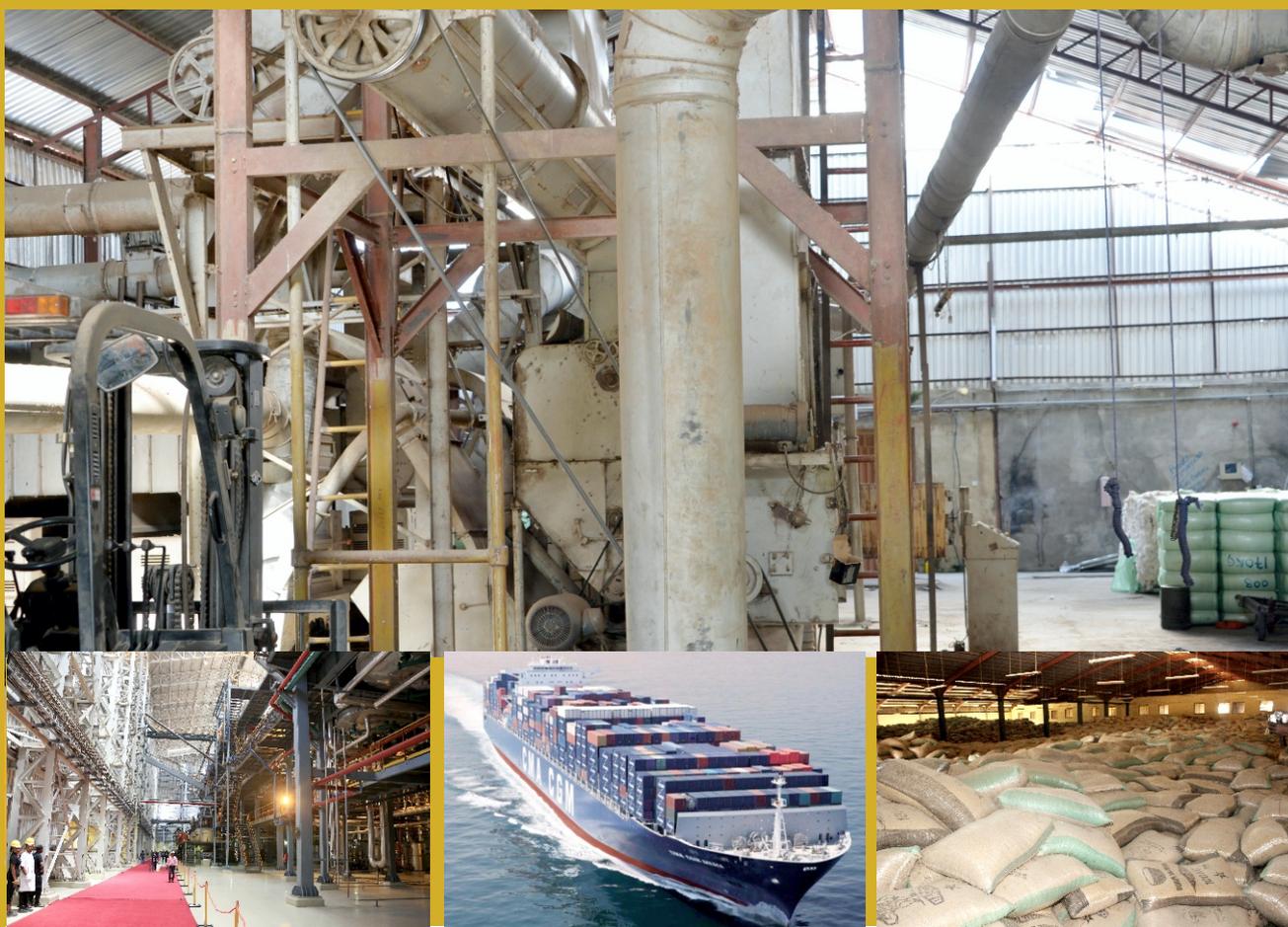




BULLION

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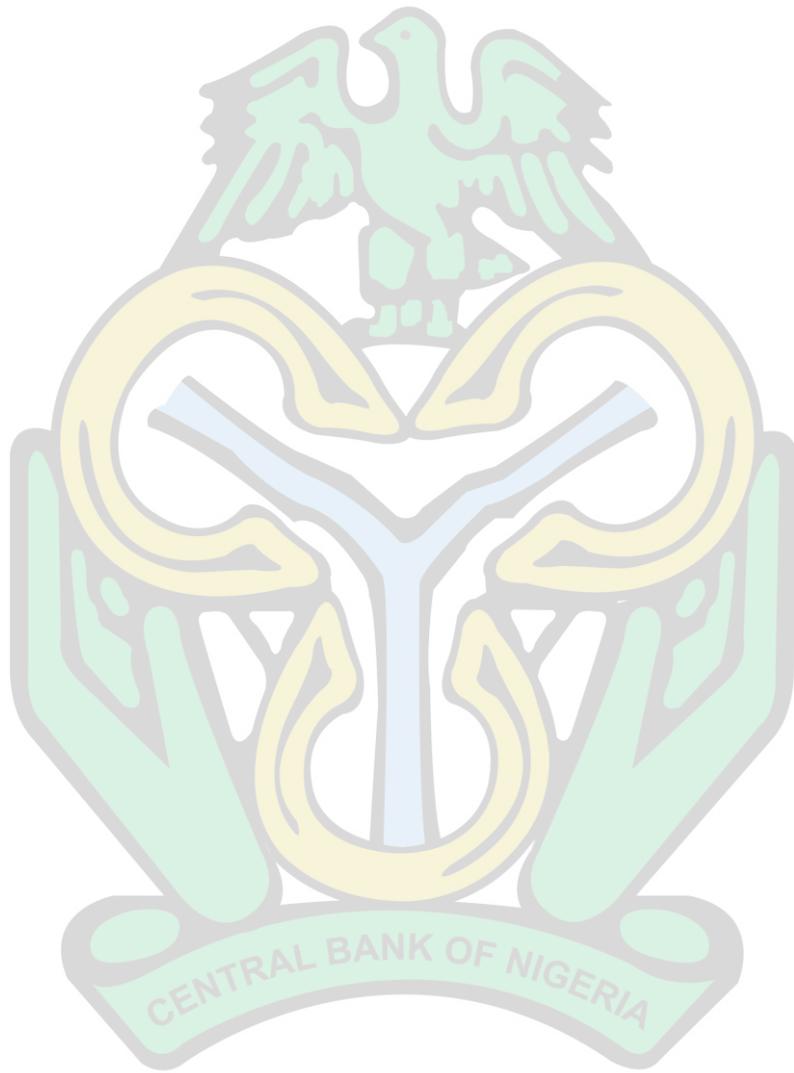
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Relationship Between Volatility in Domestic Oil Production, Oil Price and Exchange Rate in Nigeria: Co-integration and Granger Causality Tests.



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Abstract

The paper examines the relationship between volatility in domestic oil production, oil prices, and exchange rate in Nigeria. The study employs monthly time series data, from January 2006 to August 2018. Data for the Nigerian Bonny light oil prices (COP), Domestic Oil Production (DOP) and Exchange Rate (EXR) are obtained from the Central Bank of Nigeria (CBN) website. While, dummy variable (DUM) represents stability and instability in the Niger-Delta oil-rich region was traced from historic oil disruptions in the region. Autoregressive Distributed Lag (ARDL)/bound testing method and pairwise granger causality were employed. Unit root test result shows that DOP is stationary at level, while COP, EXR and DUM became stationary at first difference. The empirical result from the ARDL, established that there is a long run co-integrating relation between DOP, COP, EXR and DUM. Pairwise granger causality test proves that the direction of causation runs from COP to DOP. However, DOP and EXR are found to granger cause each other (feedback effect). Moreover, the direction of causality between DOP and DUM runs from DUM to DOP. The result further indicated that COP granger causes

EXR and not the reverse. The paper recommends fully involvement of natives and traditional rulers for dialogue and negotiations with the militants. The Nigerian government should also give diversification, the most needed attention, and with utmost seriousness it deserved.

Keywords: Oil, production, prices, exchange rate, ARDL, granger causality, Nigeria.

1.0 Introduction

Over the past four decades, Nigeria has continuously made a significant impact on the global oil exploration and production, owing to its position as the sixth largest oil exporting country in the Organization of Petroleum Exporting Countries (OPEC), and the largest producer of crude oil in Sub-Saharan Africa (NNPC business, 2015). The country has proven oil reserve of about 32 billion barrels of largely low sulphur light crude (Oladifo and Fabayo, 2012). In 2018, Nigeria was ranked as the eight largest with proven oil reserve deposit among the OPEC members (OPEC, 2018). The proven oil reserve then was 36,972 billion barrel, while, crude oil production was estimated at 1,601.6 million barrel per day (OPEC, 2019). The large quantity of proven oil and gas deposits as well as maximum oil production capacity per day has turned the country, to be one of the major players in the international oil market (NNPC business, 2015).

The varieties of crude oil reserve deposit in the country are: Qua Iboe light, Antan blend, Odudu blend, Bonny medium, Brass River, Forcados and Bonny light, to mention but few. However, Bonny light remains the best and most desirable, as it attracts market in American and European refineries. This is not unconnected with the fact that, Bonny light contents low sulphur, and is low corrosive to refinery infrastructure and less environmental impact of its bi-products in refinery effluent.

Therefore, the U.S. has been the largest buyer of Nigerian crude oil, accounted for 40% of the country total oil export. PWC's report (2013) further stated that 33 per cent of Nigeria's oil and gas exports are destined for the USA. As of March 2007, the value of the Nigeria's crude oil sold to U.S. has reached an average of 41.76 million barrels, an estimated national income of approximately 2.5 billion dollars a month (Ifedobi, 2015). Meanwhile, crude oil is being priced in American Dollar internationally, therefore, changes in oil prices directly affect exchange rate of the oil exporting countries (Smahi and Mohamed, 2018). Moreover, plethora of literatures have also reaffirmed that oil price has a significant impact on exchange rate movement, by implication, Nigerian Naira like other oil exporting countries' currency seems to be susceptible to oil price changes.

Nigeria is a mono-cultural economy, depending heavily on oil exportation, indeed crude oil is the mainstay and the driving force of the country's economic growth (Umar, 2017). The oil sector is the largest sector as it contributes to about 95 per cent of the Nigerian foreign export earnings, and 83 per cent of the federally collected revenue. Since 1970s, when the oil sector relegated the agricultural sector to background which hitherto considered to be the largest contributing sector to the Nigerian economy, crude oil has since then become the mainstay of the country economy, and one that determines the economic and political destiny of the country (Yeldu *et. al*, 2013, Etuk, 2013).

Crude oil exploration and production activities has concentrated in the Niger-Delta region, the area covers 70000sq km spread over certain ecological zones along the gulf of Guinea. The inhabitants are the minority ethnic groups in the country, the region accounts for 90 percent of the total nation's oil and gas reserve (Oyefusi, 2007). However, for over a decade, the

region has engulfed into incessant violence and uprising by the so-called Niger-Delta militant groups (such as Niger-Delta Volunteer Service (NDVS), Movement for the Survival of Ogoni People (MOSOP), Movement for Emancipation of Niger Delta (MEND), Niger Delta Peoples Volunteer Force (NDPVF), Niger Delta Vigilante (NDV) etc.). The militants engaged in attacking and destroying oil facilities and foreign oil investments in the region, in their struggle for self-determination and local control of oil resources (Emmanuel, 2017).

Another factor that breeds hostility and violent reactions from the militants has been the negative impact of oil exploration and production, such as pollutions and other environmental degradations affecting the communities, as well as the nonchalant attitude on the part of government and foreign firms to address these fundamental issues inimical to societal welfare.

Therefore, for quite some time now, the Nigerian oil sector has been facing enormous challenges ranging from lack of cooperation from the indigene communities, rampant vandalization of oil pipelines and infrastructures, smuggling and oil theft, severe ecological damage, activities of the militants and other security challenges in the Niger-Delta oil producing region.

This resulted to recurring oil production volatility and consequently declining oil revenue. Evidently, crude oil production level was 5100 barrels per day (bpd) in 1958, climbed up to about 2.055 million bpd in 1983, it further escalated to 2.3 million bpd in 2014. But militia activities from 2001 to 2009 led to slump in oil production activities and consequently declined output levels and foreign export earning' as well as reduction in oil revenue (Osaru and Kanwanye, 2019). Citing instance, Emmanuel (2017)

reported that in 2006 alone, MEND cuts oil production by about 30%. However, in 2010 significant improvement in oil production was recorded, owing to reduction in militia activities motivated by amnesty granted to the repentant militants by the Nigerian government. Dwindling oil production was further witnessed in 2016 attributed to the incidence of oil thefts, militant attacks on oil facilities and sea pirates in the Niger-Delta region of Nigeria (Usoro, Ikpang and George, 2019). To sum up, the issue of volatility in the Nigerian oil production due to militia activities in the Niger-Delta has persisted for over two decades.

On the relationship between oil prices shocks, conflicts and oil production, Sharma (1998), Zamani (2004), Wang et al (2005), Xie et al (2006) and Kulkarni and Haidar (2009) viewed that fluctuations in oil price is basically originated from an imbalance between supply and demand, resulted from events such as wars or conflict, political and economic factors as well as other predictable and unpredictable factors affecting supply and demand.

Specifically, ADB (2009) attributed increased crude oil prices in 2004 to the supply-side factors such as the war in Iraq, policy development in Venezuela and conflicts in the Niger-Delta region, Nigeria. More to the supply sides factors, Barsky and Kilian (2004), Nkomo (2006) and Hamilton (2009) argued that most of the previous price increases and slumps in oil production were linked with the political instabilities in the Middle East. Even the most historical oil price shocks such as the Yom Kippur war and Arab oil embargo of 1973, Iranian revolution of 1979, Iraq inversion to Kuwait in 1990, US fears of an Iraq invasion in 2003 were associated with social and political instabilities (Umar, 2017).

From the foregoing discussions, it is

apparent from both empirically-based and theoretical evidences that there has been a link between conflict/militancy; volatility in domestic crude oil production, oil prices and exchange rate movements. The present study aims at empirically examining both the long run and short run relationship between the variables of interest, as well as identify the direction and their causal relation. Study of this nature is important, as it assesses how conflicts/militancy, and consequently oil supply cut affects oil prices and exchange rate movements. The study also helps to understand the inter-relationship between these variables, in oil exporting countries, like Nigeria. This will ultimately gave a policy direction that will boost the expected huge investment in the oil sector, reduce uncertainties in oil production and subsequently, improved revenue generation that will ensure faster economic growth and development.

Though, considerable number of studies have attempted to examine the relationship between oil prices and exchange rate (see Krugman 1980, Golub 1983, Olomola 2006, Iwayemi and Fawowe 2010, Adeniyi 2011, Adeniyi, Omisakin, Yaqub and Oyinlola 2012, Fratzscher *et. al* 2014, Osuji 2015, Onoja, 2015, Obioma and Charles, 2015, Smahi and Mohamed 2018, Tumba 2019 and Olayungbo 2019). Few other studies such as; Aleisa and Dibooglu (2002), Ike and Innocent (2015) investigated the interaction between crude oil production, foreign exchange rate and crude oil prices. To the best of our knowledge, none of the studies reviewed so far have attempted to study the co-integration relation between volatility in oil production (in relation to militancy), oil prices, and exchange rate in Nigeria.

Following this introduction, as section one, section two is the literature review, methodology is in section three. Section four provides presentations and

discussions of the results. Section five contains the conclusion and policy recommendations.

2.0 Literature Review

There are vast literatures that studied the relationship between oil prices and exchange rate movements. However, very few studies have attempted to examine the existing relation between volatility in the domestic oil production and militancy in Nigeria. While, an insignificant number of studies focused on analysing the interaction between crude oil production, oil price and exchange rate.

It was earlier established the existing positive relationship between oil prices and exchange rate in oil-exporting countries, while the relationship between the two were found to be negative in oil-importing countries; this was emphasized in the works of Krugman (1980) and Golub (1983). According to Krugman (1980) and Golub (1983) oil exporting countries, may experience exchange rate appreciation, when oil prices rise and depreciate, when oil prices declined. While, in oil-importing countries exchange rate depreciates, if oil price appreciates and vice versa.

However, terms of trade and wealth effect are the two major channels through which oil price affects exchange rate, that rising oil price deteriorates trade balance of the oil-importing countries, and subsequently depreciates local currency. On the other hand, higher oil price leads to transfer wealth from oil importing to oil exporting countries (Fratzscher, Schneider and Van Robays, 2014), afterward, many studies produced mixed results. Smahi and Mohamed (2018) examined the relationship between oil price and nominal US Dollar/Algerian Dinar exchange rate, using monthly data over the period of 2008-2015. Vector Error Correction model (VECM) result showed that increase oil price leads to the depreciation of Algerian

Dinar against US Dollar. Result from the granger causality test has provided evidence that, there exists a bi-directional relation between oil prices and exchange rate. Fratzscher *et. al.* (2014) further examined the relationship between oil prices, the US Dollar and asset prices. Result from the study revealed that, increased oil price leads to depreciation of US Dollar exchange rate. In addition, the study found a bi-directional causality between oil prices and US Dollar.

In Nigeria, many studies have used different methods to examine the relationship between oil price and exchange rate movements. Olomola (2006), Adeniyi, Omisakin, Yaqub and Oyinlola (2012) employed Generalized Auto regressive Conditional Heteroscedasticity (GARCH) and Exponential GARCH (EGARCH) techniques to study the inter-relationship between oil prices and exchange rate in Nigeria, using daily time series data from January 2, 2009 to September 28, 2010.

The empirical result found that, increase in crude oil price appreciates the Nigerian Naira against US Dollar. Osuji (2015) investigated the link between crude oil price and foreign exchange rate causality in Nigeria, using monthly data from January, 2008 to December, 2014.

The study employed Ordinary Least Square (OLS) and VAR model. Result from the study depicted that crude oil price significantly affect exchange rate. It further showed a unidirectional causality from crude oil prices to exchange rates. Again, Onoja (2015) examined the link between exchange rates and crude oil prices in Nigeria, using Error Correction Model (ECM) on a quarterly data from 1981:Q1 to 2009:Q2. The study found that oil price volatility does not affect exchange rate in the short run. Tumba (2019) applied ARDL/bound testing procedures to examine the impact of oil price volatility on

exchange rate in Nigeria, for the annual time series data from 1986 to 2015. The finding revealed a negative, but significant long run relationship between volatility of crude oil prices and exchange rates in Nigeria. However, in the short-run, negative and insignificant relationship between the variables was found. Result from the granger causality test portrayed the absence of causation between oil price volatility and exchange rate in Nigeria. In a similar studies, Iwayemi and Fawowe (2010), and Adeniyi (2011) provided evidence of a negative relationship between oil price and exchange rate. Obioma and Charles (2015) studied the interaction between crude oil price, consumer price level and exchange rate in Nigeria, through the application of Vector Auto regressive model on a monthly data from January 2007 to February 2015. The study confirmed that oil price shock has a negative impact on exchange rate. In addition, the granger causality test result showed a unidirectional causal relation, runs from crude oil price to exchange rate. Olayungbo (2019) investigated the causal relation between oil prices, exchange rate, trade balance and foreign reserves in Nigeria, using quarterly time series data from 1986Q4 to 2018Q1, the study indicated that no causal relation exists between oil prices and exchange rate.

On a relationship between oil production and Niger-Delta conflicts, study by Obi (2011) has shown evidence of the existing conflict relations between oil industry and local community, arising from mode of production, oil exploration and aftermath of oil production such as pollution, degradation and gas flaring. According to Emmanuel (2017) who undertook a survey research on oil and gas industry in Nigeria established that communal conflicts, pipeline vandalization, kidnapping, sabotage, crude oil theft, among other militant activities pose a greater challenge to oil industry, because it negatively affects both the upstream and downstream oil

production. It also observed to be responsible for slower economic growth in Nigeria.

For an interaction between crude oil production, exchange rate and crude oil prices, Ike and Innocent (2015) examined the relation and direction of causality between foreign exchange rate, oil prices, oil production and oil export in Nigeria from 2006 to 2014. The study indicated that foreign exchange rate bears a positive and insignificant relation with crude oil prices. Similarly, a weak and insignificant relation exists between crude oil production and foreign exchange rate. However, no granger causality was found between crude oil production and exchange rate in Nigeria. Aleisa and Dibooglu (2002) investigated the sources of real exchange rate movement in Saudi Arabia. The study employed structural VAR model, and found that oil production shocks rather than real oil price shocks are responsible for real exchange rate movements. The study therefore recommended the Saudi Arabian authority to ensure stabilization of oil production.

3.0 Methodology

The study employs monthly time series data from January 2006 to August 2018. The periods are selected based on the availability of data from the source. Domestic oil production (DOP), Bonny light crude oil prices (COP) and exchange rate (N/\$) (EXR) were obtained from the Central Bank of Nigeria (CBN) website. It was however documented that the Nigerian domestic oil production is highly influenced by external and internal factors, notable among them are OPEC policies on the output or supply decisions, extent of compliances to OPEC production quota, global macroeconomics and geopolitical conditions, oil price volatility, social and political stabilities in the oil producing region of Nigeria. Since volatility measures the dispersion or variation of some value

points from its central mean value overtime (Usoro *et.al*, 2019), then, the idea behind volatility in oil production implies high variations in oil production (falling oil production) due to militants attacks on oil installations and low variations (rising oil production) during a relative calm period. Therefore, the study used dummy variable (DUM) to represent stability and instability in the Niger-Delta oil-rich region which was sourced from historic trend of crude oil disruptions in Nigeria. The dummy variable was categorized into four periods. First, was period between early 2006 to June 2009, when there were massive attacks of oil pipelines, piracy and kidnapping oil workers in the Niger-Delta by the militant groups, most especially Movement for the Emancipation of the Niger Delta (MEND).

Consequently, many oil companies in the region were forced to suspend or cut down production. However, the announcement by the Nigerian government on June 26, 2009 to grant amnesty and an unconditional pardon to militants in the Niger Delta, had drastically reduced the attacks of oil facilities. Second period was between July 2009 to December 2015, when the relative peace was restored, following the full implementation of presidential amnesty program by the two former Presidents Umaru Musa Yar'adua and Goodluck Jonathan administrations.

The program was considered to be successful with violence and kidnappings decreasing sharply, while, oil production and exportation increased from 700,000 barrels per day in mid-2009 to between 2.2 and 2.4 million bpd in 2011 (Wikipedia). Amnesty program ended in January, 2016, as a result, oil production and plummeted to nearly 1 million barrel per day, the lowest level since early 2003 (Tanimu, 2009). Third period was from February, 2016 to July, 2017, when the Niger Delta militants group, particularly, the Niger-Delta Avengers (NDA) resumed attacks on oil facilities (see appendix), that witnessed a

sudden and substantial decline in crude oil production. However, August, 2017 to August, 2018 is considered as a stable or peaceful period, due to engagements and negotiation between the Nigerian government and militant groups in the Niger-Delta. In this study, value of 1 is assigned as a dummy denotes calm or peace period, while 0 represents a dummy for period of conflict or unrest.

The study applied the ARDL/ bound testing method to examine the long run relationship between the volatility in domestic oil production, crude oil prices (Bonny light), exchange rate (N/\$) and the Dummy variable. The study further employed Pair wise granger causality to determine the direction and causal relation between the variables.

Model specification

$$DOP = f(COP, EXR, DUM) \dots \dots \dots (1)$$

$$DOP = \alpha_0 a_1 COP_t + a_2 EXR_t + a_3 DUM_t + \epsilon_t (2)$$

Where DOP stands as the domestic oil production, COP denotes Nigerian Bonny light crude oil prices. Exchange rate of Nigerian Naira to dollar is represented by EXR. In this study however, the rate of exchange used is the interbank rate and not the black market exchange rate. Dum symbolizes dummy variable, in form of 1 for the relative period of peace and 0 for the period of unrest in the Niger-Delta oil region.

ARDL parameterize equation is specified

$$\Delta DOP_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta DOP_{t-i} + \sum_{j=0}^p \alpha_2 \Delta COP_{t-j} + \sum_{k=1}^p \alpha_3 \Delta EXR_{t-k} + \sum_{l=0}^p \alpha_4 \Delta DUM_{t-l} + \beta_1 DOP_{t-1} + \beta_2 COP_{t-1} + \beta_3 EXR_{t-1} + \beta_4 DUM_{t-1} + \epsilon_t \dots \dots \dots (3)$$

α_0 is the constant term, $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ and $\beta_1, \beta_2, \beta_3, \beta_4$ are the parameters/ coefficients of the model. Δ stands for the first difference operator, while ϵ_t is the error or disturbance term.

Bound testing involves computing F-test to determine the joint cointegration of the dependent variable on one or more

periods lagged value of the explanatory variables. The null hypothesis is $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$, which implies testing for the absence of long run equilibrium relationship between the variables, hence it coincides with zero coefficients for all $k+1$ variable. A rejection of H_0 implies a long run relationship. However, there are two critical values for the bounds testing, the lower bound and the upper bounds critical values. The null hypothesis of no cointegration would be rejected, if the calculated F statistics is greater than the upper bound critical value. On the other hand, if the calculated F-statistic is less than the lower bound critical values, the null hypothesis of no cointegration cannot be rejected. Hence no long run relationship can said to exist between the variables. If

on the other hand, the calculated F-statistic value fall in-between the lower and upper bound critical values, then the conclusion is that the result is inconclusive. In the presence of a long run cointegration, next is to conduct short run error correction model estimation, in order to ascertain the short run behaviour of the series and the speed of adjustment towards the long run equilibrium.

We can therefore specify the short run dynamic error correction model (ECM) as follows:)

$$\Delta DOP_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta DOP_{t-i} + \sum_{j=0}^p \alpha_2 \Delta COP_{t-j} + \sum_{k=1}^p \alpha_3 \Delta EXR_{t-k} + \sum_{l=0}^p \alpha_4 \Delta DUM_{t-l} + \phi ECT_{t-1} + \varepsilon_t \dots \dots \dots (4)$$

Where α_0 is the coefficient of the constant term, $\alpha_1, \alpha_2, \alpha_3$ and α_4 are the coefficients of the short run variables. Also ϕ is the

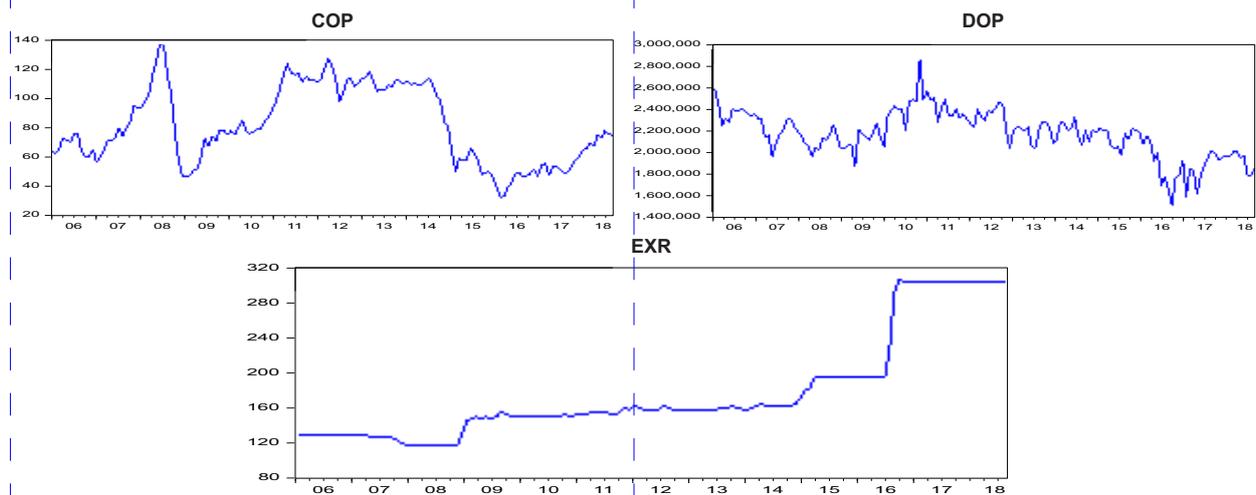


Table 1: Descriptive Statistics

	DOP	COP	EXR	DUM
Mean	2167763.	80.96671	179.3752	0.605263
Median	2195000.	75.34500	157.6500	1.000000
Maximum	2880000.	138.7400	309.7300	1.000000
Minimum	1500000.	30.66000	116.7900	0.000000
Std. Dev.	221372.0	26.68199	61.43781	0.490410
Skewness	-0.334082	0.179159	1.296306	-0.430706
Kurtosis	3.526324	1.810731	3.255612	1.185507
Jarque-Bera (JQ)	4.581907	9.770762	42.98417	25.55128
Probability	0.101170	0.007556	0.000000	0.000003
Sum	3.30E+08	12306.94	27265.03	92.00000
Sum Sq. Dev.	7.40E+12	107501.2	569965.3	36.31579
Observations	152	152	152	152

Source: Researcher’s computation using EVIEWS 9.0

coefficient of the lagged error correction term (ECT_{t-1}), while, ϵ_t is the disturbance term.

4.0 Results and Discussions

Figure 1: Crude oil price, Domestic oil production and exchange rate (\$/N).

DOP seems to have high mean, maximum and minimum values, it also has a high standard deviation compare to other variables, and this is followed by exchange

rate. This is because, unlike COP, EXR and DUM, the DOP is valued in millions. However, the negative skewness of DOP and DUM signifies that the distribution has a long left tail, showing that the distribution has skewed to the left. The distribution for the variables COP and EXR however, has skewed to the right, indicating a long right tail of the distribution. The kurtosis of DOP and EXR exceeded 3, which means that the distribution is peak relative to the normal. On the contrary, Kurtoses for COP

Unit root tests results using ADF and PP

Table 2: Unit Root Results

VARIABLE	ADF				PP			
	Intercept		Trend and Intercept		Intercept		Trend and Intercept	
	level	1 st Diff	Level	1 st Diff	Level	1 st Diff	Level	1 st Diff
DOP	-2.7742	-7.3356*	-3.2410	-7.3053*	-3.4534**	-20.3112*	-4.2175*	-20.2002*
COP	-2.5242	-8.4041*	-2.6763	-8.3918*	-2.1547	-8.4041*	-2.2900	-8.3918*
EXR	0.2256	-5.9417*	-1.6071	-6.0867*	0.2527	-6.1907*	-1.6229	-6.1200*
DUM	-1.9031	-12.1927*	-1.9836	-12.1553*	-1.9304	-12.1927*	-2.0219	-12.1553*

* & **Denoted the series is stationary at 1% & 5% probability levels.

From table 2 above, none of the variable is stationary at level under ADF. However, PP has shown that Domestic oil production (DOP) is stationary at level, both with intercept, and trend and intercept. Thus,

we have combination of variables (COP, EXR and DUM) which are I(1) and other variable (DOP) that is I(0). This allows the use of ARDL model to ascertain the cointegration relation among the series found to have a different order of integration.

The computed F-statistics (5.58) is greater than the

Bounds testing result

Table3: ARDL Bound test result Critical Bounds values

Test statistic	Value	K	Significance	I0 (Lower Bound)	I1(Upper Bound)
f-statistic	5.577	3	10%	2.72	3.77
			5%	3.23	4.35
			1%	4.29	5.61

upper bounds at 5% critical value. Thus, we reject the null hypothesis of no cointegration and conclude that there is long run cointegration relationship between DOP, COP, EXR and DUM.

Diagnostic tests

The adequacy and the stability of the model specification are determined by the

diagnostic tests using Breusch-Godfrey LM test of autocorrelation and Breusch-Pagan-Godfrey test of heteroscedasticity. Further tests include Jarque-Bera Normality testand Ramsey RESET test. The results are presented in the table below.

Table 4: Results of Diagnostics Statistics

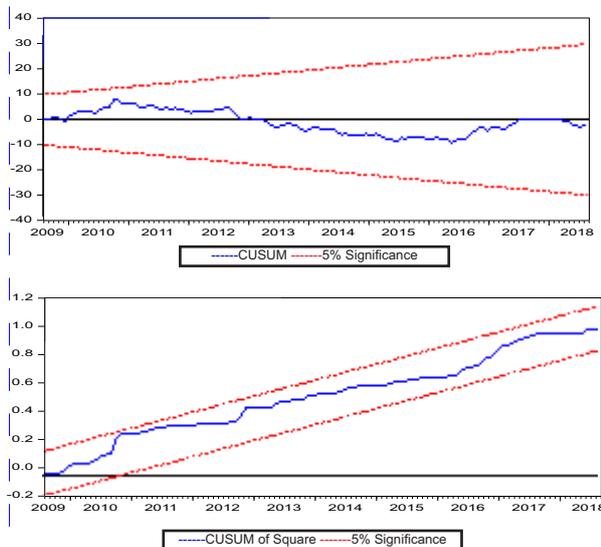
Test	LM version	F-statistic
Normality (Jarque-Bera Test Statistics)	JQ= 15.20[0.0005]	Not applicable
Serial Correlation (Breusch - Godfrey LM Test)	CHSQ (2) = 2.7994 [0.2467]	F(2,141) = 1.3407[0.2650]
Heteroscedasticity	CHSQ (6) = 33.997 [0.7573]	F(6,143) = 0.5527[0.7672]
Specification Error (Ramsey RESET Test)	t(142) =2.3106[0.022]	F(1,142) = 5.3391[0.022]

Source: Researcher’s computation using EVIEWS 9.0. Note: values in parenthesis are p-values.

The series are found not be normally distributed as JQ has shown to be statistically significant. Thus, we reject the null hypothesis of normally distribution and accept the alternative hypothesis that the frequency distributions of the series are not normal distributed. The serial correlation test using Breusch-Godfrey has shown that both the F version and LM version are insignificant, indicating that the series are not serially correlated. This also portends that the error terms are independents, which means that, the error term in one period does not depend on the error term of another period. Therefore, we conclude that there is no auto correlation at 5% level. The Breusch – Pagan – Godfrey is a Lagrange multiplier test of the null hypothesis of no heteroscedasticity. The

heteroscedasticity test result has shown high p-value revealing that, it is statistically insignificant. This suggests that, we accept the null hypothesis, and conclude that the residuals have a constant variance (Homoscedasticity). To check if there is any recursive residual, because of the structural break, we conduct the stability test using CUSUM and CUSUMSQ charts below. The blue line does not cross the red, which means that there is no recursive residual in terms of mean in the CUSUM, and in terms of variance in the second chart (CUSUMSQ). Hence, none of the variables is sensitive to structural break. Therefore, the estimated parameters of the model are stable over the study period.

Figure 2: CUSUM and CUSUM of Square.



Estimated ARDL model

Having established a long run co-integration relationship between the variables as presented in table 3, it became imperative to estimate the long run coefficients of the ARDL model. The result is presented in table 5 below:

Table 5: Result of the estimated long run coefficients (Dependent variable: DOP)

Variable	Coefficient	Prob
COP	-72.824	0.9546
EXR	-2191.759	0.0000***
DUM	176981.14	0.0050***

*** Denote the series is stationary at 1% probability level.

From table 5 above, crude oil price (COP) has a negative coefficient and insignificant long run relation with the domestic oil production (DOP). This implies that 1 per cent increase price of Bonny light crude oil, would result to a declined Nigerian domestic oil production by 72.82 per cent. Therefore, there is an inverse relationship between oil price and domestic oil production in Nigeria. Again, the long run coefficient of the exchange rate shows a negative sign and statistically significant relation with the domestic oil production. This indicates that domestic oil production decreases by 2191.76 per cent, if exchange rate of the local currency to the US dollars appreciated by 1 per cent. This implies that domestic oil production tends to decrease, when the Naira to Dollar exchange rate appreciated in value. This result disputed the finding of Ike and Innocent (2015), who established a weak and insignificant relation between domestic oil production and exchange rate in Nigeria.

Direct and significant relationship also exists between DOP and dummy variable. This means that stability in the Niger-Delta boosts the domestic oil production in Nigeria. It further suggests that instabilities related to vandalization, bombing oil facilities and kidnapping oil workers by Niger Delta militants, lead to a decline level of domestic crude oil production in Nigeria. This corroborates assertion by Emmanuel (2017), who emphasized that the activities of militants groups in the oil-rich Niger Delta had inflicted untold levels of destruction on strategic oil sites, and put a serious dent into the production of crude oil and gas resources in Nigeria. Again Obi (2011) has provided evidence of the existing conflict relations between oil production and conflict in Niger Delta. In addition, Punch Newspaper (2008) has reported that, according to Funsho Kupolokun a managing Director to NNPC, Nigeria loss 600,000 barrels of oil daily, because of conflict and insecurities in the Niger Delta. According to NNPC (2009), oil losses due to militancy reached over \$1

billion annually, which represent 32% of the revenue generated that year. It was further reported that between 2009 to 2011, Nigeria lost over 136 million barrels of oil, equivalent to \$109 billion to oil theft, militancy and sabotage. Again, 10 million barrels valued at \$894 million was also lost, due to pipeline vandalism (NEITI-EITI Core Audit Report of Oil and Gas, 2009-2011).

It was pointed out earlier that, the supply-side factors such as conflicts in Nigeria had contributed immensely in increasing crude oil prices in 2004 and declined domestic oil production. Furthermore, Umar (2017) observed that oil price volatility in Nigeria was caused not only by the happenings within the global economy, but by output shocks resulting from oil theft, pipeline vandalization and consequently falling oil production below the projected benchmark. This means that unrest in the Niger-Delta oil rich region causes output volatility that resulted to oil price volatility and dropped oil revenue to the Nigerian government. Sharma (1998), Zamani (2004), Wang et al (2005), Xie et al (2006), and Kulkarni and Haidar (2009) confirmed that the fluctuation in energy market particularly crude oil price is basically originated from an imbalance between supply and demand, resulted from events such as wars and political crisis. Therefore, it is a common knowledge that most oil price fluctuations experienced in the past were caused by war and conflicts. Studies such as Barsky and Kilian, (2004), Nkomo (2006) and Hamilton, (2009) have already supported the arguments that most of the previous price increases and dwindling oil production were associated with the economic, social and political instabilities in the oil producing countries.

Short run dynamic and error correction mechanism

The study further examined the short run dynamic behaviour of the variables, and observed the speed of adjustment towards the long run equilibrium, using Error

Correction Model (ECM).

Table 6: Result of the estimated short-run relationship and error correction mechanism variable: DOP).

Variable	Coefficient	Prob
ΔDOP(-1)	-0.162	0.0502**
ΔCOP	-693.28	0.6124
ΔEXR	-3519.13	0.0157**
ΔDUM	30149.68	0.6389
Constant	833981.88	0.0000*
ECM(-1)	-0.339	0.0000*

Source: Researcher's computation using EViews 9.0

* & **Denote the series is stationary at 1% & 5% probability levels.

The result shows the existence of a negative and insignificant short run relationship between COP and DOP. EXR is also found to have a negative and statistical significant short run relationship with DOP at 5% probability level. Similarly, positive and insignificant relationship exists between DUM and DOP. Most importantly, the coefficient of ECM

assumes the expected negative sign and it is statistically significant at 1% p-value. This indicates that ECM, which measures the speed of adjustment at which DOP adjusts to change in COP, EXR and DUM, before converging towards its equilibrium, is about 34%. This means that 34% of deviations from the equilibrium, due to temporary shocks from the explanatory variables, would be corrected within one month period. Thus, it would take almost 3 months for DOP to adjust to its long run equilibrium.

Pairwise Granger Causality test
 The one-optimal Lag lengths Selected using SC.
 Sample: 2006m01-2018m08.
 Lags: 1.
 Observations:151.

Table 7: Pairwise granger causality test result

Null hypothesis	F-stat	p-value	Hypothesis Accept/Reject	Causality
COP does not Granger Cause DOP	5.09308		Reject	Unidirectional
DOP does not Granger Cause COP	0.26325	0.6087	Accept	No causality
EXR does not Granger Cause DOP	6.61751	0.0111**	Reject	Bi-Directional
DOP does not Granger Cause EXR	9.70146	0.0022*	Reject	
DUM does not Granger Cause DOP	2.97110	0.0869***	Reject	Unidirectional
DOP does not Granger Cause DUM	0.05148	0.8208	Accept	No causality
EXR does not Granger Cause COP	1.3E-05	0.9972	Accept	No causality
COP does not Granger Cause EXR	4.60894	0.0334**	Reject	Unidirectional
DUM does not Granger Cause COP	0.02706	0.8696	Accept	No causality
COP does not Granger Cause DUM	1.08654	0.2989	Accept	No causality
DUM does not Granger Cause EXR	2.54663	0.1127	Accept	No causality
EXR does not Granger Cause DUM	0.82666	0.3647	Accept	No causality

Source: Researcher's computation using E-views 9.0*,**(***) denotes significant causal relationship at 1%,5% (10%) significant level.

The result presented above suggests that, the causal relation between COP and DOP runs from crude oil price (COP) to domestic oil production (DOP) and not the reverse. Therefore, the null hypothesis is rejected, since the p-value is statistically significant at 5%. This implies that COP granger causes DOP, on the contrary, DOP does not granger causes COP. On the other hand, DOP has a bi-directional relation with exchange rate (EXR), this

means that both DOP and EXR granger cause each other (feedback effect). This contradicts Ike and Innocent (2015), who found no granger causality between crude oil production and exchange rate in Nigeria. It also differs from Aleisa and Dibooglu (2002), who also provided evidence that the causal relation runs from crude oil production to exchange rate, but in Saudi Arabia.

The direction of causality between DOP and DUM, runs from DUM to DOP at 10% significant level, and no other way round. This also suggests that stability (peace) and instability (violence) in the Niger-Delta represented by Dummy variable granger causes DOP. While, no causation runs from DOP to DUM. The result further found a unidirectional relationship between COP and EXR, showing that at 5% significant level COP granger causes EXR and not the reverse. Therefore, the result emphasizes that change in oil prices contain information about future movement of Nigerian exchange rate. This is consistent with the result of Obioma and Charles (2015) and Osuji (2015). Studies by Olomola (2006), Adeniyi, Omisakin, Yaqub and Oyinlola (2012) equally affirmed that increase in the crude oil prices appreciates the Nigerian Naira against US Dollar. In contrast, Olayungbo (2019) and Tumba (2019) found no evidence of causation between crude oil prices and exchange rate in Nigeria.

Similarly, Independent causal relationship exists between DUM and COP, and between DUM and EXR. In other word, neither DUM nor COP granger causes each other. Again neither DUM nor EXR granger causes each other. This is because DUM affects DOP directly, on the other hand DOP influences COP and EXR.

5.0 Conclusion and Recommendations

Empirical researches on domestic oil production are too scanty, despite the fact that the Nigerian annual budget estimate is usually prepared on the basis of projected oil production benchmark and oil price estimates in the international oil market. Likewise, studies on the impact of militancy on the domestic oil production are also very few. Much attention and considerable efforts have been devoted in studies related to oil prices volatility and exchange rate movements. Furthermore, research on the interaction between conflicts/militancy, oil production volatility, oil prices and exchange rates has not been explored, which is the main concern of this

paper. From the analysis, the study has established evidence of co-integration relation between these variables of interest. Similarly, the long run and short run estimates revealed a negative and insignificant relation between domestic oil production and crude oil price. This implies that rising oil price in the international oil market does not increase domestic oil production much. The main factor determines the increase (fall) domestic oil production is peace or stability (instability) in the Niger-Delta oil region, as the result indicated a positive and significant relation between crude oil production and dummy variable both in the long run and in the short run. Again, negative and significant relation exists between crude oil production and exchange rate. On the direction and causal relation between the variables, the granger causality test result reveals a unidirectional causal relation runs from COP to DOP, DUM to DOP, and COP to EXR. This pointed out that crude oil price contributes to changes in the domestic oil production, the same way stability (instability) determines the level of oil production in Nigeria, also crude oil price influences exchange rate movements and not the reverse. The only bi-directional relation found is between DOP and EXR.

Therefore, considering the importance of the Niger Delta oil-rich region to the revival of the Nigerian economy, the paper recommends improvement in the standard of living of the Niger-Delta communities, through provision of adequate social amenities and other developmental programs. This will ensure smooth, stable and uninterrupted oil exploration, production and exportation. It is advisable that government involve the natives and traditional rulers in dialogue and negotiations with the militants, in order to ensure the sustenance of the relative peace in the Niger Delta. Government should also intensify search for oil in the Northern parts, presumed to have large and commercially viable oil reserve deposit, to grant an increase oil exploration

and production, reduce oil production volatility, boosts government revenue generation and reduce over dependence of one region for oil exploration and production activities. The Nigerian government should seriously consider diversification of the economy as the best

option, through design long term policies and programs targeting the non-oil sector, especially agricultural sector that was considered neglected, though less volatile and dependable.

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Impact of AML/CET Regulations on Digital Disruptions (FinTech) and financial inclusion in Sub-Saharan Africa



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Abstract

Financial Technology is becoming paramount in all financial institutions, being utilized in helping companies manage most of their financial operations efficiently through the use of softwares and specialized algorithms. The future of finance will shine brightest when it provides standard and valuable services to the society, however this will come with its own merits and demerits. I have prepared this report to carry out a detailed discussion on the impact that the AML/CFT controls have on FinTech and the financial inclusion initiative in sub-Saharan Africa. The AML/CFT controls can be applied more effectively in the formal systems for banking and financial service provisioning. Sub-Saharan Africa being among the developing countries is on the process of taking conscious measures aimed at developing regulations that can ensure greater AML/CFT controls on the financial technology-based service providing organizations as well. However, these controls should continue to evolve to stay relevant and to address the obstacles in the way of greater financial inclusion for this region.

Keywords

Anti-Money Laundering, Anti-Money Laundering/Combating the Financing of Terrorism, AML/CFT, Combating the Financing of Terrorism, Financial Technology, financial inclusion, FinTech, Nigeria, Sub-Saharan Africa.

Introduction

Financial inclusion is defined as the accessibility that the people have to appropriate products and services from the finance sector in transparent and fairly fashion. Financial inclusion has become a very important national and international policy initiative driving the countries towards development and contributing to the fight against poverty. The developing countries in sub-Saharan Africa are transitioning towards greater financial inclusion with the help of mobile banks. These technologies have made it possible for people to make use of the mobile phone in storing monetary value that can be used for making purchases and payments to other users in mobile money platforms. People can also redeem the mobile money for cash and convert cash currency into mobile money by depositing it into the account (Cagri & Grossman, 2015).

Therefore, mobile money is placed at the crossroads between financial services and mobile technology by creating a unique position that is popularly known as financial technology (FinTech). I have prepared this report in an effort to carry out research on the impacts that the Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) controls have on FinTech and the financial inclusion initiative in sub-Saharan Africa. It begins with discussing the FinTech landscape of sub-Saharan Africa and current use of mobile money by the countries belonging to this region. It then goes on to present a discussion on the AML/CFT laws and regulations that are developed by the International Monetary Fund (IMF) and the Financial Action Task Force (FATF). The final section of the report discusses the

impact that these regulations are having on financial inclusion, financial technology sector as well as advantages and disadvantages of the AML/CFT controls on the initiative of increasing accessibility to financial services in the sub-Saharan Africa (Adetunji, 2017). With financial inclusion having extended dramatically in sub-Saharan Africa, evolution of mobile banking as well as access to financial services is still limited to traders and the agricultural sector. An economy with millions of poor and low income earners, without access to financial institutions, savings and loan opportunities many might not opt out of poverty.

Current Sub-Saharan African FinTech Landscape

Financial technology (FinTech) is transforming into a significant force that is contributing to shaping and defining the financial industry and the entire economy of the world. There are new technologies being developed with every passing day that are contributing to technological disruption and transformation of the competitive forces by defining the landscape of the financial services sector. The same holds true for Sub-Saharan Africa as this region emerges as global leader inaccessibility to technology is associated with financial services and mobile fund transferring services (CBN, 2019).

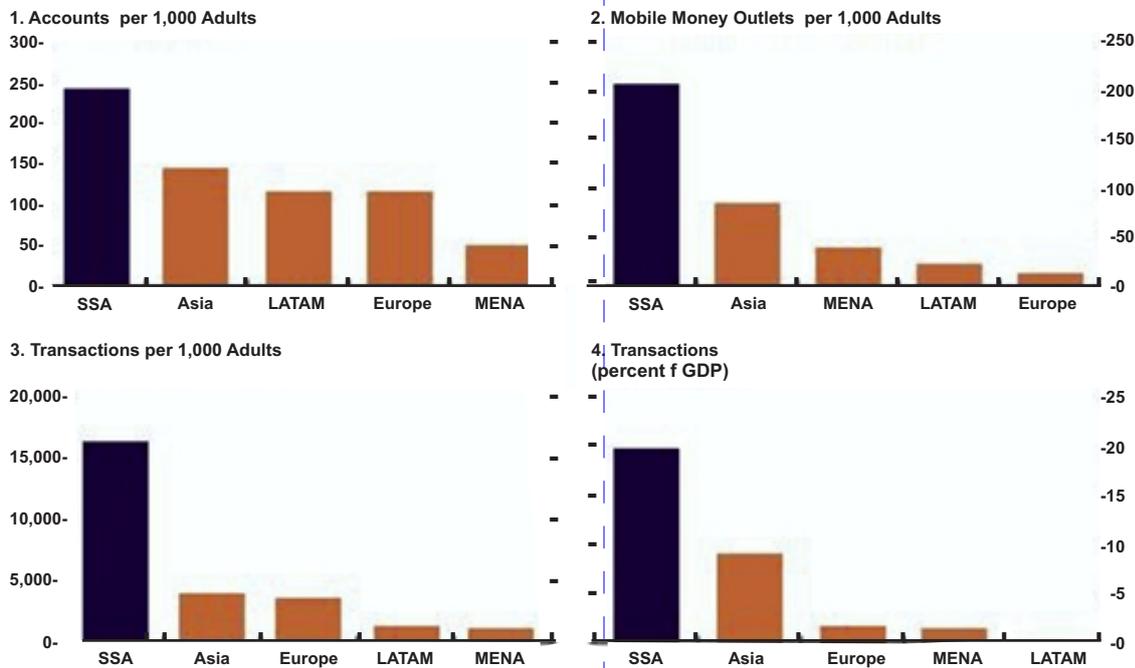
All over the world, about 2500 organisations operating in the financial services sector have received an investment of more than \$50 billion and are contributing to incorporating technology in the process of borrowing, exchanging, saving, investing, protecting and spending the funds. The last two decades have witnessed the liberalization of financial functions and significant reforms in the frameworks of the monetary policies in sub-Saharan Africa. The banking organisations opening the doors for Pan African monetary Exchange with the help of the technology-based payment

systems and the introduction of tools like credit cards and mobile wallets have also contributed to significant growth in the mobile payments in sub-Saharan Africa (Abuja, 2019). FinTech has immense possibilities for the developing countries but the technology is also raising concerns about the increased vulnerability that comes with the transformed Business models of the financial function in. There are new organisations entering the industry for providing financial services that do not have any prior experience. An example of such innovations is the blockchain-based crypto currencies that entered the mainstream financial industry in the last few years. These technologies are developed for a more secure digital exchange of funds and easy cross border payments making the business transactions simpler and faster. However, there is a new set of risks identified with these technologies that are yet to be understood and explored in line with the existing regulations, legislative rules and policies (Malady, Buckley, & Arner, 2014).

The overall financial inclusion in the countries belonging to sub-Saharan Africa is moderate to low despite significant progress and technological development in the past two decades. When compared with the other developing countries across the world, sub-Saharan Africa is still following a financial system that is relatively shallow. While most of the advanced and developed nations have 92% of their population transact with the help of a bank account, the developing countries report the same to be about 38%. The average percentage of people having a bank account in the sub-Saharan region is still close to 20%. This lower percentage is attributed to the lack of effective infrastructure, lower financial literacy of the population in this region and under investment in the financial initiatives (FATF, 2014). The amalgamation of technology and financial services introduced the sub-Saharan African economies to mobile money has brought about a radical change in how the financial

services are delivered across this region. As a result of this, sub-Saharan Africa is emerging as a global leader in the adoption and use of mobile money-related innovations. Out of the total 45 countries belonging to sub-Saharan Africa, 40 are

already abreast with the latest Financial Technology and actively using it for transactions. Within this region, east Africa is remarkably ahead of the rest of the sub-Saharan economies and because of this, financial technology is not only acting as

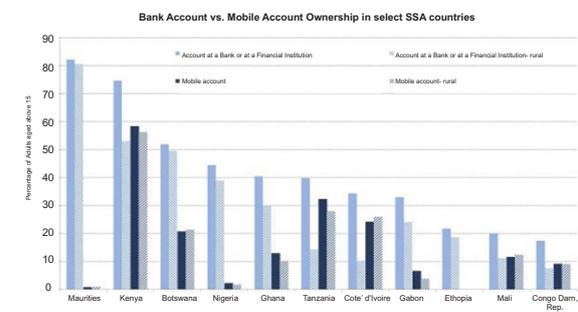


Source: IMF Financial Access Survey-
Note: LATAM-Latin America; MENNA - Middle East and North Africa; SSA - Sub-Saharan Africa

Mobile Money Indicators

(Amadou & Maino, 2019)

Sub Saharan Africa is leading the way globally when it comes to the use of mobile money and there are more mobile money accounts that are registered and active per capita that is the direct result of embracing the ongoing Financial Technology and innovation in this region. The above figure indicates the popularity of mobile money wallets and their related transactions for sub-Saharan Africa, Asia, Latin America, Europe, and the Middle East and North Africa. About 20% of the transactions of the total GDP in sub-Saharan Africa now take place with the help of the mobile money while this figure is only about 7% in Asia and less than 2% in the other regions of the world (Ackman, 2018). In fact, there are more mobile money accounts in the sub-Saharan African economies as compared to the traditional accounts in the banking organisation as indicated by the research carried out in the year 2018.



(EIB, 2017)

The analysis of the financial inclusion for the individual countries belonging to sub-Saharan Africa indicates that there is striking diversity in this percentage and each country has a unique set of challenges. Addressing these challenges requires tailored strategies of financial inclusion. The above figure depicts the stark contrast between figures of financial inclusion for the urban and rural regions for the countries belonging to sub-Saharan Africa.

This graph is an indicator of how the underdeveloped countries are compensating for the financial inclusion gap with an increase in mobile money accounts. In the case of Nigeria, there is a huge gap between the urban population holding a bank account and the number of people belonging to the rural regions opening a bank account. This is a huge opportunity that is largely untapped by the mobile bank services. It is also interesting to note that the mobile infrastructure in the countries that is one key consideration for mobile transactions does not limit the ability of the Nations to carry out transactions with the help of mobile money. The countries like Namibia and Botswana report for or more mobile phone subscriptions than the number of people living in the country and still the total volume of transactions taking place through mobile money is low. On the contrary, the countries like Tanzania, Kenya and Uganda that still report for low mobile telephony penetration, contribute the most towards the total mobile transactions as compared to their GDP (Yepes, 2011).

Anti-Money Laundering and Countering Financing of Terrorism Regulations

Financial technologies and mobile money are enabling a lot of countries to achieve greater financial inclusion. This mobile money makes it extremely convenient to not only carry out transactions but also to store and redeem cash. The unavailability of financial services in the developing countries was considered to be the biggest restriction on the growth and economic development of these regions. FinTech has enabled these economies to address most of these challenges and overcome them by achieving greater financial inclusion. All these technologies have provided the countries belonging to the sub-Saharan Africa shortcut to financial inclusion and a path for faster development (Kersop & Toit, 2016).

However, this easy mode of transaction and monetary exchange is also so be misused for activities like money laundering and terrorism financing. Money laundering can be defined as a crime of making a profit so that the proceeds from this crime can be concealed or used for criminal activities. The common money laundering activities include corruption, manipulation of the markets, tax evasion, drug trafficking and fraud. All the funds that are generated through these activities result in diverting the resources that could otherwise be used for economic and social welfare. These activities also have a negative impact on the general functioning and stability of the countries and their financial operations. Therefore, the International Monetary Fund (IMF) has developed Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) controls that are regularly assessed and updated to mitigate the impact of the activities associated with money laundering and terrorism financing (IMF, 2009).

AML/CFT controls are emerging as a new necessity in the financial service sector that is powered by technology. These regulations are developed and defined in order to improve the overall compliance of the countries with a collectively accepted set of standards that can benefit the financial services sector and the international technological powered system working in it. Therefore, the IMF in collaboration with countries throughout the world is constantly looking for strengthening the regulations and contributing to the international system of finance (Finmark Trust, 2015). The three broad areas that are covered with the help of the AML/CFT laws and regulations include the conduct of the financial service providers, the regulations governing any third-party beneficiaries of the financial services and the conduct of the employees of the financial organisations.

Nigeria is the largest sub-Saharan African economy and the Central Bank of Nigeria

has a detailed AML/CFT Manual that sets out all the procedures and policies that guide the conduct organisation and the members working for it (Proshare, 2019). The country has also developed a regulatory body Fintech Association of Nigeria that is contributing to greater regulation of the FinTech products and services available in the country. However, Nigeria has largely adopted a stance that is pro-innovation and that promotes the organisations providing technological enabled FinTech products and services to the population that still suffers from financial exclusion as compared to the other developing countries of the world. The Payments System Vision 2020 developed by the central bank of Nigeria in the year 2013 help in setting this foundation for the country by creating a network of electronic payments infrastructure for increasing financial inclusion. This is being revised at present under a proposed Payments System Vision 2030 that will contribute to the further advancement of financial technologies penetration in the region. However, this undertaking also includes effective measures for AML and CFT controls with laws that are specific to FinTech and the electronic payment channels.

Impact on Financial Inclusion

The biggest hurdle in the economic growth of sub-Saharan Africa is low financial inclusion. Only about 25% of the total adult population in this region has a bank account operating with the formal bank or financial institution. As FinTech continues to contribute towards broadening the reach of financial services and greater accessibility to these services by the people belonging to these regions, the formal financial systems of the sub-Saharan Africa are still underdeveloped in comparison with the other developed and developing economies of the world (Chikalipah, 2017). The Financial Action Task Force (FATF) is a body that is formed for the development and promotion of

AML/CFT controls. However, the recommendations by FATF also ensure greater cooperation among the International Financial bodies and institutions. There is an ongoing discussion between the impact that the AML/CFT controls have on the accessibility to financial services and financial inclusion at large. While it is important to ensure greater accessibility to financial services and the general increase in financial inclusion, it is also important to ensure that the activities associated with money laundering or terrorist financing are put in check. Having a financial system that is completely informal, undocumented and unregulated can impact the effect of AML/CFT controls and their very purpose. The greater dependency of the economy on informal financial service providers can also hamper the general development of the company and limit the access to credit for the organisations and individuals in these economics.

Therefore, developing a formal system of financial services is central to the success of an effective regime for AML/CFT. FATF is motivating the sub-Saharan African countries to develop national policies for financial inclusion that are mutually supportive and that also promote the goals of the AML/CFT controls. FinTech brings with it, unique set of challenges and risks because of the different supply channels, services and products offered by the service providers. FATF please try to enhance the flexibility of the AML/CFT controls to show that the national jurisdictions and the international bodies can craft controls that are appropriate and effective for addressing these risks and challenges.

AML/CFT obligations sometimes have a negative impact on the objective of financial inclusion since they increase the cost of financial Service provisioning and the general cost of business which gets distributed among the service providers and the customers alike. This is a challenge that is repeatedly being

acknowledged and addressed by FATF by bringing about changes in the regulations. The FinTech empowered financial service providers have developed a market that is largely unregulated and attractive. This underground economy is not only making the legitimate transactions easier but also opening new avenues for illicit transactions (FATF/OECD, 2011).

Conclusion and recommendations

It can be concluded that financial inclusion has become a very important national and international policy initiative driving the countries towards development and contributing to the fight against poverty. The developing countries in sub-Saharan Africa are transitioning towards greater financial inclusion with the help of mobile banks. Currently, the biggest hurdle in the economic growth of sub-Saharan Africa is low financial inclusion. Only about 25% of the total adult population in this region has a bank account operating with the formal bank or financial institution. The AML/CFT

controls can be applied more effectively in the formal systems for banking and financial service provisioning. With a good platform of financial inclusion individuals are able to look for more convenient and secure models of accumulating, holding and transferring values. Business owners having innovative ideas and aggressive attitude enables them to utilize these institution services in growing and investing their businesses. Banks on the other hand are able to grow and serve more markets segments in the economy. The countries belonging to sub-Saharan Africa are taking conscious measures to develop regulations that can ensure greater AML/CFT controls on the financial technology-based service providing organizations as well. However, it is important that these controls continue to evolve and develop with the changes and evolution in FinTech to stay relevant and to address the obstacles in the way of greater financial inclusion for this region.

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Impact of Financial Deepening on Socio-economic Development in Nigeria: 1991 - 2018



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ABSTRACT

This study investigates the relationship between financial deepening and socio-economic development in Nigeria. The specific objectives examined the impacts of broad money supply, private sector credit and financial openness on human development index in Nigeria from 1991 to 2018. Time series data on each of the variables were analyzed using Fully Modified Least Squares and Granger Causality test. The unit root test results revealed that all the variables in the model became stationary after first difference and are all I (1). The cointegration test result revealed that the variables had long run relationships. The cointegrating regression result indicated that broad money supply had significant negative relationship with HDI. A 1 percent increase in broad money supply would lead to 0.0103 reductions in the HDI score. On the other hand, private sector credits and financial openness index were found to exert significant positive impact on HDI. The causality test results indicate that unidirectional causality runs from broad money supply and credit to the private

sector, to HDI. It was equally found that bidirectional causality exists between financial openness and HDI as well as joint causality flowing from all the explanatory variables to HDI. This finding implied that the explanatory variables collectively have the power of predicting changes in HDI. Hence, it was concluded amongst others that CBN should support more cross-border mobility of capital in order to provide opportunities for free flow of financial products and services to facilitate the process of socio-economic development.

Keywords: Financial Deepening, Financial Inclusion, Economic Development.

JEL Classification: E61, E65, F43, F47

1.0 Introduction

1.1 Background to the Study

Global recognition has been given to the deepening of financial systems. According to World Bank (2015), greater access to financial services for both households and businesses tend to reduce income inequalities and stimulate economic growth. From the economists' viewpoint, financial deepening is germane to economic development, Tuaneh and Ewubare (2016). Basically, improved access to financial services can make remarkable difference in the process of economic development through poverty reduction and more equitable income distribution. Nwanna and Chinwudu (2016) observed that financial deepening was intended to improve economic conditions in the economy through greater competitive efficiency in the financial markets and the associated positive spillover effects in the real sector.

In furtherance of global recognition of the role of deepening, the United Nations (UN), the World Bank, the Group of Twenty (G-20) and the World Economic Forum (WEF) have all underscored the need for countries to provide greater access to financial products for both individuals and

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firms as a pathway to reducing poverty and equitable income distribution. Countries are tasked to prioritize financial inclusion in their monetary policy frameworks to increase opportunities for the development of their economies. It is believed that financial sector policies that promote competition and offer appropriate incentives to individuals provide better opportunities for poverty reduction and more equitable allocation of resources, World Bank (2012). In addition, the Supply-Leading hypothesis underscores the growing popularity of financial deepening in creating and expanding the level of liquidity and driving overall economic efficiency.

Like other monetary authorities in developing economies, the Central Bank of Nigeria (CBN) has continued to promote the deepening of the Nigerian financial system to engender rapid growth and sustainable development. With monetary policy tools, the CBN promotes real sector development with increased opportunities for reducing poverty and income inequality.

As a pathway to sustainable deepening of the Nigerian financial system, the CBN launched the National Financial Inclusion Strategy (NFIS) in 2012 with a target of reducing the rate of financial exclusion from 46.3 percent in 2010 to 20 percent in 2020. To deepen the inclusiveness of the financial system and provide more opportunities for socio-economic development, the CBN introduced other policy initiatives. Among them are, the Anchor Borrower's Programme (ABP) and licensing of 25 Mobile Money Operators, CBN (2017).

The CBN increased the capital requirement of microfinance banks (MFBs) in order to ensure that they are well positioned to deliver sustainable micro-financing services in accordance with the overall objective of NFIS. Despite the growing advocacy on Enhancing Financial

Innovation and Access (EFInA), the pace of financial deepening and overall inclusion has remained sub-optimal. As at 2016, 41.6 percent of adults in Nigeria were financially excluded, EFInA (2016). The CBN (2017) report revealed that, it was paradoxical that despite efforts to deepen the Nigerian financial system, high occurrences of income gap, poverty and low labour absorption capacity had continued to prevail in the Nigerian economy. Although numerous attempts have been made in the past to explain the effectiveness of financial deepening, emphasis has been on economic growth with little or no attention given to development. This study, therefore, seeks to bridge this research gap by estimating the empirical link between financial deepening and socio-economic development in Nigeria from 1991 to 2018.

1.2 Statement of the Problem

Enhancing financial services to improve social welfare has remained the core of the financial deepening objective of the CBN. The policy framework requires the CBN to play a central role in regulating the financial sector to create enhanced and enabling environments for businesses to thrive. However, some externalities particularly from fiscal policy, have affected the implementation of monetary policy in Nigeria which has constrained the ability of the CBN to deliver on its mandate of promoting a sound financial system. Policy makers and other stakeholders in the Nigerian economy have divided opinions on whether deepening the Nigerian financial system will foster inclusive growth through poverty reduction, employment generation and equitable income distribution amongst other. This is because of available statistics on Nigeria's core development indices.

The World Bank (2018) revealed that the GNI index measure of income inequality averaged 45.27 percent between 2009 and 2018. The International Labour

Organization Statistics, ILOSTAT(2018) showed that the labour force participation rate (percentage of total population ages 15 and above) averaged only 55.39 percent between 2009 and 2018. This has brought the debate on the macroeconomic effectiveness of financial deepening in promoting economic development through employment generation and more equitable income distribution. Again, the level of development in the Nigerian financial system suggests that monetary policies geared towards promoting financial deepening are somehow ineffective in facilitating economic development.

1.3 Objectives of the Study

This study broadly examined the role of financial deepening in promoting socio-economic development. The specific objectives include:

- i. Examine the relationship between broad money supply and human development index in Nigeria;
- ii. Determine the impact of credit to the private sector on human development index in Nigeria;
- iii. Explore the impact of financial openness on human development index in Nigeria and
- iv. Determine if there is a significant causal relationship between financial deepening and human development index in Nigeria.

1.4 Hypotheses

The hypotheses are stated as follows:

H01: There is no significant relationship between broad money supply and human development index in Nigeria.

H02: Credit to the private sector does not significantly impact on human development index in Nigeria.

H03: Financial openness has no significant impact on human development index in Nigeria.

H04: There is no significant causality

between financial deepening measures and human development index in Nigeria.

2.0 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Conceptual Issues

2.1.1 Concept of Financial Deepening

Financial deepening implies the ability of financial institutions to effectively mobilize savings for investment purposes. It also presupposes active operations of financial institutions in the financial markets, which in turn entails the supply of quality financial instruments and financial services, Ndekwu(1998). This is in accordance with the assertion of Nnanna and Dogo (1999) that financial deepening represents a system free from financial repression. Mbutor and Uba (2016) offered a general view of financial inclusion, making available financial services such as savings, credit and insurance to the disadvantaged and low-income population at affordable costs. They further explained that the inclusiveness of the financial system entails a condition of allowing easy access to use of formal system services by the population. Deepening of the financial system is considered to play a critical role in the development of the financial system. According to the Alliance for Financial Inclusion (AFI), access to financial services is the grounding principle of financial inclusion. AFI's Financial Inclusion Data (FID) Working Group, defines the three main dimensions as access, usage and quality. Today, financial inclusion is a significant international policy goal, included as an enabler of many of the UN Sustainable Development Goals (SDGs).

The need to improve the liquidity position and deepen the financial system in developing countries has led to various liberalization policies on the part of governments around the world. Financial deepening focuses more on the process of financial intermediation. Financial markets

undertake this vital role of intermediation, by channelling funds from surplus units (savers) to deficit units (investors). Some of the liberalization policy targets were designed to affect interest rates, money supply and credit availability to the private sector. The goal of these policy objectives was to achieve rapid economic advancement through the financial system. The inclusiveness of the financial system entails households and firms having reasonable access to financial products and services that meet their growing financial needs, delivered in a responsible and sustainable manner, World Bank (2015).

Socio-economic development involves improvement of lifestyles of individuals through improved education, health and life expectancy as well as skill development, employment and income (labour force participation). It is the process of economic and social transformation based on cultural and environmental factors. Therefore, it can be understood as the process of social and economic development within the society. It is measured with indicators such as reduction in income inequality, poverty reduction, life expectancy, literacy and levels of employment amongst others.

Fritz (2010) argued that socio-economic development emphasizes progress in terms of economic and social factors within a geographic unit. Essentially, economic development is the process of raising the level of prosperity through increased production, distribution and consumption of goods and services. Social development on the other hand, refers to the complexity of social dynamics and focuses on the social concerns of people as objectives of development and people-centred approaches to development. Indicators of social development provide comparative information on areas such as income, poverty, employment, employment security, education, health,

crime and civic participation, Fritz (2010).

Aye (2015) investigated the causality between financial development and economic growth in Nigeria over the coverage period 1961-2012. A bootstrap rolling window estimation was used to evaluate Granger causality between financial deepening and economic growth over different time periods. The results revealed that there was no causality between the two series. The tests further revealed that while financial deepening has predictive influence for economic growth at some periods, economic growth has predictive control for financial deepening at other periods.

Socio-economic development of any region equally depends on various factors such as per capita income, level of agricultural development, level of industrial development, level of urbanization, occupational structure, level of educational development, health status, transport and communication. Per capita income is widely accepted as a general measure of development. It is customary to identify whether a region has been backward or advanced in the levels of development using the estimates of per capita income. The regions which enjoy higher per capita income are deemed to be more developed than the states or regions with low per capita income.

2.2 Theoretical Literature

2.2.1 Supply-Leading Hypothesis

The Supply-Leading hypothesis is based on the assumption that financial deepening fosters growth. The existence and development of financial markets are therefore key to increasing the level of savings and investments. The conventional view of the Supply-Leading hypothesis postulates that the direction of causality flows from financial development to economic growth. If transaction costs are high, exchange among economic

agents will not occur. The need to reduce allied costs for exchange to take place has led to the emergence of financial institutions and markets for effective financial intermediation in the financial sector.

A well-developed financial sector provides critical services to reduce transaction costs and increase the efficiency of intermediation. It mobilizes savings, identifies and funds good business projects, monitors the performance of managers, facilitates trading and the diversification of risks and fosters exchange of goods and services. Agbetsiafa (2003) observed that these services result in more rapid accumulation of physical and human capital, and faster technological innovation, thus inducing faster long-term economic growth. In addition, Ohwofasa and Aiyedogbon (2013) argued that the Supply-Leading hypothesis centres on the assumption that well-functioning financial institutions have the capacity to drive total economic efficiency, create and expand liquidity, mobilize savings, enhance capital accumulation, transfer resources from non-growth sectors to more modern growth inducing sectors, and also promote competent entrepreneurs in the various sectors of the economy.

More importantly, the Supply-Leading theory explicitly demonstrates how financial intermediaries overcome market frictions and lower costs of transferring information or wealth between households and firms. Some of the arguments are of the view that in one way or another financial intermediaries give individuals or firms the opportunity to achieve economies of scale, an option that may not have been available. Thus, intermediaries enhance economic efficiency and growth because they help allocate capital to its best possible use. According to McKinnon (1973), an efficient financial sector tends to reduce transaction and monitoring costs

and asymmetric information with benefits of improved financial intermediation. Overall, the Supply-Leading hypothesis has it that growth in the real sector is largely determined by the extent of financial development. Consequently, financial deepening is expected to create opportunities for increased and sustained growth of the economy.

2.2.2 Demand-Following Hypothesis

Robinson (1952) pioneered the Demand-Following hypothesis. In contrast to the Supply-Leading thesis, the Demand-Following thesis argues that financial development primarily follows economic growth and that the engines of growth must be sought elsewhere. Rising incomes from the agricultural or rural sector provides funds for which the financial intermediaries exist to service. Economic growth provides the demand which the finance sector fulfils. The primary function of intermediaries is to solicit funds from surplus units and allocate them among deficit units. The proponents of the Demand-Following hypothesis argue that expansion of the real sector fosters the development of the financial sector due to increase in macroeconomic outcomes.

It is argued in monetary economics literature that the Demand-Following perception of the development of the financial markets is merely a lagged response to economic growth. Simply put, growth in the real sector of the economy is perceived to trigger demand for financial products. That is, as the economy expands, it triggers increased demand for more financial services and thus leads to greater financial development. Gurley and Shaw (1955) contends that if incomes grow at a warranted pace, the demand for financial assets shall also grow at a specifiable pace. In addition, transactions demand for money keeps abreast with growing incomes. The accumulation of assets and rise in income levels stimulate

demand. Financial development therefore follows economic development as economic growth is believed to cause financial institutions to develop their financial base and increase credit.

The Keynesian theory of financial deepening asserts that financial deepening occurs due to an expansion in government expenditure. In order to reach full employment, the government should inject money into the economy by increasing government expenditure. An increase in government expenditures increases aggregate demand and income, thereby raising demand for money (Mckinnon (1973)). Robinson (1952) posits that it is the necessity for high economic growth that creates demand in the financial sector. Thus, in these views, it is the improvements in the economy that drive higher demand for the use of money, which consequently promotes financial development. In other words, financial markets develop and progress as a result of increased demand for their services from the growing real sector. Hence, causality is believed to run from economic growth to financial development, given that an increase in economic growth causes a rise in demand for financial services and this consequently leads to the expansion of the financial sector.

2.2.3 Choice of Hypothesis

This study is built on the Supply-Leading hypothesis which assumes that financial deepening is beneficial to the growth of the economy. The rationale for anchoring this study on the Supply-Leading hypothesis is based on the theory that the financial sector promotes rapid and diverse growth of the real sector leading to sustainable development.

2.3 Empirical Literature

Different empirical studies have been

conducted across the globe on the development impacts of financial deepening with various empirical evidences.

Karimo and Ogbonna (2017) examined the direction of causality between financial deepening and economic growth in Nigeria for the period 1970–2013. The study adopted the Toda–Yamamoto augmented Granger causality test and the results showed that the growth-financial deepening nexus in Nigeria follows the Supply-Leading hypothesis. This means that it is financial deepening that leads to growth and not growth leading to financial deepening. Among others, the study recommended that policy efforts should be geared towards removing obstacles that undermine the growth of credit to the private sector and restore investors' confidence in the stock market.

Bakang (2016) analysed the effects of financial deepening on economic growth in the Kenyan banking sector using quarterly time series data from 2000 to 2013. In the study, financial deepening was measured by four alternative indicators such as liquid liabilities as ratio to nominal GDP; credit to private sector as ratio to nominal GDP; banks' assets as ratio to banks' plus central banks assets and banks' deposits as ratio to nominal GDP. On the other hand, economic growth was measured by real GDP. The study revealed that the banking sector in Kenya has been an important source of economic growth. The empirical results specifically revealed that liquid liabilities, credit to the private sector, central bank assets and other banks' deposits have positive and statistically significant effects on GDP. The study therefore recommended improvements to the existing policies in order to encourage the public save more money with banks so as to stimulate the deepening of the financial system.

Ghildiyal, Pokhriyal and Mohan (2015)

estimated the causal impacts of financial deepening on economic growth in the case of India using Auto regressive Distributed Lag (ARDL) Bound testing approach, a new approach as an improvement over the other traditional techniques of cointegration. Furthermore, in using the Granger Error Correction Model (ECM) technique, the study also examined the causal impact in the short run. The findings suggested that there was an equilibrium relationship in the long run between financial deepening and economic development. The results also suggested that financial deepening caused economic growth in the long run and in the short run. It was therefore concluded that government had to put more effort towards financial deepening in order to enhance the pace of economic growth. The study recommended that efforts be put to provide easy credit to private sector, stock market development and to foster foreign trade.

Agbelenko and Kibet (2015) empirically examined the relationship between financial development and economic growth in the West African Economic and Monetary Union (WAEMU) for the period 1981-2010. Using the General Moment Method (GMM), the study found a positively and statistically significant effect of financial development on economic growth and the causality was bi-directional. In addition, the variables of foreign direct investment and real exchange rate contributed positively to economic growth in the region while inflation and openness discouraged economic growth in the region. The study suggested that policy makers should pursue targets of macroeconomic policies that may attract foreign direct investments while controlling inflation and trade openness.

Chinweze (2017) investigated the impact of financial deepening in reducing poverty in Nigeria. Human Development Index was used as proxy for reducing poverty due to

its multi-dimensional nature while the ratios of credit to the private sector, broad money supply and market capitalization to GDP were used to proxy financial deepening. Data sourced from Central Bank of Nigeria Statistical Bulletin (2015) and World Development Indicators published by the World Bank from 1981 to 2015 were used to analyse this relationship by adopting the multi-linear econometric model and using the Error Correction Model. Unidirectional causality running from financial deepening to poverty reduction was observed. The study concluded that financial deepening was beneficial in reducing poverty in Nigeria. The study therefore recommended policy makers to embark on policies enhancing financial inclusion and financial intervention programmes in Nigeria.

3.0 Methodology

3.1 Research Design

This study made use of ex post facto research design given the nature of the data required for the empirical analysis. Onyia (2012) observed that ex post facto design was ideal for collecting numerical quantitative data on phenomena that occurred in the past.

3.1.1 Data Collection Method and Sources
Annual time series data covering the period from 1991 to 2018 were collected for socio-economic development index and indices of financial deepening from sources such as the United Nations Development Programme (UNDP) and CBN Statistical Bulletin, various editions.

3.2 Model Specification

This study adapted a multivariate model with some modifications based on the work of Chinweze (2017) which investigated the impact of financial deepening on reducing poverty in Nigeria using Human Development Index (HDI) as the dependent variable and broad money

supply, private sector credit and market capitalization as independent variables. However, this study made notable improvements on the model by introducing financial openness index as part of the explanatory variables. This was informed by the growth of financial integration and its role in shaping the process in stimulating economic development.

The model is specified functionally as follows:

$$HDI = f(MRG, CRP, FIO) \tag{4}$$

Where: HDI = Human development index, proxy for socio-economic development

MRG = Broad money supply

CRP = Credit to the private sector as a ratio of GDP

FIO = Financial openness

The econometric form of the model is expressed linearly as:

$$HDI_t = \pi_0 + \pi_1 MRG_t + \pi_2 CRP_t + \pi_3 FIO_t + \epsilon_t \tag{5}$$

Where: HDI, MRG, CRP and FIO are the variables of interest defined earlier in equation (4).

π_0 = constant parameter

$\pi_1 - \pi_3$ = Coefficients of the explanatory variables

ϵ_t = Random error term

The a priori expectations that define the expected signs of the slope parameters are provided as:

$$\pi_1 > 0, \pi_2 > 0, \text{ and } \pi_3 > 0.$$

The vector auto regressive (VAR) model for testing for evidence of causal relationship between financial deepening indicators and HDI is configured as:

$$|HDI_t = \sum_{i=1}^p \beta_{11} HDI_{t-i} + \sum_{i=0}^p \beta_{12} MRG_{t-i} + \sum_{i=0}^p \beta_{13} CRP_{t-i} + \sum_{i=0}^p \beta_{14} FIO_{t-i} + u_{1t} \tag{6}$$

$$MRG_t = \sum_{i=1}^p \beta_{21} MRG_{t-i} + \sum_{i=0}^p \beta_{22} HDI_{t-i} + \sum_{i=0}^p \beta_{23} CRP_{t-i} + \sum_{i=0}^p \beta_{24} FIO_{t-i} + u_{2t} \tag{7}$$

$$CRP_t = \sum_{i=1}^p \beta_{31} CRP_{t-i} + \sum_{i=0}^p \beta_{32} HDI_{t-i} + \sum_{i=0}^p \beta_{33} MRG_{t-i} + \sum_{i=0}^p \beta_{34} FIO_{t-i} + u_{3t} \tag{8}$$

$$FIO_t = \sum_{i=1}^p \beta_{41} FIO_{t-i} + \sum_{i=0}^p \beta_{42} HDI_{t-i} + \sum_{i=0}^p \beta_{43} MRG_{t-i} + \sum_{i=0}^p \beta_{44} CRP_{t-i} + u_{4t} \tag{9}$$

Where: B11 - B44 = (k x k) coefficient matrices

U1 – U4 = vector of random error terms

K = dimensional white noise process with E (Ut) = 0

P = optimal lag order

The null hypothesis of no causality is

tested at 5 percent level of significance.

3.2.1 Variables Description

a. Human development index (HDI): This is a statistic composite index of life expectancy, education, and per capita income indicators, which are used to rank countries into four tiers of human development. A country scores a higher HDI when the life span is higher, the education level is higher, and the GNI (PPP) per capita is higher. It is a conglomerate of socio-economic indicators and used here as a dependent variable.

b. Broad money supply (MRG): This comprises of narrow money in addition to savings and time deposits, as well as foreign denominated deposits. In this study, the total volume of money supply in the economy as a ratio of GDP is used.

c. Credit to the private sector (CRP): This measures loans and other financial products provided to the private sector of the Nigerian economy in accordance with CBN's monetary policy measures of direct credit control. It is measured as a ratio of GDP. Increase in credit availability to the private sector is expected to boost economic development.

d. Financial openness index (FIO): This defines the index of capital account openness measured based on the IMF Annual Report on Exchange Arrangements and Exchange Restrictions. Increase in financial openness is expected to stimulate the financial deepening process and increase opportunity for economic development.

3.3 Estimation Techniques

The Fully Modified Ordinary Least Squares (FM-OLS) developed by Phillips and Hansen (1990) was used to provide optimal estimates of cointegrating regressions. The FM-OLS method is a modification of the conventional Classical Least Squares also known as Ordinary Least Squares (OLS) as it accounts for serial correlation effects and for the

endogeneity in the regressors that results from the existence of a cointegrating relationship. The asymptotic behaviour of FM-OLS can be studied in models with full rank I(1) explanatory variables, models with I(1) and I(0) explanatory variables and models with only stationary regressors, Phillips (1995). The FM-OLS is specifically applied to estimate the long coefficients of the explanatory variables. In addition to the FM-OLS, the Vector Auto regressive (VAR) Granger causality test was applied in testing for the direction of causality between the measures of financial deepening and social development indicators. Descriptive statistics was equally used to determine the average values of the variables over the sample period and the spread of the observations of each of the variables around their respective mean values. More importantly, diagnostic tests were conducted in the course of this study. Below is a review of the pre-test and post estimation diagnostic tests.

3.3.1 Pre-estimation tests

a. Unit Root Test: The Augmented Dickey-Fuller (ADF) unit root procedure developed by Dickey and Fuller (1981) was adopted in this study to know if each of the variables are stationary or not. It is helpful in identifying the order of integration for each of the underlying variables. The general specification of the ADF model is provided as follows:

$$\Delta Y_t = D_0 + D_1t + \sum_{i=1}^z k_i \Delta Y_{t-i} + u_t \tag{1}$$

- Where: Y_t= economic variable of interest
- D₀and D₁t = intercept and deterministic trend
- k_i= parameter estimate of the variable of interest
- z = optimal lag length
- Δ= First difference operator
- u_t = Stochastic term

In the model above, the null hypothesis of a unit root is tested against the alternative hypothesis of no unit root at 5 percent level of significance using t-statistic or its

corresponding probability value.

b. Cointegration Test: This test was carried out to determine whether or not the underlying economic time series have long run equilibrium relationships. In this study, the multivariate cointegration test proposed by Johansen and Juselius (1990) was applied to ascertain whether or not long-run relationships exists among the underlying series. Specifically, the null hypothesis of no cointegration was tested against the alternative hypothesis of cointegration at 5 percent level. The formal configuration of Johansen-Juselius cointegration model with a focus on trace and maximum Eigenvalue statistics is provided as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \tag{2}$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{3}$$

Where the $\hat{\lambda}_i$ denotes estimated values of the characteristic roots and T = the number of observations. The trace and maximum Eigenvalue statistics are used in testing the null hypothesis of no cointegration against the alternative hypothesis of cointegration. The existence of at least one cointegrating equation at the selected level of significance and lag order implies that the variables under investigation have long run relationship.

3.3.2 Post-estimation tests

a. T-test: The test is used to determine if each of the regression estimates (constant and slope parameters) are statistically significant or not. The computed t-value is compared with the critical t-value at 5 percent significance level. A regression coefficient parameter is considered to be statistically significant if the computed t-statistic is greater than the critical t-value at 5 percent level.

b. Coefficient of Determination (R²): This test provides information on the explanatory power of the explanatory variables. It is useful when measuring the percentage of variations in the response

variable that is attributed to the explanatory variables. More importantly, it is helpful in determining whether the entire model is significant or not. The benchmark for the coefficient of determination to be reliable is 50 percent.

c. F-test: The F-test is used to ascertain if the entire model is statistically significant. The calculated F-value is to be compared with the critical F-value at 5 percent significance level. The test can be conducted using the probability value of the empirical F-statistic and comparing it with the significance level of 5 percent (0.05). If the former is less than the later, the overall model is regarded as statistically significant.

d. Serial correlation test: The serial correlation test also known as autocorrelation was conducted to determine if the residuals are serially independent or not. Evidence of serial dependence in the residuals implies that the model is serially correlated. This study applied the correlogram test based on the Q-statistics. The null hypothesis of no serial correlation was tested against the alternative of serial correlation at 5 percent level.

e. Heteroscedasticity test: This test is applied to know if the residuals have constant variance. Thus, the null hypothesis of homoscedasticity was tested against the alternative hypothesis of heteroscedasticity at 5 percent level.

4.0 Results and Discussion

4.1 Trend Analysis

The descriptive statistics are presented in the figures and tables below. Although the CBN expressed its commitment in increasing access to credit through the ABP and other credit creation channels, the proportion of borrowers per 1000 adult population continued to fluctuate as reported in figure 1.

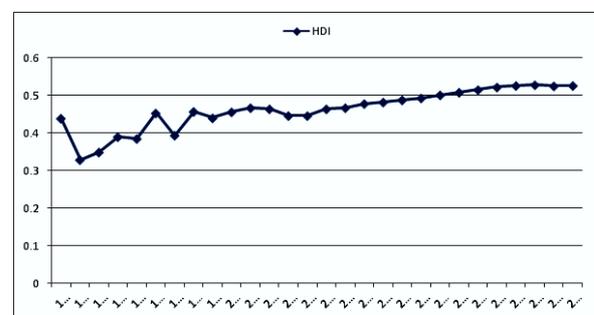
△Figure 1: Borrowers from Deposit Money Banks per 1000 adults.



Source: Author's computation, with data from the IMF Financial Access Survey, 2019.

As observed from Figure 1, borrowers from Deposit Money Banks (DMBs) increased from 26.48 persons per 1000 in 2014 to an all-time high value of 31.06 persons per mille in 2015. It trended downwards from 29.86 persons per mille in 2016 to 21.78 persons per 1000 in 2018. This shows that access to funds from the financial sector by businesses and individuals had continued to reduce over time.

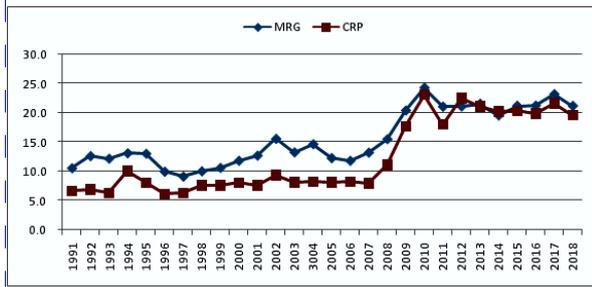
Figure 2: Plot of HDI



Source: E-views Results Output 2020

It was observed from the result that HDI varied between 0.328 and 0.525 during 1991 and 2018. From 1991 to 2010 it averaged 0.438. This is an indication that Nigeria's performance in terms of average life expectancy, mean years of school and standard of living was not really impressive. However, the performance improved between 2011 and 2018 because the HDI score in each of these latter years was 0.5 and above.

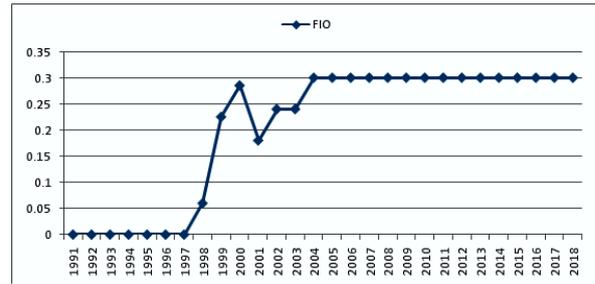
Figure 3: Plot of broad money supply and private sector credit (% of GDP)



Source: E-views Results Output, 2020

As observed from figure 3, broad money exceeded credit to the private sector over the period except in 2012 and 2014 when credit to the private sector marginally exceeded broad money supply. This is indicative that broad money supply has remained a dominant tool employed by CBN to engender financial deepening.

Figure 4: E-views Results Output, 2020



Source: Compiled by the Researcher with data computed based on Chinn & Ito

Figure 4 shows that financial openness index increased to 0.06025 in 1998. It further increased to 0.2863 in 2000 but fluctuated between 2000 and 2003. It remained stable at the value of 0.30125 for the rest of the period (2004-2018).

Table 1: Descriptive statistics for the variables

	HDI	MRG	CRP	FIO
Mean	0.461071	15.63571	12.41429	0.205504
Median	0.464500	13.30000	8.250000	0.301250
Maximum	0.527000	24.30000	23.10000	0.301250
Minimum	0.328000	9.200000	6.200000	0.000000
Std. Dev.	0.053325	4.749286	6.246523	0.131137
Jarque Bera	3.250056	2.958258	4.077515	4.814098
Probability	0.196906	0.227836	0.130190	0.090081
Observations	28	28	28	28

Computed by the researcher with data from CBN Statistical Bulletin, UNDP and Chinn & Ito

4.1.1 Unit Root Test Results

The results of the unit root test are displayed in Table 2

Table 2: ADF unit root test results

Variables in the model	T-statistic/p-value for levels test	T-statistic/p-value for first difference test	Order of integration
HDI	-1.643 (0.447)	-11.374 (0.000)	I(1)
MRG	-2.208 (0.466)	-4.696 (0.005)	I(1)
CRP	-2.138 (0.503)	-5.394 (0.001)	I(1)
FIO	-1.348 (0.853)	-3.640 (0.047)	I(1)

Computed by the researcher with data from CBN Statistical Bulletin, UNDP and Chinn & Ito

4.1.2 Cointegration Test Results

The Johansen-Juselius multivariate cointegration test results are presented in Table 3.

Table 3: Cointegration test results Series: HDI MRG CRP FIO

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.731133	70.50016	47.85613	0.0001
At most 1 *	0.581493	37.66173	29.79707	0.0051
At most 2 *	0.428495	15.88517	15.49471	0.0437
At most 3	0.073113	1.898103	3.841466	0.1683
None *	0.731133	32.83844	27.58434	0.0096
At most 1 *	0.581493	21.77656	21.13162	0.0406
At most 2	0.428495	13.98706	14.26460	0.0552
At most 3	0.073113	1.898103	3.841466	0.1683

Computed by the researcher with data from CBN Statistical Bulletin, UNDP and Chinn & Ito

NB: * implies rejection of the hypothesis at the 0.05 level

4.1.3 Cointegrating Regression Model

The result of the cointegrating regression model estimated using FM-LS is reported in table 4

Dependent Variable: HDI

Method: Fully Modified Least Squares (FM-LS)

Sample (adjusted): 1991 2018

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MRG	-0.010321	0.004240	-2.434380	0.0231
CRP	0.010724	0.003101	3.458190	0.0021
FIO	0.299063	0.050587	5.911809	0.0000
C	0.427667	0.029563	14.46647	0.0000
R-squared	0.818673	Mean dependent var		0.461926
Adjusted R-squared	0.795021	S.D. dependent var		0.054145
S.E. of regression	0.024514	Sum squared resid		0.013821
Long-run variance	0.000652			

Computed by the researcher with data from CBN Statistical Bulletin, UNDP and Chinn & Ito

4.1.4 Post-estimation tests

The post estimation tests for the cointegrating regression model in table 5 are presented as follows:

Table 5: Wald test result for joint significance of the regression estimates

Test Statistic	Value	df	Probability
F-statistic	35.87348	(3, 23)	0.0000
Chi-square	107.6205	3	0.0000
Null Hypothesis: C(1)=C(2)=C(3)=0			
Null Hypothesis Summary:			
C(1)		-0.010321	0.004240
C(2)		0.010724	0.003101
C(3)		0.299063	0.050587

Computed by the researcher from the cointegrating regression model

Correlogram Test

This is a residual based (error term) test.

Table 6: Correlogram test for serial correlation

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
. * .	. * .	1	-0.129	-0.129	0.5023	0.478
. .	. .	2	0.074	0.058	0.6720	0.715
. .	. * .	3	0.068	0.087	0.8248	0.844
. **	. **	4	0.257	0.279	3.0712	0.546
. *	. *	5	0.076	0.155	3.2793	0.657
. .	. .	6	0.061	0.066	3.4188	0.755
. .	. * .	7	-0.056	-0.110	3.5417	0.831
. .	. ** .	8	-0.059	-0.223	3.6854	0.884
. .	. * .	9	0.025	-0.120	3.7120	0.929
. .	. .	10	0.013	-0.022	3.7204	0.959
. .	. .	11	-0.047	0.036	3.8271	0.975
. * .	. .	12	-0.107	0.003	4.4258	0.974

Computed by the researcher from the cointegrating regression model

4.1.5 Granger Causality Test Results

The results of the Granger causality test are reported in Table 7.

Table 7: Granger causality tests results

Null hypothesis tested: There is no evidence of causality in the series

Flow of causality	Chi-square (X ²) calculated	P-value	Inference
MRG → HDI	48.622	0.000	Reject null hypothesis
HDI → MRG	1.0314	0.960	Accept null hypothesis
CRP → HDI	39.599	0.000	Reject null hypothesis
HDI → CRP	0.482	0.993	Accept null hypothesis
FIO → HDI	37.441	0.011	Reject null hypothesis
HDI → FIO	29.230	0.000	Reject null hypothesis
MRG, CRP, FIO → HDI	109.802	0.000	Reject null hypothesis

Computed by the researcher with data from CBN Statistical Bulletin, UNDP and Chinn & Ito

4.2 Major Findings

4.2.1 Descriptive Statistics

The descriptive statistics offered some important information on the distribution of the series over the study period. The result showed that the average score of HDI is 0.461 whereas broad money supply and credit to the private sector have mean values of 15.635 percent and 12.414 percent respectively. This finding is an indication that on the average, monetary policy stance places emphasis on increasing monetary aggregates in

meeting the goal of financial deepening. The average value of financial deepening index as reported in the last column and row one is 0.2055. The standard deviation shows that the observations for each variable cluster closely around their respective mean values. This is welcoming as each of the standard deviations are less than their corresponding mean values. The Jaque-Bera statistics and their corresponding probability values provide enough evidence for accepting the null hypothesis of normal distribution in the series.

4.2.2 Pre-estimation tests

ADF unit root and Johansen-Juselius cointegration tests form the basis for the pre-estimation tests. The ADF unit root test results in table 2 shows that all the variables are not stationary at levels. Thus, the null hypothesis of unit root cannot be rejected for each of the variables. The variables were differenced once and they were all found to be stationary after first differencing. The first difference stationarity of the series is very informing and justifies the theoretical condition for using the FM-LS in accordance with the assertion of Phillips & Hansen (1990) and Phillips (1995). More importantly, the Johansen-Juselius cointegration test results revealed that at 5 percent level of significance, the trace statistic shows evidence of three cointegrating vectors while maximum Eigenvalue statistic indicates two cointegrating equations. Based on the findings, the null hypothesis of no cointegration is rejected. Hence, the long-run relationship exists among the variables in the model. Consequently, the cointegration model is estimated.

4.2.3 Cointegrating Regression Model

The cointegrating regression result in tables 3 and 4 shows that broad money supply has a significant negative relationship with HDI. A 1 percent increase in broad money supply leads to 0.0103 reductions in the HDI score. This finding is contrary to the a priori expectation and suggests that increasing the monetary aggregates alone while holding other indices of financial deepening constant is not adequate to engender socio-economic development. On the other hand, private sector credits and financial openness index were found to exert significant positive impact on HDI. These findings are in conjunction with the theoretical expectation and agree with the results of Karimo and Ogbonna (2017) on the nexus of financial deepening and economic growth and Chinweze (2017) on the benefits of financial deepening. The

coefficient of determination shows that the 81.86 percent variations in HDI are as a result of collective changes in all the explanatory variables. The long run variance (0.00065) is very low thereby indicating that the model is good for long term forecasting.

4.2.4 Post-estimation diagnostics test results

The Wald test result reported in table 5 shows that the slope parameters (coefficients of the regressors) are jointly significant at 5 percent level of significance. This is because the probability value (0.000) of the F-statistic (35.873) falls below 0.05. Hence, all the variables are considered as jointly important in accounting for changes in HDI. The correlogram test result shows no evidence of serial correlation at 5 percent level of significance for all the twelve (12) selected lags. This is because the associated probability values of the Q-statistics for each of the 12 lags are more than 0.05. Hence, this provides enough evidence for accepting the null hypothesis of no serial correlation in the residuals.

4.2.5 Granger Causality Test Results

The Granger Causality test results presented in table 7 indicates that uni-directional causality runs from broad money supply and credit to the private sector towards HDI. This result agrees with the findings of Chinweze (2017). The result equally shows that bi-directional causality exists between financial openness and HDI. It was further observed that joint causality runs from all the regressors to HDI. This finding implies that the explanatory variables collectively have the power of predicting changes in HDI.

5.0 Conclusion and Recommendations

5.1 Conclusion

Financial deepening has continued to gain popularity in economics literature following the growing interconnectivity between the financial and real sector. Thus, this study examines the role of financial integration in socio-economic development using FM-LS and Granger Causality tests as data analysis methods. The result of the FM-LS shows that broad money supply has significant negative relationship with HDI. The result further reveals that private sector credits and financial openness index are positively linked to the HDI. The causality test results show that unidirectional causality runs from broad money supply and credit to the private sector towards HDI while bi-directional causality flows between financial openness and HDI. Overall, joint causality runs from all the explanatory variables to HDI. This agrees to a large extent with previous research studies such as; Ogbuagu and Ewubare (2014), Tuaneh et al (2016), Chinweze (2017) and Karimoet al. (2017). Hence, it is concluded that financial deepening is an important source of socio-economic development in Nigeria.

5.2 Recommendations

- a. The CBN as the principal regulator of the Nigerian financial system should allow cross-border mobility of capital in order to provide opportunity for free flow of financial products and services and facilitate the process of socio-economic development.
- b. Policy makers should ensure that the private sector is allowed greater as well as sustainable access to financial services at affordable costs to boost their productivity and contributions to socio-economic development. This can be seen in the collaborative strategic response by the financial services industry to realize huge reductions on annual costs where the CBN, in conjunction with the Bankers' Committee initiated an industry Shared Services Programme to identify cost drivers in the industry and the opportunities for collaboration with the possibility of achieving 30% cost reduction with the attendant positive impact on lending rates and bank charges.
- c. The CBN and Deposit Money Banks (DMBs) should ensure that expansion of monetary aggregates through increased broad money supply is targeted at making more opportunities available for broad-based growth and sustainable development.
- d. The key players in the banking sub-sector should ensure that more innovative approaches such as agent banking and mobile banking are prioritized in the financial inclusion process in order to broaden access to financial services for businesses and individuals in underserved rural areas.

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APPENDIX

Secondary Time Series Data: HDI, broad money supply as a ratio of GDP, credit to the private sector as ratio of GDP and financial openness index, 1991-2018

YEAR	HDI (index)	MRG (% of GDP)	CRP (% of GDP)	FIO (index)
1991	0.438	10.6	6.7	0
1992	0.328	12.7	6.9	0
1993	0.348	12.2	6.4	0
1994	0.389	13.1	10.1	0
1995	0.384	13.1	8.1	0
1996	0.452	10.0	6.2	0
1997	0.393	9.2	6.3	0
1998	0.456	10.1	7.7	0.06025
1999	0.439	10.6	7.7	0.226059
2000	0.455	11.9	8.1	0.286309
2001	0.466	12.7	7.7	0.18075
2002	0.463	15.6	9.4	0.241
2003	0.445	13.3	8.2	0.241
2004	0.445	14.7	8.2	0.30125
2005	0.463	12.3	8.2	0.30125
2006	0.466	11.8	8.3	0.30125
2007	0.477	13.3	8.0	0.30125
2008	0.481	15.5	11.2	0.30125
2009	0.487	20.5	17.7	0.30125
2010	0.492	24.3	23.1	0.30125
2011	0.5	21.1	18.0	0.30125
2012	0.507	21.1	22.5	0.30125
2013	0.514	21.6	21.1	0.30125
2014	0.521	19.6	20.2	0.30125
2015	0.525	21.2	20.4	0.30125
2016	0.527	21.3	19.9	0.30125
2017	0.524	23.2	21.7	0.30125
2018	0.525	21.2	19.6	0.30125

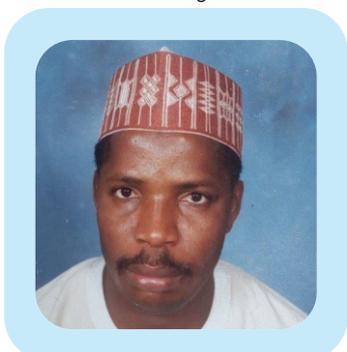
Source: CBN Statistical Bulletin (2018 & 2019) , UNDP (2018)

The Role of Agriculture in the Economic Diversification of the Nigerian Economy: (1980 – 2016)



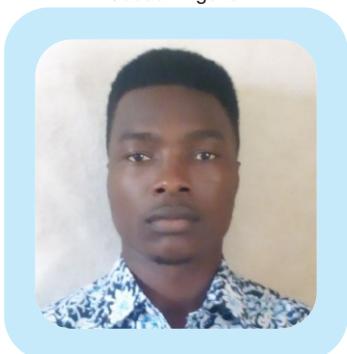
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Abstract

This study empirically examines the role of agriculture in the diversification of the Nigerian economy, using time series data from 1980–2016. Estimation results using Cointegration and Vector Error Correction Technique indicate that agricultural output has a positive relationship and significant impact with non-oil exports (NOE) and that non-oil revenue has a positive relationship with non-oil exports (NOE). It was recommended that, government should endeavor to increase agricultural productivity by improving its expenditure on the sector so as to enhance the growth of the economy. Government should also increase its non-oil revenue and revive the sector through sufficient budgetary allocation and efficient utilization of allocated resources in order to guarantee poverty reduction, sustainable livelihood and enhanced food security.

Keywords: Agriculture, economic diversification, cointegration, error correction term, sustainable development.

1.0 Introduction

Nigeria is the largest oil exporting country in Africa and has a rapidly growing economy. The country follows a resource based growth strategy driven by the production and exporting of oil. With the volatility of global oil prices and often volatile growth of its economy, the country has wasted much of its opportunities to break away from underdevelopment despite its massive natural and human resource endowments. It has dwelt only on its huge crude oil resources as the major source of revenue, driving a monolithic economy for years in spite of the enormous developmental challenges it faces (Ojo, 1994).

Agriculture has been an important sector in the Nigerian economy in the past decades, and is still a major sector despite the oil boom. Basically, it provides employment opportunities for the teeming population,

eradicates poverty and contributes to the growth of the economy. The study of economic history provides us with ample evidence that an agricultural revolution is a fundamental pre-condition for economic development (Eicher and Witt, 1964; Oluwasami 1966).

The agricultural sector has the potential to be the industrial and economic springboard from which a country's development can take off. Indeed, more often than not, agricultural activities are usually concentrated in the less developed rural areas where there is a critical need for rural transformation, income redistribution, poverty alleviation and socio-economic development (Stewart, 2000). Nigeria's economic aspirations have remained that of altering the structure of production and consumption patterns, diversifying the economic base and reducing dependence on oil, with the aim of putting the economy on a path of sustenance, all inclusive and non-inflationary growth. Despite Nigeria's vast agricultural resources both human and natural, it is still faced with acute food crisis, the intensification of poverty and massive suffering of the overwhelming majority of Nigerians. This situation is however typical of all third world countries operating within the neo-colonial capitalist system (Akor, 2009).

Diversification implies "movement into new fields and stimulation and expansion of existing traditional products." Diversification does not discourage specialization, but requires that resources be channeled into the best alternative uses (Iniodu, 1995). It presents the most competitive and strategic option for Nigeria in the light of her developmental challenges and given her background. Diversification has a lot of benefits for Nigeria to maximally utilize her abundant resource base to rebuild the economy and enjoy the benefits of all the linkages, synergy, economies of scale, grow national technology and foreign investment profile, build human capital, exploit new opportunities, lessen

averagely operational costs, increase national competitiveness and grow the standard of living and confidence of the citizens for national renaissance.

Economic diversification is generally taken as the process in which a growing range of economic output is produced. It can also refer to the diversification of markets for exports or the diversification of income sources away from domestic economic activities (i.e. income from overseas investment). The last is particularly relevant to capital-surplus oil exporting countries.

In spite of Nigeria's rich agricultural resource endowment, there has been a gradual decline in agriculture's contributions to the nation's economy (Manyong et al., 2005). In the 1960s, agriculture accounted for 65-70% of total exports; it fell to about 40% in the 1970s, and crashed to less than 2% in the late 1990s. The decline in the agricultural sector was largely due to rise in crude oil revenue in the early 1970s. Less than 50% of the Nigeria's cultivable agricultural land is under cultivation, even though, smallholder and traditional farmers who use rudimentary production techniques, with resultant low yields, cultivate most of this land. But, smallholder farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, and inadequate research and extension services. (Lawal, 2011).

Options for diversifying an economy abound, such as agriculture, entertainment, financial services, industrialization, information and communication technology, tourism, mining, etc. However, it is worthy to note that country-specific circumstances ought to as a matter of necessity, be considered. This is cogent, since due to structural differences, a model that fits an economy perfectly well may prove irrelevant in another.

Given its major objective of examining the role of agriculture in diversifying the productive base of the Nigerian economy with a view to reducing dependence on the oil sector; and following Eko, et.al, (2013), this study zeroed in on agriculture as imperative. The choice of this approach is informed by developmental policy in Nigeria and the huge successes recorded by 'Asian Tigers' (some Asian countries) in applying these imperative, as well as the fact that these countries were basically at the same level of national development with Nigeria, at the time of their respective take-off and still share certain similarities with Nigeria. (Eko, et al. 2008).

In view of the gradual decline in agricultural contribution to the nation's economy which has negative effect on the Nigerian economy as a whole, this research work is aimed at examining the agricultural sector as the key to the diversification of the Nigerian economy for sustainable development as its main objective. The specific objectives are:

- i. To examine the impact of agricultural output on economic diversification in Nigerian.
- ii. To determine the role of agriculture in the diversification of Nigerian economy for sustainable development.

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

2.1.1 The concept of Agriculture

Agriculture is a way of life that involves production of animals, fishes, crops, forest resources for the consumption of man and supply of agro-allied product required by various sectors. It is seen as the inherited and dominant occupation employing about 70% of Nigerians. Though, subsistence agriculture is practiced in this part of the world, it will not be an overstatement to say that it is the life-wire of the economies of developing countries.

Components of agricultural production include Crop production: this involves the cultivation of different crops which may be food crops or cash crops, Livestock which involves rearing of domestic animals for consumption. Such animals include goat, ram sheep etc, Forestry concerns the preservation and maintenance of economic trees or plants and Fishing involves breeding and catching of fish from the river for domestic consumption and commercial purpose.

Broadly speaking, agricultural activities are undertaken as peasant farming and or plantation farming. Peasant farming involves cultivation of small scale acres of land. This is also called subsistence agriculture because it is undertaken to meet domestic needs and survival or to eke out living from the farm produce. The size of the of the land used by peasant farmers is determined by the size of their family, land and the number of the size of the family interested in agriculture. Rudimentary agriculture equipment such as hoes, cutlasses, and axes etc. which are crude in nature are usually used.

Plantation farming: is the system that involves the use of a large estate of land permanently planted with economic or commercial crops which include cocoa, tea, cotton, sugar, tobacco, rubber, sugarcane, palm tree, coffee and other commercial crops. In plantation farming land could be owned by government, private, individuals or corporate bodies. Mechanized equipment and modern inputs are mainly used in plantation farming.

2.1.2 Concept of Development

The term development may mean different things to different people. The concept has been misconceived by many to mean economic growth. This view is myopic because the concept does not consider if the increase in per capital income trickle-down. The concept is more than a sustained increase in per capita income. If

the sustained in per capita income brings about the desirable social changes, and improve the functioning, capability of individual, we will say there is economic development although, increase in income per capita must have occurred before there can be development. .

2.2 Theoretical Framework

2.2.1 Agricultural based economic development theory:

Wiggins (2009) propounded the Agricultural based economic development theory which stressed that Agriculture requires technical, institutional and financial incentive change that will raise the productivity of small farmers. The theory further explains that in strive for economic development; agricultural financial scheme can play a dual role of increased purchasing power and provision of input to sustain the industrial revolution.

2.2.2. Structural change theory:

The theory which was formulated by Nobel laureate W. Arthur Lewis in the mid-1950s emphasized on the mechanism by which developing economies can transform their domestic structure from a heavy dependence on traditional subsistence agricultural to a more modern and advanced agricultural practices through sufficient financial support. An extended version of this theory adds that increased agricultural development cannot be realized unless government builds a supporting system which creates and provides the necessary incentives, opportunities and most importantly productivity in the agricultural sector.

2.2.3 Sustainable Livestock Theory:

Chamber and Conway (1991) extended the sustainable livestock theory for capabilities, including capital and other social resources as well as other farming practices required for a means of living. The theory holds that increase output can only be achieving by ensuring secured

ownership of, or access to capital resources and income earning activities which includes; reserves and assets to offset risk, ease stocks and meet contingencies as well as enhancement and maintenance of productive resources on a long term basis. Therefore, increase agricultural output (food security) is not just food affordability but the ability to produce food and earn income on a long term basis by farmers.

2.3 Empirical Literature

Ligon and Sadoulet (2008) in their analysis, using panel data, investigated the contribution and impact of the agricultural sector and non-agricultural sector on GDP. The findings agree with other researchers that the agricultural sector is significantly a stimulant for the growth and development of an economy about other sectors.

Simeon (2009) using the global trade analysis project (GTAP) approach found out the growth capacity of Nigerian agricultural sector. The study concluded that the bias against the agricultural sector should be discarded and meaningful contribution in terms of funding and the entire well-being should be made available because, the agricultural sector holds the capacity for job creation, food sufficiency and foreign exchange earnings from exportation.

Okoro (2011) investigated the contribution of agricultural sector on the Nigerian economy, using panel data for a period of 1986 - 2007. The study discovered a positive relationship between agricultural sector and economic growth. From the finding, FDI and domestic savings were able to explain 81 percent of the variation in the economic growth. He recommended, better improvement of the Nigerian agricultural sector, and that the government and Central Bank of Nigeria (CBN) should have accessible and low-interest rate loan plan for farmers and also

strengthen the research institutions for noble findings.

Ebere et al. (2012) investigated on the impact of government spending on agriculture and economic growth, using the Ordinary Least Squares (OLS) econometrics technique on a time series data from 1980 - 2012. The study revealed that there exist a positive and significant association between GDP and agricultural output. The study also figured out a couple of constraints among which are paucity of capital available to the rural farmers, poor infrastructure and emphasis was laid on timely and adequate agricultural extension services among all key agents in the agricultural sector.

Oyetade and Oluwatoyese (2014) examined the effect of the agricultural sector as the determinant of economic growth, using a time series econometric model from 1980 to 2011. The study revealed a positive relationship between the agricultural sector and economic growth. It was discovered that the agricultural sector could be the determinant for exportation, if given due attention in all ramification in terms of funding and enabling the environment to key actors in the sector. The study also concluded that there are constraints to the full attainment of agricultural sector progress.

Ahungwa et al., (2014) examined trend of the impact of agriculture to GDP 1960 - 2012 using time series data. The regression results show that there exists positive and significant relationship between the agricultural sector and GDP, with GDP accounting for 66.4 percent of the variation in the economy, and also displays the dominance of the agricultural sector relative to other sectors of the economy. The study recommended that there should be a conducive and enabling environment provided by the government and decision makers so that the full gains can be derived from the sector.

Mussema (2015) examines the drivers of agricultural diversification in Oromia region. Hackman's two-step method was employed on survey data from a regionally representative household survey. The study discovered that asset ownership, soil quality, agricultural extension, and level of infrastructural development are the significant drivers of crop diversification in Oromia. The study recommends that public investment and policy reform geared toward risk mitigation, soil health improvement, extension information, and reduction in transactions will have the greatest pay off in promoting agricultural diversification.

Inusa et al., (2018) investigates the impact of agriculture on economic growth of Nigeria using Ordinary Least Squares (OLS) regression technique on a time series data from 2016 to the second quarter of 2017. The study discovered that exchange rate has positively and significantly impacted agricultural output. Loans and advances, and total savings were also discovered to have significantly impacted agricultural output as a component of GDP. The study recommends that agricultural inputs be largely sourced locally and foreign exchange be made favorable, government allocation to the sector be increased and monitored to ensure prudence in its usage.

Adesoye (2018) examined how enhancing the agricultural value chain can contribute to rapid economic diversification in Nigeria. Autoregressive distributed lag (ARDL) model was employed as the econometric method of estimation from (1981-2015). Findings showed that agricultural raw material, machinery and land have direct impact on agricultural productivity in Nigeria while agriculture productivity had positive impact on economic growth in Nigeria. The study recommended that government should make deliberate efforts to create institutions that will make policy programmes on agricultural development not only to enhance its growth and the

overall output growth but also make it all inclusive.

3.0 Materials and Methods

3.1 Data and Data Source

Secondary data was used in this study. The data was obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank's Development Indicators. The models used in this study were estimated using data on non-oil exports (NOE) and some macroeconomic indicators which includes: government expenditure on agriculture (GEA), agricultural value added (AGV) and agricultural GDP (AGDP) for the period 1980-2016.

3.2 Model Specification

The model specifies that non-oil export (NOE) is significantly influenced by non-oil revenue (NOR), government expenditure on agriculture (GEA), agricultural value added (AGV) and agricultural GDP (AGDP). The research model adopts the Cobb -Douglas production function which takes the form:-

$$Q = f(AL^\alpha K^\beta) \dots\dots\dots i$$

Where Q is the output; A is the level of technology; L is labor; K stand for capital; while α and β stand for the coefficients of labor and capital respectively.

The equation can be transformed by incorporating government expenditure on agriculture (GEA) as a proxy to labor (L) and non-oil revenue(NOR) as a proxy to capital(K), while agricultural GDP and agricultural value added as factor a inputs that determine non-oil export(NOE).The functional relationship can be expressed as follows;

$$NOE = f(AGDP, GEA, AGV, NOR) \dots\dots\dots ii$$

Where:

- NOE = Non-oil exports
- AGDP = Agricultural GDP
- GEA = Government expenditure on Agriculture
- AGV = Agricultural value added

NOR = Non-oil revenue

From equation (2) above, an econometric model can be generated by incorporating intercept (β_0) and disturbance variable (μ) as follows:-

$$NOE = \beta_0 + \beta_1 AGDP + \beta_2 GEA + \beta_3 AGV + \beta_4 NOR + \mu \dots\dots\dots iii$$

Finally, a time series model can be generated by adding (t) subscribe to equation 3 above with the exception of intercept of the model (β_0) as:-

$$NOE_t = \beta_0 + \beta_1 AGDP_t + \beta_2 GEA_t + \beta_3 AGV_t + \beta_4 NOR_t + \mu_t \dots\dots\dots iv$$

Equation four (4) is our final model for estimating the role of agriculture in the diversification of the Nigerian economy for a period of 37 years.

3.3 Method of Data Analysis

A time series data covering (1980-2016) a period of 37 years was estimated using Augmented Dickey Fuller (ADF) unit root test, Vector Autoregressive (VAR) method, Lag Length Selection Criteria, Johansen co-integration technique, Vector error correction model (VECM) and Ordinary least square estimator

3.3.1 Unit Root Test (ADF)

ADF test is used to determine the order of integration of a variable, i.e. how many times it has to be differenced or not to become stationary. The null hypothesis is that there is no unit root. The rule is that if the (ADF) test statistic is greater in absolute terms than the five percent critical value we accept the null hypothesis i.e. the variable is stationary, but if the (ADF) test statistic is less than the five percent critical value i.e. the variable is non-stationary we reject the null hypothesis and go ahead to difference once.

If the variable does not become stationary at first difference we difference twice. However it is expected that the variable becomes stationary at first difference.

The Fundamentals of Augmented Dickey Fuller (ADF) test

- (1) $\Delta y_t = \alpha_0 + \alpha_1 y_t + \sum_{k=1}^m \beta_k \Delta y_{t-k} + \epsilon_t$
- (2) $\Delta y_t = \alpha_0 + \alpha_1 y_t + \sum_{k=1}^m \beta_k \Delta y_{t-k} + \delta t + \epsilon_t$
- (3) $\Delta y_t = \alpha_0 + \alpha_1 y_t + \sum_{k=1}^m \beta_k \Delta y_{t-k} + \delta t + \rho y_t + \epsilon_t$v

Ho: $\delta = 0, \rho = 1$ (presence of unit root, the data is non-stationary)
 H₁: $\delta < 0, \rho \neq 1$ (the data is stationary and does not need to be differenced)

Unit Root Equation

This test is conducted by “augmenting” the preceding three equations by adding the lagged values of the dependent variable Y_t. The Augmented Dickey Fuller (ADF) test here consists of estimating the following regression:

$$y_t = \alpha_0 + \alpha_1 y_t + \delta y_{t-1} + \sum_{j=1}^m \beta_j \Delta y_{t-j} + \epsilon_t$$

$$NOE_t = \alpha_0 + \alpha_1 NOE_t + \delta NOE_{t-1} + \sum_{j=1}^m \beta_j \Delta NOE_{t-j} + \epsilon_t$$
.....vi

Where ϵ_t is a pure white noise error term, t is the time or trend variable and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2}), \Delta Y_{t-2} = (Y_{t-2} - Y_{t-3}),$ etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term is serially uncorrelated, so that we can obtain an unbiased estimate of δ , the coefficient of lagged Y_{t-1}. So the rest regressors equation is as follows:

$$NOE_t = \alpha_0 + \alpha_1 NOE_t + \delta NOE_{t-1} + \sum_{j=1}^m \beta_j \Delta NOE_{t-j} + \epsilon_t$$

$$NOR_t = \alpha_0 + \alpha_1 NOR_t + \delta NOR_{t-1} + \sum_{j=1}^m \beta_j \Delta NOR_{t-j} + \epsilon_t$$

$$AGDP_t = \alpha_0 + \alpha_1 AGDP_t + \delta AGDP_{t-1} + \sum_{j=1}^m \beta_j \Delta AGDP_{t-j} + \epsilon_t$$

$$AGV_t = \alpha_0 + \alpha_1 AGV_t + \delta AGV_{t-1} + \sum_{j=1}^m \beta_j \Delta AGV_{t-j} + \epsilon_t$$

$$GEA_t = \alpha_0 + \alpha_1 GEA_t + \delta GEA_{t-1} + \sum_{j=1}^m \beta_j \Delta GEA_{t-j} + \epsilon_t$$
.....vii

3.3.2 VAR-Lag Length Selection Criterion

Determination of the VAR lag length will be preceded by the estimation of differenced data through the unrestricted VAR. In order to avoid reporting unauthentic casual relations; it is important to determine the optimal lag length to be used for the

estimation in the Johansen co-integration and the Vector error correction models. A combination of Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SC), Likelihood Ratio (LR), Hannan-Quinn (HQ), Final prediction error (FPE) were adopted and ran for the optimal lag length.

3.3.3 Johansen Co-integration Test

Co-integration is a statistical property possessed by some time series data that is defined by the concept of stationarity and the order of integration of the series. A stationary series is one with a mean value which will not only vary with the sampling period. The series will constantly return to its mean value as fluctuations occur. In contrast, a non-stationary series will exhibit a time varying mean.

$$X_t = \alpha_1 X_{t-1} + \dots + \alpha_p X_{t-p} + \beta_1 t + \mu_t$$
.....viii

Consider a VAR model of order p:

Assume the vector: $x = f$ (AGDP, GEA, AGV, NOR)

Where:

- NOE= Non-oil exports
- AGDP= Agricultural GDP
- GEA = Government expenditure on Agriculture
- AGV= Agricultural value added
- NOR= Non-oil revenue

Assume that the vector has a VAR representation of the form:

$$X_t = z + \sum_{i=1}^p \Pi_i X_{t-i} + \mu_t$$
.....ix

Decision Rule

Ho: = 0 (there is no co-integration among the variables)

H₁: $\neq 0$ (there is co-integration among the variables)

If the trace or Max-Eigen test statistics value is greater than its critical value in absolute terms at 5% level of significance, we reject Ho and accept H₁. This means that there is co-integration among the variables of study and otherwise there is no cointegration.

Co-Integration Test Equation.

Johansen's methodology takes its starting point in the vector auto-regression (VAR) of order p given by

$$\Delta Y_t = \mu + A1y_{t-1} + \dots + APy_{t-p} + \epsilon_t \dots \dots \dots x$$

Where Y_t is an nx1 vector of variables that are integrated of order one commonly denoted I(1) and ϵ_t is an nx1 vector of innovations. This VAR can be re-written as:

$$\Delta y_t = \mu t + \Pi y_{t-1} + \sum_{j=1}^p \Gamma_j = 1 \Delta y_{t-j} + \epsilon_t \dots \dots \dots xi$$

Now the equation of the study will be written as

$$\Delta NOE_t = \mu t + \Pi NOE_{t-1} + \sum_{j=1}^p \Gamma_j = 1 \Delta NOE_{t-j} + \epsilon_t$$

$$\Delta NOR_t = \mu t + \Pi NOR_{t-1} + \sum_{j=1}^p \Gamma_j = 1 \Delta NOR_{t-j} + \epsilon_t$$

$$\Delta AGV_t = \mu t + \Pi AGV_{t-1} + \sum_{j=1}^p \Gamma_j = 1 \Delta AGV_{t-j} + \epsilon_t$$

$$\Delta GEAT_t = \mu t + \Pi GEAT_{t-1} + \sum_{j=1}^p \Gamma_j = 1 \Delta GEAT_{t-j} + \epsilon_t$$

$$\Delta AGDP_t = \mu t + \Pi AGDP_{t-1} + \sum_{j=1}^p \Gamma_j = 1 \Delta AGDP_{t-j} + \epsilon_t \dots \dots \dots xii$$

3.3.4 Vector Error Correction Model

Yule (1936) and Granger and New bold (1974) were the first to draw attention to the problem of spurious correlation and found solutions on how to address it in time series analysis. A vector error correction model (VECM) is a restricted VAR designed for use with non-stationary series that are known to be co-integrated. The VEC has a co-integration relation built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. The co-integration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

The purpose of the error correction model is to indicate the speed of adjustment from the short-run equilibrium to the long-run equilibrium state. However, the greater the coefficient of the vector error term (ECM), the higher the speed of adjustment of the model from the short-run to the long-run equilibrium.

The VECM express the relationship between Y_t and X_t . The model specification

can then be express as:

$$\Delta Y_t = \alpha_0 + \beta_1 \Delta X_t - \pi \mu_{t-1} + e_t \dots \dots \dots xiii$$

Only if then, Y_t and X_t are co-integrated, by definition $\mu_t \sim I(0)$. Which will now have the advantage of including both long-run and short-run information. In this model,

$$\Delta LNOE_t = \alpha_0 + \alpha_1 \Delta NOR_t + \alpha_2 \Delta LGEA_t + \alpha_3 \Delta LAGV_t + \alpha_4 \Delta LAGDP_t + VECT_{t-1} + \mu_t \dots \dots \dots xiv$$

3.4 Diagnostic Checks

Diagnostic checks were further applied and appropriate lags levels determined to ensure a better model. These tests include

3.4.1 Serial Correlation

In order to find out where the error terms are correlated in the regression, we will use the Breusch-Godfrey Statistics. The Breusch-Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no autocorrelation of any order up to p.

3.4.2 Heteroscedasticity Test

Breaking this assumption means that the Gauss–Markov theorem does not apply, meaning that OLS estimators are not the Best Linear Unbiased Estimators (BLUE) and their variance is not the lowest of all other unbiased estimators.

3.4.3 Normality Test

To find out if the error term is normally distributed with zero mean and constant variance. The Jarque-Bera test was used to test for the normality in the time series variable used.

4.0 Data Presentation and Analysis

4.1 Unit Root Test

The variables were verified for stationarity

by subjecting them to unit root test using Augmented Dickey-Fuller test. The results of the unit root test are presented on table 4.1 below

Table 4.1
Unit Root Test

Variables	Order of integration	Augmented Dickey Fuller Test				
		Critical Values			ADF Statistic	Prob.
		1%	5%	10%		
NOE	I (0)	2.6639210	1.951687	1.610579	4.309301	0.0001
...	I (1)	2.634731	1.951000	1.610907	7.057164	0.0000
ΔAGDP	I (1)	3.632900	2.948404	2.612874	4.621661	0.0007
ΔAGV	I (1)	3.639407	2.951125	2.614300	6.314073	0.0000
Δ2NOR	I (2)	3.653730	2.957110	2.617434	7.633912	0.0000

Source: (Computed by author using E-views 9)

1. Δ= Difference Operator
2. I(d) = No. of times of integration
3. Level = 10%, 5% and 1% level of significance

The results on table 4.1 above shows that the variables have been found to be stationary at level, first and second differencing at 1%, 5% and 10% level of significance respectively, i.e. one of the variable is integrated of order I (0), three (3) of the variables are integrated of order I(1) while the remaining one (1) is integrated of order I(2).

4.2 Vector Autoregressive Estimate.

VAR estimation enabled the determination of the optimal lag length selection while serial correlation test was conducted to determine the stability of the VAR equations where it was found that residuals were not auto correlated.

The result of the serial correlation LM test is presented on table 4.2.1 below.

Table 4.2.1 *Serial correlation LM test*

Lags	LM-Stat	Prob.
1	34.02548	0.1074
2	31.19919	0.1825

Prob from chi square with 25 df

From the table 4.2.1 above it can be observed that there is absence of serial correlation. In other words the residual are not autocorrelated.

Result of the VAR lag length selection criteria is presented on table 4.2.2 below

Table 4.2.2
VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1045.991	NA	8.32e+19	60.05662	60.27881	60.13332
1	-908.8336	227.2893	1.39e+17	53.64763	54.98079	54.10784
2	-862.5201	63.51560*	4.52e+16*	52.42972*	54.87384*	53.27343*

*Indicates lag order selection by the criterion.

From the table 4.2.2 above, it is indicated that LR, FPE, AIC, SC, and HQ selected lag two (2) as the optimal lag. Lag two (2) was selected for the estimation procedure as presented on the table.

Results of the Johansen Co-Integration Test are presented on tables 4.3.1 and 4.3.2

4.3 Johansen Co-Integration Test

Tables 4.3.1 and 4.3.2 compare unrestricted co-integration rank test obtained from the trace and maximum Eigen value test with the corresponding critical values due to Mackinnon. The results on tables 4.3.1 and 4.3.2 indicate

that trace statistics show evidence of four (4) co-integrating equations and maximum Eigen statistics show evidence of two (2) co-integration equations at 5% critical value, which implies existence of unique long-run relationship between non-oil export and other variables of study in the model.

Table 4.3.1
Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.808984	123.6148	69.81889	0.0000
At most 1 *	0.610401	67.33119	47.85613	0.0003
At most 2 *	0.422540	35.28153	29.79707	0.0106
At most 3 *	0.379637	16.61158	15.49471	0.0338
At most 4	0.011064	0.378258	3.841466	0.5385

Source: (Computed by author using E-views 9)

Trace test indicates four(4)co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

From table 4.3.1 above, the trace statistic at (None * = 123.6148) exceeds its critical value of 69.81889, the null hypothesis of no co-integrating equations is rejected. Also the trace statistic at (At most 1* =67.33119) is greater than it critical value of 47.85613, the null hypothesis that there is one or fewer co-integrating equations is therefore rejected. Also the trace statistic at (At most 2* =35.28153) is greater than its critical value of 29.79707, the null

hypothesis that there are two or fewer co-integrating equation can be rejected. While the trace statistic at (At most 3*=16.61158) is greater than its critical value of 15.49471, the null hypothesis that there are three or fewer co-integrating equation is also rejected. Finally the trace statistics at (At most 4 =0.378258) is less than its critical value of 3.841466, the null hypothesis that there are four or fewer co-integrating equation is therefore accepted.

Table 4.3.2

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.808984	56.28359	33.87687	0.0000
At most 1 *	0.610401	32.04965	27.58434	0.0124
At most 2	0.422540	18.66995	21.13162	0.1068
At most 3 *	0.379637	16.23333	14.26460	0.0241
At most 4	0.011064	0.378258	3.841466	0.5385

Source: (Computed by author using E-views 9)

Trace test indicates 4 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level **Mackinnon-Haug-Michelis (1999) p-values

The Eigen value shown on table 4.3.2 also indicates the presence of co-integration. The max Eigen statistic at (None*=56.28358) exceeds its critical value of 33.87687, the null hypothesis of no co-integrating equations is rejected. Also the max Eigen statistic at (At most 1 *=32.04965) is greater than its critical value of 27.58434, the null hypothesis that there is one or fewer co-integrating equations is rejected. Also the max Eigen statistic at (At most 2 * = 18.66995) is less than its critical value of 21.13162, the null hypothesis that there are two or fewer co-integrating equations are accepted also the max Eigen statistic at (At most 3 * = 16.23333) is greater than its critical value of 14.26460, the null hypothesis that there

are three or fewer co-integrating equations can also be rejected. Finally, the max Eigen statistics at (At most 4 =0.378258) is less than its critical value of 3.841466, the null hypothesis that there are four or fewer co-integrating equations can be accepted. Therefore, since we found four co-integrating vectors, the economic interpretation of the long-run on Non-oil Export (NOE) in Nigeria can only be obtained by normalizing the estimates of the unrestricted co-integrating vector on the Non-oil Export.

Results of the VECM OLS estimates of NOE and the corresponding diagnostic tests are presented on tables 4.4.1 and 4.4.1.1 respectively.

4.4 Error Correction Model (ECM)

Table 4.4.1

VECM OLS Estimates of NOE

	Coefficient	Std. Error	t-Statistics	Prob.
C(1)	0.800572	0.471360	1.698429	0.1035
C(2)	-0.515845	0.435494	-1.184507	0.2489
C(3)	-0.739223	0.397155	-1.861298	0.0761
C(4)	0.442821	0.160371	2.761229	0.0114
C(5)	-0.371632	0.139189	-2.669992	0.0140
C(6)	3.038479	4.694494	0.647243	0.5242
C(7)	1.148653	4.029051	0.285093	0.7782
C(8)	0.157052	0.054252	2.894843	0.0084
C(9)	-0.059816	0.044050	-1.357908	0.1883
C(10)	-2.906915	1.718697	-1.691348	0.1049
C(11)	-0.874184	1.535580	-0.569285	0.5749
C(12)	11.01282	28.81686	0.382166	0.7060

R-squared = 0.422946 Adjusted R-squared = 0.134419

Durbin Watson D* = 1.670846 F statistics = 1.465880

Prob. (F-statistic) = 0.213954.

From table 4.4.1, above it can be seen that there are two error correction terms i.e C(1) and C(2), but the rule is that the ECT must be either positive significant or negative significant at 0.05. Therefore ECT

(1) is positive and insignificant while ECT(2) is negative and also insignificant. R-squared is 0.42, indicating that 42% variation in the dependent variable is explained by the independent variables.

Diagnostic Test

Table 4.4.1.1

Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.0839	F(2,20)=0.02069
2	Heteroscedasticity	CHS(15)=0.0567	F(15,18)=0.0121
3	Normality	JB=11.73497	0.002830

From table 4.4.1.1 the result shows that the model is generally free from serial correlation. In other words the residuals are not auto correlated. Additionally, no evidence of heteroscedasticity was found in the errors of the estimated system while confirming that the errors are normally distributed. Therefore, it can be concluded

that the results are not affected by white noise distribution process, enhances efficiency and consistency.

Results of the VECM OLS estimates of NOR and the corresponding diagnostic tests are presented on table 4.4.2 and 4.4.2.1 respectively

Table 4.4.2

VECM OLS Estimates of NOR

	Coefficient	Std. Error	t-Statistics	Prob.
C(13)	1.973988	0.525092	3.759316	0.0011
C(14)	-0.757838	0.485138	-1.562110	0.1325
C(15)	-1.359427	0.442428	-3.072653	0.0056
C(16)	0.351958	0.178652	1.970076	0.0615
C(17)	0.023499	0.155055	0.151550	0.8809
C(18)	-1.196091	5.229639	-0.228714	0.8212
C(19)	-2.315914	4.488339	-0.515985	0.6110
C(20)	0.063956	0.060437	1.058223	0.3014
C(21)	0.016217	0.049071	0.330481	0.7442
C(22)	-6.865892	1.914619	-3.586036	0.0016
C(23)	2.520183	1.710628	1.473250	0.1548
C(24)	79.78675	32.10181	2.485428	0.0210

R-squared = 0.806141 Adjusted R-squared = 0.709211

Durbin Watson D* = 2.307741 F statistics = 8.316772

Prob. (F-statistic) = 0.000015.

From table 4.4.2, above it can be seen that there are two error correction terms i.e C(13) and C(14), (ECT13) is positive and significant at 0.05, which means that there is a long-run relation or causality running from NOR, AGV, GEA, AGDP to NOE while

ECT14 is negative in sign but insignificant.

R-squared is 0.80, indicating that 80% variation in the dependent variable is explained by the independent variables.

Diagnostic Test

Table 4.4.2.1

Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.0666	F(2,20)=0.0210
2	Heteroscedasticity	CHS(15)=0.4991	F(15,18)=0.5976
3	Normality	JB=101.8926	0.000000

From the above table 4.4.2.1 the result shows that the model is generally free from serial correlation. In other words, the residuals are not auto correlated. Additionally, no evidence of heteroscedasticity was found in the errors

of estimated system while it was confirmed that the errors are normally distributed. Results of the VECM OLS estimates of AGV and the corresponding diagnostics test are presented on tables 4.4.3 and 4.4.3.1 respectively.

Table 4.4.3

VECM OLS Estimates of AGV

	Coefficient	Std. Error	t-Statistics	Prob.
C(25)	-0.068198	0.017529	-3.890556	0.0008
C(26)	0.058138	0.016195	3.589829	0.0016
C(27)	0.017823	0.014769	1.206763	0.2403
C(28)	-0.007743	0.005964	-1.298228	0.2077
C(29)	0.015306	0.005176	2.957093	0.0073
C(30)	-0.311638	0.174580	-1.785069	0.0880
C(31)	-0.206202	0.149833	-1.376208	0.1826
C(32)	-0.005441	0.002018	-2.697057	0.0132
C(33)	0.000643	0.001638	0.392346	0.6986
C(34)	0.108797	0.063915	1.702210	0.1028
C(35)	0.069290	0.057106	1.213365	0.2379
C(36)	-1.008834	1.071649	-0.941385	0.3567

R-squared = 0.671712 Adjusted R-squared = 0.507569
 Durbin Watson D* = 2.007610 F statistics = 4.092219 Prob. (F-statistic) = 0.002393
 From table 4.4.3, above it can be seen that there are two error correction term i.e. C (25) and C(26), ECT(25) is negative and significant at 0.05, which means that there is a long-run relation from NOR, AGV,

GEA, AGDP to NOE. ECT26 is positive in sign and significant at 0.05 which means that there is also a long-run relation from NOR, AGV, GEA, AGDP to NOE or causality running from AGV to NOE R-squared is 0.67, thereby indicating that 67% variation in the dependent variable is explained by the independent variables.

Diagnostic Test

Table 4.4.3.1

Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.3144	F(2,20)=0.4942
2	Heteroscedasticity	CHS(15)=0.5308	F(15,18)=0.6360
3	Normality	JB=0.323150	0.855025

From the table 4.4.3.1 the result shows that the model is generally free from serial correlation. i.e. the residuals are not autocorrelated. Additionally, no evidence of heteroscedasticity was found in the errors of estimated system. While normality of the errors, it was confirmed

that the errors are normally distributed.

Results of the VECM OLS estimates of AGDP and the corresponding diagnostic tests are presented on tables 4.4.4 and 4.4.4.1 respectively.

Table 4.4.4
VECM OLS Estimates of AGDP

	Coefficient	Std. Error	t-Statistic	Prob.
C(37)	-4.208074	1.430771	-2.941122	0.0076
C(38)	2.999520	1.321902	2.269094	0.0334
C(39)	1.808751	1.205527	1.500381	0.1477
C(40)	0.321297	0.486791	0.660031	0.5161
C(41)	0.916372	0.422495	2.168957	0.0412
C(42)	5.207874	14.24972	0.365472	0.7182
C(43)	-23.21551	12.22982	-1.898270	0.0709
C(44)	-0.021495	0.164678	-0.130527	0.8973
C(45)	0.422076	0.133709	3.156666	0.0046
C(46)	6.737067	5.216951	1.291380	0.2100
C(47)	-3.958377	4.661118	-0.849233	0.4049
C(48)	31.97180	87.47099	0.365513	0.7182

R-squared = 0.761187 Adjusted R-squared = 0.641781
 Durbin Watson D* = 2.079657 F statistics == 6.374762 Prob. (F-statistic) = 0.000118

ECT26 is positive in sign and significant at 0.05, which means that there is a long-run relation from NOR, AGV, GEA, AGDP to NOE.

From table 4.4.4, above it can be seen that there are two error correction term i.e. C(37) and C(38), ECT(37) is negative and significant at 0.05, which means that there is a long-run relation from NOR, AGV, GEA, AGDP to NOE or Causality running from AGDP towards NOE.

R-squared is 0.76 which means that 76% variation in the dependent variable is explained by the independent variables.

Diagnostic Test

Table 4.4.4.1

Diagnostic test result

	Test statistics	LM version	F version
1	Serial correlation	CHSQ(2)=0.7112	F(2,20)=0.8167
2	Heteroscedasticity	CHS(15)=0.3180	F(15,18)=0.3510
3	Normality	JB=0.575322	0.750016

From the table 4.4.4.1 the result shows that the model is generally free from serial correlation. Residuals are not auto correlated. No evidence of heteroscedasticity was found in the errors of estimated system and residuals of the errors are normally distributed. Therefore, it can be concluded that the results are not affected by white noise distribution process, enhances efficiency and consistency.

Discussion of Findings

The discussion of findings is done in line with objectives of the study.

Objective 1: To examine the impact of agricultural output on economic diversification in Nigeria.

The result showed that agricultural output had a positive relationship with and significant impact on non-oil exports (NOE) which is in line with the work of Oyetade and Oluwatoyese (2014) who concluded that the agricultural sector could be the determinant for exportation, if given due attention in all ramification in terms of funding and enabling the environment to key actors in the sector.

An increase in agricultural output brings about an increase in non-oil exports (NOE). As agricultural output increases (i.e. the total productivity of the economy, it enhances raw materials for industries and export promotion thereby leading to more employment of labor from both the agricultural sector and the industrial sector, and eventually increase in NOE.

Objective 2: To investigate the role agriculture in the diversification of Nigerian economy.

It was found that non-oil revenue had a positive relationship with non-oil exports (NOE). This is in line with the result of most researches as seen in the works of A. A. Awe and S.O Ajayi (2009) where the authors found that non-oil revenue has a positive and significant impact on economic diversification in Nigeria and

Adesoye (2018) who concluded that agriculture productivity had positive impact on economic growth in Nigeria.

5.0 Conclusion and Recommendation

The research aimed at examining the role of agriculture in the diversification of the Nigerian economy during the period 1980-2016. In the empirical exercise, the Augmented Dickey-Fuller (ADF) unit root test for finding out the presence of unit root in all the variables, the Johansen's co-integration test to check for long-run relationship among the variables, as well as the vector error correction model and the ordinary least squares were employed. We found that there was the presence of long-run relationship between non-oil exports (NOE), government expenditure on agriculture (GEA), agricultural GDP (AGDP), and agricultural value added (AGV).

Estimation results indicate that non-oil revenue had a positive and significant relationship with non-oil exports while government expenditure on agriculture had a negative relationship but significant impact on economic diversification in Nigeria over the period of study.

The following recommendations were made from the findings thus:

Government should endeavor to increase agricultural productivity by improving its expenditure on the sector so as to enhance the growth of the economy. And given that agricultural output was found to have a positive relationship with non-oil exports (NOE) and given that agricultural sector is the major contributor to gross domestic products (GDP) in Nigeria, which is capable of changing social indicators of the economy, policies aimed at adequate financing of agricultural sector by government in order to boost its output should be vigorously pursued in order to create more job opportunities.

Government should intensify its efforts towards the diversification of the economy to increase its non-oil revenue given the

findings that non-oil revenue has a positive and significant impact on the economic diversification of Nigeria.

Moreover, the anticipated benefits from agricultural sector have been minimal in Nigeria. There is therefore an urgent need to revive the sector through sufficient

budgetary allocation, consistent policies and efficient utilization of allocated resources in order to guarantee poverty reduction, sustainable livelihood and enhanced food security which will lead to comprehensive agricultural development as well as economic diversification.

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Impact of Tax Revenue on Economic Growth in Nigeria (1981-2017)



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Abstract

The main objective of this research is to assess empirically the impact of tax revenue on economic growth in Nigeria, spanning from 1981 to 2017. It employs, time series data obtained from the CBN statistical bulletins, FIRS annual publications and National Bureau of Statistics (NBS) portal. To achieve the objectives of the study, OLS and ARDL techniques were employed to estimate the relationships and the dynamics and long-run effects of independent variables on dependent variable. ARDL bound test revealed that the variables are co-integrated while ARDL long-run estimation indicated that petroleum profit, value

added tax and government domestic debt are significant and positively related to GDP. In addition, company income tax and customs and excise duties came out significant but have negative impact on economic growth. Accordingly, the research recommends that, the government should intensify efforts towards increasing the collection of tax revenue, as low contribution of tax revenue to GDP was discovered over the period of the study. This can be done through blocking all loopholes in our tax laws as well as bringing more prospective tax payers into the tax net especially the informal sector.

KEYWORDS: Tax revenue, economic growth

JEL: E62, H2

1.0 Introduction

Effective tax administration is an issue as old as taxation itself. The balancing act between maximizing tax revenues and minimizing the impact on the populace in which the state must engage, was evident as early as 2350 BC. The responsibility shouldered by the government of any nation, particularly the developing nations, is enormous. The need to fulfil these responsibilities largely depends on the amount of revenue generated by the government through various means.

Taxation is one of the oldest means by which the cost of providing essential services for the generality of people living in a given geographical area is funded. Globally, governments are saddled with the responsibility of providing some basic infrastructures for their citizens. Taxation is a major source of government revenue all over the world and governments use tax proceeds to render their traditional functions, such as: the provision of roads, maintenance of law and order, defence against external aggression, regulation of trade and business to ensure social and economic stability (Appah & Eze, 2013).

The structure of Nigerian tax administration is in line with the system of government in operation. These include the three-tier system comprising the local government, state government and federal government structures. Each of these tiers of government is constitutionally saddled with administration of specific taxes, while the joint tax board oversees the whole system and resolve disputes (Akintoye and Dada, 2013). The Board of Inland Revenue administers the federally collected taxes through the Federal Inland Revenue Service (FIRS), while the board of State Internal Revenue Service administers the taxes collectible by the state government and the revenue committee administers taxes and levies collectible by the local governments (James and Moses, 2012).

Some of the challenges of Nigerian tax administration as highlighted by McPherson (2004) are; paucity of tax statistics, unethical practices (corruption), non-prioritization of tax efforts, poor administrative processes, multiplicity of taxes, economic structural problems which hinders effective implementation of taxes and the challenge of underground economy. This study is therefore intended to examine the impact of tax revenue on the growth of Nigerian economy.

The revenue accruing to the federal government of Nigeria from taxation over the years has remained grossly insufficient to meet the expanding social and public spending requirements in the country. In the opinion of Ayuba (1996), the tax system is grossly inefficient as it is characterized by tax evasion, avoidance and record falsifications, which have led to consistent low tax revenue inflow. Gross inefficiency and leakages have hampered the amount of revenue realized from tax sources over the years, which has been affecting the economy negatively. The inability of the Federal Inland Revenue Service Board to ensure total compliance with tax rules by

companies and bring all operational companies into the tax net has significantly limited the contribution of tax revenue to economic growth.

According to James and Moses (2012), the prevalence of tax evasion in the Nigerian tax system, has curtailed the amount of revenue collected from tax income, this in no doubt has effect on the government expenditure and inflation in the economy. Moreover, the revenue generation capacity of the nation's present tax administrative system is hampered by challenges such as paucity of data, inefficient monitoring and enforcement system, and corrupt practices (Leyira, Chukwuma, and Asian, 2012). These challenges have impeded the economic growth in Nigeria and accentuated by the resultant effect of companies closing down, hence, reducing the tax revenue of the Government.

Likewise, the problem associated with corruption and corrupt practices have eaten deep into this nation; therefore, the Nigerian tax justice is tainted with lack of transparency, unaccountability and inefficient administrative system, which on the other hand has a negative effect on the economic growth. Globally, a tax contribution of 20% to a nation's GDP is acceptable, however in Nigeria, tax contribution to GDP is about 0.7% (Iweala, 2013).

In this case, this research is designed to unravel the problem of low tax yield to Nigeria's economy and proffer immediate solutions. The problem of poor economic growth due to insufficient revenue collection from the non-oil tax sector and inefficient administrative framework by Federal Government of Nigeria were the major issues this research investigated. The immediate and remote causes or reasons for poor/little tax revenue contribution to economic growth (below expected), in Nigeria is therefore a

fundamental problem that must be solved if the Economic Recovery and Growth Plan (ERGP) 2020 would be realized.

Consequent from the problem mentioned above, the main objective of this research is to examine the impact of tax revenue collection by Federal Government on the economic growth in Nigeria. The specific objectives are to: ascertain the influence of Petroleum Profit Tax on economic growth in Nigeria; assess the impact of companies' income tax on economic growth in Nigeria; Examine the impact of customs and excise duties on economic growth in Nigeria; determine the impact of VAT on the economic growth and; to assess the impact of government domestic debt on economic growth in Nigeria.

The result of this study provides empirical evidence and contributes to the body of existing literature. Also, it would assist the government to block revenue leakages, harness greater revenue sources, and evolve an effective policy framework, which would guarantee quality tax administration and foster economic prosperity. It would guide the government on how to generate more income from tax so as to be less dependent on income from the volatile oil sector.

2.0 Review of Related Literature

2.1. Conceptual Issues

2.1.1. Concept of Taxation

According to World Bank (2000), taxes are compulsory transfer of resources to the government from the rest of the economy; it was also made known that no single tax structure can possibly meet the requirements of every country. The best system for any country should be determined taking into account its economic structure, its capacity to administer taxes, its public service needs, and many other factors. Nonetheless, one way to get an idea of what matters in tax policy is to look at what taxes exist around the world. This is with a view to meeting or

providing the common goods; taxation is required to finance public expenditure, as noted by (Miller and Oats 2006).

2.1.2. Concept of Revenue

The income of government through taxation is known as public revenue or public income. Public revenue can be defined in two ways viz: Narrow sense and Broader sense. In the narrow sense, public revenue includes income from taxes, price of goods and services, supplied by public sector undertakings, revenue from administrative activities such as fees, fines etc. In the broader sense public revenue includes all the income of the government during a given period of time, including public borrowing from individuals and banks. Income from public enterprises is known as public receipts (Stiglitz, 1999).

2.1.3. Concept of Economic Growth

Economic growth can be seen as the increase in the size of an economy between two time periods measured by the Gross Domestic Product (GDP). GDP is defined as the final value of all finished goods and services produced within a country's borders during a specific time period. It is calculated as the sum of private consumption, government expenditures, private capital investment and net exports at market prices in an open economy. The equation for GDP is shown below (Hanafi, 2016).

$$Y = C + I + G + NX$$

Where; Y is the total output (GDP), C represents private consumption, I represent investment expenditure, while G is the sum of government spending and NX is the total net exports which can be negative or positive depending on the balance of trade position, Economic growth is the basis of future standard of living and prosperity among different nations (Hanafi, 2016)

2.1.4. Nigerian Tax System

The Nigerian political environment embraces the federal system of governance; hence her fiscal operations adhere to the same principle, which has severe consequences on the tax management system in the country (Odusola, 2006). Government's fiscal policy is based on the three-tiered tax structure i.e. the Federal, State and Local Governments, each of which has different tax jurisdictions. They further state that in 2002, almost 40 different taxes and levies are distributed among all three levels of government (Enahoro and Olabisi 2012).

Odusola (2006) opined that avoidable complexity; distortion and largely inequitable tax laws that have limited application in the informal sector that dominates the economy characterize tax system in Nigeria. The Nigerian tax system has experienced remarkable variations in recent times. The Nigerian tax system is of multi activities, which include tax administration, tax laws, and tax policies (Adesola, 2004). Under current Nigerian law, the three tiers of Government enforce taxation, that is. Federal Government, State Government, and Local Government with each tier of government having its sphere clearly writing out in the Taxes and Levies (approved list for Collection) Act, 1998 (Abubakar, 2008).

2.2. Theoretical Framework

The economists have put forward many theories or principles of taxation at different times to guide the state as to how justice or equity in taxation can be achieved. The main theories or principles are as follows:

2.2.1. Socio Political Theory of Taxation

Ogbonna and Appah (2012) affirmed this reasoning and justify the imposition of taxes for financing state activities and for

the provision of a basis for apportioning the tax burden between members of the society. They advocated that, for a tax system, which is not designed to serve individuals but one that cures the ills of the society as a whole. The society is made up of individuals but is more than the sum total of its individual members; consequently, the tax system should be directed towards the health of the society as a whole, since individuals are integral part of the broader society (Chigbu, Ogbonna and Appah, 2012).

2.2.2. Benefits Theory

This assumes an exchange or contractual relationship between the state and the taxpayers, certain goods and services are provided by the state and the cost of such goods and services are contributed in the proportion of the received benefits, thus, the benefits received present the basis for distributing the tax burden in specific manner. This theory overlooks the possible use of the tax policy for bringing about economic growth or stabilization. The cost of service theory is very similar to the benefits-received theory. The theory emphasizes on semi commercial relationships between the state and the citizens to a greater extent. The implication according to Chigbu, et. al, (2012) was that, the citizens are not entitled to any benefits from the state and if they do, they must pay the cost thereof. In this theory, the costs of services are scrupulously recovered unlike the benefits-received theory where a balanced budget is implied (Chigbu et al, 2012).

This study therefore focuses on the socio-political and benefit theories which enables us to assess the extent to which the Nigerian tax system conforms to this scenario where the link between tax liability and economic benefits are linked. If applicable, such will enhance accurate tax

revenue projection and targeting of specific tax revenue sources given an ascertained profile of economic development. It will also assist in estimating a sustainable revenue profile there by facilitating effective management of a country's fiscal policy among others.

2.3. Empirical Literature

In achieving sustainable growth and development in the social and economic sectors of a country, the government must consider the trade-off involved in attracting Foreign Direct Investment (FDI) in terms of giving incentives and the impact of these on the country's sustainable growth or development. Tax is a fiscal instrument used to encourage or discourage specific production or consumption behaviors that affect the economic, environmental or social sustainability. The tax policies of a nation determine whether foreign direct investment would be attracted or not. If investors are brought into a country, it means that the investors will bring their stable and free capital, their technology, efficiency and contribution to nation's capital accumulation and job/wealth creation. Taxation also fosters a fair relationship between developed and developing countries so as to ensure that developing countries get a fair allocation of tax base and tax room in emerging trade relations (Adeyemi, 2012).

Haq-Padda and Akram (2011) used panel data from 3 South-Asian countries during the period of 1973 to 2008 and applying Multiple regression method to examine the impact of tax policies on economic growth

using data from 3 South-Asian economies and discovered that tax policies adopted by developing countries have no evidence that taxes permanently affect the rate of economic growth. The results of the study suggest that the neo-classical growth models best describe the relationship between output and the tax rate because a higher tax rate permanently reduces the level of output but has no permanent effect on the output growth rate.

In addition, Ariyo (2007) using time series data for the period of 1970 - 1990 and applying Ordinary Least Square (OLS) to evaluate the productivity of the Nigerian tax system has given the negative impact of persistent unsustainable fiscal deficits on the Nigerian economy for the period 1970-1990 to devise a reasonably accurate estimation of Nigeria's sustainable revenue profile. The results of his study showed a satisfactory level of productivity of the Nigerian tax system. The study therefore recommended an urgent need for the improvement of the tax information system to enhance the evaluation of the performance of the Nigerian tax system and facilitate adequate macroeconomic planning and implementation.

Furthermore, Jibrin, Blessing and Ifurueze (2012) using Ordinary Least Squares (OLS) method from the time series data to examine the impact of Petroleum Profit Tax on Economic Development in Nigeria for the period 2000- 2010. The finding revealed that Petroleum Profit Tax has a positive and significant impact on Gross

Variables	Label	Measure
<i>Economic growth</i>	<i>GDP</i>	<i>Index of quantity of output</i>
<i>Companies Income Tax</i>	<i>CIT</i>	<i>The rate of profit tax of company</i>
<i>Petroleum Profit Tax</i>	<i>PPT</i>	<i>The rate of petroleum profit tax</i>
<i>Customs and Excise Duties</i>	<i>CED</i>	<i>The rate of import and local product tax</i>
<i>Value Added Tax (VAT)</i>	<i>VAT</i>	<i>The rate of value added tax</i>
<i>Government Domestic Debt</i>	<i>GDD</i>	<i>Index of internal debt</i>

Source: Authors' computation

Domestic Product in Nigeria. The study therefore recommended that government should improve on the effectiveness and efficiency of the administration and collection of taxes with a view to increasing government revenue.

3.0. Data and Methodology

The study makes use of time series data for the period of 36 years (1981-2017) from secondary sources. The data used is drawn from Central Bank of Nigeria (CBN) statistical Bulletin, reports of Federal Inland Revenue Service (FIRS) and the National Bureau of Statistics (NBS) portal. The variables used in this study are; Gross Domestic Product (GDP), Company Income Tax (CIT), Petroleum Profit Tax (PPT), Custom and Excise Duties (CED), Value Added Tax (VAT) and Government Domestic Debt (GDD) represent dependent, independent and other control variable respectively.

The research employs quantitative analysis. This was done in four folds: first, the descriptive analysis, secondly diagnostic tests, thirdly correlation, fourthly trend analysis and lastly simple linear regression analysis was performed. A post estimation tests were also conducted to determine the reliability of the ARDL model specified and also Vector Error Correction Model VECM were also conducted.

The Igbasan (2015) model is adopted for this research. This is because its title of the relationship between tax revenue and

economic growth of Nigeria (1981-2015) is similar to the research topic of this paper. However, the model adopted is with modifications. This is because Igbasan (2015) model only employed GDP as Dependent variable and CIT, PPT, CED and VATS as Independent variable without any control variable. This paper included Government Domestic Debt (GDD) as a control variable. The model specification is as follows:

$$GDP_t = \beta_0 + \beta_1CIT_t + \beta_2PPT_t + \beta_3CED_t + \beta_4VAT_t + \beta_5GDD_t + \mu_t$$

Where:

- GDP = Gross Domestic Product
- CIT = Companies Income Tax
- PPT = Petroleum Profit Tax
- CED = Custom and Excise Duties
- VAT = Value Added Tax
- GDD = Government Domestic Debt
- β_0 = Intercept
- μ = Error term

4.0 Results and Discussion

This section of the analysis provides an overview on the data set while attempt is also made to describe the main attributes of the data. The descriptive analysis of the time series data obtained is done in two folds, namely: descriptive analysis of the raw data obtained in million naira is shown in Table 4.1.1.

4.1. Descriptive analysis

The table 4.1.1 below shows the summary of the data for better understanding of the variables

Table 4.1.1: Descriptive analysis of the raw data of variables in Naira (N'Million)

	GDP	PPT	CIT	CED	VAT	GDD
Mean	28218660	725879.7	243505.9	140785.6	1313475.	22834344
Median	4434231.	68574.00	33300.00	87900.00	199850.0	7940080.
Maximum	4.05E+08	3201319.	1384055.	601258.0	9723484.	1.20E+08
Minimum	94325.02	3747.000	403.0000	1616.000	7261.000	150000.0
Std. Dev.	69908304	991698.4	386254.8	162262.5	2827062.	33105975
Skewness	4.558487	1.188097	1.591963	1.487756	2.285899	1.639158
Kurtosis	24.86477	3.096137	4.294104	4.860597	6.414772	4.546923
Jarque-Bera	841.7809	8.718959	18.21031	18.98638	32.56200	20.25800
Probability	0.000000	0.012785	0.000111	0.000075	0.000000	0.000040
Sum	1.02E+09	26857548	9009718.	5209067.	31523396	8.45E+08
Sum Sq. Dev.	1.71E+17	3.54E+13	5.37E+12	9.48E+11	1.84E+14	3.95E+16
Observations	37	37	37	37	24	37

Source: Researchers' computation using E-view 9 software, 2019.

Table 4.1.1 shows the summary statistics of all the variables under study in their raw form. It shows the mean, maximum, minimum and standard deviations of all variables.

The skewness, kurtosis and Jarquebera statistics of all variables shown on Table 4.1.1 do not fully indicate the true nature of the data series since the probability value of Jarquebera statistics of all the series are shown to be less than the acceptable 0.05 for GDP, PPT, CIT, CED, VAT and GDD indicating non-normality of the series.

These average values were used in the determination of the contribution of each

form of tax revenue and domestic debt to GDP. Their respective minimum and maximum values are equally shown indicating variations over the years for the respective series, this is further shown in the trends of GDP and each of the independent variables provided.

The standard deviation values indicate the dispersion or spread in the data series. The higher the value, the higher the deviation of the series from its mean and the lower the value, the lower the deviation of the series from the mean. The variable with a higher degree of dispersion from the mean is the

Table 4.2.1a. Result of the Unit Root Test

Augmented Dickey-Fuller (ADF)				
Variable	Level		First difference	
	Constant	Constant& Trend	Constant	Constant& Trend
GDP	5.104618	3.149694	-0.662651	-3.920010**
PPT	-1.997112	-2.606310	-4.551081***	
CIT	-1.681409	-0.798932	-4.624966***	-4.816374
CED	-0.765298	-1.410034	-6.138460***	-6.091569
VAT	0.868839	-0.269318	-4.285855***	-5.021094
GDD	8.339228	3.666504	-0.465317	-3.777155**

***, ** and * significance at 1%, 5% and 10% respectively.

Source: Researchers' computation using E-view 9 software, 2019.

The result for unit root test of ADF shows that Petroleum Profit Tax (PPT), Companies Income Tax (CIT), Customs and Excise Duties and Value Added Tax (VAT) measured by their natural logarithm are stationary at first difference intercept, while Gross Domestic Product (GDP) measured by its natural logarithm and Government Domestic Debt (GDD) measured by its natural logarithm are stationary at first difference trend and intercept. This implies that the simple linear regression estimate is not the appropriate estimation technique as the series are in different order of integration, thus, bounds co-integration test and pair wise granger causality is performed and the results are shown in the next section.

Table 4.2.1b: Bounds Co-integration Tests Result

Since the series under review are in different order of integration as stated in the previous section, bounds co-integration test as proposed by Pesaran, Shin and Smith (2001) is conducted in this section

Table 4.2.1b allows for the bounds co-integration tests. The bounds test result on Table 4.2.1b shows that the f-statistic value of 27.98 is greater than the Critical Value Bounds for the upper bound I(1) at 10% level of significance, thus, there is co-integration as such there is long-run relationship between the dependent and independent variables

Test Statistic	Value	K
F-statistic	27.97985	5
Critical Value Bounds		
Significance	I0 Bound (lower bound)	I1 Bound (upper bound)
10%	2.08	3
5%	2.39	3.38
2.5%	2.7	3.73
1%	3.06	4.15

Source: Researchers computation using E-view 9 software, 2019.

4.2.1 Pair wise Granger Causality

To further confirm the nature and extent of relationship among the variables of the study, analysis of pair wise granger causality test was carried out using 2 lags period of each individual series.

There exist of none directional granger causality relationship between GDP and PPT, CED and VAT. This can be said that

there is no causal relationship running either from CIT, VAT and GDD to GDP. Similarly, there is causal relationship that running either from PPT to CIT or from VAT to PPT, or VAT to GDD. While also GDP does granger cause CIT and GDD; implying that causality relationship is unidirectional running only from GDP to CIT and GDD but it is not running back from them to CIT and GDD. Moreover, CED does granger cause PPT and GDP.

Table 4.2.1.c: Pairwise Granger Causality Test Results

Null hypothesis	Obs	F-statistic	P. Value
→ LGDP _____ LCIT	34	6.83693	0.0037
→ LGDP _____ LGDD	34	3.71443	0.0366
→ LPPT _____ LGDP	34	2.63156	0.0891
→ LCED _____ LGDP	34	4.84542	0.0153
→ LCED _____ LPPT	35	7.19528	0.0028

***, ** and * significance at 1%, 5% and 10% respectively.

Source: Researchers' computation using E-view 9 software, 2019.

4.2.2. The Impact of tax revenue on economic growth in Nigeria

To examine the effect of Tax revenue of Companies Income Tax (CIT), Value Added Tax (VAT), Petroleum Profit Tax (PPT), Customs and Excise duty (CED) and Government Domestic Debt (GDD) on the economic growth of Nigeria. In order to achieve the main objective of this study, two stages of analyses were performed, namely: diagnostic test and regression

analysis through Auto-Regressive Distributed Lag (ARDL) model. These are discussed as follows:

4.2.3 The ARDL Model Estimation Results

In order to perform this test, Auto-Regressive Distributed Lag (ARDL) model is estimated for the model.

This is shown on Table 4.2.3. The ARDL model estimation on

Table 4.2.3: Auto-Regressive Distributed Lag (ARDL) model

Variables	Coefficient	Std Error	t-Stat.	Prob.
Constant	10.42489	2.973750	3.505639	0.0049***
LPPT	0.184507	0.070044	2.634164	0.0232**
LPPT(-1)	0.180160	0.082888	2.173535	0.0525*
LCIT	-0.632571	0.214039	-2.955398	0.0131**
LCED	-0.815726	0.222900	-3.659604	0.0038***
LCED(-1)	-0.513702	0.189838	-2.706005	0.0204**
LVAT	0.412963	0.145102	2.846022	0.0159**
LVAT(-1)	1.157711	0.201237	5.752984	0.0001***
LGDD	0.519052	0.350514	1.480833	0.1667
LGDD(-1)	0.487897	0.307560	1.586348	0.1410
CointEq(-1)	-1.660610	0.110895	-14.974556	0.0000***
Cointeq = LGDP - (0.2200*LPPT -0.3816*LCIT -0.8019*LCED + 0.9474*LVAT + 0.6074*LGDD + 6.2883)				
Fixed regressors	Constant			
Number of models evaluated	22			
Selected Model	ARDL(1, 1, 0, 1, 1, 1)			
R ²	0.996445			
Adj. R ²	0.993214			
F-Statistic	308.3644			
Prob.(F-Stat)	0.000000*			
Durbin-Watson stat	2.668316			

Dependent Variable: Log(GDP) *significance at 5%

Source: Researchers' computation using E-view 9 software, 2019.

Table 4.2.3 above shows that in the Short run, Petroleum Profit Tax has a positive and significant impact on economic growth in the current year at 5% level of significance and also positive and significant at 10% at lag -1, this implies that an increase in PPT at current year by 1 will lead to increase in GDP by 18%. CIT has a negative and significant impact on economic growth at current year at 5%, this implies that an increase in CIT at current year by 1 will lead to decrease in GDP by 63%. CED has negative and significant impact on economic growth in

current year at 1%, and also was negative and significant at 5% at lag -1, this implies that an increase in CED by 1 in the current year will lead to decrease in GDP by 81% and also 51% at lag -1. VAT has a positive and significant impact on economic growth in the current year at 5%, and also have positive and significant at 1% at lag -1, this implies that an increase in VAT at current year by 1% will lead to increase in GDP by 41% and also 1.51% at lag -1. The result of GDD is not significant which means it has no impact on economic growth.

4.2.4. The speed of Adjustment

The speed of adjustment VECM met the three conditions: negative, less than one and statistical significant. The speed of adjustment is 1.66%. This implies that each year will be adjusting itself to reach long run equilibrium by 1.66%.

The long run regression estimate on Table 4.2.4a shows that Petroleum Profit Tax

(PPT) measured by Log (PPT), Value Added Tax (VAT) measured by log (VAT) and Government Domestic Debt measured by log (GDD) have positive effects on Gross Domestic Product (GDP) which is measured by Log (GDP). While Companies Income Tax (CIT) measured by log (CIT) and Customs and Excise Duties (CED) measured by log (CED) have negative and significant effects on GDP

Table 4.2.4a Long Run Estimation

Variables	Coefficient	Std Error	t-Stat.	Prob.
Constant	6.288291	1.522389	4.130540	0.0017*
LPPT	0.219967	0.061433	3.580607	0.0043*
LCIT	-0.381566	0.120486	-3.166894	0.0090*
LCED	-0.801911	0.141167	-5.680567	0.0001*
LVAT	0.947430	0.133602	7.091433	0.0000*
LGDD	0.607391	0.122090	4.974962	0.0004*

Dependent Variable: Log(GDP) *significant at 5%

4.3 Discussion

In order to achieve the objective of examining the effect of tax revenue on economic growth, the analysis was done in two stages, namely: diagnostic test and regression analysis. The result for unit root test of ADF showed on table 4.2.3 indicated that Petroleum Profit Tax (PPT), Companies Income Tax (CIT), Custom Excise Duties and Value Added Tax (VAT) measured by their natural logarithm are stationary at first difference intercept, while Gross Domestic Product (GDP) measured by its natural logarithm and Government Domestic Debt (GDD) measured by its natural logarithm are stationary at first difference trend and intercept. Thus, bounds co-integration test as proposed by Pesaran, Shin and Smith (2001) was conducted by estimating Auto-Regressive distributed Lag (ARDL) model. The bounds test result showed on table 4.2.1b indicated that the f-statistic value of 27.98

is greater than the Critical Value Bounds for the upper bound I(1) at 10% level of significance, thus, there is co-integration as such there is long-run relationship.

The result from the longrun estimation of the variables of this study is inconsistent with prior expectations as it was expected that all measures of tax revenue and domestic debt would have positive effect on GDP. Also, the coefficient of the independent variable shows that an increase in PPT, VAT and GDD by 1% will have 0.22%, 0.95% and 0.61% positive impact on the growth of Nigerian economy. An increase in revenue from CIT, CED by 1% will cause a 0.38% and 0.80% decline in GDP respectively.

Further, the R-square of the ARDL model on Table 4.2.3 showed that about 99% variations in GDP can be attributed to the proxies of tax revenue and government domestic debt, while the remaining 1% variations in GDP are caused by other factors not included in this model. This

shows a strong explanatory power of the model. This is further emphasized by the probability of the f-statistic of 0.000000, which shows that the regression result is statistically significant because this is less than 5% which is the level of significance adopted by the study.

The result shows that, the variable with a higher degree of dispersion from the mean is the Gross Domestic Product (GDP), this further explains its variations over the years under study. Their respective minimum and maximum values are equally shown indicating variations over the years for the respective series, this is further shown in the trends of GDP and each of the independent variables. The trend analyses further indicate that for the period under study, there has been consistent growth in the GDP and tax revenue. Specifically, there is a sharp increase in Gross Domestic Product (GDP) in 2009 following the period of global economic recession in 2008 and also, in 2016. The fluctuations in the global oil prices have affected the tax revenue associated to petroleum profit tax (PPT), this is evident in 2006, 2008, and 2014 showing indications of sharp decline in PPT in Million Naira. Also, Custom and Excise Duties (CED) declined in 2005 and 2007 due the federal government waiver policy for Dangote Nigeria plc.

Therefore, long run was estimated for the model which shows that Petroleum Profit Tax (PPT), Value Added Tax (VAT) and Government Domestic Debt (GDD) have positive effects on Gross Domestic Product (GDP), while Companies Income Tax (CIT) and Customs and Excise Duties (CED) have negative effects on GDP. It has been observed that the result of multiple regression analysis indicates that some sources of tax revenue have a negative effect on GDP, although this is not the result of their simple linear regression estimates. For instance, Companies Income Tax (CIT) and Custom and Excise Duties (CED) have negative effects on GDP when combined with other sources of tax revenue, this is in line with the result of

Chigbu and Njoku (2015); Ebiringa and Emeh (2012); Ibadin and Oladipupo (2015); Okoli, Njoku, and Kaka (2012). This implies that some sources of tax revenue in Nigeria such as CIT and CED have not contributed positively to economic growth of this nation over the period of study.

5.0 Conclusions and Policy Recommendation

Findings from this study provide insight into the impact of tax revenue on economic growth. It further provided an insight as to the extent to which each of the independent variables affects the dependent variable. There is evidence of co-integration among the variables. Petroleum Profit Tax, Value Added Tax and Government Domestic Debt have positive and significant impact on economic growth, this implies that increase in the proceeds from these taxes will boost economic growth. While Company Income Tax and Customs and Excise Duties have negative and significant impact on economic growth. This implies that increase in tax from these two sources will result to a fall in the level of economic growth in Nigeria.

Based on the findings and conclusions of this study, the following recommendations are made:

1. Efforts should be intensified by the government towards increased collection of PPT and VAT; this is due to the contribution of both PPT and VAT revenue to GDP over the period of study. This can be done through blocking all loopholes in our tax laws as well as bringing more prospective tax payers into the tax net.
2. There should be stringent penalty imposed on any individual or corporate body who indulges in any form of tax malpractices irrespective of states, if the positive correlation between tax revenue and economic growth should be maintained.
3. Government through Federal Inland

- Revenue Service should create an effective and reliable data base for every citizen to minimize (if not eliminate) the incidence of tax evasion and there should be constant training and re-training of VAT administrators through seminars, conferences to keep them abreast with the modern trends in tax administration. This is because as shown in the result, in the long run VAT has a positive effect on the GDP.
4. Government should also be able to use taxpayers' monies in the provision of infrastructural facilities. This will in no doubt boost the morale of the citizenry towards tax payment.
 5. Staff of Tax Authorities should be adequately motivated in order to enhance revenue generation and improve the percentage of tax revenue to GDP to march the world expected rate of 20%, instead of 8.67% recorded in this study.
 6. There should be constant review of existing tax laws just as it is done in the United State of America and other advanced economics, so as to keep the act in pace with the economic reality. As the result of this study has shown that in the long run, Companies Income Tax (CIT) and Custom Excise Duties (CED) do not contributed positively to economic growth of this nation.
 7. Federal government should increase the monitoring of Nigerian Custom Service on Customs and Excise duties remitted in order to correct the negative impact that has on economic growth from this study.
 8. It is important to monitor the negative impact of taxes on aggregate supply and aggregate demand if the impact on economic growth (GDP) is the focus. We are aware that taxes can be used to discourage production and consumption with resultant declining impact on GDP.

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Impact of Monetary Policy on Inflation Rate in Nigeria: Vector Autoregressive Analysis



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ABSTRACT

The Nigerian monetary authorities have implemented several monetary management policies with the aim of achieving price stability and economic growth in the country, but without success. This study was conducted to examine the impact of monetary policy management on inflation in Nigeria during the 1985- 2019. Autoregressive distributed lag analysis was employed on time series data covering the period. It was found that while monetary policy rate and foreign exchange rate impacted negatively on inflation; broad money supply impact positively on it. Therefore, the study recommended that monetary authorities should fix the

exchange rate at where the value of naira will rise. Besides, government should direct more investment on productive activities in other to increase output of goods and services in the country. This will lead to a fall in inflation rate and hence economic growth in the country.

KEY WORDS: Broad Money supply, Economic growth, Foreign Exchange Rate, Inflation Rate, Monetary Policy Rate.
JEL Classification: E52 C01 C22

1.0 Introduction

The core idea of monetary policy has been construed to mean price stability at the expense of other key performance indicators like economic growth that culminates to job creation which measures the growth performance of a nation, stable broad money supply as well as prime lending and exchange rates which determine financial sector's stability in an economy . This is why the main objective of monetary policy in Nigeria has been to ensure price and monetary stability. This is achieved mainly by causing savers to avail investors of surplus funds for investment through appropriate interest rate structures; stemming wide fluctuations in the exchange rate of the naira; proper supervision of banks and related institutions to ensure financial sector soundness; maintenance of efficient payments system; application of deliberate policies to expand the scope of the financial system so that domestic economies, which are largely informal, are financially included. Financial inclusion is particularly important in the sense that the larger it is, the larger is the interest rate sensitivity to production and aggregate demand and the more effective monetary policy is in stabilizing prices (Mbutor, 2010).

Consequently, the effectiveness of monetary policy in taming inflationary trends in developing economies such as the Nigerian economy has been in doubt although appreciable progress has

been made in this regard since the introduction of various financial sector reform programs in 1986. Goshit (2006) undertook a theoretical examination of the causes of financial sector's instability in Nigeria and its implications for the development of the economy and reported that ensuring a sound and stable financial sector has been a difficult task for the monetary authorities. This is due to rapid financial sector liberalization, loose monetary policy and excessive fiscal spending, banking malpractice, undue political interference in banking operations, as well as, poor internal governance of the financial institutions. This study views an effective monetary policy as the major tool of enhancing financial sector's stability in Nigeria through the stabilization of prices. Thus, the Nigerian monetary policy framework has continued to face several challenges. No wonder, the CBN is increasingly focusing more on the aspect of price stability, recognizing its relevance in macroeconomic stability for sustainable output and employment growth. In contrast, economists have disagreed, about whether price stability and money supply should be the central objective of macroeconomic policies or whether these policies should serve broader monetary policy goals (Nwosa et al, 2011).

For Nigeria and other developing countries, growth policies are better delivered as full packages since fiscal and monetary policies are inextricable, except in terms of the instruments and implementation authorities. However, monetary policy appears more potent in correcting short-term macroeconomic maladjustments because of the frequency in its application and altering the policy tools, relative ease of its decision process and the sheer nature of the sector which propagates its effect to the real economy – through the financial system. This is why investigating the effectiveness of monetary policy under market mechanisms in controlling inflation in the Nigerian economy is relevant.

Since mid-1980s, inflation has become so serious and contentious a problem in Nigeria and other developing economies. Though inflation rate is not new in the Nigerian economic history, the recent rates of inflation have been a cause of great concern to many. During the period under review (1985–2017), there has been a dwindling trend in the inflationary rates leading to major economic distortions. The continued over valuation of the naira in 1980s, even after the collapse of the oil boom engendered significant economic distortions in production and consumption as there was a high rate of dependence on import which led to balance of payment deficits. This resulted into taking loans to finance such deficits. An example was the Paris Club loan, which was a mere \$5.39 billion in 1983 and subsequently rose to \$21.6 billion in 1999 (CBN 2001).

The Economic Recovery Emergency Fund of 1986 where one percent of workers' salaries was deducted monthly to build the funds was meant to curb inflationary trends in Nigeria. This gradually and greatly reduced the purchasing power of the working class. But the policy measures failed as the prices of goods and the profits of corporate bodies were not controlled. Therefore, as prices rose, the labor unions agitated for higher wages, resulting in further higher prices (Agba, 1994). The factors behind the unsatisfactory performance of monetary policy management and economic growth in Nigeria can be explained within the purview of domestic and external factors. In the domestic front, there has been the problem of corruption, poor governance, mismanagement of resources, and bank failures have led to inadequate funds for productive sectors, in particular manufacturing sub-sector, leading to poor performance, which has worsened the Nigerian economic performance. In the external front, there has been the problem of consistent fall in exchange value of naira as a result of excess importation of manufactured goods over exportation.

leading to dwindling foreign exchange earnings for Nigeria and hence her inability to finance economic growth programs and to import the needed raw materials and technologies that could be used to quicken the pace of economic growth towards fighting inflation in Nigeria. It is against this background this study was designed to examine the impact of monetary policy on inflation in Nigeria during the 1985-2019. The paper is divided into five sections. Section 1 is the introduction. Section 2 deals with literature review, including conceptual and theoretical review, and theoretical framework as well as empirical review. Section 3 contains methodology and data. Section four is concerned with data presentation and interpretation of results. Finally, conclusion and recommendations are contained in section 5.

2.0 Literature Review

2.1 Conceptual and Theoretical Review

Monetary policy is a deliberate action of the monetary authorities to influence the quantity, cost and availability of money and credit to achieve desired macroeconomic objectives of internal and external balances (CBN, 2011). Sani et al (2012) defined monetary policy as the combination of measures taken by monetary authorities (e.g. the CBN and the Ministry of Finance) to influence directly or indirectly both the supply of money and credit to the economy and the structure of interest rate for economic growth, price stability and balance of payments equilibrium.

By definition, inflation is a persistent and appreciable rise in the general level of prices (Jhingan, 2002). Not every rise in the price level is termed inflation. Therefore, for a rise in the general price level to be considered inflation, such a rise must be constant, enduring and sustainable. The rise in the price should affect almost every commodity and should not be temporal. But Dernburg and McDougall (1980)'s definition is more

explicit referring to inflation as a continuing rise in prices as measured by an index such as the Consumer Price Index (CPI) or by the implicit price deflator for Gross National Product (Jhingan 2002). Thus, a practical definition of inflation would be persistent increase in the general price level at a rate considered too high and therefore unacceptable (Hameed, 2010).

There are three approaches to measure inflation rate. These are the Gross National Product (GNP) implicit deflator, the Consumer Price Index (CPI) and the producer price index (PPI). The period to period changes in the two latter approaches (CPI and PPI) are regarded as direct measures of inflation. There is no single-one of the three that rather uniquely best measures inflation. The Consumer Price Index (CPI) approach, though it is the least efficient of the three, is used to measure inflation in Nigeria as it is easily and currently available on monthly, quarterly and annual basis (CBN, 1991). This study views inflation as a function of monetary policy. This means that keeping inflation at tolerable level depends on the effectiveness of monetary policy.

Monetary policy is the macroeconomic policy laid down by the central bank. It involves management of money supply and interest rate and it is the demand side economic policy used by the government of a country to achieve macroeconomic objectives like inflation, consumption, growth and liquidity (The Economic Times, 2018). All central banks have three tools of monetary policy in common. Most have many more. They all work together in an economy by managing bank reserves.

The monetary authorities have six major tools of monetary management. First, it sets a reserve requirement, which tells banks how much of their money they must have on reserve each night. If it weren't for the reserve requirement, banks would lend 100 percent of the money you've

deposited. Not everyone needs all their money each day, so it is safe for the banks to lend most of it out. The CBN requires that banks keep a certain percent of deposits on reserve. That way, they have enough cash on hand to meet most demands for redemption. For instance, when the Fed wants to restrict liquidity, it raises the reserve requirement. The Fed only does this as a last resort because it requires a lot of paperwork. It's much easier to manage banks' reserves using the Fed funds rate. This is the interest rate that banks charge each other to store their excess cash overnight. The target for this rate is set at the eight annual Federal Open Market Committee meetings. The Fed funds rate impacts all other interest rates, including bank loan rates and mortgage rates.

The Fed's third tool is its discount rate. That's how it charges banks to borrow funds from the Fed's fourth tool, the discount window. The FOMC sets the discount rate a half-point higher than the Fed funds rate. The Fed prefers banks to borrow from each other. Fifth, the Fed uses open market operations to buy and sell Treasury and other securities from its member banks. This changes the reserve amount that banks have on hand without changing the reserve requirement. Sixth, many central banks use inflation targeting to manage monetary policy. It clearly sets expectations that they want some inflation. The Fed's inflation goal is 2 percent for the core inflation rate. People are more likely to buy if they know prices are rising. In addition, the Federal Reserve created many new tools to deal with the 2008 financial crisis. These included the Commercial Paper Funding Facility and the Term Auction Lending Facility.

Economic growth is defined in Business Dictionary (2001) as increase in a country's productive capacity as measured by comparing gross domestic product (GDP) in a year with the GDP in the previous year. Increase in capital stock, advances in technology and improvement

in the quality and level of literacy are considered to be the principal causes of economic growth (Faridi, 2012). According to Dernburg and McDougall (1980) and Jhingan (2002) economic growth is the growth of the potential output of an economy as a result of expansion in stock of capital and in labour force as well as improvement in the productivity of both labour and capital. It is related to a quantitative sustain increase in a country's per- capital output accompanied by expansion in its labour force, consumption, capital and volume of agricultural trade. It is important to state that no individual(s) or country can export what it did not produce.

2.2 Theoretical Framework

This study is situated on the famous quantity theory of money propounded by Fisher (1911). The theory in its simplest form depicts that changes in the stock of money supply will be translated into equi-proportionate change in the general price level (inflation rate). This is based on the assumption that at full employment, the level of transaction (national output) and velocity is constant, or at least change slowly (Adenuga et al, 2000). Thus, inflation will be directly proportional with the quantity of money stock. The starting point of the quantity theory of money is the popular identity:

$$MV=PY \dots\dots\dots(2.1)$$

Where M = money supply, V = velocity of money in circulation, Y = real national output, and P = aggregate price level. From equation 2.1, we can derive another equation as follows:

$$P=MV/Y \text{ or } V=PY/M \dots\dots\dots(2.2)$$

Sequel to the above, the proportional relationship between the money stock and general price level (inflation) can be shown in the elasticity of the price level with respect to the money supply is:

$$E_{pm}=\partial P/\partial M.M/P \dots\dots\dots(2.3)$$

$$\text{Differentiating equation 2.1 totally yields: } M\partial V+V\partial M=P\partial Y+Y\partial \dots\dots\dots(2.4)$$

But Y and V are constant at full

employment, i.e. change in Y and V is zero at full employment. Thus, equation 2.4 yields:

$$V\partial M = Y\partial P \text{-----(2.5)}$$

$$\partial P / \partial M = V/Y \text{-----(2.6)}$$

Substituting equation 2.6 into equation 2.3 yields:

$$E_{pm} = V/Y \cdot M/P \text{-----(2.7)}$$

From equation 2.2, $V = PY/M$. Substituting this into equation 2.7 yields:

$$E_{pm} = 1/Y \cdot PY/M \cdot M/P = 1 \text{-----(2.8)}$$

Equation 2.8 above depicts that there is a direct proportional relationship between the general price level (inflation) and the growth rate of money supply, when velocity and output are constant. That is, in a regression of inflation on money supply growth, the coefficient of money is expected to be unity (1). The proportional relationship imply that a permanent increase in money growth leads to an equal increase in the rate of inflation (general price level).

2.3 Empirical Review

Inflation is one of the most important economic variables that can distort economic activities of any country. As a result, there exist a large number of empirical studies on the determinant of inflation. Khan and Schimmelpfennig (2006) examined the relative importance of monetary factors and structural list supply-side factors for inflation in Pakistan. A stylized inflation model is specified that includes standard monetary variables (money supply, credit to the private sector), exchange rate, as well as wheat support price as a supply-side factor that has received considerable attention in Pakistan. The model is estimated for the period January 1998 to June 2005 on a monthly basis. The results indicate that monetary factors have played a dominant role in recent inflation, affecting inflation with a lag of about one year. Changes in the wheat support price influence inflation in the short run, but not in the long run. Furthermore, the wheat support price matters only over the medium term if accommodated by monetary policy.

Amarasekara (2009) examined the impact of monetary policy on inflation and economic growth in Sri Lanka. The impact of money supply growth, changes in exchange rate and interest rate on inflation and economic growth was analyzed using a vector autoregressive (VAR) framework with two lags. The study adopted a quarterly, seasonally adjusted data from 1978 to 2005 on variables such as interest rate, money supply, inflation and real GDP in Sri Lanka. Results from the study indicated that inflation in Sri Lanka does not fall after contractionary changes in monetary policy. Furthermore, inflation reduced immediately exchange rate appreciated and the rate of interest also rose following a contractionary reserve shock.

Dagher and Kovanen (2011) analyses the stability of the money demand function in Ghana using bounds testing procedure developed by Pesaran et al, (2001). They estimated an Auto-Regressive Distributive Lag (ARDL) model which includes changes in broad money, its own lags, current and lagged values of the explanatory variables. The explanatory variables include income, exchange rate, deposit rate, TB rate, US TB rate, and the US libor rate. They find that the TB rate, US TB rate and the Libor rate have no significant impact on the demand, while income and exchange rate were found to have significant effects. Specifically, they found that depreciation increases money demand as is the increase in incomes. Furthermore, they found a faster convergence of the ECM to equilibrium once there is a misalignment. Using a CUSUM and CUSUM squares test on the residuals of the ECM model, they found that the money demand was stable.

Lungu et al, (2012) examined the behavior of the demand for money in Malawi for the period 1985 to 2010. Specifically, they sought to tackle two objectives: to estimate a demand for money function; and to test for the stability of the money demand function. Their model include real money

balances, real GDP, inflation, TB rate, exchange rate, and a measure of financial depth. The model estimates showed that short-run dynamics are mainly driven by lagged money balances, prices and financial innovation. However, their results showed that the exchange rate, income and TB rate were not significant. The error correction term was negative and significant, implying that variables return to equilibrium after a shock. Using characteristic roots, they found that the estimated VECM was stable.

Gul et al, (2012) studied how monetary instruments influence macroeconomic variables such as, inflation, interest rate, real GDP, exchange rate and money supply in Pakistan. OLS was used to analyse and explain the relationship between the above mentioned variables. Secondary source of data from 1995 to 2010 was used. Results from the study showed that money supply has a strong positive correlation with inflation but negative correlation with output. Exchange rate also has a negative impact on output in Pakistan. A tightening monetary policy is expected to reduce inflation, but in the case of Pakistan, a positive interest rate shock (contractionary monetary policy) led to an increase in price level.

Asuquo (2012) investigated the impact of monetary policy on price stability in Nigeria. He examined shocks in monetary policy and its responses on inflation, market interest rate and exchange rate. Monetary policy rate was used as a proxy for monetary policy indicators. Secondary data were collected from December 2006 to February 2012. 2006 was chosen because it was when the monetary policy rate was introduced. Structural VAR framework was used to estimate the model. Results from the study revealed that market interest rate and exchange rate were more responsive to shocks in monetary policy rate than inflation in Nigeria. Furthermore, expected changes in inflation cannot be guaranteed by variations in the monetary policy rate.

Other instruments, mainly, reserve requirements and open market operations used along with the monetary policy rate can effectively reduce inflation in Nigeria. Ahiabor (2012) focused mainly on the effect of monetary policy on inflation in Ghana. Variables such as interest rate, inflation, money supply and exchange rate were studied. The research adopted secondary data source from 1985 to 2009 and critically analysed the variables quantitatively. Findings from the study confirmed a theoretically expected long-run positive correlation between inflation and money supply, an inverse relationship between inflation and interest rate, as well as, a positive relationship between inflation and exchange rate in Ghana.

Ogunsakin & Awe (2014) investigates the impact of financial sector reforms on the stability of the money demand function in Nigeria. They estimate a parsimonious error correction model (ECM) which include real broad money balances; inflation; exchange rate; foreign interest rates; savings deposit rate; Treasury bill, and a dummy for post-liberalisation era. They find that the significant determinants for money demand in Nigeria are inflation, foreign interest rates, Treasury bill rate; savings deposit rate and real GDP. A test for the stability shows that the demand for money function remained stable despite the reforms, implying using of monetary targets is still relevant.

Quartey and Afful-Mensah (2014) reviewed recent monetary and financial policies pursued, as well as, the possible inter-relationships in Ghana. They posited that any effective monetary policy should be accompanied by fiscal discipline to ease monetary difficulties associated with huge budget deficits. Data on money supply, exchange rate, inflation and lending rates were compiled from Ghana Statistical Service and Bank of Ghana Statistical Bulletin from 1997 to 2012. The study concluded that the key monetary indicators improved during the period of study. However, fiscal imbalance in the

country has restricted the results. In Nigeria, Oyejide (1972) study constituted a pioneering attempt at providing an explanation of the causes of inflation in Nigeria, most especially from the structuralists' perspective. Specifically, the study examined the impact of deficit financing in propagating inflation processes in Nigeria and concluded that there was a very strong direct relationship between inflation and the various measures of deficit financing that were in use between 1957 and 1970. In a commissioned study for the Productivity, Prices and Incomes Board of Nigeria, Ajayi and Awosika (1980) found that inflation in Nigeria is explained more by external factors, most especially the fortunes of the international oil market and, to a limited extent, by internal influences. It is therefore imperative to investigate the effectiveness of monetary policy in taming inflation as a means of preventing both external and internal influences of inflation in the Nigerian economy.

The effectiveness of monetary policy in controlling inflation in Nigeria was examined by Ngerebo (2016). Relationship among variables such as inflation, savings rate, monetary policy rate, prime lending rate, maximum lending rate, treasury bill rate, growth of narrow money supply, net domestic credit, growth of broad money supply, net credit to government and credit to private sector were analysed and tested using OLS. Secondary source of data from 1985 to 2012 was collected from the Statistical Bulletin of the Central Bank of Nigeria. The study revealed that monetary policy rate, maximum lending rate, prime lending rate, net domestic credit and treasury bill rate were not statistically significant, while growth of broad money supply, credit to private sector, growth of narrow money supply, savings rate, net credit to government were statistically significant in explaining how they affect inflation in Nigeria. The findings indicated that some monetary policy instruments in Nigeria are effective in managing inflation, while

others are not.

3.0 Methodology and Data

This study adopted ex-post facto method to investigate the effect of monetary policy on inflation rate in Nigeria during the 1985-2019. To achieve this, the paper used secondary data on included variables and the techniques of autoregressive distributed lag (ARDL) to carry out the analysis. The data were subjected to various data treatment methods before being used for estimating the model. The estimated model would also be subjected to statistical and econometric tests like t-test, goodness of fit, F-test and Durbin-Watson test to determine its policy implications.

To capture the impact of monetary policy on economic growth in Nigeria, Fisher's (1911) model was applied in this study. The model states that the short-run monetary control is dictated by interest rates, which were sticky, but in the long-run the demand for money influence was real cash balance. Fisher further assumed that the rise in commodity prices would precede the increase in interest rate which was regarded as main channel of the firms operation cost. The model is specified as:

$$MV=PT.....(3.1)$$

Where M is the actual money stock, V is the transaction velocity of circulation of money, P is the average price level and T is the number of transactions made per the period. Fisher imposed the assumption that the equilibrium values of V and T will be fairly constant in the short-run and invariant with respect to change in the quantity of money.

Given the assumption, equation (3.1) can be re-written as:

$$Mv=Pt.....(3.2)$$

Where: v and t are constants. Given that M is exogenous, there must be proportional relationship in equilibrium between money supply (M) and the general price level (p). The quantity theory of money was employed by (Okafor, 2009 and Nasko, 2016), with a simple growth model. It is

based on the link between the stock of money (M) and the market value of output that it finances (PY), where P is the price level and Y is the output. M is related to P with a factor of proportionality k, the relationship is given by:

$$M=kPY \dots\dots\dots(3.3)$$

$$M/p=KY \dots\dots\dots(3.4)$$

K is assumed to be constant Equation (3.4) can actually be written as:

$$MV=PY \dots\dots\dots(3.5)$$

Where $V= 1/k$ and this is the income velocity of money, the ratio of money income (nominal GDP) to the number of times the stock of money turns over in a given period in financing the flow of nominal income. Therefore, V is a useful concept in monetary policy making.

Equation (3.3) can be written in growth form as:

$$M= P+ Y- V \dots\dots\dots(3.6)$$

If V is constant then $V=0$ so that equation (3.6) yields:

$$M= P+ Y \dots\dots\dots(3.7)$$

Given the technical output of the economy in line with the Cobb-Douglas (1928) and Barro (1990) as:

$$Y= (A\alpha K\beta) \dots\dots\dots(3.8)$$

Where:

Y = Gross Domestic Product (determinant of economic growth)

L = Labour input

K = Capital input

A = Efficiency parameter

α = Contribution of each worker to GDP

β = Contribution of each unit of capital to GDP, and $\alpha + \beta = 1$, implying constant return to scale. Or alternatively, total output (Y) is the sum of sectoral output or a function of sectoral input. Therefore:

$$Y = P + G \dots\dots\dots(3.9)$$

That is,

$$Y = P (Lp + Kp) + g (Lg + Kg) \dots\dots\dots(3.10)$$

Similarly:

$$Y = LT + KT + G \dots\dots\dots(3.11)$$

This is the theory upon which the model for this study is built.

Following studies by (Quartey and Afful-Mensah, 2014; and Ngerebo, 2016), we modify equation (3.8) as follows:

$$A=h (MPR_{t-1}, BMS_{t-1}, FER_{t-1}) \dots\dots\dots(3.12)$$

Where:

MPR= Monetary Policy Rate;

BMS=Broad Money Supply;

FER= Foreign Exchange Reserves;

Then by substituting Equation (3.12) into Equation (3.8), we arrive at the following extended form:

$$Y_t = f(MPR_{t-1}, BMS_{t-1}, FER_{t-1}, Y_{t-1}, L_t) \dots\dots(3.13)$$

Since Cobb-Douglas (1928) model that was adopted in this study is an optimisation model, it is suitable for application in Nigeria. The regression form of the model is stated in a linear form as:

$$Y = \beta_0 + \beta_1 MPR_{t-1} + \beta_2 BMS_{t-1} + \beta_3 FER_{t-1} + b_4 Lt + U_t \dots\dots\dots(3.14)$$

Equation (3.14) was adjusted by dropping labour force (Lt) and replacing output (Yt) by inflation rate (INft). Thus, the linear model stated in the log form becomes:

$$\ln INft = \beta_0 + \beta_1 \ln MPR_{t-1} + \beta_2 \ln BMS_{t-1} + \beta_3 \ln FER_{t-1} + U_t \dots\dots\dots(3.15)$$

Where:

ln= Logarithm;

INft = Inflation Rate at time t;

MPRt-1= Monetary Policy Rate at time t-1;

BMS t-1= Broad Money Supply at time t-1;

FERT-1= Foreign Exchange Rate at time t-1;

β_0 = Intercept of the regression model;

$\beta_1 - \beta_3$ = Coefficients of the explanatory variables to be estimated; and

U = Error term.

It is expected that $\beta_0, \beta_1, \beta_2,$ and $\beta_3 > 0$

The data used for this study were from secondary sources- the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Journals, the internet and other documentary sources. The data which covered the period 1985-2019 were sourced on the relevant variables used in the study as identified in equation (3.15). The reasons for choosing these variables were also adduced earlier in the section, while the choice of the period of the study is due to the fact that it witnessed quite a number of financial sector reforms geared towards the realisation of monetary policy targets. Before estimation, we will determine whether the variables are stationary or not. This will determine the underlying properties of process that

generate our time series data. In addition, the Augmented Dickey-Fuller (ADF) t-test shall be used to determine the order of integration.

Quantitative method of analyses was employed to assess the effectiveness of monetary policy in controlling inflation in Nigeria. Thus, the Augmented Dickey Fuller Unit Root Test was used to determine the stationary state of the data series. Granger Causality Test was employed to determine the causal relationship between monetary policy and inflation, while vector auto regressive (VAR) technique was adopted in carrying out the analysis.

To avoid misleading results, it is important to first determine the stationary state of the data for the study.

The models used for the test of the inflation data series (INF) are in the following forms:

$$\Delta INF_t = \alpha_1 + U_{1t} \dots \dots \dots (3.16)$$

$$\Delta INF_t = \beta_{1t} + \alpha \Delta INF_{t-1} + U_{2t} \dots \dots \dots (3.17)$$

$$\Delta INF_t = \beta_{1t} + \beta_{2t} + \alpha \Delta INF_{t-1} + U_{3t} \dots \dots \dots (3.18)$$

Where, t is the time/trend variable, α is the co-efficient of unit root, Δ is the rate of change in inflation and the U's are the error terms. The difference between equation (3.16) and the other last two equations lies in the inclusion of the constant (intercept) (β_{1t}) and the trend (β_{2t}). Note that the stationary state of the other variables or data series were also tested using similar models. In each case the null hypothesis is

that $\alpha=0$, which is the same as saying that there is a unit root.

The Granger technique (Granger, 1969; Gujarati, 2004) has been adopted to determine the direction of causal relationship between monetary policy and inflation in Nigeria. Granger proposed that for a pair of linear covariance stationary time series X and Y; X causes Y if the past values of X can be used to predict Y more accurately than simply using the past values of Y. Formally, X is said to cause Y if $\sigma^2_1(Y_t: Y_{t-j}, X_{t-i}) < \sigma^2_2(Y_t: Y_{t-j})$, where σ^2 represents the variance of forecast error and $i, j = 1, 2, 3, \dots, k$.

The Granger causality test requires the use of F-statistic to test whether lagged information on a variable say "Y" provides any statistical information about another variable "X"; if not, then, "Y" does not Granger cause "X".

Notably, the vector auto regressive distributed lag (VAR) Technique of regression was used to determine the impact of monetary policy on inflation in Nigeria. Although the VAR analysis deals with the dependence of one variable on other variables, it does not imply causation-that is, it is assumed that the variables in question are not bilaterally related, the independent variables are not collinear, and the disturbance terms are normally distributed and not serially correlated. Thus, the VAR technique is suitable because of its simplicity and the validity of its assumptions.

The unit root result in table 4.1 showed that inflation is stationary at level (0). This is

DATA PRESENTATION AND INTERPRETATION OF RESULTS

Table 4.1: Unit Root Test Result

Variable	ADF Stat.	Critical Values (5%)	Order of Integration
INF	-3.70	-3.59	I(0)
MPRt-1	-5.43	-2.99	I(1)
BMSt-1	-4.24	-2.99	I(1)
FERt-1	-3.31	-2.99	I(1)

Source: Author's computation, 2020, using E-View 10.0

because the ADF statistic (-3.70) in absolute terms is greater than the critical value (-3.59) at 5% level of significance. The result further indicated that MPR, BMS and FER were stationary only after first differencing at 5% level of significance.

Therefore, the unit root result suggests that MPR, BMS, and FER have a short-run effect on INF in Nigeria.

Table 4.2: Pairwise Granger Causality Test Result

Null Hypothesis	Obs	F-Statistic	Prob	Decision
MPR does not granger Cause INF	35	0.07919	0.11699	Reject Ho
INF does not Granger Cause MPR	35	2.09381	0.14820	Accept Ho
BMS does not Granger Cause INF	35	0.29150	0.46622	Reject Ho
INF does not Granger Cause BMS	35	2.12826	0.88031	Accept Ho
FER does not Granger Cause INF	35	0.20635	0.63498	Reject Ho
INF does not Granger Cause FER	35	1.90700	0.17338	Accept Ho

Source: Author’s computation, 2020, using E-View 10.0;

Note: $\alpha=0.05$ level of significance, $F_{\alpha}=4.28$
 The Granger causality test result in table 4.2 showed that a uni-directional relationship exists between INF and MPR running from MPR to INF and not from INF to MPR. This implies that monetary policy rate Granger-Cause inflation rate, but inflation rate does not Granger-Cause monetary policy rate in Nigeria within the study period-all at 5% level of significance. However, the result further revealed that independence is suggested between BMS

and INF, as well as, between FER and INF at 5% level of significance.

Table 4.3: Ordinary Least Squares Result

Dependent Variable: LOG(INF)
 Method: Least Squares
 Date: 03/02/20 Time: 10:27AM
 Sample: 1985-2019
 Included observations: 34
 Excluded observations: 1

Variable	Coefficient	Std Error	t- statistic	Prob
C	3.494137	2.674680	1.306376	0.2049
LOG(MPRt-1)	0.050506	0.553355	0.091272	0.9281
LOG(BMSt-1)	0.072683	0.201844	0.360098	0.7222
LOG(FERt-1)	-0.096031	0.285886	-0.335907	0.7401
R-squared	0.342409		Mean dependentvar	2.723447
Adjusted R-squared	0.222847		S.D. dependentvar	0.759643
S.E. of regression	0.669673		Akaike info criterion	2.201522
Sum squared resid	9.866170		Schwarz criterion	2.441492
Log likelihood	-24.72055		F-statistic	2.863860
Durbin-Watson stat	1.345957		Prob(F-statistic)	0.047393

Source: Author’s computation, 2020, using E-View 10.0

Using the results in table 4.3, equation becomes:

$$\text{LOG (INF)} = 3.494137052 + 0.05050581986 * \text{LOG (MPR}_{t-1}) - 0.07268345811 * \text{LOG (BMS}_{t-1}) - 0.0960311616 * \text{LOG(FER}_{t-1}) \dots\dots\dots 4.1$$

This implies that MPR insignificantly impacted positively on INF as a unit increase in MPR would result to a 0.05 increase in INF. This conforms to a priori expectation. Besides, the result showed that BMS impacted positively on INF insignificantly. This negates the proposition of the quantity theorists that an increase in money supply would increase proportionately the level of prices. In addition, the result indicates that FER insignificantly impacts negatively on INF. This does not conform to economic theory as increase in FER is expected to increase inflation.

The co-efficient of determination indicates that only 22.2% change in INF could be attributed to changes in MPR, BMS, and FER, within the study period. This implies that inflation in Nigeria could be attributed to non-monetary forces and variables other than the ones specified in this study. Notably, this corroborates the findings of Ajayi and Awosika (1980). However, the F-statistic reveals that MPR, BMS, and FER, could jointly and significantly impact on INF in Nigeria.

Conclusion and Recommendations

From the study, it is evident that:

- Monetary policy rate impacted positively on inflation;
- Broad money supply impacted positively on inflation; and
- Exchange rate impacted negatively on inflation in Nigeria.

Monetary policy, therefore, is ineffective in taming inflation in Nigeria. This is because the positive impact of monetary policy rate on inflation is insignificant; the growth of money supply does not translate into increase in prices and exchange rate

changes tend to affect inflation negatively. More so, this could be due largely to the huge number of poor who are non-bank public in the country.

Based on the findings above, the following recommendations are made:

(i) Monetary authorities should fix the exchange rate at where the value of naira will rise. This will lead to a fall in inflation rate.

(ii) Monetary authorities should reduce monetary policy rate to curtail inflation in the country.

(iii) It is recommended that financial inclusion must be strengthened as a goal by all policy makers as the fight against inflation. To achieve this, more banking institutions should be opened in rural areas to encourage the rural dwellers to cultivate banking habits.

(iv) Policy makers in the government and at the CBN should continue to emphasise the role of the banks, even as it is clear that market failure has arisen in meeting the goal of financial inclusion precisely because of a mismatch of the needs of the formal financial sector and the low income earners.

(v) It is time to look for new non-bank based models that can fill in the gaps.

A complete overhaul of the financial infrastructure, especially in the rural areas is necessary to attract the informal servers of financial services into the formal financial sector. The regulation of policies on financial inclusion that focus on the distribution channels of financial services and retail banking are also necessary to increase access to finance and monetary authority's control of money supply.

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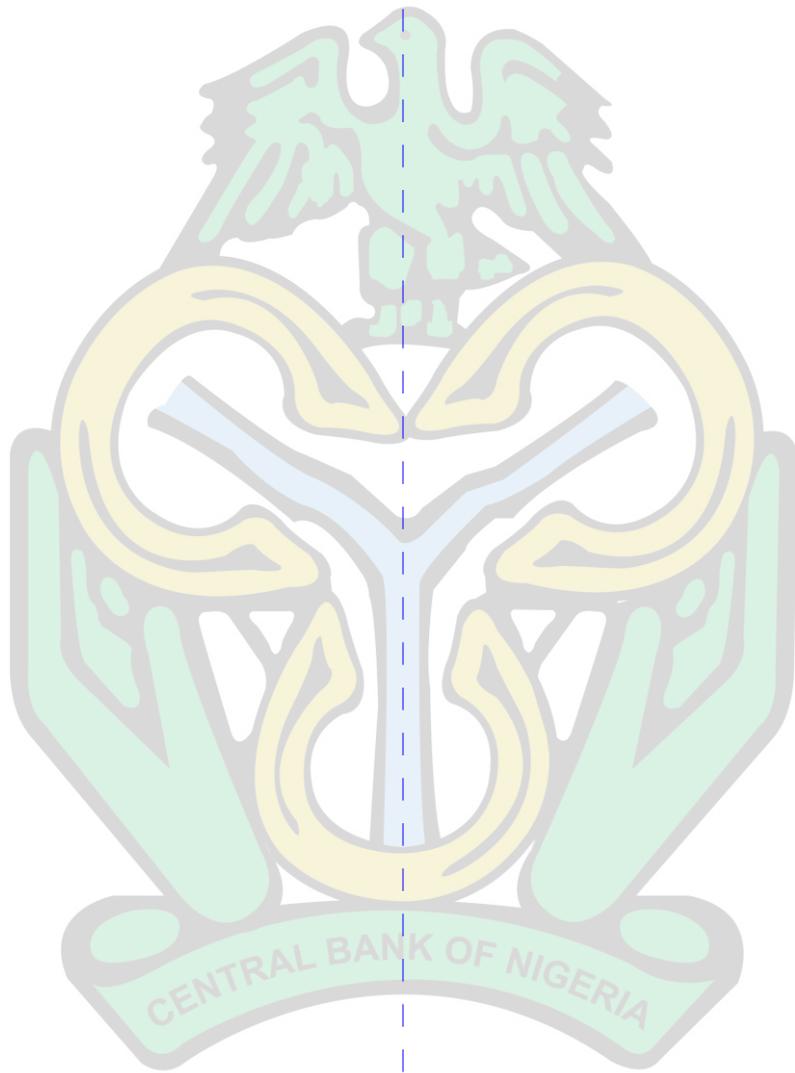
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