consumption and production was generally low before 2012 especially in West Africa. The global consumption of cashew nut rose to almost 600,000 metric tonnes in 2012 prompting the export value of Nigerian cashew nut to rise from less than 50 million USD to almost 450 million USD. This was followed by a fall in export value in 2013 to about 60 million USD. Despite the continuous rise in the global cashew nut consumption production and sanitary issues continue to affect the export value of Nigerian cashew nut. According to Ogunwolu *et al.* (2022), issues such as low yield, poor peel-ability and storage has continually resulted in the poor pricing and valuation of Nigerian cashew in the global market. The export value rose again to over 100 million USD in 2015 and to over 300 million USD in 2017. However, the export value of Nigerian cashew nut started declining again in 2019 and eventually falling to about 164 million USD in 2020. The fall of the export value of Nigerian cashew nut in 2020 can be directly attributed to the emergence of corona virus and consequently the lockdown in many cashew producing and consuming countries.
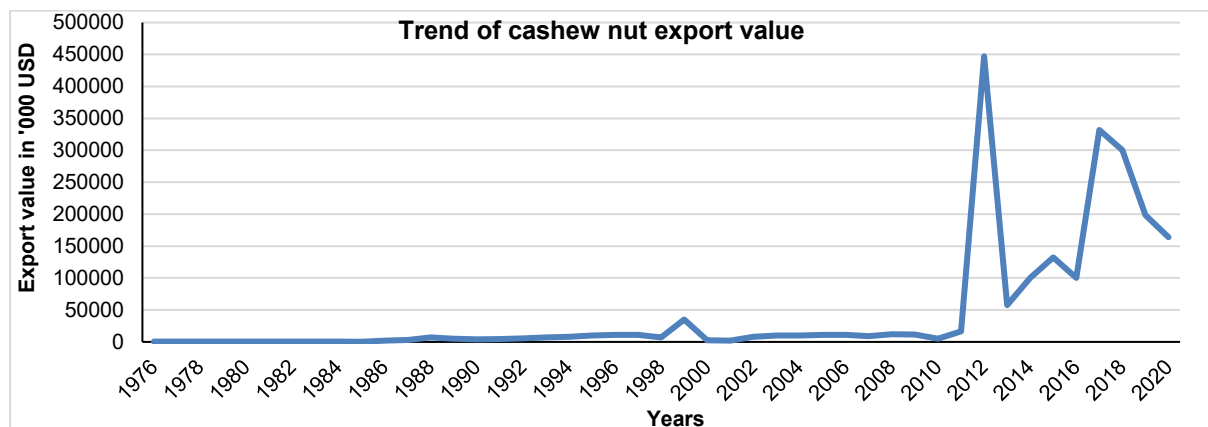

Figure 1: Trend of cashew nut export value in Nigeria (FAO, 2021)

Stationarity Test Result

The result of the Augmented Dickey Fuller (ADF) unit root test is presented in Table 1. The results show that the variables exhibit mixed orders of integration with cashew nut export value (CEXV), GDP growth (GDPG) and inflation stationary at level while cashew nut production (CPR) and real effective exchange rate (REER) stationary at first difference. This result shows that the Johansen co-integration technique is not suitable for this model; hence, Autoregressive Distributive Lag (ARDL) model which accommodates variables of order zero and one will be adopted for the study.

Bounds Test

The result of the bounds test F-statistics is depicted in Table 2. One of the criteria for using ARDL model is that the *F*-statistics must be greater than the upper limit. According to the Table 2, the estimated *F*-statistics is 4.196247 which is greater than the upper limit of 3.38. Consequently, we proceed to estimating the ARDL model.

Long-Run Results

The long run determinants of cashew nut export value are presented in Table 3. Cashew nut production significantly affects the export value of cashew nut in the long run. One percent increase in cashew production will result in 44% increase in the export value of cashew in the long run. This may be due to the current inability of the country to meet export demand for cashew nut as well as the unstable nature of cashew nut production in the country. According to Daramola *et al.* (2007), a steady increase in the production quantity will ensure stability in export quantity and supply thereby increasing the value of the commodity. A unit increase in GDP growth will result in a decrease of about 6.7 million USD in the value of cashew nut exports in Nigeria. The monolithic nature of the country and its continuous over-

dependence on crude oil ensures that a growth in the GDP of the country will only encourage further dependence on oil thereby affecting the export of other commodities such as cashew nut. Similarly, an increase in the rate of inflation in the country will result in an insignificant fall of cashew nut export value. This is in consonance with the findings of Alawode and Adeniraye (2020). There is a positive relationship between exchange rate and cashew nut export value in Nigeria. A rise in the exchange rate by a unit will raise cashew nut export value by approximately 951,000 USD. A rise in exchange rate implies a depreciation which will result in cheaper export prices and rising export quantities (Yakub *et al.*, 2019). The long run result shows an R-squared value of 0.745937 which implies that about 75% variation in the cashew nut export value is explained by the model. The Durbin Watson statistic of 2.305716 implies that there is no presence of serial correlation in the model.

Short-Run Results

The result of the factors affecting cashew nut export value in the short run is portrayed in Table 4. Cashew nut production affects the value of exported

Table 1: Unit root test

Variable	Level	First difference	I(D)
CEXV	–5.059727***		I(0)
Cashew production		–3.646827***	I(1)
Gross domestic product growth	–2.521160**		I(0)
Inflation	–6.584158***		I(0)
Real effective exchange rate		–4.400180***	I(1)

E-views 10. *** - significance at 1, 5 and 10% probability level

Table 2: Bounds *F*-test result

Number of lag length	*F*-statistics	Lower limit*	Upper limit*
5	4.196247	2.39	3.38

Peseran *et al.* (2001). Critical values were selected for a significance level of 5%.

Table 3: Autoregressive distributed lags long-run results

Dependent variable: cashew nut export value	Long-run coefficients	Standard error	*t*-statistics
Cashew production	0.449905*	0.254274	1.769371
Gross domestic product growth	–6705.254*	3865.521	–1.734631
Inflation	–4200.659	3592.851	–1.169172
Real effective exchange rate	951.9081*	472.0624	2.016488
R-squared	0.745937		
Adjusted *R*-squared	0.552366		
Dubin Watson statistics	2.305716		

* - significance at the one percent level. Computed by the authors using E-views9

Table 4: Autoregressive distributed lags short-run results

Variables	Short-run coefficients	Standard error	*t*-statistics
Lagged cashew production	0.449905**	0.176930	2.542841
Lagged gross domestic product growth	–6705.254**	2495.788	–2.686628
Lagged Inflation	–4200.659***	1167.639	–3.597565
Lagged real effective exchange rate	951.9081***	220.7825	4.311520
Error correction model	–0.805815***	0.131124	–6.145423
R-squared	0.752183		
Adjusted *R*-squared	0.660400		
Dubin Watson statistics	2.305716		

, * - significance at 5 and 1% respectively. Computed by the authors using E-views9

cashew nut in the short run. One percent increase in cashew nut production results in ca. 45% increase in the export value at 5% level of significance. Intuitively, a rise in the level of production of cashew nut in the short run should increase the export value of the crop, this is because increasing production helps to accommodate the rising demand for cashew globally. According to Ibe *et al.* (2023), the rising global demand of cashew nut is due to increase in the utilization of the crop. Adesanya *et al.* (2021) posited that a rise in production and value added in the value chain could prompt a rise in the value of cashew nut. There is a negative relationship between GDP growth and cashew nut export value in the short run. A unit increase in GDP growth will result in 6.7 million dollars decrease in cashew nut export value. According to Olaleye *et al.* (2013), agricultural exports has a bi-directional relationship with economic growth, however, due to the predominance of oil exports over agricultural commodities there may be little or negative relationship between agricultural export commodities and growth in GDP. Rising GDP in the short run will only encourage more focus on oil exports to the detriment of agricultural exports leading to a fall in the export value of agricultural commodities such as cashew. There is a negative relationship between inflation rate and the value of cashew exports in the short run. One unit increase in the rate of inflation in Nigeria will result in approximately 4.2 million USD decrease in the value of cashew nut exports. According to Olatunji *et al.* (2012) a rise in inflation rate results in a rise in agricultural production inputs which translates to decrease in quantity produced. A decrease in the agricultural quantity produced has a direct impact on the sale value because the quantity produced is an argument in the export value component. A unit

increase in the exchange rate will raise the value of cashew nut export by 952 dollars at one percent significance level. A rise in the exchange rate implies exchange rate depreciation. When a country's currency is depreciated it means that the export commodities of such a country will become cheaper in the international market in the short-run which will result in a rise in demand for exported commodities (Oluyemi and Isaac, 2017). A rise in demand for cashew nut in the international market due to depreciation will encourage local production which will ultimately result in an increase in value. According to The Error Correction Model (ECM) of –0.81 is negative, less than one and statistically significant which shows that the ECM derived is in line with theory. The result of the ECM implies that following a disequilibrium in the short run, the errors will adjust to long run equilibrium at speed of 81%. In other words, errors are corrected in the present period and tied to long run equilibrium with 81% magnitude. The Durbin Watson test value of 2.305716 shows that there exist no auto-correlation in the model. The R squared value of 0.752183 shows that about 75 percent variation in the cashew nut export value is explained by the model.

CUSUM Stability Test
After estimating an ARDL model it is important to test for the stability of the model. This study applies the CUSUM test developed by Pesaran (1997) in testing for the stability of the long-run coefficients. The result is presented in Figure 2. Stability of the model is valid when the CUSUM plot (blue line) stays within the limits of the critical bounds of five percent level of significance. The CUSUM result depicted above shows that the model is stable implying that the null hypothesis that all coefficients in the error correction model are stable will not be rejected.
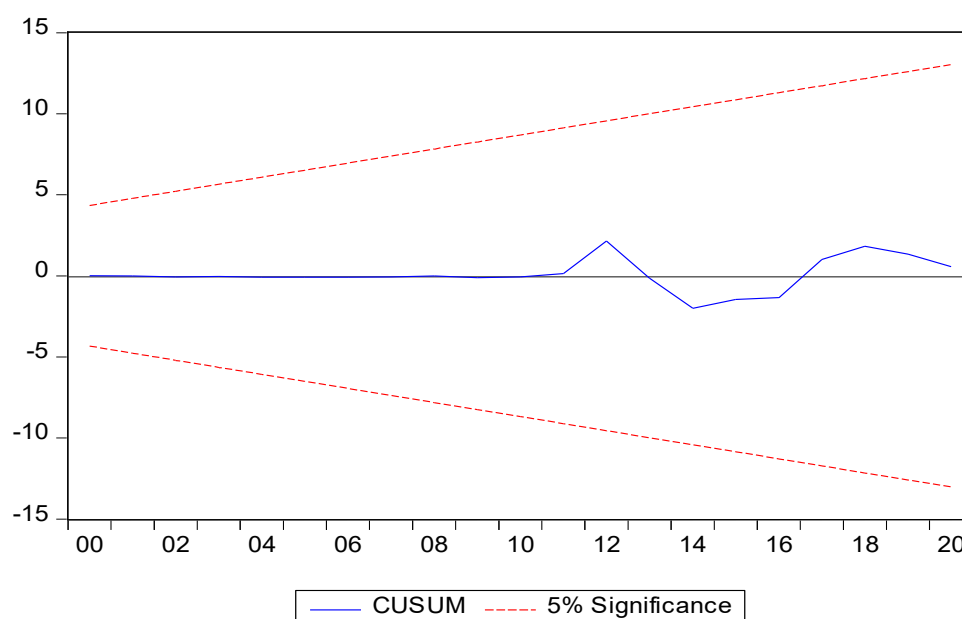

Figure 2: CUSUM test plot (author's plot using E-views 9)

CONCLUSION AND POLICY RECOMMENDATIONS

The study investigated the factors that affect the export value of Nigerian cashew nuts in the international market. The export value of Nigerian cashew in the global market has been relatively low and stable over the years with the exception of the surge in 2012 and 2017 when the value rose by over 100% in both years. It was observed that cashew production, GDP growth, and exchange rates are the main long-term factors that influence the value of Nigerian cashew nuts. In the short term, cashew production, GDP growth, inflation rate, and real exchange rate significantly affect the export value of cashew nuts.

Based on the findings, the study recommends the following: incentives to increase cashew production should be encouraged to increase export value in both the short and long term; government should also focus on improving the country's exchange rate to raise export value in the short and long term; and policies to reduce inflation rates should be implemented to increase the short-term export value of Nigerian cashew nuts.

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