EXCHANGE RATE DYNAMICS AND AGRICULTURAL SECTOR PERFORMANCE IN NIGERIA: AN ARDL APPROACH

MICHAEL AYIBANUA AMAEGBERI*

Department of Economics,
Niger Delta University, Wilberforce Island, Bayelsa State. Nigeria
E-mail: amamojr@yahoo.co.uk

OKON, ASIDOK NSIKHE
Department of Economics, University of Calabar-Calabar
Email.asidoknsikheokon2016@gmail.com

ADIE JOSEPH ADIE
Department of Economics, University of Calabar-Calabar
Email: adiejoe@unical.edu.ng

ABSTRACT
The study investigates the responsiveness of the agricultural real sector to dynamics in exchange rate in Nigeria from 1986-2019. Data used for the study were sourced from Central Bank of Nigeria Statistical Bulletin and World Bank Indicator, (2019). The study adopts Augmented Dicky Fuller and Phillips Peron (PP) to test for unit root and where the result of the unit root was not clear, the co-integration test was conducted, findings revealed that only the variables in the impact model showed existence of long run relationship. The study revealed that some variables were stationary at level while some became stationary after first difference. The Auto Regressive Distributed Lag model was used to estimate the impact of exchange rate dynamics on Agricultural output performance in Nigeria. Findings revealed that exchange rate exerts negative impact on crop production in Nigeria only in the short run. Total rainfall, bank loan to agricultural sector, consumer price impact significantly on agricultural output in the long run but in the short run, only total rainfall and consumer price index exert significant impact on agricultural output in Nigeria. The study recommends that Central Bank of Nigeria should adopt managed exchange rate such that exchange rate does not exceed required threshold to ease flow of goods and services in the economy. The Central Bank of Nigeria should design stringent policies to increase commercial bank loans to agricultural sector in order to curb the adverse consequences of the exchange rate volatility on crop and fishery output in Nigeria.

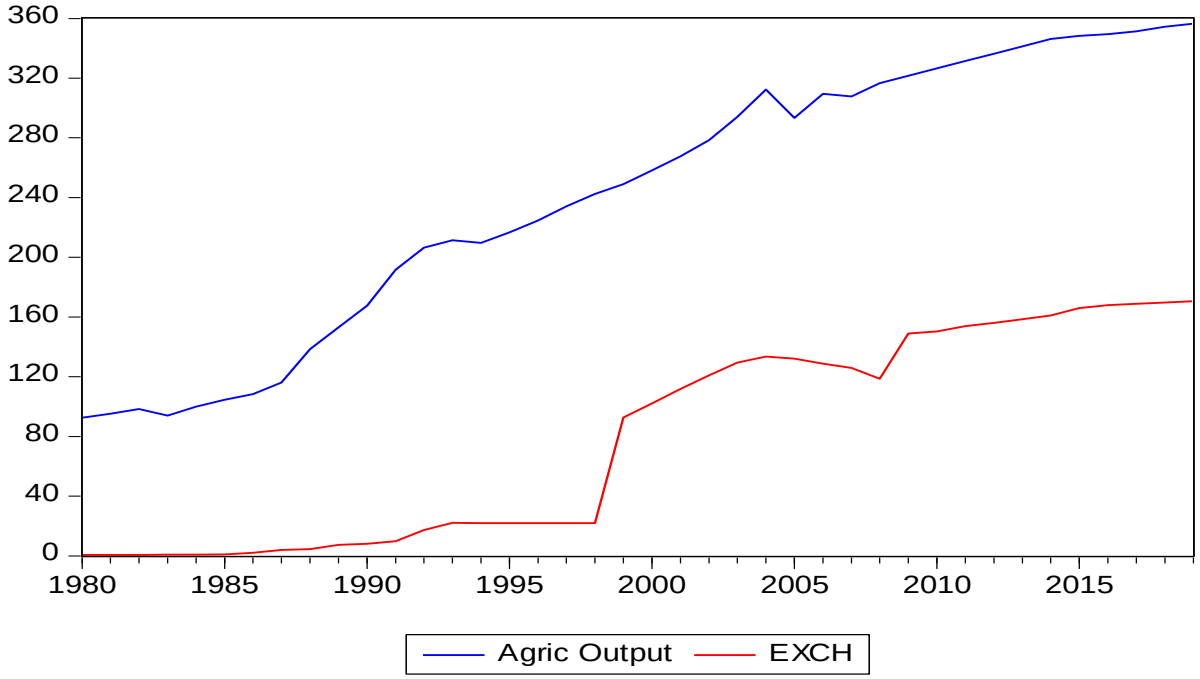
Keywords: Exchange rate, Dynamics, Agricultural sector and Performance and ARDL Model

JEL Classification G20, G22, L23, O30, O31

1. Introduction
Over the years, Nigeria like many other developing economies has pursued the goal of accelerating economic growth. Many researchers have opined different ways of achieving this economic growth and development. Feldman, Hadjimicheal & Lanahan, (2016) argued that the surest way of achieving a national development is through the real sector, especially for a nascent economy. More important in this study is the submission of Okoro (2012), who charged the monetary authorities to be more careful in handling the monetary policies of the economy. This is because, according to him, such financial rates as exchange rate play a very major role in the economic

growth and development of any economy. Lily, Kogid, Mulok, Sang & Asid, (2014) even stressed that link between strengthening exchange rate and the real sector is the surest route to accelerated development. To them, dynamics in exchange rate either build or reduce the confidence of foreign investors to invest in the real sector of the economy especially agriculture. The aforementioned studies show that the effect of exchange rate dynamics on the real sector of an economy has continued to occupy the central issue in economic development agenda. While discussing this, it is also of important to note that appreciation or depreciation of exchange rate affects the performance of other macroeconomic variables in any economy Zubair, Burney, Sarwat & Mubin, (2018). Its value can be used to assess overall performance of an economy and as such a very important variable in policy decision-making in a country Mousavi & Leelavathi, (2013). Also, the deep attention paid to variations in exchange rate stems from the fact that movements in exchange rate of a country have far-reaching implications on the real sector in general and real sector variables like investment, inflation rate, interest rate, employment (as well as unemployment) and aggregate output and agricultural output in particular (Enekwe, Ordu & Nwoha, 2018). As is well known, one of the core sectors of the economy affected by exchange rate movements is the agricultural sector (Orden, Blandford & Josling, 2017). The development of agriculture has been seen as very imperative in achieving accelerated high level of growth and development. In Nigeria, prior to independence, agriculture was the dominant economic activity, employing over 60 per cent of the population and providing about 70 per cent of federal government revenue. It constituted almost 80 per cent of Nigeria's total exports (Olajide, Akinlabi & Tijani, 2018). This impressive role has since diminished following the discovery and subsequent exploitation of oil in commercial quantities, especially beginning from 1980. The diminished role of agriculture has been blamed on several factors including dynamics in exchange rate. Ethan, Carmen & Kenneth, (2017) have further made an argument for flexible exchange rate. According to him, when the exchange rate is allowed to fluctuate in line with market conditions, there could be a decrease in agricultural exports volume leading to increased earnings. For instance, the share of agriculture in aggregate output declined sharply in the early parts of the 1980s. The Figure below depicts the dynamics in exchange rate and agricultural output over the period of 1980 to 2019.

Fig 1.1: Dynamics in Real Exchange Rate and Total Agricultural Output (1986-2019)



Source: Author's Compilation with Data from WDI, 2019

From Fig 1.1 above, we see that there is some sort of negative co-dynamics between Nigeria's nomimal exchange rate and the share of agricultural output in real GDP (in the logarithmic form) within the study periods. Subsequently, the two macroeconomic variables assumed an upward movement, up until 2005, when the real exchange rate became relatively constant and remained like that for the rest of the period under study. However, agricultural output continuously increased till 2010, when it experienced a very sharp decline. Alabi, (2015) opined that the activities of insurgency in 2010 affected agricultural productivity in Nigeria tremendously. He further added that it may take the country quite some time to recover from these unpleasant setbacks. This explains why agricultural production has been on the low ebb since 2012 which can be seen from the graph. Following the implementation of Structural Adjustment Programme (SAP) in 1986, exchange rate was liberalized which consequently led to the devaluation of the Nigerian naira against other world currencies. The devaluation of the currency which was one of the cardinal objectives of SAP, among other things, was meant to restructure the productive base of the economy and increase the domestic prices of exports, including those of agricultural sub-sector, thereby boosting domestic production (Adubi & Okunmadewa, 1999; Joseph & Akhanolu, 2011). The CBN statistical report of 2017 states the share of agriculture with respect to GDP, showing substantial disparity and long term decline from 60% in the early 1960s to 48.8% in the 1970s and 22.2% in 1980s. Unsustainable and inappropriate economic policy such as pricing, trade and exchange rate, and neglecting of the sector are essential factors responsible for the decline. Nigerian agriculture consists of food crops and trees, forestry, livestock and fisheries. In 1993, food crops accounted for about 30% of the Gross Domestic Products (GDP), livestock about 5%, forestry and wildlife about 1.3% and fisheries accounted for 1.2%. National Bureau of Statistics(2010) report that the benefits of devaluation were not realized in spite of the fact that the country embarked on devaluation to promote export and stabilize the rate of exchange. The real sector activities continued to record dismal performance. For instance, agriculture share in total output however declined from 26.03 per cent in 1987 to 27.27 per cent in 1992 but fluctuated

between 26.57 per cent and 39.05 per cent from 1993 to 2001 but rose to the height of 48.57 per cent in 2002 (CBN,2011). Agricultural share of GDP declined to 32 per cent in 2006 before climbing slowly to 37.05 per cent in 2009 before declining to 20.24 per cent in 2014. By 2016, agricultural share of gross domestic product increased to 21.21 percent (CBN, 2018).

Agriculture constitutes one of the most important sectors of the Nigerian economy. It is a veritable tool in combating poverty in third world countries and achieving long-term economic development. Although Nigeria depends heavily on the oil industry for its budgetary revenues, the country is predominantly still an agricultural society with approximately 70% of the population engaging in agricultural production at a subsistence level (CBN, 2016). However, the SAP programme led to the deregulation of interest rates in 1990 and indirect monetary policy control was put in place. Hence agricultural sector had to compete for funding with the other sectors of the economy leading to the stoppage of sectorial credit allocation policy (Brownbride & Gockel, 1996). This led to increased food import bills and hike in prices with food import increasing from 6.36% in 1991 to 27.02% and 30.56% in 1999 and 2011 respectively (NBS 2012).

Despite the various exchange rate policies and agricultural development programmes adopted over the years, the agricultural sector seemed not to have performed impressively. Over the years, the share of agriculture in aggregate gross domestic product has remained relatively low reaching its lowest of 20.17 per cent in 1980, before rising gradually to 39.21 per cent in 1985 (CBN, 2011). The share of agriculture in total gross domestic product declined from 26.03 per cent in 1987 to 27.27 per cent in 1992 but fluctuated between 26.57 per cent and 39.05 per cent from 1993 to 2001 but rose to the height of 48.57 per cent in 2002. The share of agriculture in total gross domestic product again declined from 48.57 per cent in 2002 to 32.0 per cent in 2006 before rising slowly to 37.05 per cent in 2009 and declined to 20.24 per cent in 2014. By 2016, agricultural share of gross domestic product increased to 21.21 percent (CBN, 2016). The low contribution of agricultural sector in the total economic activity arising from instability in exchange rate movements means that there is little income for farmers, the study seeks to investigate the responsiveness of the agricultural real sector to changes in exchange rate in Nigeria. The study will be of immense benefit to the government, the Central Bank and macroeconomic policy makers in Nigeria in providing an insight into the exchange rate movements in Nigeria and how variations in them affect the agricultural sector of the Nigerian economy. The study covered the period 1986 to 2019 to examine the impact of exchange rate dynamics on the real sector in Nigeria, with particular reference to the agriculture sector in Nigeria, the period is chosen to capture most significant period Nigeria started using flexible exchange rate.

2. Literature Review

2.1. Conceptual Literature

Exchange Rate: Exchange rate is the price of one country's currency in relation to another country. In order word, It is the required amount of units of a currency that can buy another amount of units of another currency (Azeez et al., 2012).

2.2. Exchange Rate Dynamics

Exchange rate dynamics is a measure of the degree or frequency by which the price of foreign exchange changes over time. The large the magnitude of the price change, the more volatile the exchange rate is. If the price increases or falls with very wide margins over a period, it shows that the exchange rate dynamics is unstable (CBN 2016).

2.3 Exchange rate Appreciation and Depreciation

Appreciation and Depreciation depict a situation where the market force of demand and supply determine the exchange rate which is often associated with a freely flexible exchange rate system, Yakubu (2007).

2.4 Exchange Rate devaluation and Revaluation: Devaluation exists when the officially declared exchange rate is altered such that a unit of a country's currency can buy fewer units of foreign currency, While **Revaluation occurs** when the monetary authorities alter the exchange rate such that the domestic currency can buy more units of foreign currency, (CBN 2016).

2.5 Exchange Rate Policy

Fixed or Pegged Exchange Rates

The fixed exchange rate is a phenomenon which occurs when the rate of a currency against other currencies is fixed. Under the pegged exchanged rates, all currency exchange transactions take place at an exchange rate that is determined by the monetary authorities (Adetifa, 2005).

Flexible or Floating Exchange Rates

This occurs when the currency of a country against other currencies is allowed to be determined freely by the forces of demand and supply in the market. These market forces operate automatically without any actions on the part of monetary authorities (Adetifa, 2005).

2.6 Theoretical Literature

2.6.1 The Elasticity Theory

This theory was developed independently by two economists namely, Marshall (1923) and Lerner (1944), to explain the outcome of policy actions on balance of payments. In specific terms, the theory prescribes the condition under which the devaluation of currency may result to an improvement in the trade balance of a country, particularly countries experiencing balance of payments disequilibrium (Caporale, Gil-Alana and Mudida, 2012). The theoretical explanation of the elasticity theory to balance of payments is anchored on Marshall- Lerner condition. According to Marshall-Lerner condition, devaluation of currency can lead to the balance of payments improvement whenever the sum of price elasticities of supply for exports and demand of imports in absolute terms is greater than one (Jhingan, 2005). This implies that as soon as this condition is achieved in any country, exchange rate devaluation may be beneficial to the devaluation country in terms of significant improvement in the trade balance (Ajakaiye, 1985, Nyong, 2005). From the theoretical exposition, devaluation of currency will cause import prices to rise, thereby making imports to fall and exports to increase. At the same time, exchange rate devaluation stimulates domestic production for exports because of the increase in profitability of exports in domestic monetary terms. Thus, with the fall in imports and an increase in exports, the balance of trade is likely to improve (Nyong, 2005).

2.6.2 The Balance of Payments Theory

The balance of payments theory of exchange rate maintains that rate of exchange of the currency of one country with the other is determined by the factors which are autonomous of internal price level and money supply. It emphasizes that the rate of exchange is influenced, in a significant way, by the balance of payments position of a country. A deficit in the balance of payments of a country signifies a situation in which the demand for foreign exchange (currency) exceeds the supply of it at a given rate of exchange. The demand for foreign exchange arises from the demand for foreign goods and services. The supply of foreign exchange, on the contrary, arises from the supply of goods and services by the home country to the foreign country. The equilibrium rate of exchange is determined, when there is neither a BOP deficit nor a surplus. In other words, the equilibrium rate of exchange corresponds with the BOP equilibrium of a country. The equality between the demand for and supply of foreign exchange signifies also the BOP equilibrium of the home country. If the rate of exchange is lower than the equilibrium rate of exchange, the demand for foreign currency exceeds the supply of foreign currency. The excess demand of foreign currency signifies the BOP deficit. As a result of the excess demand for foreign currency, the exchange value of foreign currency appreciates while the home currency depreciates.

2.6.3 Marshall-Lerner Condition

The Marshall-Lerner condition refers to the condition that an exchange rate devaluation or depreciation will only cause a balance of trade improvement if the absolute sum of the long-term export and import demand elasticities is greater than unity. Formally, the condition states that, for a currency devaluation to have a positive impact on trade balance, the sum of price elasticity of exports and imports (in absolute value) must be greater than 1. The net effect on the trade balance will depend on price elasticities.

2.3 Empirical Literature

2.3.1 Exchange rate and Agricultural Output Related Literature

It is generally argued that the type of exchange rate policy adopted by a country can affect the productive sector of a particular economy in a positive or negative ways such that, the devaluation of currency promotes exports as it makes exports cheaper relative to imports while the inflow of foreign income because of increase in export is expected to boost the domestic production in the agricultural sector which in turn should lead to an increase in the output of the sector.

Yebeah, Shaik and Allen (2020) investigated the effect of exchange rates on agricultural input prices employing the vector Autoregressive (VAR) estimation technique using quarterly data from 1981 to 2008. The study attempted to investigate the impact of the United States exchange rate and the Mexican exchange rate on the prices of farm and non-farm inputs such as chemicals, fertilizer, feeds and farm machinery. The results of the VAR estimation showed that the Mexican exchange rate has positive relationship with feed prices up to 12 months in the United States. This means that one per cent depreciation of the exchange rate led to an increase in the feed price by 0.13 percent, 0.29 percent, 0.14 per cent and 0.05 per cent, respectively in the first quarter, second quarter, third quarter and fourth quarter. For depreciation in Mexican has positive impact on fertilizer in the first and fourth quarters but negative impact on fertilizer in the second and third

quarters in the United States of America. This means that a one percent depreciation of the Mexican peso led to an increase in the fertilizer price by 0.12 per cent and 0.05 per cent, respectively in the first and fourth quarters in United States, while a one per cent depreciation of the peso led to a decrease in the price of fertilizer by 0.05 per cent and 0.04 per cent in the second and third quarters, respectively in the United States of America.

Essien and Dominic (2018) investigated effects of price and exchange rate fluctuations on Agricultural exports (cocoa) in Nigeria. Secondary data were adopted from Central Bank of Nigeria (CBN) Statistical Bulletin, Economic and Financial Reviews, Bullion and Annual Reports and Statement of Accounts (various issues), An Ordinary Least Squares Regression was used to estimate export supply function for cocoa. From the result it was observed that exchange rate movement and agricultural credits affect cocoa exports positively. The result also shows that relative prices of cocoa are not significantly related to quantity of export, however, it has a negative sign which is in line with the a priori expectation. The result, therefore, implies a positive significant effect of exchange rate volatility on cocoa exports in Nigeria. It was recommended that agricultural credit schemes should be made easily affordable for cocoa farmers in order to increase productivity and also enhance a free market determination of exchange rate for export of cocoa in Nigeria since Exchange rate has the tendency of impacting positively on cocoa export in Nigeria.

Abiodun and Salau (2019) analysed the response of aggregate agricultural output to exchange rate and price movements of food and export crops in Nigeria using available time series data that spam about 46 years from the Central Bank of Nigeria (CBN) Annual Reports. Augmented Dickey Fuller (ADF) was used to test for unit root, Cointegration and Vector Error Correction Model (VECM) was employed. From the result, it was observed that the entire variables used in the model are integrated of the same order. The results of the Vector Error Correction Model (VECM) for the estimation of short run adjustment of the variables toward their long run relationship showed a linear deterministic trend in the data and that food, export prices and real exchange rate jointly explained 57% of the variation in the Nigeria aggregate agricultural output in the short run and 87% variation in the long run. It was also noted that with respect to short run and long run, Total agricultural output responds positively to increases in exchange rate and negatively to increases in food prices respectively. The significance of food crop prices and exchange rate at 5% and 1% respectively both in the short and long run suggest that changes in these variables will has direct effect on agricultural output.

Shane, Roe and Somwaru (2020) investigated the relationship between exchange rate, foreign income and the United States agricultural exports, using time series data stretching from 1980 to 2019 under the framework of Ramsey – style general equilibrium modeling. The study employed the autoregressive (VAR) model estimation technique. The causal relationship was also examined using the directed acyclic graph (ADG) method. The result of the cointegration test based on VAR approach revealed that there was cointegration among the variable. The results of the VAR estimation showed that there was significant negative association between exchange rate and aggregate U. S. agricultural exports during the period of evaluation. The results of the granger causality test based on the directed acyclic graphs (DAG) methodology revealed that gross domestic product and exchange rate have an inverted fork causality association with agricultural exports in the United States of America. Meanwhile the results of the decomposition analysis revealed that there was the dominance of the negative effect of exchange rate appreciation on exports over the positive effect of the income growth in the United States' aggregate agricultural exports.

Mejeha, Iheke and Young (2019) investigated the effect of exchange rate policy on agricultural trade in Nigeria. Secondary data were adopted, Data was collected from 1970-2018 analyzed using multiple regression analysis and correlation analysis. From the result, it was revealed that total output of cocoa, world price of cocoa, exchange rate and average rainfall to be the significant determinants of cocoa export; world price of palm oil and rainfall for palm oil; and the significant determinants of rice import with world price of rice, time trend, exchange rate and local output of rice. The correlation results showed that there is a positive and significant relationship between exchange rate and export volume of palm oil and import volume of rice respectively. Government support to farmers in the form of credit and input subsidies is a veritable policy option that would enable the farmers to enhance their productivity. These would lead to increase export of cocoa and palm oil and reduced importation of rice. These would invariably enhance the foreign exchange earning capacity of the country as well as helping in the match towards achieving self-reliance and self-sufficiency in food production.

Olubanjo, Akinleye and Ayanda (2009) in a study on economic deregulation and supply response of cocoa farmers in Nigeria using ordinary least squares (OLS) estimation. Findings revealed that found out that exchange rate have a negative effect on output or cause decrease in output as their magnitudes increase. As expected, increased exchange rate signifies Naira appreciation and hence represents price disincentive for local (cocoa) production. The study revealed that deregulation affected the supply response of cocoa farmers positively due to higher price incentives in the deregulated regime.

Odetala and Etumnu (2018) examined the contribution of the agriculture sector to economic growth in Nigeria using the growth accounting framework and time series data from 1960-2017. The result shows that agricultural sector has contributed positively and consistently to economic growth in Nigeria. Furthermore it was observed that using Granger Causality Test, agriculture growth Granger-causes GDP growth, however no inverse relationship was found. The robust nature of the sector is evident in its ability to recover more quickly than other sectors from shocks resulting from disruptive events. The result also shows that the crop production subsector contributes the most to agriculture sector growth and that growth in the agriculture sector is overly dependent on growth of the crop production subsector. This indicates the importance of this subsector and probably, lack of investment to the other subsectors. Therefore, increased efforts in developing the livestock, fisheries and forestry subsectors will foster the contributions of agriculture sector to the Nigerian economy.

Yaqub (2019) evaluated the impact of exchange rate changes on disaggregated agricultural output in Nigeria from 1970 - 2018 using a two-stage least-squares approach. The finding of the study indicates that there are differences in the way the output of different sub-sectors responds to the exchange rate changes. The finding also revealed that exchange rate variations have negative effects on crop and fishery output, but have positive effects on livestock and forestry. The study suggested that the need for strong policy to be put in place to curb the adverse consequences of the exchange rate volatility on crop and fishery output.

2.4 Gap in Literature and Value Addition

Previous studies have exists investigating the impulse of exchange rate on agricultural export and output in Nigeria, such studies includes Yebeah, Shaik and Allen (2020), Essien and Dominic (2018), Abiodun and Salau (2019), and Yaqub (2019), among others. However, a thorough examination of these studies shows that, though many studies in Nigeria have investigated the

impact of exchange rate on the aggregate level of agricultural output, but to the best of my knowledge none of these studies has made an attempt to examine the impact of exchange rate dynamics on sub-sectors of agricultural output performance in Nigeria from 1986 to 2019 using Auto Regressive Distributed Lag model for estimation.

3. Data and Methodology

Data used for the study were sourced from Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics and World Bank Indicator (2019). Data used for the study were sourced from Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics and World Bank indicator from 1986 to2019. This period is chosen because of the increase in awareness of SAP exchange rate dynamics on Agricultural sector output performance in Nigeria. This study conducted pre estimation tests using Augmented Dickey-Fuller (1979) and Phillips-Perron (1988) test specification for unit root, Engle and Granger (1987) for co-integration test, correlation matrix for Multicollinearity test**,** Breusch-Pagan LM for Autocorrelation test, Null hypothesis that there is no heteroskedasticity for Heteroskedasticity test, Ramsey (1969) for Specification Test. The study employs the Auto Regressive Distributed Lag Model (ARDL) in the modeling of equations. The choice of employing ARDL Model to capture the study is because of the possibility of the past value of agricultural produce like Crop Production which is used to explain current value.

3.1 Theoretical Framework

This study is anchored on Marshall- Lerner theoretical framework, which shows how changes in the currency of a nation affects her import and export, which in turn affects the overall productivity of the nation. The theory postulate that an exchange rate devaluation or depreciation will only cause a balance of trade improvement if the absolute sum of the long-term export and import demand elasticity is greater than unity.

3.2 Model Specification

3.2.1 Model Specification for the study

The functional form of the model can be specified as follow:

$$\mathrm{CRP} = \mathrm{f}(\mathrm{EXCH}, \mathrm{TRFAL}, \mathrm{BLA}, \mathrm{ALF}, \mathrm{CPI}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.1$$

If the production function is of Cobb Douglas form, it implies that

Output = $\mathrm{AL}^{\beta}\mathrm{K}^{\alpha}$ ……3.2

Were A = technology

L = labour requirement

K = capital

β *and* $\propto$ refers to the marginal product of labour and capital respectively.

It follows that $\beta+\propto = 1$ for constant returns to scale,

$\beta+\propto > 1$ for increasing returns to scale and

$\beta+\propto < 1$ for decreasing returns to scale.

With the Cobb-Douglas production function and little modification (including other variables), the long run model for the study an be specified thus

$$\ln\mathrm{CRP}_t = \beta_0 + \beta_1\ln\mathrm{EXCH}_t + \beta_2\ln\mathrm{TRFAL}_t + \beta_3\ln\mathrm{BLA}_t + \beta_4\ln\mathrm{ALF}_t + \beta_5\mathrm{CPI}_t + \mu_t \ldots\ldots 3.3$$

Where

$\beta_0$to β_5 are the long run parameters to be estimated

μ_t is the error term
CRP = crop production
EXCH = exchange rate
TRFAL = total rainfall
BLA = deposit money bank loan to agricultural sector
ALF = agricultural labour force
CPI = consumer price index
The short run dynamics (in- distributed lag form) of equation 3.4 can specified as

$$\Delta lnCRP_t = \beta_0 + \beta_{1i}\sum_{i=1}^{p}\Delta lnCRP_{t-i} + \beta_{2i}\sum_{i=0}^{q}\Delta lnEXCH_{t-i} + \beta_{3i}\sum_{i=0}^{q}\Delta lnTRFAL_{t-i} + \beta_{4i}\sum_{i=0}^{q}\Delta lnBLA_{t-i} + \beta_{5i}\sum_{i=0}^{q}\Delta lnALF_{t-i} + \beta_{6i}\sum_{i=0}^{q}\Delta CPI_{t-i} + \varphi ECM_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots 3.4$$

$\beta_0 \ldots \beta_6$ Represents the short run dynamics for the parameters to be estimated and φ is the coefficient of the error correction term. The coefficient of the error correction term shows the speed of adjustment of the short run disequilibrium towards long run equilibrium.
The study will conduct unit root test and co-integration of the variables in equations 3.1. Where there is presence of long run association among the variables in equation 3.3, the study will proceed to estimate the short run dynamics.

4. Presentation of Results and Data Analysis

The results of the various tests specified in the previous chapter are analyzed as follows.

4.2 Unit Root Test of the Variable

The variables of interest were subjected to unit root test in order to ensure stationarity of the series. The unit root method adopted is Augmented Dickey-Fuller unit root test. Where the result of the ADF is not clear, the study cross checked it with Philip-Peron unit root test.

Table 4.2: a Result of ADF unit root test of the variables

	Level Form		First Difference		
Variables	*5% critical value*	*ADF test statistics*	*5% critical value*	*ADF test statistics*	*Order of integration*
AGR	*-2.881830*	*-1.959045*	*-2.881830*	*-4.466805*	*I(1)*
GXPA	*-2.881685*	*-2.708627*	*-2.881685*	*-7.819417*	*I(1)*
ALF	*-2.882279*	*-0.261112*	*-2.882279*	*-3.347327*	*I(1)*
CRP	*-2.881830*	*-1.964105*	*-2.881830*	*-4.456093*	*I(1)*
FSH	*-2.881830*	*-1.978760*	*-2.881830*	*-4.504657*	*I(1)*
LNKAP	*-2.881260*	*-0.332207*	*-2.881260*	*-4.737785*	*I(1)*
TR	*-2.881260*	*-3.466677*	*-2.883579*	*-10.27800*	*I(1)*
LIV	*-2.881830*	*-1.827862*	*-2.881830*	*-4.514253*	*I(1)*

Source: Eviews 9 Output for the Result of ADF unit root test of the variables

Table 4.2: b Result of Phillips-Peron unit root test

	Level Form		First Difference		
Variables	*5% critical value*	*PP test statistics*	*5% critical value*	*PP test statistics*	*Order of integration*
CPI	*-2.881123*	*11.96142*			*I(0)*
	-2.881123	*3.301935*			*I(0)*
EXCH	*-2.881123*	*9.895979*			*I(0)*
INT					
BLA	*-2.881123*	*3.532791*			*I(0)*

Source: Eviews 9 Output for the Result of Phillips-Peron unit root test of the variables

Table 4.2a and 4.2b shows the result of ADF unit root test and Phillips- Peron unit root test conducted. The variables were tested using ADF and it was observed that AGR, GXPA, FSH, ALF, LIV, CRP, TR and LNKAP were found to be stationary in first difference while the result of CPI, INT, EXCH, and BLA were not clear as to whether they are of order 1 or two. With this, PP unit root test was conducted on these variables and the study found that these variables were stationary at level. This implies a mixture of I(0) and I(1) variables which invariably explains the method of cointegration test to be adopted.

4.3 Correlation Test

This test compares the correlation result of each pair variables against 0.8 thresh hold proposed by Gujarati and Sangeetha (2007). A correlation value of 0.8 or above shows the presence of multicollinearity.

Table 4.3: Result of Pairwise Correlation Matrix Test

	ALF	BLA	AGR	CPI	CRP	EXCH	FSH	GXPA	INT	LIV	LNKAP	TR
ALF	1.000											
BLA	-0.624	1.000										
AGR	0.049	-0.347	1.000									
CPI	-0.675	0.741	-0.116	1.000								
CRP	0.019	-0.318	0.799	-0.083	1.000							
EXCH	-0.758	0.630	0.048	0.746	0.078	1.000						
FSH	0.169	-0.451	0.763	-0.239	0.755	-0.062	1.000					
GXPA	-0.019	-0.154	0.542	0.040	0.544	0.142	0.522	1.000				

INT	-0.447	0.711	-0.298	0.682	-0.282	0.701	-0.351	-0.131	1.000			
LIV	0.340	-0.601	0.734	-0.425	0.720	-0.257	0.752	0.476	-0.429	1.000		
LNKAP	-0.725	0.646	0.297	0.636	0.327	0.672	0.176	0.293	0.368	-0.016	1.000	
TR	-0.613	0.467	-0.186	0.521	-0.168	0.459	-0.257	-0.123	0.283	-0.342	0.497	1.000

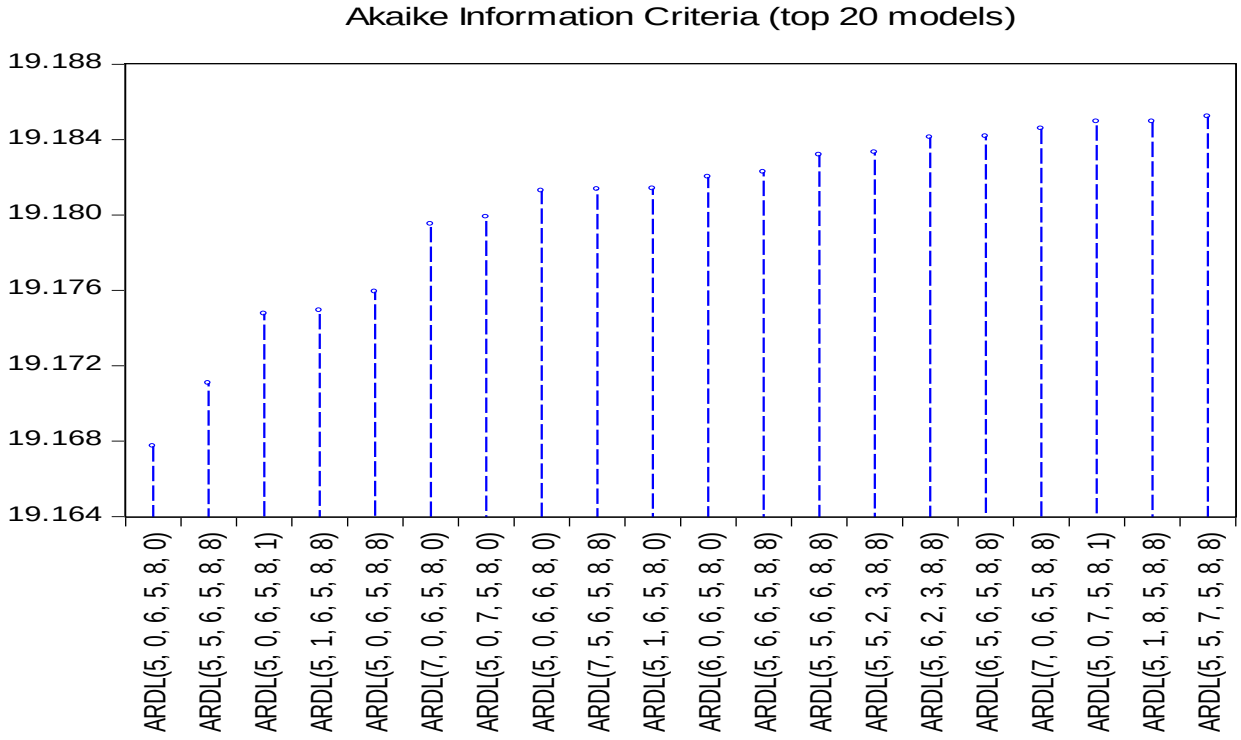
Source: Eviews 9 Output for the Result of Pairwise Correlation Matrix Test

The study conducted Pair-wise correlation test. The result of this test is presented in table 4.3. The result however, indicates that none of the variables had pair -wise correlation matrix of greater or equal to 0.8. This implies that our variables are free from multi-collinearity and as such, none of the variables contains full information about the other.

4.4 Lag Length selection for the specified Model

4.4.1 Lag Length selection using AIC for the specified model of the study

The lag length for the autoregressive distributed lag model of objective one was done using Akaike Information. Since the study used Eviews 9 which gives chance for automatic selection of lag lengths, the study selected maximum lag lengths of 6 and 8 for the dependent and independent variables respectively. At the end of evaluation, the study produced ARDL presented in figure 4.1.
Figure 4.1: graph of lag ARDL lag length selection based on Akaike Information Criterion.



Source: Eviews 9 Output for model selection based on Akaike Information Criteria

The Autoregressive Distributed Lag (ARDL) model selection is presented in figure 4.1. The result of the lag length selection showed that after 20 evaluations, the selected ARDL (5,0,6,5,8,0) is different from other ARDL such as ARDL (5,5,6,5,8,8) and ARDL (5,0,6,5,8,1). In that, ARDL (5,0,6,5,8,0) has the minimum information (19.166) based on AIC. Therefore, ARDL (5,0,6,5,8,0) becomes the suitable model for our analysis.

4.4.2 Cointegration and Bond Test Approach

The results of the unit root test presented in table 4.2a and 4.2b show that the some of the variables are I(1) and some I(0). This informs the use of bound test approach to cointegration proposed by Pesaran and Shin (1999). This result is presented in table 4.4. The null hypothesis associated with this test is that no long run association exists and the decision is to reject the null hypothesis if the value of F-statistic from the bound test conducted is greater than the upper bound value of Paseran test statistic.

Table 4.4: Result of bound test (cointegration of the variables)

Null hypothesis: No long run relationship exists

Test Statistic	Value	K	Bound Test	
			Lower bound	upper bound
F-statistic	***12.00200***	***6***	***2.62***	***3.79***

Source: Eviews 9 Output for the Result of bound test (cointegration of the variables)

Table 4.4 shows that the value of F-statistic lies above the upper bound value of Paseran test statistic. This is an indication that the null hypothesis that there is no long run association among the variables in the model is to be rejected. Therefore, there exists long run association among the variables in model for objective one.

4.4.3 Result of the Model for the study.

The long run Result

The existence of long run association among the variables in the model allows us to estimate the long run model and generate the error correction term which will be used to examine short run dynamics of the model. However, the result of long run estimation is given in table 4.5.

Table 4.5 Result of ARDL Long-run Model
Dependent Variable: CRP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCH	*-2.072396*	*2.180551*	*-0.950400*	*0.3440*

TR	*-5.816330**	*1.567728*	*-3.710039*	*0.0003*
BLA	*0.314684**	*0.046169*	*6.815924*	*0.0000*
ALF	*6.262316**	*2.672490*	*2.343251*	*0.0209*
CPI	*3.406812**	*0.748433*	*4.551925*	*0.0000*
C	*-2.607501*	*1.481665*	*-1.759845*	*0.0812*
R-Squared = 0.998797	Adj R-Squared =			
F-Statistic = 3148.046	0.998479			
Durbin-Watson stat =	Prob(F-statistic) =			
1.925924	0.000000			
Note:*denotes significant at 5%				

Source: Eviews 9 Output for the result of the long run model

Table 4.5 above shows the result of long-run estimation of the model. It revealed that that most of the variables were statistically significant except exchange rate. Also, it could be shown that total rainfall (TR) was found to exact negative but statistically significant impact on crop production while deposit money bank loan to agricultural sector (BLA), agricultural labour and consumer price index were found to exact positive and statistical significant impact on crop production in Nigeria.

On the basis of ceteris paribus interpretation of the impact of each of the variables on crop production in Nigeria revealed that holding other variables in the model constant, one millimeter increase in the amount of rainfall (TR) in Nigeria would lead to about 5.8 units decrease in the value of crop production. This is an indication that most of the crops cultivated does not require constant rainfall. Most of them require sunshine to produce. This is not surprising as sunshine is highly required for plants to manufacture their food. Excess rainfall is therefore a treat to crop production in Nigeria.

On the other hand, looking at the impact of bank loan to agricultural sector (BLA), the study found that holding other variables in the model constant, one-billion-naira increase in the amount of commercial bank loan to agricultural sector would lead to about 0.3-unit change increase in crop production in Nigeria. Although it is not surprising to see agricultural loan exerting positive and significant impact on crop production, the magnitude of the impact of agricultural loan is somewhat surprising. One would expect that loan to agricultural sector should exert high impact on crop production. This has many implications. It could be that small proportion of the loan collected is channeled to crop production. Also, it could be that other factors that acted on crop production exhibited the productivity of crops making it difficult for the loan to produce greater result.

Agricultural production especially in emerging economies requires the use of labour services – both skilled, semi-skilled and unskilled. The impact of agricultural labour on crop production was evaluated in this study and the study found that holding other variables in the model constant, an increase in agricultural labour by one man would lead to about 6.2-unit increase in crop production. This was positive and statistically significant implying that the surplus labour has not reached diminishing return as explained by Author Lewis.

Similarly, looking at the impact of consumer price index, the study found that holding other variables in the model constant, an increase in consumer price index by one percent would lead to

about 3.4 percent increase in crop production. This implies that producers of crops react positively and significantly to increase in the price of crops in the long run. This period was long enough for the producers to adjust production of crops following price increase.

Lastly, In line with the general model, the study revealed that the explanatory variables in the model explained about 99 percent of the variation in agricultural output performance in Nigeria. The value of Durbin Watson (1.92) indicates absence of auto-correlation in the residual of the model. Also, the probability value of F-statistic (0.0000) shows that the entire model is robust.

Table 4.6 Result of Short-run Estimation

The short run model explains the dynamics of the variables and the speed of adjustment of the model towards long run equilibrium. This is model utilized information from the long run model to explain what happens in the short run adjustment. This is presented in table 4.6.

Dependent Variable: ΔCRP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δ(CRP(-1))	1.679794*	0.073573	22.831751	0.0000
Δ(CRP(-2))	-1.825359*	0.131166	-13.916357	0.0000
Δ(CRP(-3))	1.176626*	0.125101	9.405397	0.0000
Δ(CRP(-4))	-0.580777	0.078576	-7.391311	0.0000
Δ(EXCH)	-14.711305*	1.499695	-9.809531	0.0288
Δ(TR)	-0.075055*	0.031583	-2.376442	0.0192
Δ(TR(-1))	0.056762	0.031559	1.798608	0.0748
Δ(TR(-2))	0.031660	0.031560	1.003172	0.3180
Δ(TR(-3))	0.064354*	0.031541	2.040314	0.0437
Δ(TR(-4))	0.024997	0.029040	0.860769	0.3912
Δ(TR(-5))	0.061641*	0.027680	2.226943	0.0280
Δ(BLA)	-0.009595	0.014945	-0.642016	0.5222
Δ(BLA(-1))	-0.054593*	0.022508	-2.425435	0.0169
Δ(BLA(-2))	0.051810*	0.023148	2.238219	0.0272
Δ(BLA(-3))	-0.020912	0.022508	-0.929082	0.3549
Δ(BLA(-4))	0.030277*	0.014040	2.156451	0.0332
Δ(ALF)	1.113258	7.632147	0.145864	0.8843
Δ(ALF(-1))	-2.996847	4.499634	-0.666020	0.5068
Δ(ALF(-2))	-6.463056	4.311398	-1.499063	0.1367
Δ(ALF(-3))	1.514329*	0.391748	3.865564	0.0002
Δ(ALF(-4))	-6.220362	4.630719	-1.343282	0.1819
Δ(ALF(-5))	-9.197935	4.950208	-1.858090	0.0658
Δ(ALF(-6))	10.992859*	3.164716	3.473569	0.0007
Δ(ALF(-7))	-3.6334924*	0.870661	-4.173254	0.0001
Δ(CPI)	2.418391*	0.524419	4.611556	0.0000
CointEq(-1)	-0.070987*	0.017813	-3.985132	0.0001

R-Squared = 0.998797	Adj. R-Squared = 0.998479
F-Statistic = 3148.046	Prob (F-statistic) = 0.000000

Durbin-Watson stat = 1.925924
*denotes sig. at 5 % and
Δ is first diff. operator

Source: Eviews 9 Output for the result of the short run model

Table 4.6 shows the result of short run dynamics of model for objective one. It is not surprising to see that almost all the variables were found to be statistically significant except bank loan to agricultural sector and agricultural labour force. Exchange rate which was not significant in the long run was observed to be significant in the short run. The lag values-lags 1-4 were found to be statistically significant in determining the current value of crop production in Nigeria.

On the basis of individual contribution of the variables in the model, the study observed that holding other variables in the model constant, one-unit increase in previous year crop production would lead to 1.6 increase in the current value of crop production in Nigeria. This is not in any way surprising since the spill-over effect of increase in crop production is argued to impact on the current value. Similarly, the impact of lag values of crop production on the current was observed to extend up to lag 4. However, the impact dies out as the lag gets larger. Also, when the impact of exchange was examined, the study found that holding other variables in the model constant, an increase in exchange rate-appreciation of naira- would decrease export and increase importation of crops. This was argued in Mundell Fleming to bring about decrease in exportation thereby discouraging local production of crops. With this, producers of crops would not find it profitable embarking on mass production.

On the other hand, looking at the impact of total rainfall on crop production in the short run, the study found that holding other variable in the model constant, one-millimeter increase in the amount of rainfall would decrease crop production by 0.07-units. Again, both the long run and short run has shown that heavy rainfall does not favour crop production. Rather, holding other variables constant, little rainfall coupled with abundant sunshine increases crop production.

Similarly, looking at the impact of consumer price index, the study found that holding other variables in the model constant, one-unit increase consumer price index (CPI) would lead to about 2.4-unit decrease in crop production in the short run. This is rather surprising as one would expect crop producers to react positively to increase in CPI. However, the effect of expectation of further decrease in consumer price index coupled with the time lag to adjust could have contributed to the behaviour of crop production towards an increase in consumer price index.

Lastly, the error correction term which measures the speed of adjustment of the short-run model toward long-run equilibrium was found to be negative and statistically significant. This in fact was in line with theory postulates. The result therefore shows that, quarterly, about 7 percent of the fluctuations in the short-run would be corrected toward long-run equilibrium. This means that annually, about 28 percent of the fluctuations or disequilibrium in the short run get corrected towards long run. With this, it would take the model about 3 years and 8 months to get adjusted fully towards long run equilibrium.

The cointegrating equation of the model is given by

Cointeq = CRP - (-2.072396*EXCH -5.8163*TR -0.3147*BLA + 6.262316
*ALF + 3.406812*CPI -2.607501)

4.7 Diagnostic Test for the short run model of the study

Serial correlation LM test of the selected ARDL Model

Serial correlation test was conducted using the Breusch-Pagan Serial correlation LM test. The null hypothesis of this test is that there is no serial correlation in the residual of the model and the decision rule is to reject the null if the probability Chi-Square is less than 0.05 for 5% level.

Table 4.7: Result of Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	*0.738066*	*Prob. (2,108)*	*0.4804*
*Obs*R-squared*	*1.887704*	*Prob. Chi-Square(2)*	*0.3891*

Source: Eviews 9 Output for Breusch-Godfrey Serial Correlation LM Test for model one

From table 4.7, it can be seen that the probability Chi-Square (*0.3891*) is greater than 0.05 at 5% significant level. In that we cannot reject the null hypothesis that there is no serial correlation in the residual of the short-run model and conclude that the residual in our short-run ADRL model is not serially correlated.

Heteroscedasticity test: This test was conducted using the Breusch-Pagan LM test. See table 4.8. heteroscedasticity test follows the F-distribution with degree of freedom given as F (*20,121*). The null hypothesis is that the error term is homoscedastic and we are to reject the null hypothesis if the probability of the Obs*R-square is less than 0.05. Otherwise, we do not the null hypothesis.

Table 4.8: Heteroscedasticity Test for the model

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	*3.730657*	*Prob. F(29,110)*	*0.0614*
*Obs*R-squared*	*69.41901*	*Prob. Chi-Square(29)*	*0.0620*
Scaled explained SS	*132.7494*	*Prob. Chi-Square(29)*	*0.1023*

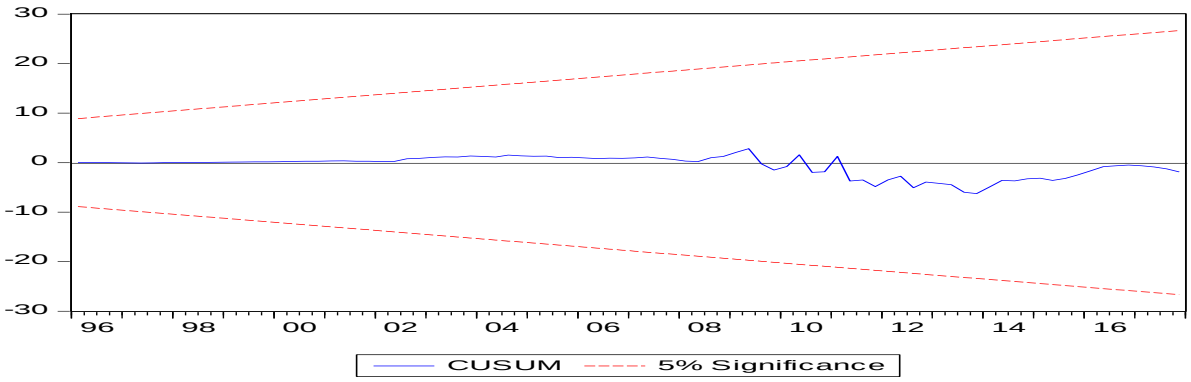
Source: Eviews 9 Output for Heteroscedasticity Test for the model

The result of table 4.9 shows that the probability of the Obs*R-square (*0.0620*) is greater than 0.05. In that, we do not reject the null hypothesis of homoscedasticity or constant variance of the residual.

Stability Diagnostic Test: stability of the short run model was tested using CUSUM test. The idea behind this test is to reject the hypothesis of model stability if the blue line lies outside the dotted red lines otherwise, the model is said to be stable. The result of this test is presented in figure 4.2.

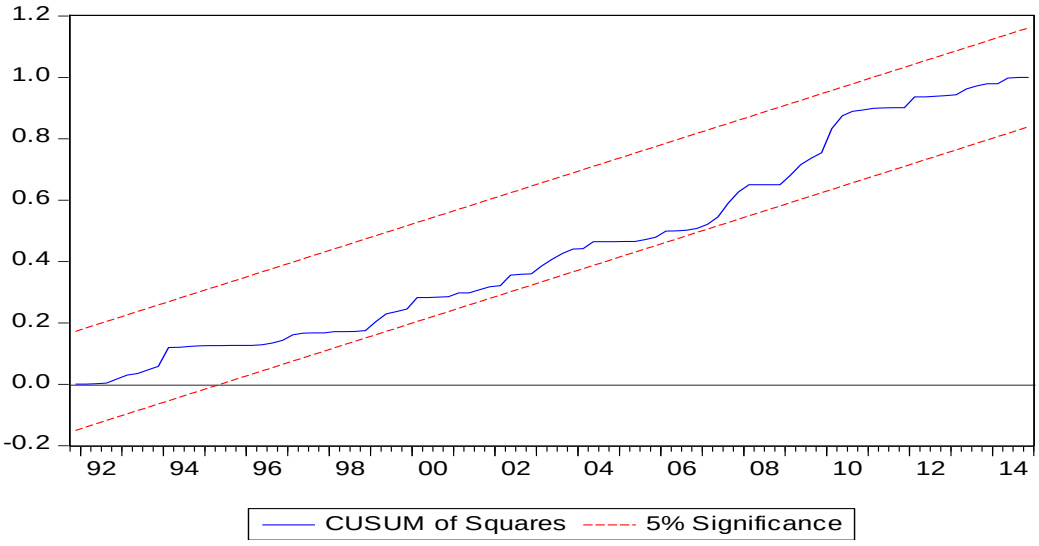
Figure 4.2: CUSUM and CUSUM square test of the short run model for the study

Fig 4.2a: CUSUM test



Source: Eviews 9 Output for Stability test of Estimated Model

Fig 4.2b: CUSUM of squares test



Source: Eviews 9 Output for Stability test of Estimated Model

The result of the CUSUM and CUSUM square test shows that the blue lines lies inside the dotted red line which indicates that the model is dynamically stable.

Ramsey Reset Test

This test ensures that the model is correctly specified. The null hypothesis for this test is that the model is correctly specified and it is to be rejected if the probability value of the F-statistic is less than 0.05, otherwise, the model is correctly specified.

Table 4.9: the result of Ramsey Reset Test

	Value	Df	Probability
t-statistic	0.070614	109	0.9438
F-statistic	0.004986	(1, 109)	0.9438

Source: Eviews 9 Output for Ramsey Reset Test for model one

4.9 Major findings of the Study

1 Findings from the study revealed that exchange rate dynamics exerts significant and negative impact on crop output only in the short run.

2. Findings from the study revealed that Total rainfall, commercial bank loan to agricultural sector, consumer price impact significantly on agricultural output in Nigeria in the long run but in the short run, only total rainfall and consumer price index exert significant impact on agricultural output in Nigeria.

4.10 Policy Implications of Findings

The findings of the study established that exchange rate plays significant role in determining the amount of agricultural productivity in a country which is necessary for the central bank of Nigeria to monitor the movement of exchange rate in order to maintain stable production.

Also, total rainfall was observed to be play important role in determination of the volume of agricultural output. This implies that policies of the government on irrigation have not exerted significant impact on the various agricultural outputs.

5. Conclusion

The study investigates the responsiveness of the agricultural real sector to dynamics in exchange rate in Nigeria. The study adopts Augmented Dicky Fuller unit root and Phillips Peron (PP) where the result of the unit root was not clear. It was discovered that some of the variables were stationary at level while some became stationary after first difference. Co integration test was conducted and findings revealed that only the variables in the impact model showed existence of long run relationship. An Auto Regressive Distributed Lag model was used to address the impact of exchange rate dynamics on Agricultural output performance in Nigeria. Findings reveals that exchange rate exerts negative impact on crop production in Nigeria only in the short run; This finding was in line with the findings of Olubanjo, Akinleye, Ayande (2019) who examined economic deregulation and supply response of farmers. On the contrary, Essien and Dominic (2018) evaluated exchange rate fluctuation and agricultural export (cocoa) and found exchange rate movement to impact positively on cocoa export. Total rainfall, bank loan to agricultural sector, consumer price impact significantly on agricultural output in the long run but in the short run, only total rainfall and consumer price index exert significant impact on agricultural output in Nigeria. The finding is in contrary to the study conducted by Yaqub (2019) who examined the impact of exchange rate changes on disaggregated agricultural output in Nigeria from 1970 - 2018 and found

that exchange rate variations have negative effects on crop and fishery output, but have positive effects on livestock and forestry.

5.1 Policy Recommendation

1. The Central Bank of Nigeria should adopt managed exchange rate and ensure that exchange rate does not exceed required threshold to ease free flow of goods and services in the economy.
2. Central Bank of Nigeria should design stringent policies that will help to increase commercial bank loans to agricultural sector and a follow up measure should be ensured to boast food sufficiency and agricultural outputs performance in Nigeria
3. The study suggested that Central Bank of Nigeria should adopts a flexible and strong policy to be put in place to curb the adverse consequences of the exchange rate volatility on crop and fishery output.

REFERENCE

Adubi, A. A., & Okunmadewa, F. (1999). Price, Exchange Rate Volatility and Nigeria's Agricultural Trade Flows: A Dynamic Analysis.

Ajakaiye, D. O. (1985). Short-Run Effects of Devaluation on Balance of Payments: The Influence of Imports Structures. *The Nigerian Journal of Economics and Social Studies (NJESS), 27*(1).

Alabi, I. (2015). The Determinants of Agricultural Productivity in Nigeria. Food, Agriculture and Environment Journal 3(2):78 - 82.

CBN (2018). Statistical Bulletin. Abuja, Nigeria: Central Bank of Nigeria.

CBN (2017). Statistical Bulletin. Abuja, Nigeria: Central Bank of Nigeria.

CBN (2016). Statistical Bulletin. Abuja, Nigeria: Central Bank of Nigeria.

CBN (2010). Statistical Bulletin. Abuja, Nigeria: Central Bank of Nigeria.

CBN (2011). Statistical Bulletin. Abuja, Nigeria: Central Bank of Nigeria.

Crissman, C., &Antle, J. (2017). Economic and Social Impacts of Integrated Aquaculture-Agriculture Technologies in Bangladesh.

Enekwe, C. I., Ordu, M. M., and Nwoha, C. (2018). Effect of Exchange Rate Fluctuations on Manufacturing Sector in Nigeria. *European Journal of Business and Management*, *5*(22), 67-73.

Engle, R. F., & Granger, C. W. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Essien, E. B., Dominic, A. O., and Sunday, E. R. (2011). Effects of Price and Exchange Rate Fluctuations on Agricultural Exports in Nigeria. *International Journal of Economic Development Research and Investment*, *2*(1), 1-10.

Feldman, M., Hadjimichael, T., Lanahan, L., and Kemeny, T. (2016). The Logic of Economic Development: A Definition and Model for Investment. *Environment and Planning C: Government and Policy*, *34*(1), 5-21.

Gil-Alaña, L. A., Caporale, G. M., and Mudida, R. (2012). *Testing the Marshall-Lerner Condition in Kenya* (No. 09/2012). Navarra Center for International Development, University of Navarra.

Jhingan, M.L. (2005). The Economics of Development and Planning. 38th Edition, Delhi, Vrinda Publications (P) Ltd.

Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration—with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169-210.

Lerner, A. P. (1944). *Economics of Control: Principles of Welfare Economics*. Macmillan and Company Limited, New York.

Lily, J., Kogid, M., Mulok, D., Thien Sang, L., and Asid, R. (2014). Exchange Rate Movement and Foreign Direct Investment In Asean Economies. *Economics Research International*.

Marshall, A. (1923). Money, Credit and Commerce. *Journal of the Royal Statistical Society*, *86*(3), 430-433.

Mejeha, R. O., Iheke, O. R., and Young, O. D. (2011). Evaluation of Exchange Rate Policy on Agricultural Trade in Nigeria. *International Journal of Agriculture and Rural Development*, *14*(2), 582-588.

Mousavi, S., & Leelavathi, D. S. (2013). Agricultural Export and Exchange Rates in India: The granger causality Approach. *International Journal of Scientific and Research Publications*, *3*(2), 1-8.

Nyong, M. O. (2005). International economics: Theory, policy and applications. *Calabar: Wusen Publishers Ltd*.

Obayelu, A. E., & Salau, A. S. (2019). Agricultural response to prices and exchange rate in Nigeria: application of Co-Integration and Vector Error Correction Model (VECM). *Journal of Agricultural Sciences*, *1*(2), 73-81.

Odetola, T., & Etumnu, C. (2018). Contribution of Agriculture to Economic growth in Nigeria. *The 18th*.

Okoro, K. N. (2012). Nigeria and the socio-economic globalization of the 20th century: A historical re-consideration. *International Journal of Development and Sustainability*, *1*(3), 1-3.

Olajide, O. T., Akinlabi, B. H., and Tijani, A. A. (2018). Agriculture Resource and Economic Growth in Nigeria. *European Scientific Journal, Esj*, *8*(22).

Olubanjo, O. O., Akinleye, S. O., and Ayanda, T. T. (2019). Economic deregulation and supply response of cocoa farmers in Nigeria. *Journal of social sciences*, *21*(2), 129-135.

Orden, D., Blandford, D., and Josling, T. (Eds.). (2017). *Wto Disciplines on Agricultural Support: Seeking a Fair Basis for Trade*. Cambridge University Press.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.

Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society. Series B (Methodological)*, 350-371.

Shane, M., Roe, T., and Somwaru, A. (2020). Exchange rates, foreign income, and US agricultural exports. *Agricultural and Resource Economics Review*, *37*(2), 160-175.

Yaqub, J. O. (2019). The Impact of Exchange Rate Changes on Disaggregated Agricultural Output in Nigeria: A Two-Stage-Least-Squares Approach.

Yeboah, O., Shaik, S., and Allen, A. (2020). Exchange rates impacts on agricultural inputs prices using VAR. *Journal of Agricultural and Applied Economics*, *41*(2), 511-520.

Zubair, M., Burney, A., Sarwat, S., and Mubin, M. (2018). Macroeconomics Relations between Exchange Rate Instability, Exchange Rate Volatility, Trade and Economic Growth Variables: The Case of Pakistan.