

## **The Impact of Exchange Rate on Palm Oil Export in Nigeria**

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### **Abstract**

This study focused on the impact of exchange rate on palm oil export in Nigeria; as export remains one of the strategies for accelerating the pace of development of any economy. The key policy objective was to examine the impact of exchange rate on palm oil export in Nigeria. This research work adopted an econometric approach to evaluate the stated objectives. The results of the Augmented dickey Fuller (ADF) unit root test, revealed that palm oil export, annual output of palm oil, exchange rate, trade openness. World price of palm oil became stationary after first difference I(1), while annual rainfall had no unit root at level I(0). The Ordinary Least Square (OLS) estimation results showed the existence of direct statistical significant relationship between, the dependent variable (palm oil export) and annual output of palm oil, world price of palm oil and annual rainfall, while exchange rate has inverse statistical significant relationship with palm oil export. The negative value of ECM, is correctly signed which implies that the result is satisfactory and has appropriate adjustment mechanism to equilibrium when disequilibrium occurs. Finally, this research work offers some policy recommendations for effective planning, management and development of palm oil sector in Nigeria.

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### **I. INTRODUCTION**

One of the strategies of accelerating growth of economy of developing economies to transform into industrialized economies is through export of primary agricultural. Abogan, Akinola, and Baruwa (2014) asserted that earnings from export will diminish the sprain on balance of payment position and improve the economy. Economists argued that exchange rate firmness facilitates production activities and economic growth. Mamta (1999) was of the view that misalignment in real exchange rate could warp production activities and consequently hamper exports growth and create macroeconomic volatility.

Palm oil which was momentous to the Nigerian economy and contributed to her Gross Domestic Product, export trade as well as foreign exchange earnings declined in terms of its contribution to non-oil exports. Aigbokhan (2001). However, Gourichon (2013) posited that in 1960 Nigeria was the world leading producer and exporter of palm oil and lost its dominant position in the international trade after 1980 and is currently the third largest producer, far behind Indonesia and Malaysia. Nigeria economy anchored on agriculture as it was the main source of employment, Gross Domestic product (GDP), and export and foreign exchange earnings.

Ekiran, Awe and Ogunjobi (2014) posited that prior to the oil boom of the early 1970, the contributions of agricultural exports (Cocoa, rubber, palm oil, palm Kernel, Cotton e.t.c) fell to 35% of the GDP, from an average of 72% between 1955 and 1969. This drop is accounted for by the decline in export of agricultural products other than palm oil that showed slight performance slip in export. Oil palm is crop of multiple values, as the palm fruit is processed to obtain three commercial products, palm oil, palm kernel and palm kernel cake. The value added or chain of palm oil are numerous. Adeniyi, Ogunsola & Oluwusi (2014) opinioned that palm oil provides raw materials in manufacture of soaps, detergents margarine, candle, confectionery, epoxy resin, bakery trade, lubricants, pomades and cosmetic. It contains carotene, a precursor of vitamin A, a high priced energy vitamin rich food use for cooking in oil producing countries of Africa.

The major policy thrust of foreign exchange policy is derived from the broad macroeconomic objectives to achieve internal and external balance within the shortest possible time. Thus according to Balogun (2007) exchange rate policy guides investors on the best way they can strike a balance between their trading partners and investing at home or abroad. Equally Mordi (2006) augured that exchange rates have effects on

inflation, prices incentives, fiscal viability and competitiveness of export efficiency in resource allocation, international confidence and balance of payments equilibrium .

(Daramola, 2004) argues that agricultural policy formulation in Nigeria is a typical market. This position is derived in part from (Anderson and Tyers, 1988) argued that the forces of demand and supply for policies are conceptualized. In the light of this, policy beneficiaries demand policies and politicians supply them. Within this state of unclear pricing policy, experienced in Nigeria in the recent history, the supply curve in this market represents the extraneous political cost of providing an extra unit of protection to an industry, in terms of reduced political support from groups opposed to such policy change, whereas the demand curve represents, at the margin, the vigilance of groups in quest of policy to proffer various degree of political support to the leadership. Under this general framework, there is also the need to accommodate social and government preferences, which include altruism, in addition to anxiety from a range of private interest groups on the supply sides of policies. Consequently, the chore has been concentrated to scrutinize the factors influencing the demand and supply of unclear policies in Nigeria and other countries at different stages of growth.

This is the base for the unpleasant agricultural policy environment prevailing previously in Nigeria. In poor nations, the demand for palm oil protection, especially producer price support is often weak. This is because marketable surplus and potential benefits are low relative to the high cost of collective action by farmers. It is costly to organize for collective action owing to the large numbers of farmers, geographical dispersion, poor infrastructure and low education in rural areas.

Ettah, Akpan & Etim (2011) posited that the country had since 1986 experienced erratic changes in her exchange rates partly due to fluctuations in the major currencies of developed countries such as dollars, pound sterling and SWISS Franc. This had become a major source of internal economic Shock since Nigeria has strong links with developed countries in trade payments, as well as monetary arrangements. From the above one can adduce that the price of foreign exchange plays critical role in the ability of the economy of developing countries including Nigeria to attain optimal levels in production activities, which will accelerate her export.

Notwithstanding the cruel neglect of the agricultural sector over the decades, its contribution especially cocoa, rubber and palm oil to gross domestic product, export trade as well as foreign exchange earnings before the 1990s was hurtful.

Exchange rate variability have been a topical and highly debated issue among academicians, policy makers, and concerned monetary authorities, on account of the vital role an optimal and sustainable exchange rate plays in the achievement of sustainable growth and development (Oaikhenan and Nwokoye, 2015). In Nigeria, Obadan (2006) observed that with the introduction of the market- based exchange rate system in 1986, the naira exchange rate has exhibited the features of continuous instability and led to poor performance of the agriculture sector, thus negatively affects export competitiveness.

In view of the poor performance of the agricultural segment in recent time and the impact of most of the economic reform programmes on agricultural supply in Nigeria, most comments on the impact of transformation on agriculture points to the fact that the reforms are showing the desired results, but others think otherwise. Price reform is an essential but inadequate condition for improved productivity (Abiodun and Salau, 2010).

Several scholars assert that exchange rate volatility decreases trade flows among countries Prasad, Rogoff, Wei and Ayham (2003). Consequently suggesting that unexpected disparity in the exchange rate negatively affects export competitiveness. Exchange rate fluctuations then may make doubt in macroeconomic policy, investment decision and may as well affect exports depending on the role played by agents in the market (Baak, 2004). Thus, exchange rate volatility has consequently remained a major anxiety of most African countries. This is because the values of foreign currencies partially determine prices paid out or acknowledged from productivity and sold out in the market as well as profitability of producers (Akhtar and Spence, 2013).

In Nigerian over the past years, exchange rates between the naira and other hard currencies particularly the US dollar have fluctuated tremendously. This has brought forth unease that trade and investment in Nigeria is likely to be impacted by the activities in the foreign exchange market. Habitually, volatility of exchange rates has influenced the mainstream of all market participants both positive and negative way. Based on the hypothesis that exporters and importers are likely to exhibit some level of risk aversion allied with the trade uncertainty, exchange rate fluctuations represent a prospective concern. The consequences of exchange rate volatility on real exports have long been at the center of debate among researchers (Afza & Alam, 2014).

However, agricultural exports constitute the greater part of Nigeria exports after oil. Agricultural productivity estimates for Nigeria showed a decline in productivity growth from the 1960s to the 1980s. Nigeria has witnessed strong economic growth in the past few years, averaging 8.8 percent real annual GDP growth from 2000 to 2011. However, the agriculture sector has lagged behind GDP growth, growing at 3.7 percent in 2011 (Onunze Martin, 2012).

Equally, oil's supremacy of the country's export basket began in the early 1970s and was greatly overblown during the 1980s. The nub of the crisis was that while oil export was growing, non-oil exports were declining making the dominance much more rapid and pervasive. The efforts to reverse these trends seem to be yielding very few results, as oil continues to dominate the country's exports. Since its discovery in Nigeria, crude oil has not only become the mainstay of her economy, but largely has remained the country's major export as well as main revenue and foreign exchange earner. Consequently, and regrettably so, the export of non-oil products has been dismal and negligible. As a result of the high level of imports and low level of non-oil exports, the country has continued to record huge balance of trade and payment deficits in global trade. This, experts agree, has been the burden of the nation's economic growth and development" (Oluwa, 2012).

However, these fluctuations in Nigeria have been influenced by the changing pattern of global trade, the structural shifts in production and the institutional changes in the economy (Omojimi and Akpokodje, 2010). In addition, it was noted that one of the major factors influencing the real exchange rate in Nigeria is the external shocks which is from the whims of the world price of agricultural products and the prices of oil, because these two natural resources are the main sources of the Nigerian export and the foreign exchange jewels. In the period that the economy depended on agricultural products, there were fewer pronouncements on the real exchange rate because the products were less volatile in nature and more people were willing to trade the product with currencies that are involved in the calculation of the real exchange rate of the country (Ogunleye, 2010).

Adaramola (2016) examined the effect of real exchange rate volatility on export volumes in Nigeria using quarterly data for the period of 1970Q1 to 2014Q4 and analyzed with Error Correction Mechanism (ECM). The results showed that there was a long run relationship between exchange rate and its volatility and agriculture export volumes in the country. It was therefore concluded that real exchange rate uncertainty had significant positive impact on agriculture export of the Nigerian economy during the study period.

Since 1986, Nigeria has witness numerous market determined exchange rates, as observed by the Central Bank of Nigeria. The Second tier Foreign Exchange (SFEM) was adopted in 1986, the Unfilled Official Market was instituted in 1987, while the Bureaux de Change was licensed in 1989. The foreign exchange market reform of 1994 resulted in the formal pegging of the naira exchange, the centralization of foreign exchange in the CBN restriction of Bureaux de change to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market and above all the discontinuation of open accounts and bills for collection as means of payments. 1995 also witnessed further reforms that gave birth to the Autonomous Foreign Exchange Market (AFEM). Equally the Inter-bank Foreign Exchange Market (IFEM) was introduced in 1999, and to further liberalize operations in the Foreign Exchange Market the Retail Dutch Applied System (R-DAS) was adopted. While the Wholesale Dutch Applied System (W-DAS) was introduced in 2006, which gave impetus to authorized dealers to sell foreign exchange to their customers with the permitted margin, making them principals rather than agents.

The above Measures were/are to avoid gyrations or fluctuations, at the same time ensure the stability of the exchange rate, as well as make it a single rate. Numerous research works have shown that exchange rate has a direct impact on some macro-economic variables but few focused on exchange rate and agricultural exports. This study therefore bridges this knowledge gap by assessing the impact of exchange rate on palm oil exports in Nigeria the study established the trend in the aims to examine the impact of exchange rate on palm oil export in Nigeria, to find the effects of trade openness on palm oil export in Nigeria, to determine the dynamic effects of world price on palm oil export in Nigeria and to observe the effects of annual rainfall on palm oil export in Nigeria. The findings of this paper of could be substantial to policy – makers in Nigeria and other nations facing exchange rate volatility that may wish to ensure stability of exchange rate.

## **II. BRIEF LITERATURE REVIEW**

### **2.1 Exchange Rate**

According to Jhingan (2003) exchange rate refers to the rate at which one currency exchanges for another. While Onuwuka (1988) defined exchange rate as the price of the monetary unit of one country expressed in the monetary unit of other countries. Thus exchange rate is the price of one currency in terms of another currency or other currencies. This rate or price / parity indicate the trust and confidence in the economic situation of a country. Exchange rate could appreciate or depreciate. It appreciates if the amount of domestic currency required to buy a foreign currency or currencies reduces, while it depreciates if the amount of domestic currency required buying a foreign currency or currencies increases. The appreciation of the exchange rate, specifically real exchange rate may create current account problems, because it leads to overvaluation. Overvaluation in turn makes imports artificially cheaper while exports relatively expensive, thus reducing the international competitiveness of a country (Takaendesa 2006).

## 2.2 Palm oil

Palm oil is extracted from the fruit of oil palm tree. Oil palm tree is a perennial tree crop grown in tropical climate. To buttress this Roundtable on Sustainable palm oil posited that palm oil is an edible vegetable oil produced from the fruits of single stemmed oil palms. Ayinde, Muchie, Adenuga, Jesudun, Olagunju and Adewumi (2012) stated that oil palm is by far the most productive of all the vegetable oil crops, yield more oil per hectare than any of the other major oilseed crops, such as rapeseed, sunflower, soya bean, peanut or cotton seed and it is cultivated in about 43 countries all of which are developing countries in the humid tropics.

According to Olagunju (2008) oil palm is a perennial crop that originated in the tropical rain forest of West Africa. Adiele (2014) stated that oil palm (*Elieas guineensis*) is one of the most important economic oil crops in Nigeria. Oil palm whose origin is traced to West Africa within the tropical rain forest is indigenous to the Nigerian coastal plains.

Palm oil production is essential source of food, employment, income generation and has extensive industrial applications. The nutritive value of palm oil combined with its industrial applications make it to command very high commercial value. To attest to the above Ayinde et. al. (2012) opined that about 80% of palm oil production is destined for human consumption with the balance going to animal feed and to various industries. The fruits of the oil palm tree contain 45 to 55% oil unlike other vegetable oils, palm oil contains high levels of beta carotene and tocotrienols, which have been found to help protect against cancer.

According to Lade (2007) about 80 per cent of the palm oil produced in Nigeria is sold to industrial users, however only about 20 percent of the oil produced is of premium quality. Hence it has a lot of value chain as can be seen in the work of Adeniye, Ogunsola and Oluwusi (2014) asserted that palm oil and palm kernel oil provide raw materials in the manufacture of soaps and detergents, margarine, candle, confectionary, epoxy resins, bakery trade, lubricants, pomades and cosmetics.

## 2.3 Exchange rate and palm oil export

Palm oil production accounted for 1.59% of the national agricultural GDP in 2006. In Nigeria, the amount of palm oil exported is very low due to the lack of production surplus and quality which makes Nigerian's palm oil not competitive in the global market; consequently, there is no incentive to export the commodity (JAD, 2012).

Though Nigeria seemed to have lost her pride of place or position in palm oil production and export, yet oil palm production remains an enterprise, creating jobs for the army of unemployed in the country. Ohimain, Emeti, Izah and Eretinghe (2014) reported that several million small holders are spread over an estimated area of 1.67 million hectares in the southern part of the country. Among the small-scale producers, traditional or semi-mechanized methods are used for oil extraction from the fresh fruits bunch.

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Palm oil is majorly produced in South East Asia, Latin America and Africa, specifically West Africa and Central Africa. According to USDA ([www.fas.usda.gov/pscho](http://www.fas.usda.gov/pscho)) Malaysia and Indonesia covered about 90 percent of the world palm oil output 1.5million tons in Thailand. About 2.5million tons in Latin America (Columbia, Ecuador, Handuras, Guartemale, Costa Rica and Brazil). Also evidence from the work of verheye (2010) showed that Nigeria, Guinea, Sierra Leone, Liberia, Ivory coast, Ghana, Togo, Benin, Cameroon, Equatorial Guinea, Congo, Angola, and Zarie are the real palm belt in Africa. Focusing on Nigeria, the work of Gourichon (2013) indicates that 24 states, mainly in the South, East and central zones produce palm oil, however the 9 states in the Niger Delta accounts for 57% of the national production. These states include Bayelsa, Akwa Ibom, Cross River, Imo, Rivers, Abia, Ondo, Edo and Delta.

The role of exchange rate and its effects on Macroeconomic performance has continued to generate interest among economists. Thus, many economists argue that exchange rate stability facilitates production activities and economic growth. They are also of the view that misalignment in real exchange rate could distort production activities and consequently hinder exports growth and generate macroeconomic instability (Mamta 1999). The Premised on the above the issue of exchange rate was not much of a problem before 1973, as majority of countries utilized the fixed exchanged rate system proposed by Brethon Woods Institution, this is why the Nigerian pound was at par with the British pound sterling.

However after 1973, most countries no longer usually limited the movement of exchange; their respective national central Banks no longer usually controlled the variability of the exchange rate to become managed floats Sang, Sriboochetta, Huang & Wiboompondse (2013). The major policy thrust of foreign

exchange policy is derived from the broad macroeconomic objectives to achieve internal and external balance within the shortest possible time. Thus according to Balogun (2007) exchange rate policy guides investors on the best way they can strike a balance between their trading partners and investing at home or abroad.

Ogun (1998) examined the effects of real exchange rate, its movement and volatility on the growth of non-oil export in Nigeria over the period 1960-1990, using simulation techniques. The results showed that the real exchange rate and also both its misalignment and volatility affect non-oil export adversely. Equally Yusuf and Edom (2007) investigated the relationship between exchange rate and non-oil export good in Nigeria, over the period of 1970-2003, using Johansen co-integration approach. The results revealed that depreciation of official exchange rate promotes export of round wood and saw wood in Nigeria.

### **Theoretical Review**

The classical and neo-classical models of trade merely refuted the earlier Mercantilists restricted trade policy. Precisely Smith's and Ricardo's absolute and comparative theories of trade, rebelled against the credo of Mercantilism by their advocacy of trade liberalism and the enlightenment of the individual, as they considered the nation as nothing more than the sum of the consumers who are the prime subject of economics. The Mercantilists posited that a nation, which imported more goods than it exported abroad, would lose gold and silver, which were the measures of wealth then, in paying for the imported goods (Ettah 2006).

Yu (2006) theorized that in a small open economy the exchanges rate appreciation reduces exports, fixed exchange rate reduces some of the uncertainty in international trade. Implied from the above is that exchange rate depreciation increases exports, and decreases import. Nyeadi, Atiga and Atogenzoya (2014) reported that (Dincer and Kandil (2011), demonstrated theoretically how exchange rate affects export in Unanticipated appreciation in local currency against trading partners will lead to exports being expensive, while important becomes cheaper in terms of the good market. Also a positive shock to the local currency through sudden appreciation or overvaluation of it leads to lower interest rates as agents will prefer to hold less domestic currency. The implication of this theory is reduction in output and exports of primary manufacturing and service sectors of the economy. Ettah et. al. (2011) reported that with respect to Nigeria, Uganda and other less developed countries Adubi and Okunmdewa (2000) Kyle and Suisenen (1994) Riedel and Donges (1977) and Kwanshie (1977) in their theoretical studies, found that real exchange rate has a strong negative impact on agricultural exports.

### **Empirical Review**

However, numerous extant literatures examined the effects of exchange rate on agricultural export and non-oil export of which agriculture is the main or dominant part. Okputu, Opué and Bankong (2012) confirmed that lagged values of exchange rate devaluation had a significant and positive relationship with agricultural export commodities but of a higher magnitude in the total agricultural export commodities than individual products in Nigeria. The study of Kayode (2003) on the effects of exchange rate on Nigeria major agricultural export commodities revealed that the low elasticity suggest potentially limited volume of agricultural export earning in response to the devaluation of the local currency.

In the same token Omojimite and Akpokodje (2010) investigated the effect of exchange rate reform on Nigeria's trade performance during the period 1986-2007. The study found a minimal positive effect of exchange rate reforms on non-oil export through the depreciation of the value of the country currency. On the other hand Abolagba, Onyekwere, Agbonkpolor and Umar (2010) examined the determinates of agricultural exports, using the Ordinary Least Squares on time series annual data of relevant variables including exchange rate. They found that appreciation of real exchange rate has statistical significant and negative impact on export of cocoa and rubber in Nigeria. Ettah et. al. (2011) investigated the effects of price and exchange rate fluctuations on agricultural exports in Nigeria, using Ordinary Least Squares Regression. Their results showed that exchange rate fluctuations positively affect cocoa export. Some of the studies presented above have exchange rate as controlled variable; however none of them has palm oil as the dependent variable. Thus the study exchange rate and palm oil export in Nigeria has knowledge gap to fill.

## **III. METHOD OF ANALYSIS**

The study employed augmented Dickson-Fuller unit root test to determine the stationarity status of the data, the Johansen Co-integration test to establish the existence or non-existence of long run relationship among the variables, the Ordinary Least Squares regression to ascertain the long run collective impact of the independent variables on the dependent variable, as well as the individual directional relationship between the independent and dependent variables. It also utilized the error correction Mechanism (ECM) to determine the speed of adjustment to equilibrium of the model whenever disequilibrium occurs. Finally the Breusch-Godfrey serial correlation LM test was conducted to diagnose the behaviour of the random variables and the stability of the model.

The data for the study were generated from Food and Agricultural Organization (FAO) statistical data base, World Bank, Nigeria Metrological Agency data base, Central Bank of Nigeria (CBN) Annual Report and Statement of Accounts and Statistical Bulletin of various years.

The theoretical framework of the study is anchored on Campa and Goldberg (1999) Model, cited and extended by Olanipekun (2013) by specifying firms' output into domestic sales and export. The study adapted the model with modification by introducing or incorporating annual output of palm oil, trade openness and annual rainfall into the model. Thus the economic agent production function is given as

$$Q_t^s = AL_t^\alpha K_t^{1-\alpha} \text{-----(1)}$$

By taking the natural log of both the left and right hand sides of the operational form of equation (1) we obtain equation (2)

$$\ln Q_t^s = A (\ln \alpha L_t + \ln(1 - \alpha) K_t) + e_t \text{----- (2)}$$

Where  $Q_t^s$  or  $Q$  represent good produced for domestic consumption and export,  $L_t$  and  $K_t$  are Labour and capital inputs respectively.  $A$  is an arbitrary function representing managerial skills,  $\alpha$  and  $(1-\alpha)$  are the elasticities, of labour and capital.

Considering the theoretical analysis of the relationship between exchange rate and export, equation 2 is specified as

$$\ln x = a_1 \ln L_t + a_2 \ln k_t + a_3 \ln e_t + a_4 \ln Q + a_5 \ln P \text{----- (3)}$$

From equation (3)  $x$  represents export goods,  $e$  denotes the exchange rate policy in the economy while  $Q$  is the total output produced in the open economy for domestic demand and export (tradable) good. If the wage rate of the tradable goods of the economic agent is constant her profit function is  $\pi(\cdot)$ , which reduces the to a function of the real exchange rate and capital utilized in the process of production, specified as

$$\pi(K_t, e_t) = \beta_1^{0.1} K_t^{0.2} e_t \text{----- (4)}$$

The profit of the economic agent is affected by exchange rate via the cost of import/importation and export. The economic agent involved in both import of raw materials and human capital for production of output will have her profit level affected greatly by exchange rate. Going by the study on exchange rate and palm oil export, the imported raw materials are fertilizers and chemicals (for pest and weed control).

**Model specification**

Model specification involves the determination of the dependent and independent variables, which will be included in the model, as well as the theoretical expectations about the signs of the parameters of the function. Therefore, for the study "the impact of exchange rate on palm oil export in Nigeria" the key determinants (independent variable) of palm oil export (dependent variable) were identified and specified in functional form as.

$$PEX = F(AOP, EXR, TPN, WPP, ARF) \text{-----(5)}$$

Where  $PEX$ = Nigeria's export quantity of palm oil (tonnes),  $AOP$ = Annual output palm oil (tonnes)  
 $EXR$ = Exchange Rate of Naira to Us dollar (₦),  $TPN$ = Trade openness,  $WPP$ = World Price of Palm oil (Us &),  
 $ARF$ = Annual rainfall

The operational form of equation (5) is:

$$PEX = \beta_0 + \beta_1 AOP_t + \beta_2 EXR_t + \beta_3 TPN_t + \beta_4 WPP_t + \beta_5 ARF_t + e_t \text{----- (6)}$$

Where  $\beta_0$  is the intercept,  $\beta_1$  to  $\beta_5$  are the parameters to be estimated,  $e_t$  the error term and  $t$  is time period. Taking the natural log of both sides of equation 6 so as to determine the elasticities of the parameters, we have

$$\ln PEX = \beta + \beta_1 \ln AOP_t + \beta_2 \ln EXR_t + \beta_3 \ln TPN_t + \beta_4 \ln WPP_t + \beta_5 \ln ARF_t + e_t \text{-----(7)}$$

By apriority expectation  $\beta_1, \beta_3, \beta_4$  and  $\beta_5 > 0$  while  $\beta_2 < 0$ . Thus increase in annual output of palm oil, high exchange rate (by way depreciation), trade liberalization proxy by trade openness, increase world price of palm oil and annual rainfall will increase the level of palm oil export.

If there is no presence of unit root and there is evidence of co-integration among the variables equation (7) will transform into Error Correction Model (ECM) as specified below:

$$\ln PEX = \beta_0 + \beta_1 (\Delta \ln AOP_{t-1}) + \beta_2 (\Delta \ln EXR_{t-1}) + \beta_3 (\Delta \ln TPN_{t-1}) + \beta_4 (\Delta \ln WPP_{t-1}) + \beta_5 (\Delta \ln ARF_{t-1}) + ECM_{t-1} + e_t \text{-----(8)}$$

The ECM in the model is the error correction mechanism which indicates the speed of adjustment to equilibrium whenever disequilibrium occurs in the model.

**IV. RESULTS**

The Augmented Dickey – Fuller (ADF) test was employed in the study because it has no poor size properties i.e. the tendency to over reject the null hypothesis when it is true (Robinson & Okowa 2011).

Table 4.1 Augment Dickey – Fuller Unit Root Test Results

Variables	Level	1 <sup>st</sup> Difference	5% critical value	Order of integration
PEX	-1.3662	-7.2471	-3.1199	1 (I)
AOP	-0.5300	-4.8671	-2.9763	1 (I)

EXR	-25558	-5.3359	-2.97663	1 (I)
TPN	-2.5617	-8.1403	-2.9763	1 (I)
WPP	-1.7193	-4.4302	-2.9763	1 (I)
ARF	-6.9387		-2.9179	1 (o)

Source: Author’s regression output

The ADF test results above revealed that only annual rainfall was stationary at level, implying that it has no unit root at level i.e. 1(0). However palm oil export, annual output of palm oil, exchange rate, trade openness and world price of palm oil, became stationary at first difference or integrated of order one i.e. I(1). This is shown by the comparison of the ADF test statistic results with the MacKinnon critical values at 5% level.

**Johansen Co – integration Test Result**

Having confirmed the order of integration or stationary of the variables. It is necessary to proceed to the determination of the existence or non-existence of long run relationship among the variables by using the Johansen Co – integration test. Below present the co-integration test results (Trace & Maximum Eigen Value)

Table 4.2 Johansen Co – integration Test Result

(a) Unrestricted Co – integration Test (Trace)				
Hypothesized no of EC(s)	Eigen value	Trace statistic	0.05 critical value	Prob.**
None *	0.8703	107.4968	69.8189	0.0000
At most 1 *	0.5689	52.3431	47.8561	0.0179
At most 2	0.5140	29.6237	29.7970	0.0523
At most 3	0.2872	10.1437	15.4947	0.2699
At most 4	0.0364	1.0020	3.8415	0.3168

(b) Unrestricted Co-integration Test (Maximum Eigen value)				
Hypothesized no of EC(s)	Eigen value	Trace statistic	0.05 critical value	Prob.**
None *	0.8703	55.0537	33.8769	0.0000
At most 1	0.5689	22.7194	27.5843	0.1858
At most 2	0.5140	19.4800	21.1316	0.0838
At most 3	0.2872	9.1417	14.2646	0.2745
At most 4	0.0364	1.0020	3.8415	0.3168

Source: Author’s regression output.

Trace test indicates 2 co-integration equ(s) at the 0.05 level

Max-eigen value test indicates 1 co-integration equ(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level.

\*\* Mackinnon – Haug Michelis (1999) P – values.

From the results on tables 4.2 a and b, the Trace and the Maximum-eigen tests statistic(s) revealed 2 and 1 co-integrating equation(s) at 5% significant level respectively. This imply the existence of statistical long run relationship between palm oil export (PEX), annual output of palm oil (AOP), exchange rate (EXR), trade openness (TPN), world price of palm oil (WPP) and annual rainfall (ARF) consequently, the null hypothesis (there is no co-integration  $r = 0$ ) is rejected. Thus exchange rate is an important determinant that can influence the level of palm oil export in Nigeria. Evident from the results, the Johansen’s technique is capable of detecting multiple co – integration relationships among variables Asaful – Adjaye (2000) and Pradhan (2010) reported by (Abogan, Akinola & Baruwu 2014).

**Long Run Model / Ordinary Least Squares Test Results.**

The conformation of the existence of long run relationship between the variables from the Johansen technique prompted the application of the Ordinary Least Squares test to ascertain the collective as well as the individual impacts of the independent variables on the dependent variable and the direction of the relationship that exist between them.

Table 4.3 Ordinary Least Squares Test Results with In PEX as Dependent variable.

Variable	Coefficient	Standard error	t-statistic	Prob
In AOP	5.2315	2.2565	2.3184	0.0429
In EXR	-0.8410	0.2580	-3.2592	0.0086

In TPN	-0.2267	0.1923	-1.1791	0.2657
In WPP	0.6830	0.1478	4.6225	0.0009
In ARF	0.7678	0.2434	3.1549	0.0102
C	16.3481	5.8247	2.8067	0.0186
R-Squared 0.9270, Adjusted R-Square 0.8904, F-Statistic 25.3846, Prob (F – Statistic) 0.0000, Durbin Watson Statistic 1.9655				

Source: Author’s regression output.

The results above revealed that 92.70% changes in palm oil export from Nigeria are explained by annual output of palm oil, exchange rate, trade openness, world price of palm oil and annual rainfall collectively. However the prob values of annual output of palm oil, exchange rate, world price of palm oil and annual rainfall are less than 5%, implying their statistical significance, which is equally buttressed from their t-statistic. Whereas annual output of palm oil, world price of palm oil and annual rainfall are directly related to palm oil export, exchange rate is inversely related to palm oil export. On the other hand, only the prob value of trade openness is greater than 5%, thus not statistically significant variable that influenced palm oil export, this is revealed in the value of its t-statistic, though, it is inversely related to palm oil export.

From the above results of t-statistic of -3.2592 and prob value of 0.0086 with respect to exchange rate, the null hypothesis which states that there is no statistic significant relationship between exchange rate and palm oil export in Nigeria is rejected and the alternative hypothesis that there is significant statistical relationship between exchange and palm oil export in Nigeria is hereby accepted. The implication of the above result is that, as the naira depreciates in terms of exchange rate with the U.S dollar, the volume of palm oil export will increase, which will benefit both the importers, exporters and oil palm farmers. In addition to the analysis above, the results on table 4.3, indicated that a unit change in AOP, EXR, TPN, WPP and ARF individually, is accompanied by 5.2315, -0.8410, -0.2267, 0.6830 and 0.7678 changes in palm oil export (PEX) respectively. The Dubin-Watson statistic of 1.9655 suggests the absence of auto correlation.

The existence of co-integration between the dependent variable and the controlled as well as intervening variables necessitated proceeding to the application of error correction mechanism, so as to capture the short run relationship between the variables (dependent and independent), as well as the speed of adjustment to equilibrium, whenever disequilibrium occurs.

**Table 4.4 Results of the Short Run Error Correction Mechanism with InPEX as Dependent Variable.**

Variable	Coefficient	Standard error	t-statistic	Prob
D (In AOP)	2.5187	2.7203	0.9491	0.3742
D (In EXR)	-1.0940	0.8261	-1.3243	0.2270
D (In TPN)	-0.2422	0.1456	-1.6639	0.1401
D (InWPP)	0.5651	0.2318	2.4378	0.0449
IN ARF	1.1200	0.2603	4.2640	0.0037
ECM (-1)	-0.8310	0.2691	-3.0877	0.0176
Constant	3.4097	0.7985	4.2702	0.0037
R – Squared 0.9158, Adjusted R – Square 0.8437, F – Statistic 12.6964, Prob (F – Statistic) 0.0019, Durbin Watson Statistic 1.7583				

Source: Author’s regression output

From the results of the error correction mechanism world price of palm oil (WPP) and annual rainfall (ARF) have direct statistical significant impact on palm oil export from Nigeria, where as annual output of palm oil (AOP), exchange rate (EXR) and trade openness (TPN) have no statistical significant impact on palm oil export from Nigeria. However annual output of palm oil is directly related to palm oil export, while exchange rate and trade openness are inversely related to palm oil export.

The ECM result is correctly signed being negative; it is also significant and has the speed of adjustment to equilibrium whenever disequilibrium occurs. Specifically equilibrium is corrected by -0.8310 units, implying 83.10% speed of adjustment of current disequilibrium to equilibrium in the following period or year. The R<sup>2</sup> revealed that the independent variables taken together explained 91.58% changes in palm oil export from Nigeria. Also the Durbin-Watson Statistic of 1.7583 indicates the absence of auto correlation in the Model.

#### 4.5 Diagnostic Test for Serial Correlation and Stability of the Model.

The diagnostic test helps to confirm the robustness of the Model. It is employed to determine the behaviour of the random variables, i.e. whether the errors are / are not serially correlated and are/are not properly distributed or stable.



Table 4.5 Breusch-Godfrey Serial Correlation LM Test Results.

R- Squared	0.2191	Mean Dependent variable	1.59E-2
Adjusted R-squared	-0.1508	S.D. dependent variable	0.08163
S.E. of regression	0.0876	Akaike Info Criterion	-1.7659
Sum Squared reside	0.1457	Schwarz Criterion	-1.2945
Long likelihood	35.6061	F-Statistic	0.5924
Durbin-Watson	2.2105	Prob (F-Statistic)	0.7876

Source: Author's Regression Output.

The result of the dynamic model diagnostic test revealed that the explanatory variables explain or account for 21.91% of the variations in palm oil export from Nigeria. This confirms the overall goodness of the model. The Akaike Information Criterion and Schwarz Criterion of -1.7659 and 1.2845 respectively, show correct specification of the model. While the F-Statistic of 0.5924 indicates joint statistical significance of all the variables in the model; at 5 percent. Also the Durbin- Watson result of 2.2105 shows that the model is free of serial correlation.

## V. CONCLUSION

The paper explored the impact of exchange rate on palm oil export in Nigeria; as export remains one of the strategies for accelerating the pace of development of any economy. The general objective of the study was to examine the impact of exchange rate on palm oil export in Nigeria. The formulated and tested hypothesis based on the controlled variable is that there is no statistical significant relationship between exchange rate and palm oil export in Nigeria.

The results of the Augmented dickey Fuller (ADF) unit root test, revealed that palm oil export, annual output of palm oil, exchange rate, trade openness. World price of palm oil became stationary after first difference I(1), while annual rainfall had no unit root at level I(0). The Johansen Co-integration test results indicated the existence of 2 co-integrating equations at 5% level of significance for Trace statistic and 1 co-integrating equation at 5% level of significance for Maximum Eigen statistic, implying long run equilibrium among the variables. The Ordinary Least Square (OLS) estimation results showed the existence of direct statistical significant relationship between, the dependent variable (palm oil export) and annual output of palm oil, world price of palm oil and annual rainfall, while exchange rate has inverse statistical significant relationship with palm oil export. The above conform with the apriori expectation. However trade openness has inverse but no statistical significant relationship with palm oil export. The negative value of ECM, is correctly signed which implies that the result is satisfactory and has appropriate adjustment mechanism to equilibrium when disequilibrium occurs. The results of the diagnostic test revealed that the model has no serial correction and it is stable; implying goodness and correct specification of the model. Policy frame work for the operation of multiple exchange rates of float manage for palm oil export and flexible for other international transactions is required.

The findings of the study prompted the recommendations that the country should adopt multiple exchange system of float manage rate for palm oil export as exchange rate has statistical significant inverse relationship with palm oil export in line with apriori expectation; and flexible rate for other international transactions. Also there should be improvement of customs clearance efficiency and logistic competence, while hidden expenses should stop and time involved in export of palm oil be reduced to stimulate export of palm oil. Thus, to increase the level of palm oil output hence export, small scale oil palm farmers should be encouraged by providing them input subsidy and affordable loans.

## REFERENCES

- [1]. Abolgba, E.O Onyekwere, N.C, Agbonkpolor, B.N & Umar, H.Y (2010) Determinants of Agricultural Exports. *Journal of human Ecology* 29(3):181-184
- [2]. Abiodum E.O and Salau S. (2010) Agricultural response to prices and exchange rate in Nigeria: application of co-integration and vector error correction model (VECM) *International Journal of Art and commerce*. Vol.3 No. 3 89-97
- [3]. Akinola, E.B Abogan, O.P, & Baruwa, I.O (2014). Non-oil Export and Economic Growth in Nigeria (1980- 2011). *Journal of Research in Economics and international Finance* vol 3(1) pp1-11
- [4]. Adaramola A. (2016) the effect of real exchange rate volatility on export volume in Nigeria *futa journal of management and technology* | volume 1 number 2 2016
- [5]. Adeniyi, O.R. Ogunsola, G.O & Oluwusi, D (2014) methods of palm oil processing in Ogun State, Nigeria. A resource use efficiency *American international journal of contemporary Research*. Vol. 4, No. 8

- [6]. Adubi, A.A & Okwunmadewa, F (2014). Price, Exchange rate volatility and Nigeria ‘Agricultural trade flows: A dynamic Analysis’ Research paper 67, African Economic Research consoteium Nairobi, Kenya
- [7]. Akhtar M. and Spence R. H., (2013). “Effects of exchange rate uncertainty on German and U.S trade,” Journal of finance. Pg; 132.
- [8].
- [9]. Aigbokhan, B.E (2001). Resuscitating Agricultural production (cocoa, cotton, Groundnuts, palm oil, Rubber etc) for exports paper presented at the 10<sup>th</sup> Annual conference of Zonal Research units of the C.B.N Apple yard, Field and Cobb (2006) international economics (5<sup>th</sup> edition) MC Graw-Hill Irwin. ISBN 0-07-287737-5.
- [10]. Ayinde, O.E. Muchie, M. Adenuga, A.H jesudum, M.O (2012 ). The Foreign Exchange Market in Nigeria” Retrieved from [http://www.cenbank.org/int\\_ops/Fx\\_market.asp](http://www.cenbank.org/int_ops/Fx_market.asp) (Accessed:12 August 2015)
- [11]. Afza, M and Alam, K. (2014).Managing foreign exchange risk among Ghanaian firms. Journal of Risk Finance volume 6 number 4, pp.306-318.
- [12]. Baak S., (2004). “Exchange rate volatility and trade. International journal of Applied Econometrics and Quantitative studies Vol. 3-1.
- [13].
- [14]. Balogun, E. D. (2007), “Effects of Exchange rate policy on Bilateral Exports Trade of WAMZ countries”. Munich personal Rep Archive (MPRA) paper No. 6234 Central Bank of Nigeria (CBN) Annual report and statement of Account and Bulletin of Various years.
- [15]. C.B.N (2013). The Foreign Exchange Market in Nigeria” Retrieved from [http://www.cenbank.org/int\\_ops/vFx\\_market.asp](http://www.cenbank.org/int_ops/vFx_market.asp) (Accessed:12 August 2015)
- [16]. Daramola, B. (2004): “Competitiveness of Nigerian Agriculture in a Global Economy: Any Dividends of Democracy?” Inaugural Lecture Series 36, delivered at the Federal University of Technology, Akure, Nigeria.
- [17]. Ekiran, J.O Awe, I.T & Ogunjobi, J.O. (2014). Agricultural export and economic growth in Nigeria: A multivariate Johansen Co integration Analysis. International Journal of Art and commerce. Vol.3 No. 3 89-97
- [18]. Ettah, E.B, Akpan, O.D & Etim, R.S (2011). Effects of price and Exchange rate fluctuations on Agricultural export in Nigeria. International journal of Economic Development Research and investment vol 2 No1
- [19]. Ettal, E.B (2006). International trade: is it really a mechanism for international inequality? Journal of social and policy issues, 13 (12), 31 – 36.
- [20]. Gourichon, H (2013) Analysis of incentives and disincentives for palm oil in Nigeria. Technical notes series, MAFAP, FAO, Rome.
- [21]. JAD (2012) Palm oil marketing and distribution pattern in Imo State, Nigeria: An application of Linear programming model. Journal of agriculture and Development Vol. 2(1)
- [22]. Kwanashie, M. (1977) Policy Modelling in Agriculture: Testing the Response of Agriculture to Adjustment Policies in Nigeria, Research Paper 57.
- [23]. Lade, A. D (2007) African export industry: what happened and how can it be revived? Case study on the Nigeria oil palm industry. (AGSF) working Document FAO Rome.
- [24]. Mamata, B. C(1999) The determinants of real exchange rate: Theory and Evidence from papua Guinea, asia pacific school of Economics and management working paper 99-2
- [25]. Mordi, N.O.(2006), Challenges of Exchange rate volatility in Economic Management in Nigeria” in the Dynamics of Exchange rate in Nigeria, Central Bank of Nigeria Bullion, vol.30, No. 3, pp. 17 – 25
- [26]. Nyead, J.D, Atiga,O & Atogenzoya, C.A (2014).The impact of Exchange rate movement on export: Empirical Evidence from Ghana. International Journal of Academic Research in Accounting, Finance and management sciences. Vol 4.No. 3 pp41-48
- [27]. Oaikhenan & Nwokoye (2015) real sector performance and exchange rate. Journal of Social Sciences, 23, 1. Retrieved from <http://www.krepublishers.com>
- [28]. Obadan, M.I., 2006. Overview of exchange rate management in Nigeria from 1986-2006 Central Bank of Nigeria Bullion, 30(3): 1-15.
- [29]. Ogun, O (1998) Real exchange rate movements and export growth: Nigeria, 1960-1990. African Economic reseaech consortium.
- [30]. Ohimain, E.I Emeti, C.I Izah, S.C & Eretinghe, D.A (2004) Small-Scale palm oil processing Business in Nigeria: A Feasibility study. Greener journal of Business and management studies ISSN: 2276-7827 vvol. 4(3), pp 70-82.
- [31]. Okputu,R. Opue, J.A & Bankong, B (2012). The effect of exchange rate devaluation on selected agricultural export commodities in Nigeria. Journal of Agricultural forestry and the social sciences 10(2).

- [32]. Olagunju, F. I (2008) Economics of Palm Oil processing in south western Nigeria. international journal of Agricultural Economics and rural Development 1(2): 69-77
- [33]. Olanipekun, D.B (2013) Exchange rate volatility and Economic Activities in Nigeria. Unpublished Ph.D Thesis: University of Ibadan, Nigeria
- [34]. Omojimito, B.U and Akpokodje.G(2010) The Impact of Exchange Rate Reforms on Trade Performance in Nigeria. Journal of Social Sciences, 23, 1. Retrieved from <http://www.krepublishers.com>
- [35]. Onwuka, E.C (1988).Contemporary international Economic relations. Nigeria: RASJEL
- [36]. Onunze Martin (2012) effect of exchange rate in agriculture export in Nigeria.
- [37]. Robinson, M.O and Okowa, E (2011) “Foreign capital inflow and economic growth in Nigeria an impact assessment perspective” . international journal series on Tropical Issues.
- [38]. Sang, W.C, Sriboonchitta, S. Huang, W.T & Wiboonpongse, A. (2013).Modeling the volatility of rubber price return. Using VARMA GARCH model. Taiwan Electronic periodical services 6, 1-15
- [39]. Takaendesa, P (2006) The Behaviour and Fundamental determinants of real exchange rate in south Africa, A masters thesis submitted to Rhodes university South Africa.
- [40]. Verheye W. (2010) Growth and production of oil palm. Journal of Social Sciences, 23, 1. Retrieved from <http://www.krepublishers.com>
- [41]. Yu, H.(2006) Determinants of exchange rate fluctuations for Venezuela: Application of an extended mundell – Flemiong model, journal of applied Econometric and international Development, Vol. 6 No.1

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