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Agricultural Export and Macroeconomic Factors in Nigeria: The Bound Test Approach

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ABSTRACT

There has been many significant research efforts that have been devoted to understand the effects of macroeconomic factors on the agriculture in Nigeria. Thus, macroeconomic factors such as exchange rate and crude oil price over the period 1981-2016 examined the effects on agricultural export in Nigeria. This paper employed the autoregressive distributed lag bound test analysis since all the macroeconomic series used in the study are of mixed integrated order of stationarity. A Granger causality was also carried out in order to examine whether there is any predictive power of crude oil price for agricultural export. The findings showed that there exists a significant relationship between the agricultural export which is the dependent variable and the exchange rate but not in the case of the crude oil price. It also revealed that the variables do cause each other in some directions. In conclusion, there is long run relationship between exchange rates and agricultural export in Nigeria.

Keywords: Agriculture Export, Macroeconomics Factors, Crude Oil Price, Exchange Rate
JEL Classifications: B22, B27, B41

1. INTRODUCTION

Nigeria found crude oil in 1956, it turned into an export product in 1958. Before the discovery of crude oil, the export products were agricultural commodities. The production level of crude oil in the country has changed throughout the years because of the OPEC's quota and socio-political instability. Taking after the discovery of crude oil that has being main source of income and foreign exchange for the country, thereby adds to more than 80% of the government's revenue. Recently, the international price of crude oil dwindled in the global market and this prompted to a shock on the foreign exchange rate of the nation. Exchange rate which is the price for which the currency of the nation can be exchange for another nation's currency depreciated (Mousavi and Leelavathi, 2013; Obioma, 2015).

Exchange rate is a crucial economic variable influencing the import and export of Nigeria's agricultural commodities globally. The ability to be able to convert the currency into another at the prevailing exchange rate is important to global business and decision making of the nation. Therefore for an import dependent nation like Nigeria in terms of the agricultural sector, there is a need to understand the interaction existing among crude oil price, exchange rate and agricultural export. Agriculture which is regarded as the engine of growth and development of most nations; as a result of its crucial role in the economic development as well as one of the major way out from poverty of most third world countries need to be re-examine. However, recent researches on the causes of development and underdevelopment have identified agricultural transformation as key to economic liberation of worsening countries. In this view, it can be presumed that agriculture is the foremost determinants of achieving economic development and whether war against poverty can be won or lost in the long run (Eyo, 2008; Omotor et al., 2009; Izuchukwu, 2011).

The development of agriculture has been slow in spite of various agricultural policies in the country Nigeria. In fact, various programmes are being introduced and implemented by the

government to improve the situation ever since 1970s. In spite of all these measures, the slow growth of agriculture could have created issues like insufficient food for the populace, inadequate raw materials for the industrial sector and decrease in its foreign exchange earnings. Thus, resulted to the question on what are the macroeconomic factors that affects agricultural export in Nigeria? Since the economic and physical welfare of the country can depend on increasing and stabilizing of agriculture through more effective policies, technologies, programmes and practices. Likewise, agriculture roles can't be overstressed in transforming the economic framework of any country given that it serves as source of food for animal and man, provision of raw materials and help in the poverty reduction of most countries.

In view of the above, the paper aims to empirically investigate the impact of macroeconomic factors on agricultural export. Therefore, the main focus of the paper is to further evaluate empirically the presence and way of Granger causality between agricultural export, exchange rate and crude oil price to help the policy makers for having a better insight into economic growth and to formulate effective economic policies. Furthermore, the paper entails five segments: introduction, reviews of related literatures divided into empirical and theoretical framework, methodology and conclusions with some recommendations.

2. LITERATURE REVIEW

In this section, relevant literatures are reviewed empirically alongside with theories in line with large numbers of studies on the relationship of macroeconomic factors and agriculture.

2.1. Theoretical Review

The achievement of sustainable and inclusive growth has been the main aim of most nations of the world, which has created lot of consideration among the various schools of economic thought extending from the classical to the neo-classical views. In the discussion of growth theory decades, the neo-classical exogenous growth theory has been the dominant school of thought. This model provided the few links of macroeconomic factors influence on export growth. However, for examining the relationship between macroeconomic variables and export, this paper will present models based on the existing literatures where an export supply function framework in which terms of trade and other macroeconomic factors are used as possible explanatory inputs.

2.2. Empirical Review

Several studies have been directed to observe the influences of macroeconomic variables on agriculture because of the essentiality of this issue in the growth of nations. In various nations, significant research efforts such as Schuh, 1974; Tweeten, 1980; Gardner, 1981; Chambers and Just, 1982; Orden and Fisher, 1991; Gbosi, 1996; Kargbo, 2000; 2007; Anthony, 2010; Munish, 2011 and so on have been devoted to understanding of macroeconomic variables linkages to agriculture. Schuh (1974) introduced the significance of the effects of macroeconomic policy for agriculture, whereas exchange rates was considered to be as a channel of macroeconomic policy transmission to agricultural sector. Nevertheless, it was argued that the overvaluation of the dollar and policy approaches to battle with the worse adjustment problems of agriculture in U.S in 1950s resulted in fluctuating of a vital share of the technical change's benefits to the consumer. In addition it was discovered that the devaluation of the dollar recently constitutes a key structural change for U. S. agriculture. Similarly, Baek and Koo (2007) investigated on the effects of the exchange rate, income and money supply of the United States and its major trading partners on agricultural trade balance using an autoregressive distributed lag (ARDL) model. It was found that the exchange rate is a crucial determinant of the short and long-run trade balance's manners. The income and money supply in both the United States and the trading partners was found to have significant impacts on U.S. agricultural trade in both the short and long run. In the same manner, Baek and Koo (2009) also examined short and long run effects of exchange rate fluctuations on bilateral trade of agricultural products between the United States and its 10 major trading partners using an ARDL approach to cointegration. In the long run, results revealed that while U.S. agricultural exports are extremely responsive to bilateral exchange rates and foreign income, the country's agricultural imports are generally sensitive to the U.S. domestic income. On the other hand, both the bilateral exchange rates and income in U.S. and its trading partners are found to have significant impacts on U.S. agricultural exports and imports in the short run.

Gil et al. (2009) analysed the impact of alterations in the monetary policy and the exchange rate on agricultural supply, prices and exports using the multivariate cointegration approach covering annual data from 1967 to 2002. Variables such as interest rate, exchange rates, money supply, inflation, agricultural output and input prices, agricultural supply and exports, income and the rate of commercial openness are considered in the study. The results of the study indicated that changes in the chosen macroeconomic factors have an influence on the agricultural sector, while the reverse effect does not hold. Likewise, Alagh (2011) examined the macroeconomic factors linkage with agriculture in India. From the extensive review of the past works the question "is there a structural constraint in agriculture or does agriculture work in a system in which as demand rises and prices rise, supply responds in the country?" emerged. This question led the study to the analysis of macroeconomic policy variables particularly government expenditure and money supply on agricultural prices and interest rates for agriculture. A partial economy framework using lags to help the specifications of model was used, while a Causal Chain model exhibited the econometrically macro policies impact on agriculture in an important way.

Kargbo (2000) examined impacts of monetary and macroeconomic factors on real food prices in eastern and southern Africa during 1980-1996 era. The study used cointegration technique and error correction modelling to test the long-run relationship between real food prices and the selected factors that influence some African countries' behavior. It was found that fluctuations in domestic food production, fused with income, trade, exchange rate and monetary policies have significant impacts on real food prices. Similarly, Colman and Okorie (1998) examined the effects of the trade and foreign exchange management policies of Structural Adjustment Program (SAP) on agricultural export in Nigeria.

Protection rates and incidence parameter are used to assess the policy results over the period (1970-1992). The findings indicated that the protection of import-competing sectors has not been eradicated and has resulted into the taxation of all export goods, with major proportion of such taxes borne by agricultural exports. The failure to maintain steady policies and slightly weak approach to implementation of some policies, led to the inability of the SAP policy instruments to achieve its aims. Omotor et al. (2009) examined the effects of policy reform on Nigeria's agricultural exports. The result indicated that agricultural export is significantly influenced by domestic consumption and economic liberalization. Thus, suggested that policy reforms on agricultural productivity should go beyond liberalization of the economy.

In the same manner, Iganiga and Unemhilin (2011) examined the effect of Federal government agricultural expenditure on agricultural output coupled with other variables like aggregate commercial credits to agriculture, consumer price index, annual average rainfall, population growth rate, food importation and GDP growth rate. Co-integration method was employed for analysing long and short run impacts of the variables on the agricultural output. It was concluded that investment in the agricultural sector is vital and should be accompanied with supervised credit facilities. In addition, food importation should be ban in order to encourage local producer. Similarly, Lawal (2011) studied on the level of government spending on the agricultural sector and GDP by a simple linear regression. It was found that government spending follow an irregular pattern and that the influence of the agricultural sector to GDP has a direct relationship with government finance to the sector. The study therefore recommended that government should increase her financial plan allocation on agricultural sector because of the sector's main role to economic growth and development of nations. Eyo (2008) examined the effect of macroeconomic policies adopted on agricultural output growth in Nigeria. It was found that exchange rate system lately did not stimulate agricultural export. In all, recommendation on macroeconomic policies that will reduce inflation, increase foreign private investment in agriculture, present encouraging exchange rates, make agricultural credit to have significant effect on agricultural output growth would be helpful in revitalizing government expenditure in the sector and ensure agricultural output growth in country.

Linkages has been established between nation's growth and agriculture, since the agricultural sector's performance is being seen as the prospects of non-oil sector and the economy overall. Likewise several macroeconomic variables and policies has be linked to sectors output growth particularly on agriculture based on this study reviewed, thus necessitate investigating of macroeconomic factors influencing agricultural output in Nigeria.

3. METHODOLOGY

The study was conducted in Nigeria; one of the sub-Sahara Africa countries situated on the Gulf of Guinea in the western Africa's part. This study utilized secondary data regarding the selected macroeconomic variables and Nigeria's agricultural export. Annual data covering 1981-2016 are analysed through the unit root test and regression analysis. The data were sourced the World Bank Database, Central Bank of Nigeria Statistical Bulletin and Annual financial reports of Statistics of various issues.

3.1. Model Specification

$$Y_t = C_0 + C_1 Cop_t + C_2 Ex_t + U_t$$

Where:
Y_t=Agricultural export
Cop_t=Crude oil price
Ex_t=Exchange rate
C_0, C_1 and C_2=Constants
U_i = Error term.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Unit Root Test

Augmented Dickey Fuller (ADF) and Philips-Perron (PP) test are employed for conducting of the unit root test; for determining the order of integration. According to Table 1, the unit root test result using ADF and PP including lag length selected by Schwarz Criterion (SC) are both at level and first differences of all variables. All variables remain stationary at first difference according to ADF and PP unit root test. In summary, according to the two methods of unit root tests, we can conclude using ADF and PP that all variables (exchange rate, crude oil price and agricultural export) are stationary at I (1). The unit root test approves that none of the variables is at I (2) and this result indicates proceed with the ARDL cointegration test where I (0) and I (1) variables are inclusive.

Table 2 shows VAR lag order selection criteria for the variables (agricultural export, crude oil price and exchange rate), because selecting of the optimal lag length is an important condition in ARDL bounds test approach. The optimal lag length five is selected for the model based on all the criteria statistics. Thus, our target is to estimate the co-integration relationship for agricultural export as a dependent variable with independent variables which are exchange rate and crude oil price.

Thereby, we estimate only "F" statistics for agricultural with exchange rate and crude oil price. The results of the estimated "F" statistics for equation is given in Table 3. Therefore, the null

Table 1: ADF and PP unit root test

Variable	ADF		PP		Result
	Constant	Trend and constant	Constant	Trend and constant	
Agricultural export	2.452100	3.914584**	2.294447	3.73820**	I (0)
Exchange rate	5.386226***	5.326928***	5.386226***	5.326928***	I (1)
Crude oil price	6.323787***	6.482564***	7.203390***	10.00710***	I (1)

***, **, * denotes rejection of the null hypothesis of a unit root at the 1%, 5%, and 10% significance level. No asterisk indicates that the series is non-stationary. ADF: Augmented Dickey Fuller, PP: Philips-Perron

Table 2: VAR lag order selection criteria

Endogenous variable: AGRICULTURAL_EXPORT						
Exdogenous variable: C CRUDE_OIL_RENT EXCHANGE_RATE						
Date: 10/29/16 Time: 09:47						
Sample: 134						
Included observations: 28						
Lag	**Log L**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	−345.1880	NA	3.71e+09	24.87057	25.01330	24.91420
1	−339.9025	9.060713	2.73e+09	24.56447	24.75478	24.62265
2	−337.3080	4.262400	2.44e+09	24.45057	24.68847	24.52330
3	−332.9680	6.820044	1.93e+09	24.21200	24.49747	24.29927
4	−328.3589	6.913722	1.50e+09	24.95420	24.28726	24.05602
5	−325.4009	4.225602*	1.31e+09	23.81435	24.19498	23.93072
6	−325.2023	0.269589	1.40e+09	23.87159	24.29980	24.00250

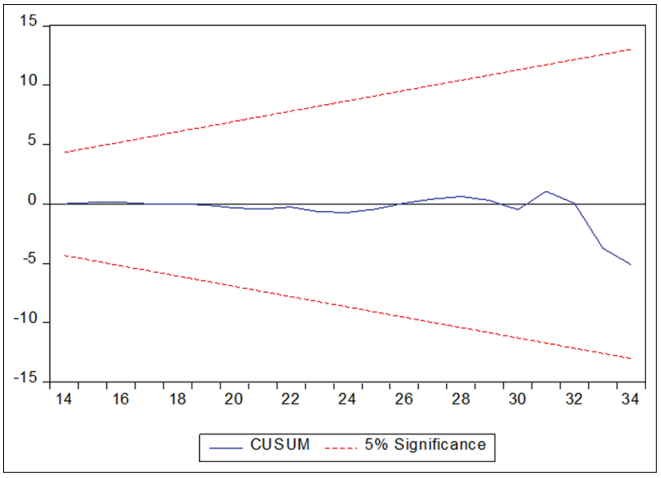
*indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FRE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Table 3: ARDL bound test statistics and critical value (restricted intercept; no trend)

Computed F-statistic=5.023518 (lag structure, k=2)		
Bounds level	**Lower I (0)**	**Upper I (1)**
Critical bounds value (1%)	4.13	5
Critical bounds value (5%)	3.1	3.87

Narayan (2005) critical value for 5% significance level is I (0)=3.478, I (1)=4.335 and for 1% significance level is I (0)=4.948, I (1)=6.028. ARDL: Autoregressive distributed lag

Figure 1: CUSUM test



hypothesis of no cointegration is rejected and the existence of long-run equilibrium relationship is confirmed. Conclusion of cointegration is derived from Narayan's (2005) critical value table for the respective independent variables (k = 2) and number of observations (n = 34) for lower and upper bounds at 1% and 5% significance level.

But, it can be concluded that agricultural export is not co-integrated with crude oil price but with exchange rate. This implies that there is no long run relationship between agricultural export and crude oil price. Therefore a Granger causality was carried out to examine the cause direction of the variables.

The results of the causality test shows that crude oil price → exchange rate, agricultural export exchange rate, crude oil price → agricultural export and exchange rate to agricultural export are insignificant at 95% level of confidence. But exchange rate to crude oil price and agricultural export → crude oil price are significant at 95% level of confidence. Thus, the result suggests that there is a way causality direction from exchange rate to crude oil price, likewise from agricultural export to crude oil price.

4.2. Result of Residual Diagnostics

The Breusch-Godfrey serial correlation LM test show that $n.R^2$ equals to 12.72172 and the Prob.Chi-Square (5) which is 0.0742 is insignificant; this indicates that the estimated model have no autocorrelation problem. The Harvey test for heteroscedasticity show that $n.R^2 = 10.95168$ and the Prob.Chi-square (2) is 0.1407. Also, Ramsey reset test show that the F-statistics equals 0.376846 with the probability is 0.5462. Similarly the CUSUM test is referred to as the Figure 1.

5. CONCLUSIONS AND RECOMMENDATIONS

The study has been able to establish a long run relationship between the agricultural export and the exchange rate; but crude oil price and agricultural export are not co-integrated. Thus, it can be concluded that the exchange rate is good indicators for predicting quantity of agricultural export in Nigeria. However, based on the possibility of Granger causality between the crude oil price and agricultural export, the result indicates that agricultural export does cause crude oil price. The study hereby recommended that investigation of various macroeconomic factors are required for an effective policy by the government for supporting of export growth in the country.

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