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# Agriculture in Place of Crude Oil Production as an Alternative Income Earner for Nigeria: A Cointegration Analysis Approach

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***Author's contribution***

*The sole author designed, analyzed and interpreted and prepared the manuscript.*

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## ABSTRACT

**Aims:** To examine the contribution of agriculture as an alternative to crude oil production on the Nigerian economy using cassava production as proxy.
**Study Design:** Johansen-Juselius co-integration procedure and error correction models are adopted.
**Place and Duration of Study:** The data used in this study are from secondary sources. Data on gross domestic product per capital (GDPPC), and naira exchange rate (ER) are obtained from NGA_Country Meta Data_Agric 2013, while that on cassava production (CAS) are obtained from FAO Statistics Division 2013. Data covered 1980 and 2010.
**Methodology:** The study uses Johansen-Juselius co-integration procedure to examine a possible long run equilibrium among GDPPC, CAS, and ER. Unit root, Granger-causality, and cointegration tests were conducted.
**Results:** All variables are integrated of order one. Causality test indicates that both CAS and LEXH Granger cause GDPPC. The causality is one-way. Both trace and max-eigenvalue tests indicate 1 cointegrating equation with P=0.0296 and 0.0255 respectively. Johansen-Juselius co-integration procedure identified a long run equilibrium among gross domestic product per capital, cassava

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production, and naira exchange rate. GDPPC adjusts to disequilibrium at 21%, CAS adjusts at 9.2% while ER adjust to disequilibrium at a rate of 11% each year. The result shows that a unit increase in CAS produced over last period production will increase GDPPC by 5.6733 units, while a unit increase in ER over last period value will reduce GDPPC by 1.3098 units.

**Conclusion:** The adjustment rate of disequilibrium by LCAS and LGDPPC are statistically significant good policies to encourage the production of cassava should be put in place to boost employment opportunities and increase revenue to the government.

*Keywords: Co-integration; long-run equilibrium; cassava; employment.*

## 1. INTRODUCTION

Agriculture, also called farming or husbandry, is the cultivation of animals, plants, fungi, and other life forms for food, fiber, biofuel and other products used to sustain human life. Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that nurtured the development of civilization [1]. Agriculture generally speaking refers to human activities, although it is also observed in certain species of ant and termite [2].

The history of agriculture dates back thousands of years, and its development has been driven and defined by greatly different climates, cultures, and technologies. Until the Industrial Revolution, the vast majority of the human population labored in agriculture. Pre-industrial agriculture was typically subsistence agriculture in which farmers raised most of their crops for their own consumption instead of for trade. Modern agronomy, plant breeding, and agrochemicals such as pesticides and fertilizers, and technological improvements have sharply increased yields from cultivation.

Oil palm (*Elaeis guineensis*) is one of the most important economic oil crops in Nigeria. Cultivation of oil palm serves as a means of livelihood for many rural families and indeed the farming culture of millions of people in the country. The reference to oil palm as a crop of multiple value underscores its economic importance. Oil palm is made of essential components, namely; the fronds, the leaves, the trunk and the roots which are used for several purposes ranging from palm oil, palm kernel oil, palm wine, broom, and palm kernel cake [3].

As at early 1900, Nigeria was producing all palm oil sold in the world market and it was considered a dominant source of foreign exchange [4]. Up until the 1960s, Nigeria was the world's largest producer of palm oil accounting for 43% of global palm oil production. Over-reliance on traditional production methods, excessive tapping of palm trees for palm wine and the Nigerian civil war, are factors that contributed to Nigeria's inability to meet up with the global rise in demand for palm oil.

Behrooz and Benjamin [5] are of the opinion that before the advent of crude oil production in Nigeria, Nigeria's main stay was agriculture and was dominated by palm crude oil production. Nigerian palm crude oil production and exportation is ranked 4$^{th}$ in the world. The Nigerian economy has performed poorly since independence despite the huge mineral, material and human endowment, as well as the accelerating dynamics of the global economy.

In Adebile [6], cassava (*Manihot esculenta*), is extensively cultivated as an annual crop in tropical and subtropical regions for its edible starchy, tuberous root, a major source of carbohydrates. It is a major staple food in the developing world and indeed Nigeria. Cassava leaves are rich in protein, vitamins, and minerals yet cassava is marginalized. Nigeria is the world's largest producer of cassava. Cassava is the most widely cultivated crop and provides food and income to over 30 million farmers and large numbers of processors and traders. The climatic conditions and the soil in Nigeria are suitable for its cultivation. Cassava has been used as an important and cheap feed in many European countries. Both the roots and the leaves are usable as food to livestock. It is estimated that approximately 4 million tons of cassava peelings useful as livestock feeds are annually produced as a by-product in Nigeria alone during processing of cassava roots. Therefore, cassava offers tremendous potentials as a cheap source of food energy for animals if adequately supplemented with other nutrients. Cassava is commonly used for feeding pigs, ruminants and poultry.

Cassava flour can be used as partial replacement for many bakery and pasta products [7]. Several sources report that at least 10% of the wheat flour used for baking can be substituted by cassava flour without change of taste or other qualities [8]. Cassava is one of the richest fermentable substances for the production of crude alcohol/ethanol. Ethanol can be made from various carbohydrate materials including cassava roots, cassava starch, and other starches or ingredients such as molasses. Dry chips may contain up to 80% of fermentable substances (starch and sugars). Crude alcohol from cassava is used mostly for industrial purposes such as in cosmetic and pharmaceutical industries [8].

The objective of this paper is to examine cassava, an agricultural product as possible alternative to crude oil production in Nigeria using co-integration approach. To this end, interaction between volume of cassava produced, exchange rates and gross domestic product per capital is modeled. This is significant because a positive relationship will encourage government to diversify the economy which will invariably lead to more employment and more income to the government. The remainder of this paper proceeds as follows: Section II is for the reviews of past relevant researches. Section III presents the methodology adopted. Section IV shows the findings of the study and section V contains the discussion and recommendations based on the research.

## 2. LITERATURE REVIEW

The Nigerian economy is considered the second largest economy in Africa, after South Africa [9]. Despite the fact that oil accounts for 95 percent of Nigeria's export revenues and 76 percent of government revenues, it has done little to alleviate poverty in the country [10]. Agriculture still remains a crucial sector, employing over 70 percent of the Nigerian labour force and serving as a potential vehicle for diversifying the Nigerian economy and enabling economic development. Nigeria has a broad range of agricultural commodities, with the main ones being cassava, maize (corn), cocoa, millet, palm oil, peanuts, rice, rubber, sorghum, and yam. Agriculture and oil contributed about 65 percent and 5 percent of Gross Domestic Product (GDP) respectively at Nigeria's independence in 1960, the sectors accounted for about 32 percent and 37 percent, respectively, in 2006 [11].

Agriculture, since independence, held the key to Nigeria's rapid economic transformation, poverty alleviation, stable civil and good governance as well as national and food security. The exploitation of the agricultural sector since the 1960s provided the main source of employment, income and foreign exchange earnings for Nigeria. This was due to focused regional policies based on commodity comparative advantage. The sector employed over 70 percent of the labor force, fed the population estimated at 55million and 60million in 1963 and 1965 respectively, guaranteeing the greater percentage of the food security of the average household. In the same period, export of cash crops earned 70 and 62.2 percent respectively, of Nigeria's total foreign exchange and contributed 56.7 and 66.4 percent of GDP in 1960 and 1965 respectively. The dominant position of the agricultural sector in this period in the Nigerian economy was therefore, not in doubt. The advent of commercial exploitation of oil resources, however, turned the trend against agriculture and its downstream industries from the rest of seventies onwards. It is estimated that about 75% of Nigeria's total land area amounting to 68 million ha has agricultural use potential while about 33 million ha is actually under cultivation [12].

Cassava is Africa's second most important food staple, after maize, in terms of calories consumed. It is a major source of calories for roughly two out of every five Africans. It is consumed daily and sometimes more than once a day [13]. Cassava growing belts fall within four agro ecological zones South East, South West, South-South, and Central states. The first three zones are within the humid tropics, with soil types that are rich in plant nutrients. Cassava production has potential to create employment opportunities for the unemployed labour force in the rural areas both in its cultivation, processing and marketing. Nigeria is the largest producer of cassava in the world. About 31.8 million tonnes are produced annually with internal demand put at about 48 million tonnes. Russia and the rest of Europe have now turned to Nigeria the acclaimed number one producer of cassava in the world following the inability of Thailand to sustain supplies of cassava chips [14].

Unemployment is the greatest challenge to underdeveloped and developing countries. Some major causes of unemployment in Nigeria; faulty manpower planning and expansion of educational facilities that have unduly raised the

expectations of Nigerian youths, the economic recession, the institution of NYSC, graduate attitude to some type of jobs especially in other location as well as search behaviour of employers and job seekers, use of capital intensive technology, wide rural- urban migration, formal-informal sectors differentials [15].

Investigating the effect of real Exchange rates on unemployment in Latin America Frenkel and Ros [16] argue that real Exchange rates affect unemployment by indirectly affecting increase level of output. Halil [17] investigated the impact of the Real Effective Exchange Rate (REER) on Turkish Agricultural Trade using vectors autoregressive methodology and Johansen cointegration principle. He found that export cause REER, but REER cause import in the sense of Granger causality and that evidence of cointegration was found between these variables. REER has smaller effects on export and import in the short-run when compared to the long-run effects. In studies carried out by Oyejide [18], Hughes and Penson [19], observe that there are marked increases in volume of agricultural exports over the years but the volatility, frequency and instability of the exchange rate movements since the beginning of the floating exchange rate raise a concern about the impact of such movements on agricultural trade flows. Chambers and Just [20] noted that while some research found that exchange rates play a role in agricultural exports, still others found that the exchange rate has relatively small impact on the agriculture sector of the economy.

Obayelu [21] estimated the response of aggregate agricultural output to exchange rate and price movements of food and export crops in Nigeria using Johansen cointegration technique and found that the variables are cointegrated. They found that there exists a linear deterministic trend in the data and that food and export prices as well as the 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. Total agricultural output responds positively to increases in exchange rate and negatively to increases in food prices both in the short and long run. 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 are passed immediately to agricultural output.

Behrooz and Benjamin op cit used the Johansen-Juselius cointegration test procedure to evaluate the relationship between palm crude oil production and Nigeria's economic performance and found that neither palm crude oil production nor crude oil production was statistically significant in contributing to the economy. Both variables showed a weak short-run result but the cointegration between the variables indicate a long-run equilibrium relationship indicating that both the growth of palm oil and crude oil will contribute to the growth of Nigeria economy.

Adebile op cit investigated the characteristics, trend, and the impact of the oil industry on the production of cassava from 1961 to 2010 using both descriptive and inferential statistical methods. The study concluded that the claim of a negative effect of the oil industry of the 1970s on cassava production could not be confirmed.

Anyanwu [22] in their study considered the relationship between Gross Domestic Product and output of major stapled food crops of Nigeria between 1990 and 2001. Using correlation matrix, the result showed that there is a strong, positive and statistically significant relationship between GDP and these food crops except for wheat. Policies should therefore be put in place by the appropriate authorities geared towards providing production incentives to the rural farmers to enable them produce more of these stapled food crops that have significant impact on the GDP of Nigeria.

Azeez et al. [23] examines the effect of exchange rate volatility on macroeconomic performance in Nigeria from 1986 to 2010. Using Ordinary Least Squared and Johansen co-integration estimation techniques they found that Oil Revenue and Exchange Rate are positively related to GDP while Balance of Payment (BOP) is negatively related to GDP. They also found a long-run relationship between these variables and GDP. Oil revenue and balance of payment exert negative effects on GDP in the long-run, exchange rate volatility contributes positively to GDP in the long run.

Oyovwi [24] evaluates the effect of exchange rate volatility on economic growth in Nigeria on the basis of annual data from 1970 to 2009. He applied Co-integration analysis technique and Generalised Autoregressive Conditional Heteroscedasticity (GARCH) technique. He found that in the short run, economic growth is positively responsive to exchange rate volatility while in the long run, a negative relationship exists between the two variables. The long run

dynamics show that increase in oil price depress economic growth in Nigeria. Thus, the income effect of rising oil price is not felt while the output effect is evidenced in factory closure and re-location to neighbouring countries.

Mahmoud [25] compared the long-term and short-term relationship between GDP, export and investment during the years 1991-2008. Results show that there is a positive and significant long term relationship between gross domestic production, investment and export at 95% confidence level. He however found that the relationship of investment and export is an inverse one. In the short term, impact of investment and exports on GDP are positive. Effect of domestic production on investment is positive, but negative on export.

## 3. METHODOLOGY AND DATA

The data used in this study are from secondary sources. Data on: GDP (current US$), Consumer Price Index (CPI) (2005=100) and exchange rate (official rate LCU/US$) are obtained from NGA_Country_MetaData_Agric 2013. For cassava production (Tonnes) data are obtained from FAO Statistics Division 2013. This paper uses the cointegration and error-correction models, to test the causal relationship between nominal GDPPC, volume of cassava produced, and exchange rate between 1980 and 2010. Granger-causality test were conducted to identify variables that have causal effect on GDPPC in particular. The existence of a long-run equilibrium (stationary) relationship among economic variables is referred to in the literature as cointegration. According to Granger [26], standard tests for causality are valid only if there exits cointegration. Therefore, a necessary precondition to causality testing is to check the cointegrating properties of the variables under consideration. All variables used are in logarithm form.

Let $y_t$ be a vector containing n observable variables, the general VAR formulation with p lags for $y_t$, can be expressed as:

$$y_t = \mu + \Pi_1 y_{t-1} + \Pi_2 y_{t-2} + \ldots + \Pi_p y_{t-p} + \varepsilon_t \quad (1)$$

Where $\varepsilon_t$, a vector of residuals, is assumed to be i.i.d Gaussian with zero mean and positive definite covariance matrix $\Omega$ ($\varepsilon_t \sim NI_p(0,\Omega)$, $y_0,\ldots,y_{-p+1}$ are assumed fixed).

If $y_t$ contains variables that are cointegrated then the vector of differences $\Delta y_t$, defined as $\Delta y_t = (1-L)y_t$, is stationary and there are some linear combinations of the variables in $y_t$ that are stationary. Under these conditions, (1) can be expressed as a vector error correction model (VECM).

$$\Delta y_t = \mu + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \ldots + \Gamma_{p-1} \Delta y_{t-p+1} + \Pi_1 y_{t-1} + \varepsilon_t \quad (2)$$

Or,

$$\Delta y_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \Pi_1 y_{t-1} + \varepsilon_t \quad (3)$$

Alternatively, under the cointegration hypothesis, Johansen [27] demonstrated that the presence of unit roots leads to a reduced rank condition on the long-run matrix $\Pi$ such that $\Pi = \alpha\beta'$ so (3) can be expressed as:

$$\Delta y_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \alpha(\beta' y_{t-1}) + \varepsilon_t \quad (4)$$

Where α and β are matrices of order $n \times r$ and rank equal to $r$ ($r \le p$). The columns of β are the cointegration vectors, which can be interpreted as long-run economic relations so that $\beta' y_{t-1}$ is a $r \times 1$ vector of stationary relations, while the columns of $\alpha$ correspond to the loading factors and denote how each variable in $y_t$ "corrects". Johansen [28] suggested a maximum likelihood procedure to estimate the cointegration rank $r$, and the matrices β and $\alpha$.

If there are more than two variables, then, Johansen-Juselius cointegration methodology (1990) must be implemented, because there may be more than one cointegration vector. Johansen-Juselius cointegration technique represents the same thing as a multivariate generalization of the Dickey-Fuller used for unit root test [29].

The Cointegration Test

Let

$$\Delta y_t = \pi y_{t-1} + \varepsilon_t \quad (5)$$

$$\pi = (A_t - I) \quad (6)$$

The rank of $\pi$ matrix *r* represents the number of linear combination of variables included in $\pi$ matrix or number of cointegrating vectors. The following is the two tests statistcs which declare the rank of $\pi$ matrix:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \quad (7)$$

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (8)$$

Where

$\hat{\lambda}_i$ = The estimated value of the characteristic roots obtained from the estimated $\pi$ matrix. *T* = the number of usable observations.

## 4. RESEARCH FINDINGS

### 4.1 Unit Root and Cointegration Test

All variables used in this study are integrated of order one ~ *I*(1). Accordingly, it is suitable to use the Johansen's cointegration technique for the extraction of the long-term relationship between the variables. Granger Causality Tests as shown in Table 1 reveals the Granger Causality pair wise test. It is observed that both the volume of cassava (LCAS) production and exchange rate (LEXH) Granger cause Gross Domestic Product (LGDPPC). The causality is one-way in this case.

The trace and max-eigenvalue tests results of Johansen-Juselius are presented in Table 2 below. The table shows that both trace and max-eigenvalue tests indicate 1 cointegrating equation at the 0.05.

### 4.2 Vector Error Correction Model

The first thing is to determine the order of the VEC Model. VER (p) was run for p=1, 2,...,6. VEC (5) is selected based on the three criteria (Log likelihood, AIC and SIC). The results are presented in Table 3 below.

From Table 3, the error correction term is indicated as:

$$\tau_{t-1} = -0.672868*(\text{LGDPPC}(-1) + 5.673263*\text{LCAS}(-1) - 1.309786*\text{LER}(-1) - 98.87917) \quad (9)$$

The focus of the analysis is on $\tau_{t-1}$ term, as it provides an explanation on the extent to which the system under consideration deviates from the long-run equilibrium. The associated coefficients indicate the short-run disequilibrium responses of the model. Equation (9) has an economic implication that the last period's equilibrium error will affect the current period. If this residual equals zero, then the system is in equilibrium [30].

**Table 1. Pairwise Granger Causality Tests**

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| LCAS does not granger cause LGDPPC | 30 | 5.9504 | 0.0077 |
| LGDPPC does not granger cause LCAS | | 0.1232 | 0.8847 |
| LER does not granger cause LGDPPC | 30 | 11.3445 | 0.0003 |
| LGDPPC does not granger cause LER | | 1.1194 | 0.3423 |
| LER does not granger cause LCAS | 30 | 2.4780 | 0.1043 |
| LCAS does not granger cause LER | | 0.6528 | 0.5292 |

*Test obtained at Lag 2*

From the study it is found that LCAS, and LER granger cause LGDPPC in a one way causality. The study indicates one co integrating relationship which implies that there exists a long-run equilibrium relationship between Gross domestic product per capital, cassava production, and the nominal exchange rate of the naira. The study reveals that only two variables (LGDPPC and LCAS) are significantly adjusting disequilibrium see Table 3 below. The short run adjustment coefficient of -0.6729 by GDPPC implies that about 67% of disequilibrium is "corrected" each year by changes in LGDPPC, about 22% of disequilibrium is "corrected" each year by changes in LCAS, and about 11% of disequilibrium is "corrected" each year by changes in LER. The long run relationship reveals that cassava production has a positive effect on GDPPC because a unit increase in cassava produced over last period production will increase GDPPC by 5.6733 units. On the other hand, a unit increase in exchange rate over last period value will reduce GDPPC by 1.3098 units. Fig. 1 shows the behavior of the disequilibrium for a unit change in each of the variables.

### 4.3 Testing for Serial Correlation

The Breusch-Godfrey (BG) Test is use. The VEC Residual Serial Correlation BG Tests of no serial correlation at lag order 5 to 10 could not be rejected at 5% significance level. This shows that the analysis is free of serial autocorrelation. The VEC model is adequate for this study.

### 4.4 Variance Decomposition

Table 4 is the variance decomposition table. It can be seen that both LGDPPC and LCAS explained more than 97% of shocks emanating from each of them in the first period. Half of the shock to LER at the first period was borne by LCAS and 64% was also borne by LCAS in fifth period. At the tenth period, both LGDPPC and LCAS shared 60% and 25% respectively of shocks due to LER. As time grows however, shocks from LCAS were borne by LGDPPC (23% in first period and 65% in tenth period). This shows that shocks from both LCAS and LER were shared to LGDPPC over the periods.

**Table 2. Cointegration tests**

| | | Unrestricted cointegration rank test (Trace) | | | Unrestricted cointegration rank test (Maximum Eigenvalue) | | |
|---|---|---|---|---|---|---|---|
| Hypothesized No. of CE(s) | Eigenvalue | Trace statistics | 5% critical value | Prob.** | Max-eigen statistic | 5% critical value | Prob.** |
| None * | 0.537994 | 31.72944 | 29.79707 | 0.0296 | 23.16535 | 21.13162 | 0.0255 |
| At most 1 | 0.210486 | 8.564088 | 15.49471 | 0.4072 | 7.090137 | 14.26460 | 0.4785 |
| At most 2 | 0.047944 | 1.473950 | 3.841466 | 0.2247 | 1.473950 | 3.841466 | 0.2247 |

*Trace and Max-eigenvalue tests indicate 1 cointegrating eqn(s) at the 0.05 level*
** denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values*

**Table 3a. The short-run coefficients**

| Speed of adjustment parameters (Short-Run Coefficients) | | | |
|---|---|---|---|
| **Error correction:** | **D(LGDPPC)** | **D(LCAS)** | **D(LER)** |
| CointEq1 | -0.67287 | -0.22359 | 0.10654 |
| Standard Error | (-0.1733) | (-0.08394) | (-0.44159) |
| t-Statistic | [-3.88274] | [-2.66363] | [ 0.24126] |

**Table 3b. The long-run coefficients**

| The Cointegration Vector (Long-Run Relationship) | | | | |
|---|---|---|---|---|
| **Cointegrating eq:** | **LGDPPC(-1)** | **LCAS(-1)** | **LER(-1)** | **C** |
| CointEq1 | 1.00000 | 5.673263 | -1.309786 | -98.87917 |
| | | (-0.91174) | (-0.23302) | |
| | | [ 6.22244] | [-5.62085] | |

*Source: Author's Calculation, standard error in parentheses in ( ), t-statistic in [ ]*
*R-squared = 0.855507; Adj. R-squared = 0.525237*

**Table 4. Variance decomposition of the variables**

| Variance decomposition test | | | | | |
|---|---|---|---|---|---|
| **Product** | **Period** | **Stand error** | **LGDPPC** | **LCAS** | **LER** |
| LGDPPC | 1 | 0.129746 | 100 | 0 | 0 |
| | 5 | 0.685760 | 64.53882 | 22.23059 | 13.23060 |
| | 10 | 9.548665 | 63.00398 | 21.03459 | 15.96143 |
| LCAS | 1 | 0.062847 | 2.568621 | 97.43138 | 0 |
| | 5 | 0.215920 | 42.74492 | 47.32666 | 9.928423 |
| | 10 | 3.115540 | 65.37586 | 18.73534 | 15.88881 |
| LER | 1 | 0.330614 | 1.532635 | 50.68840 | 47.77896 |
| | 5 | 0.873483 | 19.37385 | 63.83514 | 16.79101 |
| | 10 | 4.988200 | 60.07243 | 24.73382 | 15.19376 |

*Source: Author's Calculation*

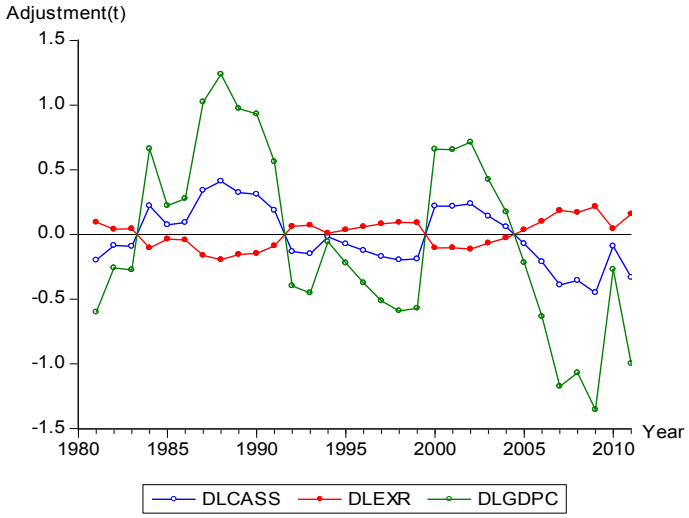


**Fig. 1. Graph of pattern of adjustment to previous error for every unit increase in the variables**

## 5. DISCUSSION AND RECOMMENDATIONS

In this study we have examined the impact of volume of cassava produced and nominal exchange rate variations on gross domestic product per capital between 1980 and 2010. Cointegration tests between these variables indicate that they are co-integrated. The cointegration test indicates one cointegration relationship which implies a long run equilibrium exists among the series. These results show that there exist of a stable long-run relationship between these three variables. The speed of adjustment parameters of 67% for LGDPPC indicate a fast rate which implies that shocks to it are easily adjusted if appropriate policies could be put in place. An adjustment speed of 22% for LCAS indicates a slower but significant adjustment process. The speed of 11% for LER also is a slow one but statistically insignificant. This could mean a relative stability in the exchange rate market over the period. Fig. 1. shows the pattern of adjustment to equilibrium level, the graph for LER is more or less a stable one oscillating close to zero, validating the insignificance of its adjustment to equilibrium. It is obvious from the figure that LCAS and LGDPPC adjust disequilibrium from time to time. Since adjustment back to equilibrium position is basically done by LCAS and LGDPPC it is advisable to put policy in place to encourage the production of cassava. It can be concluded that over a long period of time, agricultural products and nominal exchange rate variations have had very important implications for Nigeria gross domestic product per capital. The contribution of cassava to GDPPC is high as revealed in the study. Price fluctuations and low quality of products will induce production and sales fluctuations. Inconsistent policy has adversely affected the Nigerian cassava industry so much that willing investors are discouraged while some in the business are folding up [31]. If the residual is zero, Saunders op cit, the system is in equilibrium. From equation (9), this can be achieved if not less than 17.43 units of cassava is produced in the current period while the exchange rate remains unchanged. The government needs to educate farmers on the use of modern ways of farming in cassava production. Ways of preserving must improve so that wastages are minimized. This approach will reduce fluctuation that is harmful to the GDPPC. Some agricultural products are seasonal and wastages increase. Government should buy excesses to prevent loss. Government could subsidize as it is done in the US and other developed countries to encourage farmers and lure the young ones into farming. The responsibility should be shared between the federal, state and local governments. In the US Agricultural subsidy is primarily governed by periodically renewed U.S. farm bills and governance is both a federal and a local responsibility with the United States Department of Agriculture being the federal department responsible. Truman et al. [32] noted that Nigeria's cassava transformation is the most advanced in Africa. However, the scope for

increasing the use of cassava in Nigeria's industries is, to a large extent, determined by the development of an efficient and well-integrated production and marketing system. This will assure a steady supply of cassava products of stable, high quality standards and appropriate price, and of specific properties required by domestic industries and export markets. Thus, public and private investments in research and development are required to develop cassava products for industrial usage, if well targeted, could offer good returns and prospects for the future of cassava in Nigeria.

## 6. CONCLUSION

Important policy conclusions can be drawn from this result, that our production strategy and domestic monetary policies have important effects on the Nigerian gross domestic product per capital in the long run. The government should adopt strategies that will motivate the agricultural sector, this will improve the standard of living of the average Nigerian and redirect energies from crime. Also, if our monetary policy strategy does not target lower inflation rate then our currency will be weaker which on the long run will have an adverse impact on the Nigeria GDPPC. Nigeria to date is yet to diversify the productive base away from the continued reliance on a single industry, petroleum. There continues to be underutilization of industrial capacity, high unemployment rate and political anxiety.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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