VOLUME 8, NO. 3, DECEMBER 2019
ISSN 0189-0998

JOS JOURNAL OF ECONOMICS

DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES,
UNIVERSITY OF JOS

VOLUME 8, NO. 3, DECEMBER 2019
ISSN 0189-0998

JOS JOURNAL OF ECONOMICS

DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES,
UNIVERSITY OF JOS

JOS JOURNAL OF ECONOMICS

Volume 8, No.3, December 2019

ISSN 0189-0998

Publishers:
Department of Economics,
University of Jos, Jos Nigeria.

CONTENTS

CORRUPTION, GOVERNMENT EFFECTIVENESS AND ECONOMIC GROWTH: THE CASE OF ECOWAS

Ogbebor, Timothy Ogieva
Department of Economics,
University of Benin, Benin City, Nigeria

Ighodaro, Clement Atewe
Department of Economics,
University of Benin, Benin City, Nigeria

Abstract

Corruption and government ineffectiveness are widely believed to be major hindrances to economic growth in developing countries. The World Bank sees corruption as one of the major challenges to conquering extreme poverty by the year 2030. Similarly, development economists opine that reducing corruption to the barest minimum is one sure way of attaining the laudable targets of the Sustainable Development Goals (SDGs) particularly in developing countries. This paper investigates this claim with regard to the ECOWAS sub-region using panel data covering the period 2000 to 2016. In order to avoid spurious results, the panel unit root tests results confirm that all the variables in the model are stationary at order I(1) while the panelco-integration tests indicate that there exists long-run relationships among the variables. Using a dynamic panel regression analysis methodology, the regression results of the fixed and random effects models, as well as the fully modified ordinary least squares (FMOLS) suggest that corruption has significant and negative relationship with economic growth in ECOWAS while the relationship between government effectiveness on economic growth is significant and positive. The paper recommends that ECOWAS countries should institute stiffer punishments for offences bordering on corruption, set up anti-corruption agencies and special courts to try offenders as well as embark on re-orientation of its citizens to appreciate the adverse effects of corruption in order to improve the standard of living of its people.

Keywords: Corruption, Economic growth, ECOWAS, Government effectiveness, Panel data

INTRODUCTION

In the past four years of the current administration in Nigeria, a new phrase on the issue of corruption has emerged. The President of the most populous nation in the ECOWAS sub-region and indeed Africa stated that "if we do not kill corruption, corruption will kill us". The phrase summarizes the importance that any developing country must attach to the issue of corruption

for it to ensure sustainable growth and development and improvement in the standard of living of its people. It points to the fact that corruption has the capacity to destroy any economy if it is allowed to thrive. It also re-echoes the call made in 1996 by the then-World Bank president, James D. Wolfensohn who asserted that the world needs to deal with the cancer of corruption for developing countries to achieve economic growth and poverty reduction (Bhargava, 2005).

Corruption is commonly defined as the abuse of public or corporate office for private gain (Bhargava, 2005). The World Bank (www.worldbank.org) considers corruption as a major obstacle to ending extreme poverty by 2030. This is because corruption erodes trust in government and impedes investment, resulting in negative effects on economic growth and job creation. Though corruption is a worldwide phenomenon, it is prevalent in sub-Saharan Africa (Richards, Nwanna, & Nwankwo, 2003).

Over the past two decades, attention to the subject of corruption as a factor in development has increased with the launch of Transparency International in 1993, the 1997 Organization for Economic Cooperation and Development (OECD), Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, and the 2003 United Nations Convention against Corruption (Brookings Institution, 2016). In development economics literature, corruption and poor governance are seen as challenges to the efficient delivery of dividends of governments such as health, growth in income, income inequality, education, infrastructure, and an efficient private sector. Some studies have found that high levels of corruption result in lower levels of investment and growth, and that corruption discourages both capital inflows and foreign direct investment into an economy (Lambsdorff, 2003a; Wei2000; Mauro 1995). Some others assert that corruption lowers productivity, reduces the effectiveness of industrial policies, and encourages businesses to operate in the unofficial sector leading to violation of tax and regulatory laws in the process (Lambsdorff, 2003b; Ades & Di Tella, 1997;

Kaufmann, 1997). Other effects of corruption include mediocrity in leadership, fallen standards of education and productivity, income inequality, high rates of unemployment, mass poverty, and general lack of progress in socio-economic and political life (CLEEN Foundation, 2010). In general, corruption has a negative effect on the provision of basic services, so it affects poor people disproportionately (Department of International Development, 2015).

Government effectiveness is also an essential determinant of long-run economic growth just as corruption. The widespread opinion that good governance is an important prerequisite for growth is confirmed by the study of Kaufmann and Kraay (2002 and 2003). Kaufmann, Kraay and Mastruzzi (2010) saw governance as (i) the process of the selection, monitoring and replacement of governments; (ii) the power of the government to effectively establish and perform sound policies; and (iii) the respect of citizens and the state for the institutions that govern economic and social interactions among them. The ECOWAS sub-region and indeed sub-Saharan African countries (SSA) have faced the problem of poor governance for many decades. This has led to unstable political environment which has resulted to the difficulty of increasing domestic investment, efficient utilisation of available domestic resources, and attracting foreign inflows needed for economic growth (Akanbi, 2010; Omoteso & Mobolaji, 2014).

A review of the aggregate economic performance of the ECOWAS sub-region in the period under consideration has been less than satisfactory. Average Gross Domestic Product (GDP) growth stalled in 2016 at 0.5 percent after several years of remarkable economic growth. Meanwhile, inflation has hit double digits since 2015, external debt has been growing and the labour market is almost entirely informal. Poverty is high with 43 percent of the population below the international poverty line of $1.90 per day in 2013. Income inequality is high even during periods of economic growth up to 2016. Only few formal jobs are created as the normal course of structural transformation where labour shifts from agriculture to manufacturing have

stalled in the sub-region. This is due to customs problem, unavailability of finance, high taxes, rigid regulation by low-quality bureaucracies, and inadequate energy and transport infrastructure (ADB/West Africa Economic Outlook, 2018). This performance has been partly attributed to inappropriate and inconsistent policy regimes, corruption, ethnic strife and wars, adverse security conditions, weak institutions; all of which are related to governance issues (Omoteso & Mobolaji, 2014).

STRUCTURE OF THE STUDY

The study is organised under seven sections. Section one covers the general introduction. Section two is on the organization of the study. Section three presents a review of the key concepts of the paper, while section four is the review of empirical literature. In section five, the methodology of the study is discussed. The empirical results of model estimation is presented and analysed in section six. The last section, which is section seven, is devoted to the conclusion and recommendations of the research.

CONCEPTUAL REVIEW

Corruption and Government Effectiveness

Corruption occurs when persons, especially those who hold government offices circumvent laid down procedures and processes in order to satisfy their personal benefits, either to enrich themselves or to gain political and social advantage (Nye, 1967, World Bank, 1997). Government effectiveness or good governance refers to quality management of human and material resources and the development of policies that are people–oriented with the capacity of positively affecting the standard of living of a vast majority in society (Mira & Hammadache, 2017). To the World Bank, government effectiveness is evaluated by the capacity of implementation of government policies to drive the efficient operation of market forces to achieve economic growth. Government effectiveness in a developing country

enables optimal deployment of limited productive resources, and political reforms which are the prerequisite for economic growth. Control of corruption and government effectiveness are two of the World Bank's enumerated six indicators of good governance which also include political stability and absence of violence, regulatory quality, rule of law, and voice and accountability (Kaufman, et al, 2010).

LITERATURE REVIEW

Empirical studies have been undertaken by various researchers on the relationship between corruption, governance and economic growth. In this section, we reviewed some of the studies.

Awan, Akhtar, Rahim, Sher and Cheema (2018) examined the association between governance, corruption and economic growth in five South Asian Associations for Regional Cooperation (SAARC) countries of Bangladesh, India, Nepal, Pakistan, and Sri Lanka using panel data for the period 1996-2014. Panel regression test was conducted using Fixed Effects Method of estimation based on the Hausman Specification test results. The study found that government effectiveness and political stability have positive and significant effects on economic growth in the selected SAARC countries while corruption exerts adverse effects on economic growth. The results further revealed that among the governance indicators, government effectiveness has greater influence on GDP growth in the selected SAARC countries.

Habyarimana and Dushimayezu (2018) probed the existence of a pro-cyclic relationship between governance and economic growth and development in Rwanda using two techniques (scatter and line plots and ordinary least squares). The results suggest that, the level of economic development and growth not only depends on fixed capital formation and the labour force, but also on good governance. The results indicated that good economic performance, further economic growth and development in Rwanda was driven by good governance in the country. It recommended that taking

lessons from Rwanda's good governance system and replicating it in other African countries can lead to political stability and sustainable growth and development on the continent.

Bayar (2016) examined the impact of six public governance indicators made up of voice and accountability, political stability and the absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption, on the economic growth in the transitional economies of the European Union during the period 2002-2013. The results showed that all governance indicators except regulatory quality had a statistically significant positive impact on economic growth. The findings also indicated that control of corruption and rule of law had the largest impact on economic growth, while political stability had the lowest impact.

Odeh (2015) investigated the impact of corruption on good governance in Nigeria using secondary data and certain indicators derived from the main composites of the concepts of Good Governance such as the legitimacy of the government, the accountability of public officials, and the capacity/ competence of government to formulate policies and deliver services to the citizens, as well as respect for human rights and the rule of law. The study found that despite the huge resources put into the implementation of policies geared towards good governance in Nigeria, there have not been visible changes in the living standards of the citizens due to gross corruption. It concluded that corruption is one of the major reasons for the poor economic performance, decaying infrastructures, the rising cost of living and poverty in Nigeria.

Omoteso and Mobolaji (2014) analysed the impact of governance indices (especially control of corruption) on economic growth in selected Sub-Saharan African (SSA) countries for the period 2002 to 2009. The study covered forty-seven Sub-Saharan African countries and adopted the panel data framework, the fixed effect, the random effect and the maximum likelihood estimation techniques for the analyses. The study found that

political stability and regulatory quality indices have growth enhancing features, as they impact on economic growth in the region significantly, while government effectiveness impacted negatively on economic growth in the region. Despite several anti-corruption policies in the region, the impact of corruption control on economic growth is not very obvious. The study also found that simultaneous implementation of accountability and rule of law indicators have more positive impact on economic growth in the region.

The study by Han, Khan and Zhuang (2014) addressed the question of whether countries with above-average governance grow faster than countries with below-average governance. Using the World Bank's worldwide governance indicators to measure government performance, the study found that government effectiveness, political stability, control of corruption, and regulatory quality are more significantly positively correlated with economic growth than rule of law and voice and accountability. The study suggested that good governance, while important in itself, can also help in improving a country's economic prospects.

An empirical study conducted by Farida and Ahmadi-Esfahani (2006) examined the impact of corruption on economic growth in Lebanon. Using a neoclassical model, the study hypothesised that corruption reduced the country's standard of living as measured by real per capita GDP. They showed that corruption deterred growth indirectly through reduction of the factor input productivity in a Cobb-Douglas production function. The results of the study suggested that corruption increases inefficiencies in government expenditure and reduces investment and human capital productivity, leading to a negative impact on output.

On the whole, while many studies suggest that corruption exerts negative influence on economic growth, a few others argue that it could efficiently grease the wheel of commerce (Huntington 1968, Paul 2010).

This study adopts the neo-classical growth model applied by Farida and Ahmadi-Esfahani (2006), and Mobolaji and Omoteso (2009) to enable it to econometrically investigate the relationship between corruption, government effectiveness and other control variables, and economic performance of developing countries such as ECOWAS countries.

METHODOLOGY

Model Specification

The model specified in this study is based on the simple neoclassical growth model as applied in earlier studies by Hodgson (2006), Mobolaji and Omoteso (2009), and Omoteso (2014). In the model, it was hypothesised that corruption reduces a country's standard of living as measured by per capita income while good governance effectiveness exerts a positive effect on per capita income. There is, thus, a causal relationship between economic growth (PCY),corruption (CORR), governance effectiveness (GOV) and other control variables such as domestic credit to the private sector as a proportion of GDP (CPS/GDP), the ratio of investment to GDP (INV/GDP), and the ratio of imports to GDP (IMP/GDP). Thus, the functional relationship specified for the model is:

$$PCY = f(CORR, GOV, CPS/GDP, INV/GDP, IMP/GDP) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The dependent variable used in this model to proxy economic growth is Per Capita Income (PCY). The explanatory variables of interest are corruption (CORR), which is measured by control of corruption index, and government effectiveness (GOV).The control of corruption index captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests(World Bank, WGI, 2017). Corruption is widely seen as having a negative effect on economic growth, especially in developing countries. It works through increases in the levels of inefficiencies in government expenditure as well as reduction in investment and human capital

productivity, which invariably impact negatively on economic growth (Farida and Ahmadi-Esfahani, 2006). Government effectiveness is defined as the perceptions of the quality of the civil and public services and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (World Bank, WGI, 2017). Good governance is assumed by many economists to have positive influence on economic growth.

To control other factors which affect economic growth, this study used variables often employed in growth literature such as the ratio of domestic credit to the private sector to GDP, the ratio of Investment to GDP, and ratio of imports to GDP. All the variables are expected to exert positive effects on economic growth except corruption, and the ratio of imports to GDP. Deeper financial systems have long been associated with economic growth in economics literature. The financial sector is seen as the central nervous system of any economy, hence its importance in the economic development of any nation. The financial system plays a key role in the mobilisation and allocation of savings for productive purposes, provides the needed structures for monetary management and serves as the basis for managing liquidity in the economy (Sanusi, 2012). Investment (INV) is measured by gross fixed capital formation and it is acknowledged as an important determinant of economic growth in economic theory. It is expected that the greater the level of investment in an economy, the higher will be the level of economic growth.

The econometric form of model (1) takes a dynamic panel regression form which assumes cross-sectional heterogeneity (cross section effect) and period heterogeneity (time effect). In specifying the panel regression model, cross sections (ECOWAS countries) and year dummies (2000-2016) are included. This ensures that biases due to heterogeneity in the data set are minimized. The panel multiple regression model with an error term (ε_t) is specified in econometric form as:

$$PCY_{it} = \beta_0 + \beta_1 PCY(-1)_{it} - \beta_2 CORR_{it} + \beta_3 GOV_{it} + \beta_4 CPS/GDP_{it} + \beta_5 INV/GDP_{it} + \beta_6 IMP/GDP_{it} + \alpha_i + \varepsilon_{it} \quad \ldots\ldots(2)$$

The βs are parameters, α_i is the unobserved country effect, ε_{it} denotes the disturbances; i and t denote cross-section and time indicators, respectively.

Where:

PCY_t	= current Per Capita Income
$PCY(-1)_t$	= one-period lagged Per Capita Income
$CORR_t$	= current level of Control of Corruption
GOV_t	= current governance effectiveness
CPS/GDP_t	= current Domestic Credit to Private Sector to GDP ratio
INV/GDP_t	= current Investment to GDP ratio
IMP/GDP_t	= current Import to GDP ratio
α_i	=unobserved individual (country specific) effects and
ε_{it}	= error terms over the cross-section and time
i	= individual country
t	= time

The apriori expectations for the explanatory variables are: $0 < \beta1, \beta3, \beta4$, and $\beta5$; $\beta2, \beta6 < 0$.

METHOD OF DATA ANALYSIS

Generally, there are many differences, both institutional, policy, and macroeconomic environments that characterize countries in the ECOWAS sub-region (Ogbebor, Okungbowa, and Adegboye, 2018). As a result, it is likely that the analysis of the relationship between foreign direct investment, trade openness and economic growth without considering such differences would distort our generalization and estimation process. Based on this observation, the panel data analysis method is preferred as it considers the cross-sectional and time-series characteristics of the sample data. In essence, the panel data analysis accommodates 'time as well as the heterogeneity' effects of the countries.

The panel data analysis captures the aforementioned characteristics by including the individual country's specific effects which may be random or fixed. Moreover, the fixed effects model could be costly in degrees of freedom because it is equivalent to the use of a dummy variable for every country. The random effects model, on the other hand, assumes the independence between the error term and the independent variables. In this study, we employ fixed effects and random effects panel models in order to specify the relationship between financial deepening and economic growth in ECOWAS. The Housman test would subsequently be used to select between the fixed and random panel estimation techniques: The fully modified ordinary least squares (FMOLS) estimation technique is also used in this study to provide a basis of comparing the results of the fixed and random effects regression models.

THE DATA

The data used in this study are panel data; a combination of time series and cross-sectional data. The study uses data covering the period 2000-2016 for fifteen (15) countries which make up the ECOWAS sub-region. The countries are Benin, Burkina Faso, Cabo Verde, Cote D'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. All the data are obtained from the World Bank *World Development Indicators* database (2017) and the Worldwide Governance Indicators (WGI) database (2017) produced by Daniel Kaufmann and Aart Kraay.

EMPIRICAL ANALYSIS

a) Descriptive Statistics

First, the descriptive statistics of the data are presented in Table 1 below in order to explain some underlying features. The table shows that the average annual per capita income (PCY) for the fifteen ECOWAS countries for the period under review is $630.32. This is considered very low when compared with the average annual PCY in some advanced and emerging

economies such as Australia, Belgium, Brazil, Britain, China, France, South Africa, and South Korea which stand at $33,541, $32,299, $6,378, $37445, $3,177, $30,721, $4,374, and $16,618 respectively for the period 2000 to 2016 (WDI, 2017). The maximum and minimum values of the variable suggest that there is a wide gap among the countries in terms of per capita income in the sub-region. This is confirmed by the high standard deviation value of 562.94 which indicates that many of the values are highly dispersed from the mean. The Jarque-Bera (J-B) value is highly significant at the 1 percent level indicating that the density function of the series is not normally distributed. The null hypothesis of the J-B test is that the variable is normally distributed; hence we reject the null hypothesis and accept the alternative hypothesis that the series is non-normally distributed. The skewness is positive at 2.22 and indicates that the per capita income figures for most of the countries lie to the left of (are less than) the mean value. The kurtosis value is high at 7.72 and indicates the presence of extreme values which may generate heteroskedastic variations in the data. The data set is highly leptokurtic and shows that extreme outliers in the per capita income values may generate heterogeneity issues in the analysis.

Table 1: Descriptive Statistics

Variable	Mean	Max.	Min.	Std. Dev.	Skew	Kurtosis	J-B	Obs.
PCY	630.83	2867.65	70.16	562.94	2.219	7.722	446.27	255
CORR	-0.631	0.949	-1.556	0.523	1.139	4.342	74.33	255
GOV	-0.793	0.353	-1.772	0.462	0.350	2.374	9.370	255
DCPS/GDP	16.10	65.74	0.410	12.34	1.987	7.743	406.81	255
INV/GDP	19.94	51.46	1.097	8.766	0.828	3.863	37.04	255
IMP/GDP	44.89	236.39	10.67	28.08	4.000	24.21	5461.67	255

Source: Authors' compilation from Eviews 9

The mean value of the corruption series is -0.631. The control of corruption score ranges between -2.5 and 2.5. In terms of percentage, the mean score is 30 percent. This is considered a low score suggesting that, on the average, ECOWAS countries perform poorly on the issue of corruption. The extreme values (maximum and minimum values of 0.949 (80%) posted by Cabo Verde and -1.556 (4%) recorded by Guinea Bissau) indicate that while a few countries are performing relatively well in the fight against corruption (Cabo Verde, and Senegal), other countries such as Guinea Bissau, Nigeria and Cote D'Ivoire are lagging far behind. The score for other countries of the ECOWAS is generally poor. The low standard deviation value of 0.523 for the corruption index confirms that most of the countries' average scores are around the mean value. The average value of the level of governance effectiveness within the sub-region is -0.793 (23%). The best performers in governance are Cabo Verde and Ghana while the least performance was posted by Togo, Sierra Leone, and Liberia.

The J-B values for all the series are significant at the 1 percent level and indicate that the series are not normally distributed. This outcome clearly shows that the use of panel data analysis procedure for the estimation of the relationships in this study is appropriate considering the heterogeneity in all the data series.

b) Panel Stationarity Test

In this section, a check for the unit root (stationarity) properties of the individual variables is carried out. To do this, a summary of the major panel unit root test methods of Levin, Lin & Chu (LLC), Im, Pesaran & Shin (IPS), ADF Fisher Chi-Square and PP Fisher Chi-Square is applied. This is due to the fact that the LLC and IPS (the two major panel unit root tests commonly used in the literature) may produce conflicting stationarity results for some of the variables (as in the case of the INV/GDP variable), making it difficult to take a decision on whether the variable is stationary or not. The summary of the tests is presented in table 2 below.

Table 2: Summary of panel unit root tests

Variable	LLC Test/ (Probability)	IPS Test/ (Probability)	ADF Fisher/ (Probability)	PP Fisher/ (Probability)	Remark
PCY	-5.88276/	-5.30455/	82.1834/	132.248/	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	I(1)
CORR	5.59429/	-5.22889/	82.1315/	137.989/	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	I(1)
GOV	-8.43274/	-6.80119/	102.894/	204.302/	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	I(1)
CPS/GDP	-3.00055/	-4.99213/	79.6528/	182.877/	Stationary
	(0.0013)	(0.0000)	(0.0000)	(0.0000)	I(1)
INV/GDP	0.24554/	-5.54581/	84.8077/	162.407/	Stationary
	(0.5970)	(0.0000)	(0.0000)	(0.0000)	I(1)
IMP/GDP	-4.84730/	-5.28806/	81.4024/	156.027/	Stationary
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	I(1)

Source: Authors' compilation from Eviews 9

The stationarity tests reveal that all the variables were non-stationary at levels but became stationary after first differencing.

c) Panel Co-integration Test

We further conduct a panel co-integration test to confirm if the variables have long-run relationships using the Kao and Pedroni Residual co-integration tests. The Kao test in Table 3 below reveals that there is co-integration and long-run relationship between all the variables in the model. The null hypothesis of no co-integration is rejected at the 1 percent level of significance.

Table 3: Kao Co-integration Test

Null Hypothesis: No Cointegration

	t-Statistic	Prob.
ADF	-3.278885	0.0005
Residual variance	1301.461	
HAC variance	281.4086	

For the Pedroni test, three different tests were conducted under the trend assumptions of no deterministic trend, deterministic intercept and trend, and no deterministic intercept and trend. One of the tests reveals the existence of co-integration while two tests indicate the absence of co-integration. Based, on a majority of the results from the Kao and Pedroni tests, it can be safely concluded that there is a long-run relationship between the variables.

Table 4: Pedroni Co-integration Tests

Outcome	No Deterministic Trend	Deterministic Intercept and Trend	No Deterministic Intercept and Trend
Panel v-Statistic	-3.049042 (0.9989)	-2.889095 (0.9981)	-2.249638 (0.9878)
Panel v-Statistic (Weighted)	-3.049042 (0.9989)	-2.889095 (0.9981)	-2.249638 (0.9878)
Panel rho-Statistic	3.971155 (1.0000)	4.501566 (1.0000)	2.2739 (0.9885)
Panel rho-Statistic (Weighted)	3.971155 (1.0000)	4.501566 (1.0000)	2.2739 (0.9885)
Panel PP-Statistic	0.925363 (0.8226)	-1.701223 (0.0445)*	-2.799449 (0.0026)*
Panel PP-Statistic (Weighted)	0.925363 (0.8226)	-1.701223 (0.0445)*	-2.799449 (0.0026)*
Panel ADF-Statistic	0.933399 (0.8247)	-1.578381 (0.0572)*	-2.799755 (0.0026)*
Panel ADF-Statistic (Weighted)	0.933399 (0.8247)	-1.578381 (0.0572)*	-2.799755 (0.0026)*
Group rho-Statistic	5.702382 (1.0000)	5.956790 (1.0000)	4.008695 (1.0000)
Group PP-Statistic	2.114379 (0.9828)	-0.932193 (0.1756)	-2.355288 (0.0093)*
Group ADF-Statistic	2.123832 (0.9832)	-0.795735 (0.2131)	-2.355663 (0.0092)*

(*passes significance test by at least 10 percent)

Source: Authors' compilation from Eviews 9

REGRESSION ANALYSIS

Fixed Effects Model, Random Effects Model, Housman Test and Fully Modified Ordinary Least Squares (FMOLS) Estimation Techniques

The panel data estimation procedure employed in this section assumes that the biases in the pooled data could either come from cross-sectional heterogeneity or time series (periodic) variations. As a result, the fixed and random effects models estimation tests are conducted. The Housman test of heterogeneity used to determine the best effects model (random or fixed) to be adopted in the analysis. The estimation of the model is also carried out

using the Fully Modified Ordinary Least Squares (FMOLS) to enable us to compare the results of the fixed or random effects model. The summary of the estimation results of the fixed and random effects models, the Hausman test and the FMOLS are contained in Tables5 below.

Table 5: The Estimation Results – Random Effects& Fully Modified Ordinary Least Squares (FMOLS)

	Random Effects Model	Fully Modified Ordinary Least Squares
Variable	**Coefficient (p-value)**	**Coefficient (p-value)**
DPCY(-1)	0.136061	0.186439
	(0.0112)	(0.0001)
DCORR	-180.2265	-139.0966
	(0.0000)	(0.0000)
DGOV	454.7698	369.0347
	(0.0000)	(0.0000)
DCPS/GDP	16.07463	19.85290
	(0.0000)	(0.0000)
DINV/GDP	5.682279	1.040111
	(0.0035)	(0.5247)
DIMP/GDP	-3.956099	-0.77343
	(0.0012)	(0.4948)
Diagnostics and Summary Measures		
R-squared	0.543656	0.544493
Adjusted R-squared	0.531096	0.496291
F-statistic	43.28499	n/a
Prob(F-statistic)	0.00000	n/a
Durbin-Watson stat	1.819688	n/a
Hausman Test	**0.0000000**	
(p-value)	**(1.0000)**	

Source: Authors' compilation from Eviews 9

First, the result of the Housman test is analysed to ascertain the most appropriate model. The null hypothesis of the test is that the random effect model is the most appropriate. That is:

H_0: Random Effects Model is Appropriate

H_1: Fixed Effects Model is Appropriate

The Housman test shows that the Chi-square statistic of the equation is highly insignificant with a probability of 1.0000. From the result, the null hypothesis that the random effect model is the best model to be employed cannot be rejected. Hence, the best method to apply is the random effects model.

Thus in this study, the results of the random effects model is used for the analysis. The results of the FMOLS regression as above are similar to those of the random effects model and thus can be said to validate the Hausman test which suggests the random effects as the best for the study.

The adjusted coefficient of determination (adjusted R squared) value of the random effects model of 0.53 is fair, suggesting that only 53 percent of the systematic variations in per capita income in ECOWAS are captured by all the variables in the model. The R squared value is good since as Iyoha (2004) noted, the coefficient of determination for panel data studies are sometimes low due to heterogeneity effects. The F-statistic (43.25) and corresponding p-value (0.0000) indicates that a significant relationship exists between per capita income (economic growth) and all the independent variables combined. The Durbin-Watson statistic of 1.82 suggests there is no likelihood of autocorrelation.

The individual effects of the explanatory variables on the dependent variable are determined based on the coefficients and p-values of the series. From the results, one period lagged per capita income is positively and significantly correlated with economic growth. This shows that economic

growth in one period has the potentials to fuel growth in the next year and this is in line with apriori expectation. When the underlying structures for economic growth have been properly laid in a particular year, there is the likelihood that it will propel growth in successive years except if major shocks are brought to bear on the economy.

The two main variables of interest (CORR and GOV) in the model are statistically significant. The corruption variable is significant at the 1 percent level with a negative coefficient of -180.23.This suggests that the level of corruption control has a negative relationship with economic growth in ECOWAS. The coefficient of 180.23 indicates that a unit increase in CORR will lead to 180.23units rise in per capita income. The implication is that an increase in corruption control (will reduce the level of corruption in the society), and will substantially propel growth in the economies of ECOWAS. The result is consistent with the findings of Awan, et al. (2018), Odeh (2015), and Farida and Ahmadi-Esfahani (2006) which found positive correlation between corruption and economic growth. On the other hand, the level of government effectiveness variable passes the significance test at the 1 percent level and has a positive coefficient of 454.77, signifying that a unit increase in government effectiveness causes a far more than proportionate increase in per capita income. This shows that in general, government effectiveness is one of the major drivers of economic growth in countries in the ECOWAS sub-region; hence governments in the sub-region must pay greater attention to improving the level of governance in their countries. The result corroborates the outcomes of similar studies carried out by Habyarimana and Dushimayezu (2018), and Han, Khan and Zhuang (2014).

The financial deepening control variable of CPS/GDP variable is equally significant at the 1 percent level and positively signed. This conforms to apriori expectation of a significant positive relationship between financial

development and economic growth. The result is consistent with the studies of Darrat (2016), Alrabadi and Kharabsheh (2016), Kiran, Yavusand Guris (2009), and Khan and Senhadji (2000) which found positive correlation between financial deepening and economic growth. The second control variable in the model (INV/GDP) is also significant and positively signed, portraying an expected positive relationship between investment and economic growth as in the economics literature. The third control variable (IMP/GDP), which partly measures the degree of openness in ECOWAS economies, is negatively signed and significant at the 1 percent level. This may be due to the negative balance of trade that results from high reliance on imported goods to satisfy domestic needs to the detriment of exports. The ratio of imports to GDP is very high for ECOWAS countries such as Cabo Verde and Liberia. Liberia, in particular, recorded very average IMP/GDP ratio of 103.23 for the period 2000-2016, with an all-time high of 236.39 in 2007.

CONCLUSION AND RECOMMENDATION(S)

The objective of this paper is to empirically investigate the relationship between corruption, government effectiveness and economic growth in the ECOWAS sub-region. In order to estimate the coefficients of the variables employed in the study, several econometric tests were conducted using panel data covering the period 2000-2016. Specifically, the fixed and random effects and the Fully Modified Ordinary Least Squares (FMOLS) were undertaken using various explanatory variables to determine the exact quantitative relationship between the dependent variables and the regressors. The results of the study indicate that corruption exerts very significant and strong negative influence on economic growth while the relationship of government effectiveness and economic growth in ECOWAS is significant and positive. Similarly, the level of financial development and investment also proved to be

major determinants of economic growth in the sub-region. The implication is that persistent problem of slow and sometimes stagnant economic growth and development in the ECOWAS sub-region can be reversed by improvements in government effectiveness and the control of corruption.

Considering the high impact of the two major variables of interest on economic growth in the model, the study recommends that ECOWAS countries should institute stiffer punishments for offences bordering on corruption, set up anti-corruption agencies and special courts to try offenders as well as embark on re-orientation of its citizens to appreciate the adverse effects of corruption in order to improve the standard of living of its peoples.

REFERENCES

Ades, A. & Di Tella, R. (1997). National Champions and Corruption: Some Unpleasant Interventionist Arithmetic. *The Economic Journal*, 107, 289-313

African Development Bank/West Africa Economic Outlook (2018). *Macroeconomic Developments and Poverty, Inequality, and Employment.* ISBN 978-9938-882-67-4

Akanbi, O. A. (2010). Role of Governance in Explaining Domestic Investment in Nigeria. *University of Pretoria, Working Paper Number* 168.

Alrabadi, D. W. H., & Kharabsheh, B. A. (2016). Financial Deepening and Economic Growth: The Case of Jordan. *Journal of Accounting and Finance*, 16(6), 158-166

Awan, R. U., Akhtar, T., Rahim, S., Sher, F., & Cheema R. (2018). Governance, Corruption and Economic Growth: A Panel Data Analysis of Selected SAARC Countries. *Pakistan Economic and Social Review*, 56(1), 1-20

Bayar, Y. (2016). Public Governance and Economic Growth in the Transitional Economies of the European Union. *Transylvanian Review of Administrative Sciences*, 48E, 5-18

Bhargava, V. (2005). The Cancer of Corruption. *World Bank Global Issues Seminar Series*. Retrieved from www.siteresources.worldbank.org

Brookings Institution (2016). The Two Problems of Corruption and Poor Governance. Retrieved from https://www.brookings.edu, 2016/07

CLEEN Foundation (2010). Corruption and Governance Challenges in Nigeria. Conference Proceedings, *CLEEN Foundation Monograph,* Series No.7

Darrat, A. F (2016). Are Financial Deepening and Economic Growth Causally Related? Another Look at the Evidence. *International Economic Journal,* 13(3), 19-35

Department of International Development (2015). Why Corruption Matters: Understanding Causes, Effects and How to Address Them. *Evidence Paper on Corruption*, UK Aid.

Farida, M., & Ahmadi-Esfahani, F. Z. (2006). Corruption and Economic Growth in Lebanon. *Australian Agricultural and Resource Economics Society 52nd Annual Conference.*

Graf Lambsdorff, J. (2003a). How Corruption Affects Persistent Capital Flows. *Economics of Governance,* 4, 229-243

Graf Lambsdorff, J. (2003a). How Corruption Affects Productivity. *Kyklos*, 56, 457-474

Habyarimana, J., & Dushimayezu, B. (2018). Good Governance, Economic Growth and Development: Insights from a 22-Year Econometric Analysis in Rwanda. *East Africa Research Papers in Economics and Finance*, EARP-EF No. 2018:19

Han, X., Khan, H. A., & Zhuang, J. (2014). Do Governance Indicators Explain Development Performance? A Cross-Country Analysis. *Asian Development Bank Economics Working Paper Series*, (417).

Hodgson, G. M. (2006). Institutions, Recessions and Recovery in the Transitional Economies. *Journal of Economic Issues*, 40(4), 875-894.

Huntington, S. P. (1968). Political Order in Changing Society, New Heaven: Yale University Press.

Iyoha, M. A. (2004). *Applied Econometrics,* Second Edition, MINDEX Publishing, Benin, Nigeria.

Jhingan, M. L. (2010). *The Economics of Development and Planning.* Vrinda Publications (P) Ltd, Delhi, 39th Edition.

Kaufmann, D. (1997). The Missing Pillar of Growth Strategy for Ukraine: Institutional and Policy Reforms for Private Sector Development. In Peter K. Cornelius and Patrick Lenain (eds.) *Ukraine: Accelerating the transition to Market, Washington: IMF*, 234-275

Kaufmann, D. & Kraay, A. (2002). Growth without Governance /draft paper/, The World Bank, May, 12.

Kaufmann, D., Kraay, A., &Mastruzzi, M. (2003). Governance Matters III (Governance Indicators for 1996-2002) /draft paper/, The World Bank, May 8.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators: A summary of methodology, data and analytical Issues. *World Bank Policy Research Working Paper* no. 5430.

Khan, M. S., & Senhadji, A. S. (2000). Financial Development and Economic Growth: An Overview. *IMF working Paper WP/00/209*, A paper presented at the African Economic Research Consortium Meeting, Nairobi, Kenya, December 3.

Kiran, B., Yavus, N. C., & Guris, B. (2009). Financial Development and Economic Growth: A Panel Data Analysis of Emerging Countries. *International Research Journal of Finance and Economics*, 30, 1450-2887

Mauro, P. (1995). Corruption and Growth. *Quarterly Journal of Economics*, 110, 681-712

Mira, R., & Hammahache, A. (2017). Relationship between good governance and economic growth: A contribution to the institutional debate about state failure in developing countries. CEPN–Centre d'economie de l'Universite' Paris Nord CNRS n 7234

Mobolaji, H. I. &. Omoteso, K. (2009). Corruption and Economic Growth in Some Selected Transitional Economies. *Social Responsibility Journal*, 5(1), 70-82.

Nye, J. S. (1967). Corruption and Political Development: A Cost-Benefit Analysis. *American Political Science Review*, 61(2), 417-427

Odeh, A. M. (2015). The Effects of Corruption on Good Governance in Nigeria. *International Journal of Development and Sustainability*, 3, 292-307

Ogbebor, T. O., Okungbowa, O. G., & Adegboye, A. C. (2018). International Development Assistance and Educational Development in ECOWAS. *Dutse Journal of Economics and Development Studies (DUJEDS)*, 5(1), 139-151

Omoteso, K., & Mobolaji, H. I. (2014). Corruption, Governance and Economic Growth in Sub-Saharan Africa: A Need for the Prioritisation of Reform Policies. *Social Responsibility Journal*, 10(2), 316 – 330, doi10.1108/SRJ-06-2012-0067

Paul, B. P. (2010). Does Corruption Foster Growth in Bangladesh? *International Journal of Development Issues*, 9(3), 246–262.

Richards, D., Nwanna, G. & Nwankwo, S. (2003). Debt Burden and Corruption Impacts: African Market Dynamism, *Management Decisions*, 41(3), 304-310.

Rose-Ackerman, S. (2005). The Challenge of Poor Governance and Corruption. *Revista DIREITGO GV*, ESPECIAL 1, 207-266

Sanusi, L. S. (2012). *Banking Reform and its impact on the Nigerian Economy.* Being a Lecture delivered at the University of Warwick's Economic Summit, UK 17th February, 2012

The World Bank (1997). World Development Report 1997: The State is a Changing World. World Bank, Washington DC.

The World Bank (2012). Global Financial Development Report: Key Terms Explained. Retrieved from http://go.worldbank.org/E9RQKCP9JO.

The World Bank (2017). World Development Indicators (WDI). https://data.worldbank

The World Bank (2017). Worldwide Governance Indicators (WGI) produced by Daniel Kaufmann and Aart Kraay.

Wei, S. (2000). How Taxing is Corruption on International Investors? *Review of Economics and Statistics*, 82, 1-11

MODELING INTEREST AND EXCHANGE RATES NEXUS IN NIGERIA: A NONLINEAR AUTOREGRESSIVE DISTRIBUTED LAG MODEL

Gideon G. Gohit, Ph.D.
Department of Economics,
University of Jos, Jos, Nigeria

Zumba Y. Ishemu
Department of Economics,
University of Jos, Jos, Nigeria

Abstract

One of the macroeconomic goals which policy makers strive to achieve is exchange rate stability. However, over the years, Nigeria has continued to grapple with a continued fall in the value of the Naira against the US Dollar. One of the instruments the monetary policy authority in Nigeria has adopted to strengthen the Naira against the US Dollar over the years is the use of lending interest rate. This paper has attempted to model interest and exchange rates nexus in Nigeria using a nonlinear Autoregressive Distributed Lag (ARDL) model. Monthly data on nominal Naira/US Dollar exchange rate and lending interest rate (maximum and prime) from January 1986 to August 2019 were employed. The paper adopted the Nonlinear Autoregressive Distributed Lag (NARDL) model to find out whether positive and negative changes in interest rate exert different impacts on exchange rate in the short and long run in Nigeria. Findings of the study revealed an evidence of short and long run asymmetry in the response of the Naira/US Dollar exchange rate to negative and positive changes in interest rate in Nigeria. It was also found that the long run impacts on the Naira/US Dollar exchange rate did not differ significantly from the short run impacts. In the short and long run, while positive change in interest rate has positive and statistically significant impact on the Naira/US Dollar exchange rate, negative change in interest rate has negative and statistically insignificant impact on the Naira/US Dollar exchange rate. The study revealed that a 1% increase in interest rate significantly depreciates the Naira against the US Dollar by 3.6456% and 1.2732% in the short and long run respectively. Besides, a 1% reduction in interest rate would insignificantly improve (appreciate) the Naira against the US Dollar by 0.3216% and 0.1123% in the short and long run respectively. The study therefore recommended that the monetary authorities in Nigeria should, from time to time, set a limit beyond which the lending interest rate should not exceed since increase in the lending rate significantly places the Naira at a disadvantage against the US Dollar.

Keywords: Modeling, Asymmetry, Exchange Rate, Interest Rate.

JEL Classification: C59, D82, F31, E49

INTRODUCTION

Interest rate has increasingly become a tool for achieving some macroeconomic objectives in the hands of policy makers, most especially in recent times. Craig (2001) in recognition of this fact observed that interest

rates are crucial elements in the transmission of monetary policy actions to economic actions. One of the macroeconomic goals which policy makers strive to achieve is exchange rate stability. Exchange rate stability is of great concern to both developed and developing countries since no nation of the world is self sufficient. However, unless the Central Bank of a country adopts a policy of trading its domestic currency at a predetermined rate or price (fixed exchange rate policy), exchange rate is never stable. Many developing nations today, Nigeria inclusive, in addition to exchange rate instability are faced with a continued depreciation of the value of their respective currencies against other currencies.

One of the macroeconomic problems Nigeria has faced over time is maintaining low and stable exchange rate, most especially the Naira/US Dollar exchange rate. Due to a continued fall in the value of the Naira against the US Dollar and other currencies, monetary policy authorities in Nigeria have among other measures, adopted the use of interest rate as a tool for strengthening the value of the Naira against the US Dollar. Worthy of note is that in Nigeria just like in other countries of the world, the important position exchange and interest rates have assumed in the macroeconomic domain has made them undergo different regimes. For instance, the fixed, flexible and some mixtures or modifications of exchange rate regimes (the free-floating rate regime, the fixed exchange rate regime, the managed floating regime and the adjustable peg) have been practiced at various times in the economic history of Nigeria. Similarly, as an instrument of monetary policy in Nigeria, interest rate has undergone two different regimes, i.e., the controlled regime which operated before 1986 and the deregulated regime which came into operation in August 1987 (CBN, 2016) under the Structural Adjustment Programme (SAP).

From the independence of Nigeria to 1985, the value of Nigerian currency was higher than the value of the US Dollar (CBN, 2017, World Bank,

2018). However, over time, the Nigerian currency has lost its value *vis-a-vis* the value of the US Dollar and other foreign currencies, either through a deliberate attempt (devaluation) or otherwise (depreciation). Exchange rate crisis in Nigeria deepened during the recent economic recession the country experienced (which lasted from the first quarter of 2016 to the second quarter of 2017) and has somewhat continued even in the aftermath of the recession. The crisis has left the Nigerian government and monetary policy authorities puzzling on the best way to stabilize it. One of the major policies adopted by the Nigerian government through the monetary policy authorities in tackling the exchange rate crisis is the use of interest rate.

The use of interest rate by monetary policy authorities in Nigeria over time to curb exchange rate crisis and or maintain low exchange rate appears to be ineffective. This is because even with the deliberate attempts by the federal government of Nigeria, through the monetary policy authorities to raise the Monetary Policy Rate (MPR) – an interest rate which anchors other interest rates in the country from 12 to 14 percent in July 2016 and also reduced it from 14 to 13.5 percent in March 2019, the Naira/Dollar exchange rate still remains high. Currently, the Naira/Dollar exchange rate hovers around N306 per US Dollar in the Inter-Bank foreign exchange market and around N365 in the Bureau De Change foreign exchange market. This is clear evidence, that despite the use of interest rate to achieve favourable exchange rate in Nigeria, the country is still bedeviled by unfavourable Naira/US Dollar exchange rate. It is against this background that this paper modeled the nexus between lending interest rate and the Naira/Dollar exchange rate in Nigeria for the period 1986 to 2019.

The aim and objectives of this paper are to:

i. examine whether the Naira/US Dollar exchange rate responds symmetrically to positive and negative changes in interest rate in Nigeria;

ii. investigate whether exchange rate reacts symmetrically to positive and negative changes in interest rate in the short and long run in Nigeria;

iii. examine the impact of positive and negative changes on exchange rate in the short and long run in Nigeria; and

iv. investigate the differences in the impact of negative and positive changes on exchange rate in the short and long run in Nigeria.

To achieve these objectives, this paper has been organized into six sections: Introduction, Conceptual Review, Theoretical Framework, Empirical Review, and Methodology and Result. The last section comprises the conclusion and policy recommendations of the paper.

CONCEPTUAL REVIEW

Exchange rate is defined as the price of a currency relative to another currency (Krugman, Obstfeld & Melitz, 2012). That is to say it is the number of units of a domestic currency that will purchase one unit of a foreign currency. Exchange rate is considered to be a price at which external and internal economic factors are aligned (Rewane, 2016). This definition suggests that exchange rate is a price that changes internal economic factors to be in right relationship with external economic factors. Mankiw (2010) defined exchange rate as the rate at which a country makes exchange in world market. Exchange rate in Nigeria is an important macroeconomic variable in the economy today because of its significance in international trade, economic stability, external balance and competitiveness, which is done via the mechanism of the relative prices of foreign and local commodities, services and assets (Seyi, 2012). Exchange rate is an important economic measurement because it reflects the economic strength and competitiveness compared with other economies (Asinya & Tako, 2014; Akonji, 2013). The strength of a

country's currency depends on a number of factors. These include the state of the economy in terms of its competitiveness and volume of its exports, the level of domestic production, and quantum of foreign reserves (CBN, 1999). Exchange rate changes also have pervasive impacts, with consequences for prices, wages, interest rates, level of production, and employment opportunities. Exchange rate could either be nominal (if changes in prices are not accounted for when computing) or real (if changes in prices are accounted for when computing). Also, exchange rate can depreciate or appreciate. It is said to depreciate if its value *vis-a-vis* the value of other currencies falls, while it is said to appreciate if its value *vis-a-vis* the value of other currencies rises. The major determinant of the value of currency are a country's terms of trade, exports of goods and services, current account deficit, tax haven and status (Rewane, 2015).

Interest rate on the other hand, is the rental payment for the use of credit by borrowers and return for parting with liquidity by lenders over time (CBN, 2016). It is considered as the amount charged and expressed as a percentage of principal by a lender to a borrower for the use of assets (Broni-Bediako, Onyiji & Nwene, 2018). Mankiw (2010) conceptualized interest rate as the market price at which resources are transferred between the present and the future. Interest rate is the amount charged on borrowed/lent money, expressed as a percentage of the principal by a lender to a borrower/lender for the use of money. Interest rate can either be nominal or real interest depending on whether or not inflation is accounted for in computing it.

THEORETICAL UNDERPINNING

Theoretically, exchange and interest rates are related. Economic Theory is rich and offers substantial guidance on an analysis of the nexus between interest and exchange rates. In this connection, economic theory suggests that all other things being equal, if the domestic interest rate of a

country's currency rises, the value of the currency against the currency of other countries will appreciate (Tafa, 2015). Similarly, according to portfolio balance model of Branson (1970), McKkinnon (1960) and Dornbusch (1975), there is a negative association between interest rate and exchange rate. According to this model, the allocation of portfolios of investment by investors is influenced by interest rate on different assets. Thus, if an interest-bearing asset of a country attracts high returns, the assets become attractive to investors, thereby shifting their investment portfolios from holding low interest-bearing assets to high interest-bearing assets and *vice versa*. This has impact on the exchange rate of a country. An increase in the interest rate of a domestic currency will increase the number of home currency deposits. All other things constant, a higher interest on a domestic currency means higher returns on the currency, thus, the demand for home currency will increase. These situations will lead to an appreciation of home currency relative to the currencies of other countries. Similarly, based on Mundell-Fleming model, an increase in interest rate is indispensable in stabilizing the exchange rate depreciation as well as in curbing the inflationary pressure and by extension, helps in avoiding diverse economic consequences (Mankiw, 2010). High domestic interest rate is essential, among other advantages; it makes domestic financial assets to be attractive to both domestic and foreign investors, hence, guaranteeing the inflows of capital into the domestic economy. *Ceteris paribus*, this inflow of capital into the domestic economy will limit the depreciation of the domestic currency *vis-à-vis* the foreign currency.

EMPIRICAL REVIEW

The relationship between interest and exchange rates has been investigated exhaustively by different authors at different times in different countries and regions and different findings have emerged from these studies. Hnatkovska, Lahiri and Vegh (2013) investigated the effects of policy-induced

changes in the level of interest rate on exchange rate in 40 countries using polynomial fit. Based on annual data for the period 1974-2009, they established that a small increase in nominal interest rate appreciates domestic currency while larger increase in interest rate depreciates domestic currency. Similarly, Sarac and Karagoz (2016) examined the impact of short-term interest rate on exchange rate in Turkey using monthly data for the period February 2003 to August 2015. They employed Vector Error Correction Model (VECM), Error Correction Model (ECM) and frequency domain Granger causality. The result of the study confirmed that short term interest rates affect the Dollar rate when Dollar rate increases over nearly 3.19 percent by the frequency domain Granger causality.

Using daily data for the period February 1999 to December 2014, Andris, Caprau, Ihnatov and Tiwari (2017) examined the relationship between interest and exchange rates in a small open emerging economy. The study found a negative relationship between exchange rate and interest rate in the short run and positive relationship between interest rate and exchange rate in the long run in Romania. Andris, Ihnatov and Tiwari (2014) applied continuous wavelet to monthly data that span from July 1997 to December 2010 to investigate and identify the pattern of co-movement of interest rate, stock price and exchange rate in India. They established an evidence of phase difference of lead-lag relationship between stock prices, exchange rate and interest rate. Similarly, Wilson and Sheefeni (2014) studied the relationship between interest rate and exchange rate in Namibia using quarterly data for the period 1993Q1-2012Q2. Vector Autoregressive (VAR) model was utilized and no clear systematic relationship was found between interest rates and exchange rates. Furthermore, they established that errors in the forecast of both the exchange rate and interest rate are dominate and insignificant percentage is attributed to other variables.

In order to examine the response of term structure of forward exchange rate to jump in the interest rate in China, Li, Feng, Wu and Xu (2013) applied Kalman Filter, Markkov Chain Monte Carlo (MCMC) and Algorism to daily data from January 2000 to August 2008 and established that jump in interest rate relates to macroeconomic announcement. Byner and Nagayasu (2010) utilized monthly data and VECM to investigate the relationship between the real exchange rate and the real interest rate differential in the UK for the period January 1973 to May 2005. Their study revealed that real interest rate differential is an important determinant of real exchange rate.

Similarly, Hacker, Harison and Mandon (2015) investigated the causal relationship between the sport exchange rate and nominal interest rate differential on Sweden using monthly and quarterly data. The study which covered January 1993 to May 2009 utilized maximum overlapping discrete wavelet transformation (DOSWT) and established that nominal interest rate differential Granger causes the exchange rate to reduce as the wavelet time scale increases. Also, the existence of negative relationship was found between interest rate and exchange rate at the shorter time scale and more positive relationship between the variables at the longer time scale.

In the same vein, Ozmen and Yilmaz (2017) investigated the relationship between the exchange rate changes and its major financial determinants in Turkey, Brazil, Indonesia and South Africa utilizing weekly data from January 2005 to December 2016. Wavelet coherence analysis was employed for the study and the results confirmed that changes in exchange rate are correlated with interest rate differential. Moreover, the study found an evidence of co-movement between the exchange rate and interest rate changes across frequencies over time. Likewise, Honda and Inoue (2018) employed wavelet and quarterly data from 2011Q1-2016Q4 to investigate the effects of negative interest rate policy in Japan and established that lowering interest rate on reserve depreciates the value of the domestic currency.

Ebiringa and Anyaogu (2014) found a negative but insignificant relationship between interest rate and exchange rate in Nigeria. They applied ARDL to annual data from 1971-2010 in order to model a long run relationship between exchange rate, interest rate and inflation in Nigeria. Hassan, Abubakar and Dantama (2017) utilized Autoregressive Conditional Heteroskedasticity (ARCH), ARDL and quarterly data spanning 1989Q1 to 2015Q4 to study the causes of exchange rate volatility in Nigeria. The result of their findings revealed that the impact of interest rate on exchange volatility rate is positive and statistically significant. Similarly, to examine the determinants of real exchange rate instability in Nigeria, Ajao and Igbekoyi (2013) employed to analyse the General Autoregressive Conditional Heteroskedasticity (GARCH) and Error Correction Model (ECM) annual data spanning 1981 to 2008. They found that interest rate movement significantly influences exchange rate volatility in Nigeria.

Based on the above empirical review, it is important to note that although there are studies on the relationship between exchange rate and interest rate in Nigeria, the paper could not find one that examined whether exchange rate in Nigeria responds symmetrically to positive and negative changes in interest rate in the short and long run. Therefore, the paper intends to fill this gap.

METHODOLOGY, MODEL SPECIFICATION AND SOURCES OF DATA

Types and Sources of Data

The study utilized monthly time series secondary data covering the period 1986 to August 2019 to examine the impact of changes in interest on exchange rate in Nigeria. The choice of this period is based on available data on the variables of interest and exchange rate in Nigeria. Data on the variables were sourced from the 2017 Central Bank of Nigeria (CBN) annual statistical bulletin and the CBN website.

Model Specification

This study investigated whether positive and negative changes in interest rate exert different impacts on exchange rate in the short and long run in Nigeria. The study adopted the Nonlinear Autoregressive Distributed Lag (NARDL) model, a model proposed by Shin, Yu and Greenwood-Nimmo (2014). This methodology is employed to investigate the presence or otherwise of asymmetric effects in short and long run of interest rate on exchange rate in Nigeria. The NARDL is an asymmetric expansion of the symmetric Autoregressive Distributed Lag (ARDL) model, a model proposed by Pesaran, Shin and Smith (1996) and later developed by Pesaran, Shin and Smith (2001). Thus, the study constructed first, the symmetric ARDL model, thereafter, the asymmetric (Non-linear) ARDL model. The unrestricted symmetric (linear) ARDL assumes that the explanatory variable(s) has/have symmetric (linear) impact on the dependent variables (Rehman, Bouri, Eraslan & Kumar, 2019). The symmetric ARDL model is stated thus.

$$\Delta \ln exr_t = \Pi + \Psi_m \sum_{m=0}^{M} \Delta \ln exr_{t-m} + \Upsilon_n \sum_{n=1}^{P} \Delta \text{int} + \Phi_1 exr_{t-1} + \Phi_2 \text{int}_{t-1} + \varepsilon_t \quad - \quad (1)$$

where $\ln exr_t$ denotes exchange rate at time t, int_t denotes interest rate at time t, Δ is the difference operator, Ψ_m and Υ_n are the short run slopes of exchange and interest rates respectively, Φ_1 and Φ_2 respectively represent the long run slopes of exchange rate and interest rate, M and P denote the optimal lags of exchange and interest rates, ε_t is the white noise error term and Π is the intercept. Adopting Shin, Yu and Green-wood Nimmo (2014) framework, the regressor (interest rate)is decomposed as follows:

$$\text{int}_t = \text{int}_0 + \text{int}_t^+ + \text{int}_t^- \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (2)$$

Where int_0 denotes arbitrary initial value of interest rate, int_t^+ and int_t^- respectively denote partial sum processes which accumulate positive and

negative partial changes in interest rate at time t. The study constructs the NARDL stated as:

$$exr_t = \Omega^+ \text{int}_t^+ + \Omega^- \text{int}_t^- + \mu_t \quad - \quad - \quad - \quad - \quad - \quad (3)$$

In Equation 3, int_t^+ is positive change (increase) in interest rate, int_t^- is negative change (decrease) in interest rate at time t and μ_t is the white noise error term which the study assumed to be stationary, i.e., it has zero mean and constant variance. Ω^+ and Ω^- are respectively the slopes of the positive and the negative changes in interest rate. Equation 3 is the long run relationship between exchange rate and interest rate. The partial sums of the negative and positive changes in interest rate are defined as follows:

$$\text{int}_t^+ = \sum_{i=1}^{p} \Delta \text{int}_i^+ + \sum_{i=1}^{p} \max(\Delta \text{int}_t, 0) \quad - \quad - \quad - \quad - \quad - \quad (4)$$

and

$$\text{int}_t^- = \sum_{i=1}^{p} \Delta \text{int}_i^- + \sum_{i=1}^{p} \min(\Delta \text{int}_t, 0) \quad - \quad - \quad - \quad - \quad - \quad (5)$$

Thus, the asymmetric ARDL model for this study is generated from a combination of Equations 1 to 5 and is stated as follows.

$$\Delta \ln exr_t = \Pi + \Psi_m \sum_{m=1}^{M} \Delta \ln exr_{t-m} + \sum_{p=0}^{P} \left(\Upsilon_p^+ \Delta \text{int}_{t-p}^+ + \Upsilon_p^- \Delta \text{int}_{t-p}^- \right) + \Phi_1 \ln exr_{t-1} + \Phi_2^+ \text{int}_{t-1}^+ +$$
$$\Phi_3^- \text{int}_{t-1}^- + \varepsilon_t \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (6)$$

Where $\Upsilon_p^+ < 0$ and $\Phi_2^+ < 0$, while $\Upsilon_p^- > 0$ and $\Phi_3^- > 0$. This means that a rise in interest rate is expected to have a negative impact on exchange rate in both the short and long run, while a fall in interest rate is expected to have positive impact on exchange rate in the short and long run.

In Equations 4 to 6, Δ and P are difference operator and optimal lags (for both positive and negative changes in interest rate) respectively, M in Equation 6 is the optimal lag of exchange rate. The study determined the optimal or appropriate lags included in estimating Equation 6 - M and P using the information criteria, which are sequential modified LR, Akaike Information criteria (AIC), Schwarz Information Criterion (SC), Hannan and Quin (HQ) and Finite Prediction Error (FPE) etc. Υ_i, Φ_i and Ψ_m are parameters, and ε_t is the white noise error term. Equation 6 implies the possibility of the existence of asymmetric impact of interest rate on exchange rate in either short run or long run or in both the short and the long run.

Similarly, the existence or otherwise of asymmetries in the short and long run is tested as:

For the short run, the null hypothesis;

$$H_0 : \sum_{p=0}^{P} \Upsilon_n^+ = \sum_{p=0}^{P} \Upsilon_p^- \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (7)$$

which states that there is symmetry - the effect of positive and negative changes in interest rate on exchange rate is symmetric and is tested against the alternative hypothesis expressed by Equation 8.

$$H_0 : \sum_{p=0}^{P} \Upsilon_n^+ \neq \sum_{p=0}^{P} \Upsilon_p^- \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (8)$$

which states that there is no symmetry i.e., the effects of positive and negative changes are not symmetric (are asymmetric). It therefore suggests that if the null hypothesis of the test is rejected, the implication is that the impact on exchange rate of positive and negative interest rates are not equal (asymmetric). Furthermore, in the case of the long run, the null hypothesis of long run symmetry, i.e.,

$$H_0 : \Phi_2^+ = \Phi_3^- \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (9)$$

is tested against the alternative hypothesis of long run asymmetry, i.e.,

$$H_1 : \Phi_2^+ \neq \Phi_3^- \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (10)$$

The study employed the Error Correction Mechanism (ECM) to estimate the short run parameters. Equation for this short run Error Correction Mechanism is stated below.

$$\Delta \ln exr_t = +\Psi_t \sum_{m=1}^{M} \Delta exr_{t-m} + \Upsilon_p^+ \sum_{p=0}^{P} \Delta \text{int}_{t-p}^+ \Upsilon_p^- \sum_{p=0}^{P} \Delta \text{int}_{t-p}^- + \phi ect_{t-1} + \varepsilon_t \quad - \quad (11)$$

In the error correction model, ect_{t-1} denotes the first lag of the error term that is generated from the estimation of Equation 6 and ϕ is coefficient of the Error Correction Term (ECT) also called the drift component. Coefficient of the first lag of the error correction term indicates the speed at which the variables adjust to the long run equilibrium after a shock or shocks in the short run (Rushdi, Kim & Silvapulle, 2012). For the convergence of the dependent variable and the independent variables to the long run equilibrium, coefficient of the lag of the error correction term should be negative, statistically significant and less than one in absolute term (Salisu & Isah, 2017). The closer the value of the speed of adjustment is to one, the greater the speed at which the variables adjust to the long run equilibrium and vice versa. The cumulative dynamic multiplier effect of a unit change in positive and negative changes in interest rate on exchange rate are given by Equations 12 and 13 respectively.

$$U_k^+ = \sum_{p=0}^{P} \frac{\partial \ln exr_{t+i}}{\partial \text{int}_t^+} \quad - \quad - \quad - \quad - \quad - \quad - \quad (12)$$

$$U_k^- = \sum_{p=0}^{P} \frac{\partial \ln exr_{t-i}}{\partial \text{int}_t^-} \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (13)$$

For $k = 0,1,.....$

Worthy of note is that as k tends to infinity, U_k^+ and U_k^- tend to approach the respective asymmetric effect of long run coefficients (i.e., Ω^+ and Ω^- respectively).

Unit Root Test

Two unit root tests were employed to test the stationarity status of the series used for the study. These unit root tests are the Augmented Dickey-Fuller (ADF) developed by Dicky and Fuller in 1981, the Phillips-Perron (PP) developed by Phillips and Perron in 1988. The PP unit root test is known to have greater significant power and performs well even in the presence of structural break (Adom & Bekoe, 2012). Besides, it produces more robust results even in the presence of high serial correlation and heteroscedasticity (Kumar, 2018). Models for the unit root test are stated as;

$$\Delta r_t = \varphi + \sigma r_{t-1} + \sum_{s=1}^{K} \rho_s \Delta r_{t-s} + \varepsilon_t \quad - \quad - \quad - \quad - \quad - \quad (14)$$

and

$$\Delta r_t = \varphi + \rho t + \sigma r_{t-1} + \sum_{s=1}^{K} \rho_s \Delta r_{t-s} + \varepsilon_t \quad - \quad - \quad - \quad - \quad - \quad (15)$$

Equations14 and 15 are unit root test models with only constant and with constant and trend respectively. In these equations, r_t is the series, on which we tested for unit root, K is the optimal number of lag(s), Δ is the first difference operator, t is the trend term and ε is the error term. Both the ADF and the PP tests have the same null and alternative

hypotheses. Their null and alternative hypotheses are; there is unit root in the series and there is no unit root in the series respectively. Hence, if the null hypothesis is rejected, the series is stationary, otherwise, it is not stationary.

COINTEGRATION TEST

Cointegration test was carried out in order to ascertain if there is a stable relationship, i.e., a long run relationship between exchange rate and the explanatory variables (positive and negative changes in interest rate). The Autoregressive Distributed Lag (ARDL) bounds cointegration test developed by Pesaran, Smith and Shin (2001) was employed to perform this task. This cointegration test was employed because of its advantages, among which are: it is fitting for a single reduced form of equation (Pesaran& Shin, 1999); it is suitable for testing for cointegration irrespective of the integration order of the independent variables, i.e., whether they are all integrated of order zero (I[0]), integrated of order one (I[1]) or a mixture of the two (Pesaran, Shin & smith, 2001; Bahmani-Oskooee& Ng, 2002; Cuestas & Gil-Alan, 2017).

Null hypothesis of the ARDL bounds cointegration test states that there is no cointegration between the dependent and the independent variables which in Equation 6 suggests that $H_0 : \Phi_1 = \Phi_2 = \Phi_3 = 0$. On the other hand, the alternative hypothesis of the test states that there is cointegration between the dependent and the independent variables, and based on Equations 6 it suggests that $H_0 : \Phi_1 \neq \Phi_2 \neq \Phi_3 \neq 0$. The ARDL bounds cointegration test is based on F-statistic which is compared with the critical values of the bounds test. If the F-statistic value is greater than the upper bound critical value, the null hypothesis is not rejected, and signifies an

evidence of cointegration between the dependent and the independent variables.

ESTIMATION AND DISCUSSION OF RESULT

Descriptive Result

As a means of investigating the distribution of the data set, descriptive analysis was conducted to analyze the stochastic properties of the data set. The result of the descriptive analyse is presented in Table 1.

Table 1: Descriptive Statistic

Variable	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Jarque-Berra	Obs
$\ln exr_t$	4.0251	4.7691	5.7357	-0.0004	1.4017	-0.8105	2.5830	47.04824***	403
int_t^+	0.2583	0.0100	5.5100	0.0000	0.6602	4.8444	30.0857	13895.23***	403
int_t^-	-0.2091	0.0000	0.0000	-7.0300	0.5994	-6.7943	61.9329	61419.60***	403

Note: *** denotes statistically significant at 1% level of significance.

Source: Authors' computation from output of E-views 8

It is observed from Table 1 that negative change in interest rate has the least average value. This is expected since the variable represents negative changes. Exchange rate on the other hand, has the greatest average value; its mean value is 4.0251. Similarly, exchange rate has the greatest median and maximum values of 4.7691 and 5.7357 respectively, followed by positive changes in interest rate with median and maximum values of 0.0100 and 5.5100 respectively. As expected, Table 1 reveals that negative change in interest rate has the least minimum value of -7.0300, while positive change in interest rate has the highest minimum value. The maximum and minimum values of the variables showed that though all the variable have less

variability, exchange rate has the highest variability while negative changes in interest rate has least variability. This is further confirmed by the respective values of the standard deviation of the variables. The implication of this low variability is that the estimates produced from these variables are not spurious. The skewness values demonstrated that exchange rate and negative change in interest are negatively skewed. This implies that the level of significance for negative change in interest rate is less than the normal while that of the positive change in interest rate is greater than the normal. The overall descriptive statistic result revealed that the estimates from these variables produced reliable result.

Unit Test Result

For the purpose of ascertaining the stationarity attributes of all the variables utilized for this study, the study employed the Augmented Dickey-Fuller (ADF) and the Philips-Peron (PP) unit root tests. Summary of the stationarity test result is reported in Table 2.

Table 2: Unit Root Test Result

Variable	Augmented Dickey-Fuller (ADF)			Phillips-Peron (PP)		
	Level	First Difference	I(d)	Level	First Difference	I(d)
$\ln exr_t$	-3.0527[d]	-14.5103***[d]	I(1)	-3.2549[d]	-14.3323***[d]	I(1)
int_t^+	-18.2112***[d]	-	I(0)	-18.6364***[d]	-	I(0)
int_t^-	-11.0401***[d]	-	I(0)	-17.3132***[d]	-	I(0)
Prime Lending Rate						
int_t^+	-11.1238***[c]	-	I(0)	-17.7869***[d]	-	I(0)
int_t^-	-17.0839***[c]	-	I(0)	-17.4994***[c]	-	I(0)

Note: *** signify statistically significant at 1% level of significance, while [c] and [d] denote test with constant and with constant and trend respectively.

Source: Authors' computation from output of E-views 8

The unit root test result showed that all the series, but exchange rate is stationary at level. This implies the presence of unit root in the series. However, after differencing the series one time, the null hypothesis that there is unit root in the series was rejected at 1% significance level. The unit root test result in Table 2 revealed a mixture of I(0) and I(1); thereby necessitating carrying out cointegration test to find out if the series jointly, can have a long run relationship even though they are stationary at different orders.

DETERMINATION OF LAG LENGTH OF THE MODEL

This study employed the lag selection criteria to determine the optimal number of lag(s) to be included in the estimation of the NARDL model and Table and the outcome of the test is presented in table 3.

Table 3: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1421.935	NA	0.272866	7.214858	7.245078	7.226832
1	-289.7127	2241.513	0.000925	1.527659	1.648537*	1.575552*
2	-280.5901	17.92177*	0.000924*	1.527039*	1.738574	1.610851
3	-272.0922	16.56557	0.000927	1.529581	1.831775	1.649312
4	-269.0330	5.916903	0.000955	1.559661	1.952513	1.715312
5	-265.6223	6.545217	0.000982	1.587961	2.071471	1.779532
6	-263.7965	3.475904	0.001019	1.624286	2.198454	1.851777
7	-262.0859	3.230759	0.001057	1.661194	2.326021	1.924604
8	-259.4768	4.887760	0.001092	1.693554	2.449038	1.992883

Note: * indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final Prediction Error, AIC:

Akaike Information Criterion, SC: Schwarz Information Criterion, HQ: Hannan-Quinn Information Criterion.

Source: Authors' computation from output of E-views 8

The sequential modified LR, Finite Information Criteria and Akaike Information Criteria suggested that two lags are the optimal number of lags to be included in the model. Thus, two lags were included in the estimation of the NARDL model. The reason for including two lags is that majority of the lag selection criteria suggested that two is the optimal number of lags of the NARDL model.

CORRELATION RESULT

Table 4 presented correlation results among exchange rate, positive and negative changes in interest rate.

Table 4: Correlation Result

	$\ln exr_t$	int_t^+	int_t^-
$\ln exr_t$	1.0000		
int_t^+	-0.1470	1.0000	
int_t^-	0.0147	0.1184	1.0000

Source: Authors' computation from output of E-views 8

The correlation result showed that a positive correlation exists between the exchange rate and negative changes in interest rate; and between positive and negative changes in interest rate. On the other hand, there is negative association between the Naira/US Dollar exchange rate and positive changes in interest rate. The correlation coefficient between exchange rate and positive changes in interest rate is -0.1470, between exchange rate and

negative changes in interest rate is 0.0147 and between positive and negative changes in interest rate is 0.1184; implying a weak correlation among the variables. Of particular interest is the correlation coefficient between positive and negative changes in interest rate, since they are the independent variables in this study. The correlation coefficient between these variables suggested that there is the absence of serious multicollinearity between the variables.

ARDL Bound Test Cointegration Test Result

In order to investigate the existence of a long run relationship between exchange rate and positive and negative changes in interest rate, bounds ARDL cointegration test was employed. Two models are considered here – the main model in which maximum lending rate is used and the robustness check model in which the prime lending rate is used. Table 5 reported result of the cointegration test.

Table 5: ARDL Bounds Cointegration Test Result

Model	f-statistic	K	Bounds		
H_0: No Cointegration			Significance Level	Lower Bound	Upper Bound
Model 1	9.9622***	2	1%	4.99	5.85
Model 2	6.3054***	2	5%	3.88	4.61
			10%	3.38	4.02

Note: *** denotes statistically significant at 1% level of significance.

Source: Authors' computation from output of E-views 8

From Table 5 it is seen that the F-statistic values of the ARDL bounds cointegration test for both the main and the robustness check models are statistically significant at 1% level of significance. Thus, the null hypothesis of the test which says that there is no cointegration between exchange rate and

positive and negative changes in interest rate is rejected. This suggests an evidence of a long run long relationship between exchange rate and positive and negative changes in interest rate. Thus, the study concluded that there is a long run relationship between exchange rate and positive and negative changes in interest rate. This further suggests that a short or short run shock(s) in the equilibrium of exchange rate and positive and negative changes in interest rate in Nigeria is transient; it dissipates with time until these variables attain their long run equilibrium (was stationary). The NARDL bounds cointegration test result supports the estimation of both the short and long run of the exchange rate model, hence, we estimated the short and long run NARDL model and the result reported on Table 6.

Table 6: Short and Long Run NARDL Estimates

Variable	Coefficient	Variable	Coefficient
	Main Result	**Robustness Check Result**	
	Short Run		
Constant	0.0681*** (0.0190)	Constant	0.0711*** (0.0210)
Δint_t^+	3.6456*** (0.7403)	Δint_t^+	1.5422* (0.8719)
Δint_t^-	-0.3216 (0.8178)	$\Delta \text{int}_{t-1}^+$	3.8300*** (1.3065)
ECT_{t-1}	0.0286*** (0.0093)	$\Delta \text{int}_{t-2}^+$	-2.4427*** (0.8651)
		Δint_t^-	-0.1943 (0.8885)
		ECT_{t-1}	-0.0294*** (-3.0211)
Long Run			
int_t^+	1.2732** (0.4955)	int_t^+	1.3007* (0.6634)
int_t^-	-0.1123 (0.2841)	int_t^-	-0.0670 (0.3022)
Adjusted R^2	0.9952	Adjusted R^2	0.9949
f-statistic	21010.75***	f-statistic	12982.92***
Symmetric Test			
Short Run	11.4118***		5.8506**
Long Run	110.0483***		99.1534
Diagnostic Test			
Normality	238777.8***		310280.1***
Serial Correlation	0.6876		0.4877
Heteroskedasticity	0.0020		0.0011
Functional Form	0.9359		1.284

Note: *,** and *** denote statistically significant at 10%, 5% and 1% level, while (.) are standard error values.

Source: Authors' computation from output of E-views 8

Result of the short and long run asymmetries is reported in Table 6. The study employed the Wald test to carry out the long and the short run asymmetry tests. It was discovered that for the short run, the value of the Wald Statistic is 11.4118 while its probability value is 0.0008, suggesting rejection of the null hypothesis of no short run asymmetry at 1% level of significance. This means that positive and negative changes in interest rate do not exert equal impact on exchange rate in Nigeria. Alternatively, it means that exchange rate does not respond equally to positive and negative changes in interest rate in Nigeria. Additionally, the asymmetry result implies that specifying linear model to investigate the impact of interest rate on exchange rate would amount to model misspecification. Similarly, for the long run asymmetry the Wald statistic is statistically significant at 1% level of significance; implying rejection of the null hypothesis of the test. The study therefore concludes that like in the short run, in the long run positive and negative changes in interest rate do not have equal impact on exchange rate.

The result on Table 6 also revealed that there is positive and statistically significant relationship between the Naira/US Dollar exchange rate and positive change in interest rate in the short run. That is, if lending interest rate in Nigeria increases, the Naira/US Dollar exchange rate rises; suggesting that the Naira becomes weak against the US Dollar. In this case, more units of the Naira are required to purchase a given unit of the US Dollar. This result does not conform to the result of Andris, Caprau, Ihnatov and Tiwari (2017) who established a negative association between increase in interest rate and exchange rate in Romania in the short run. However, the result is in line with the findings of Sargent and Wallace (1981), and Tafa (2015) who found that increase in interest rate weakens the domestic

currency. On the other hand, exchange rate and negative change in interest rate are negatively, but insignificantly related in the short run, suggesting that in the short run, a reduction in interest rate appreciates the Naira against the US Dollar, albeit, slightly. In terms of elasticity, Table 6 reported that a 1% fall in interest rate will appreciate the Naira against the US Dollar by 0.3216% in the short run. The error correction coefficient in Table 6 suggested an evidence of a long run relationship between exchange rate and positive and negative changes in interest rate in Nigeria. This confirmed the cointegration test result reported in Table 5. It suggested that in the presence of a short run deviation from the equilibrium of the variables in the previous month, the variables will move to their equilibrium by 2.86% in the current month and in the subsequent months until the variables are stable, i.e., get to their long run equilibrium.

In the long run, as evident in Table 6, positive change interest rate has positive and significant impact on exchange rate, suggesting that, increase in interest rate depreciates the Naira against the US Dollar significantly. Additionally, it means that if interest rate increases, more units of the Naira are needed to purchase one unit of the US Dollar. This positive relationship between increase in interest rate and exchange rate is in line with the findings of Fuman and Tiglitz (1998); Sargent and Wallace (1981) and Tafa (2015) who established that increase in interest rate weakens the domestic currency. Similarly, the result corroborates the result of Andris, Caprau, Ihnatov and Tiwari (2017) who found a positive relationship between increase in interest rate and exchange rate in the long run in Romania. The impact of positive change in interest rate on exchange rate in the long run does not differ from that of the short run. However, in terms of magnitude, the short run impact is higher than the long run impact. On the other hand, the impact of negative change in interest rate on exchange rate in the long run is negative but statistically insignificant. It means that in the long run a fall or reduction in

interest rate plays negligible role in appreciating the Naira against the US Dollar. The adjusted R^2 value confirms that 99.52% of the total variation in exchange rate is accounted for by positive and negative changes in interest rate. This is further confirmed by the F-statistic value 21010.75 and its significant level which revealed that positive and negative changes in interest rate are jointly significant in explaining the variations in exchange rate.

The Jarque-Bera statistic which is a test for normality of the residuals is statistically significant at 1%; indicating non-rejection of the null hypothesis of the test and this means that the residuals of the series are not normally distributed. Regarding serial correlation, homoskedasticity and functional form tests, their respective null hypotheses (there is no serial correlation, variance of the error term is homoscedastic and the model is correctly specified)respectively are not rejected at any level of significance. These indicate that the error terms of the series are independent, the variance of the error terms is constant (the NARDL estimates have the least variance) and the model that this study specified to express the relationship between exchange rate and positive and negative changes in interest rate (NARDL) is correctly specified.

CONCLUSION AND POLICY RECOMMENDATIONS

The study examined whether or not exchange rate responds symmetrically to positive and negative changes in interest rate in Nigeria using monthly data on nominal exchange rate and interest rate that span January 1986 and August 2019. NARDL model was employed and found asymmetric response of exchange rate to positive and negative changes in interest rate in Nigeria in the short and long run. It further revealed a positive and statistically significant relationship between exchange rate and positive change in interest rate in the short and long run. By and large, the study

discovered that in the short and long run, increase and reduction in interest rate do not have equal impact on exchange rate in Nigeria.

The result of the analysis therefore suggested that there is a need for the monetary authorities to design appropriate monetary policies to accommodate interest rate policies that will not place the Naira at a disadvantage against the Dollar. The government should intervene from time to time to check the limit beyond which the lending rate must not exceed since increase in the lending rate significantly places the Naira at a disadvantage against the Dollar.

REFERENCES

Adom, P. K., & Bekoe, W. (2012). Conditional Dynamic Forecast of Electrical Energy Consumption Requirement in Ghana by 2020: A Comparison of ARDL and PAM. *Energy*, 44, 367-380.

Adusei, M., & Gyapong, E. Y. (2017). The Impact of Macroeconomic Variables on Exchange Rate Volatility in Ghana: The Partial Least Squares Structural Equation Modeling Approach. *Research in International Business and Finance.* http://dx.doi.org/doi:10.1016/j.ribaf.2017.07.081

Ajao, M. G., & Igbekoyi, O. E. (2015). The Determinants of Real Exchange Rate Volatility in Nigeria. *Academic Journal of Interdisciplinary Studies,* 2(1), 459-471.

Andris, A. M., Caprau, B., Ihnatov, I., & Tiwari, A. K. (2017). The Relationship between Exchange Rates and Interest Rate in a Small Economy: The Case of Romania. *Economic Modelling,* 67, 261-274.

Andris, A. M., Ihnatov, I., & Tiwari A. K. (2014). Analyzing Time-Frequency Relationship between Interest Rate, Stock Price and Exchange Rate through Continuous Wavelet. *Economic Modelling,* 41, 227-238.

Asinya, F. A., & Takon, N. (2014). Exchange Rate Depreciation and Government Policy in Nigeria. An Empirical Evidence. *The Business and Management Review*, 4(3), 161-170.

Akonji, D. R. (2014). Capital Flight and Economic Growth in Nigeria: A Simulation Analysis. *Unpublished Dotoral Thesis, Benue State University, Makurdi, Nigeria.*

Baharumshah, A. Z., Mohd, S. H., & Masih, A. M. (2019). The Stability of Money Demand in China: Evidence from ARDL model. *Economic System, 3, 231-244.*

Bahmani-Oskooee, M. ,& Ng, R. C. W. (2002). Long Run Demand for Money in Hong Kong: An Application of the ARDL Model. *International Journal of Business and Economics,* 1, 147-155.

Barkhordari, S., & Fattai, M. (2017). Reform of Energy Prices, Energy Intensity and Technology: A Case Study of Iran ARDL Approach. *Energy Strategy Reviews, 18, 18-23.*

Belke, A., Geisslereither, K., & Gros, D. (2004). On the Relationship between Exchange Rates and Interest Rates: Evidence from the Southern Cone. *Cuodernos de Economia,* 41, 35-64.

Broni-Bediako, E. Onyiji, I. J., & Nwene, K. K. (2018). Economic Effects of Oil Price Volatility on Developing Countries: A Case Study of an Oil Exporting Country. *International Journal of Economics and Management Science,* 7(2), doi:10.4172/2162-6359.1000509.

Byner, J. P., & Nagayasu, J. (2010). Structural Breaks in the Real Exchange Rate and Real Interest Rate Relationship. *Global Finance Journal, 21*, 138-151.

Central Bank of Nigeria (1999). *Central Bank of Nigeria Annual Report,* Abuja, Nigeria

Central Bank of Nigeria (2016). Foreign Exchange Rate. *Education in economic,* Series 4.

Central Bank of Nigeria (2017). *Annual statistical bulletin.*

Craig, B. (2001). A Framework for a Macroeconomic Model of an Open Emerging Small Open Economy. *Draft for institution of policy analysis,* Toronto.

Cuestas, J. C., & Gil-Alana, L. U. (2017). Oil price shocks and unemployment in central and Eastern Europe. *Economic System*. https://doi.org/10.1016/j.ecosys.-2017.05.005

Dickey, D. A., & Fuller W. A. (1981), Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica, 49*, 1057-1072.

Ebiringa, O. T., & Anyaogu, N. B. (2014). Exchange Rate, Inflation and Interest Rates Relationships: An Autoregressive Distributed Lag (ARDL) Analysis. *Journal of Economics and Development Studies*, 2(2), 263-279.

Fuman, J., & Stiglitz, J. E. (1998). Economic crises: Evidence and Insights from East Asia. Brooking Papers on Economic Activity, Washington D. C.

Goldfajn, I., & Gupta T. (1999). Does Monetary Policy Stabilize the Exchange Rate Following a Currency Crises? *International Monetary Fund Working Paper*.

Hacker, R. S., Karrison, H. K., & Manson, K. (2015). An Investigation of the Causal Relationship between Exchange Rates and Interest Rate Differentials Using Wavelets. *International Review of Economics and Finance*, 29, 321-329.

Hassan, A., Abubakar, M., & Dantama, Y. U. (2017). Determinants of Exchange Rate Volatility: New Estimates from Nigeria. *Eastern Journal of Economics and Finance*, 1(3), 1-12.

Hnatkovska, V., Lahir, A., & Vegh, C. A. (2008). Interest Rates and Exchange Rate: A Non-Monotonic Tale, *European Economic Review, 34*, 1-41.

Hnatkovska, V., Lahiri, A., & Vegh, C. A. (2013). Interest Rate and the Exchange Rate: A Non-Monotonic Tale. *European Economic Review, 63*, 68-93.

Honda, Y, & Inoue, H. (2018). *The Effect of the Negative Interest Rate Policy in Japan: An Early Assessment*. https://doi.org/10.1016/j.jjie.2019.01.001.

Hoque, M. M., & Yusop, Z. (2010). Impacts of Trade Liberalization on Aggregate Import in Bangladesh: An ARDL Bounds Test Approach. *Journal of Asian Economics*, 21, 37-52.

Jalil, A., Feridun, M., & Ma, Y. (2010). Finance-Growth Nexus in China Revisited: New Evidence from Principal Components and ARDL Bounds Tests. *International Review of Economics and Finance, 19*, 189-195.

Krugman, P. R., Obstfeld, M., & Melitz, M. J. (2012). *International economics: Theory and Policy*. 9th Edition, United States: Pearson.

Kumar, S. (2018). Asymmetric Impact of Oil Prices on Exchange Rate and Stock Prices. *The Quarterly Review of Economics and Finance*. https://doi.org/10.1016/j.qref.2018.12.009

Li, X. P., Feng, Y., Wu, C. F., & Xu, W. D. (2013). Response of the Term Structure of Forward Exchange Rate to Jump in the Interest Rate. *Economic Modelling*, 30, 863-874.

Mankiw, N. G. (2010). *Macroeconomics*. 7th Edition. New York: Worth Publishers.

Ozmen, M. U., & Yilmaz, E. (2017). Co-movement of exchange rates with interest rate differential, risk premium and fed policy in "fragile economies". *Emerging Market Review*, 33, 173-188.

Pesaran, M. H., & Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, Chapter 11 in: Econometrics and Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, Strom, S., (eds.). Cambridge: Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Economics*, 16, 289-444.

Pesaran, M., Shin, Y., & Smith, R. (1996). Testing for the Existence of a Long Run Relationship. Faculty of Economics, University of Cambridge. No.9622.

Phillips, P. C. B., & Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrica*, 75, 335-346.

Pradhan, R. P., Norman, N. R., Badir, Y., & Samadhan, B. (2013). Transport Infrastructure, Foreign Direct Investment and Economic Growth

Interaction in India: The ARDL Bounds Testing Approach. *Procedia–Social and Behavioural Group of India,* 104, 914-921.

Rahman, M. M., & Kashem, M. A. (2017). Carbon Emissions, Energy Consumption and Industrial Growth in Bangladesh: Empirical Evidence Form ARDL Cointegration and Granger Causality Analysis. *Energy Policy,* 110, 600-608.

Rehman, M. U., Bouri, E., Eraslan, V., & Kumar, S. (2019). Energy and Non-Energy Commodities: An Asymmetric Approach Towards Portfolio Diversification in the Commodity Market. *Resource Policy,* 63, 101456.

Rewane, B.J. (2015). Exchange Rate Management: Evolution of the Nigerian Foreign Exchange Market. CBN Bullion, 39(1), 39, (3), 15.

Rewane, B. (2016). Nigeria Exchange Rate Policy Dilemma. Retrieved on January 12, 2019 from www.fdcng.c

Rushdi, M. R., Kim, J. H., & Silvapulle, P. (2012). ARDL Bounds Tests and Robust Inference for the Long Run Relationship Between Real Stock Returns and Inflation in Australia. *Economic Modelling,* 29, 535-543.

Salisu, A. A., & Isah, K. O. (2017). Revisiting the Oil Price and Stock Market Nexus: A Nonlinear Panel ARDL Approach. *Economic Modeling,* 1, 1-14.

Sarac, T. B., & Karagoz, K. (2016). Impact of Short-Term Interest Rate on Exchange Rate: The Case of Turkey. *Procedia Economics and Finance, 38,* 195-202.

Sargan, T. j.,& Wallace, N. (1981). Some Unpleasant Monetary Arithmetic. *The Federal Reserve Bank of Minneapolis Quarterly Review,* 5, 1-17.

Seyi, N.(2012). Measuring the Impact of Changing Oil Prices and Other Macro-Economic Variables on GDP. *International Journal of Finance and Economics, 52,41-49.*

Shahbaz, M., Nawaz, K., Arouri, M., Teulon, F., & Udding, G. S. (2013). On the Validity of the Keynesian Absolute Income Hypothesis in Pakistan: An ARDL Bounds Testing Approach. *Economic Modelling, 35,* 290-296.

Shahzad, M. Jan, A., U., Ali, S., & Ullan, R. (2018). Supply Response Analysis of Tobacco Growers in Khyber Pakhtunkhwa: An ARDL Approach. *Field Crop Research,* 218, 195-200.

Shalishali, M. K., & Ho, J. C. (2002). Inflation, Interest Rate and Exchange Rate: What is the Relationship? *Journal of Economics and Economic Education Research,* 3(1), 107-117.

Shin, Y., Yu, B., & Greenwood-Nimmo, M., (2014). Modeling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. Festschrift in Honor of Peter Schmidt. *Springer,* 28, 281-314.

Tafa, J. (2015). Relation between Exchange Rates and Interest Rates: Case of Albania. *Mediterranean Journal of Social Sciences, 6*(4). Doi:10.5901/ mjss.2015.v6n4p163.

Tursoy, T., & Faisal, F. (2017). The Impact of Gold and Crude Oil Prices on Stock Market in Turkey: Empirical Evidence from ARDL Bounds Test and Combined Cointegration. *Resource Policy,*15, 57-71.

Wilson, L., & Sheefeni, J. P. S. (2014). The Relationship between Interest Rate and Exchange Rate in Namibia. *Journal of Emerging Issues in Economics, Finance and Banking,* 1, 1-13.

World Bank (2018). World Development Indicators (WDI) databank.

AN ASSESSMENT OF THE RELATIONSHIP BETWEEN SELECTED MACROECONOMIC VARIABLES AND CRUDE OIL PRICE IN NIGERIA

***Sule Magaji*, Ph.D.**
Department of Economics,
University of Abuja, Nigeria
abujabankingandfinance@gmail.com

Ali Salisu
Department of Economics,
Bayero University Kano, Kano State, Nigeria
alisalisubeto@gmail.com

Ibrahim Musa
Department of Economics,
University of Abuja, Nigeria
Ibmmusa74@gmail.com

Dr. Elyakub Ahmad BaBa
Department of Economics,
University of Abuja, Nigeria

Abstract

The study examined the relationship between oil price shocks and some selected Nigeria's macroeconomic variables by utilizing quarterly data for the period of 1970-2016. Using a time frame of 46 years, the selected macroeconomic variables are Real growth Domestic Product, Consumer Price Index and Real Exchange Rate. VECM was used as the technique for analysis. The results obtained from estimation of the VECM model showed that the long-run interdependences of oil price shocks has significant impact on Real Growth Domestic Product, Consumer Price Index and Real Exchange Rate in Nigeria. The study concluded, that the major source of revenue and foreign earnings to the economy are mainly from the sales of crude oil, as the economy is entirely dependent on the level of global oil prices. As such, most of the macroeconomic indicators of the economy are directly or indirectly affected by the oil price fluctuation in the economy. The study therefore recommended that, since Nigeria does not have control over oil prices, it is required that the government diversifies the economy to reduce the adverse effect of shocks emanating from the fluctuation of global oil prices, the country should diversify its export from oil exports to non-oil exports. This is necessary in order to reduce the consequences of external shocks. The diversification of the oil revenue base would serve as a means of minimizing reliance on crude oil and petroleum products.

Keyword: Oil price, macroeconomics variables, VECM, Crude oil, Shocks

INTRODUCTION

Over the past two decades, oil markets have suffered from spectacular oil price swings. Price fluctuations of such a vital energy source depended much more than any other commodity on the supply changes (shortage or oversupply). Since the 1970s, macroeconomists have viewed changes in oil prices as an important source of fluctuations as well as paradigm of global shocks, likely to affect economies simultaneously. From the early 1970s to the early 1980s, the oil price rise is dramatically associated with disruptions in the supply of oil from the Middle East countries. Until the mid-1970s, the crude oil price was 3.00billion barrels-per-dollar on average closing price. With the Iranian crisis in 1979, a major disruption in oil supplies started. In 1999, the oil-price started a new wave of increase, which peaked in the second trimester of 2008. It reached $99.07 per barrel (inflation adjusted). This spectacular increase was due to, firstly, the growing use of modern transportation modes such as automobiles in emerging economies that increased the oil demands. Secondly, the galloping industrialization process that has occurred in emerging and developing countries put upward pressure on oil demand. Thirdly, in developing countries, the primary economic sector, agriculture including farming and irrigation, has become more mechanized and demands much more oil as the source of energy.

The Nigerian economy has consistently relied on the export of crude oil for foreign exchange earnings and revenues, particularly as it accounts for over 95 per cent of export earnings and about 85 per cent of government revenues. Its contribution to GDP, however, stood at 17.85 per cent in 2008 (Aliyu, 2009). Nigeria's oil statistics show that the country has an estimated 36.2 billion barrels of oil reserves, which makes the country the second largest in terms of oil reserve in the African continent. The Energy Information Administration (2009) estimates Nigeria's effective oil production capacity to be around 2.7 million barrels per day. Serious drop in oil production levels,

which affected exports and the plummeting of world oil prices in late 2008, resulted in huge revenue gaps for the country. Equally, the country was exposed to oil price shocks through massive importation of refined petroleum products since the collapse of local refineries in the late 1980s. Currently, the country imports almost 85 per cent of refined products for local consumption.

One of the most serious problems confronting Nigeria today is the instability in the price of oil and its attendant consequences on to economic wellbeing of its citizen. This is because Nigeria does not have control over her crude oil product, (massive importation of refined petroleum products) because of her inability to independently refine its crude oil into petroleum products. For instance, the major reason for the fuel shortage is the collapse of the country's four oil refineries in Port Harcourt, Warri, Delta and Kaduna. Though the government claims it has spent $6bn on their repairs, yet the country still relies mainly on importation of refined fuel (Elmi and Jahadi 2011). In fact, a cartel has developed in the elite class, which makes millions of dollars of profit from fuel importation and artificial scarcity of petroleum products. The elasticity of a change in oil price on macroeconomic variables is so perfect that the economy respond to even mere speculations. Thus persistent oil shocks could have severe macroeconomic implications like fluctuation in the GDP which may induce challenges with respect to policy making. It thus appears that oil price volatility poses a significant problem to macroeconomic stability and sustainable development in Nigeria. Nigeria's inability to attain sustainable development, certain level of full employment, poverty reduction, solve the unfavorable balance of trade, inflation problem and high debt ratio, are all linked to its high dependence on oil as its major source of revenue, as well as the neglect of agriculture and other sectors in a comprehensive and sincere diversification policy. The problem is compounded by decades of corruption in the oil sector, poverty, unemployment, processing and distribution costs, social conflicts in oil-

producing areas resulting to pipeline vandalism, oil theft, kidnapping of expatriate oil workers and disruption in petroleum product supply and demand.

This study is motivated by the fact that Nigeria relies heavily on crude oil export revenues, representing about 95 per cent of total export earnings and on average about 85 per cent of government revenues in annual budgets. This has severe implications for the Nigerian economy given the current, wide swings in oil prices in the international oil market. The main objective of this study is to empirically, examine the relationship between oil price shocks on some selected Macroeconomic variables in Nigeria. The need to conduct this study becomes pertinent to fill in the gaps left by the previous researches by utilizing quarterly data for the period of 1970 -2016 (a period of 46years)

CONCEPTUAL FRAMEWORK

Oil Price Shocks and Macroeconomic Variables in Nigeria

Oil price shocks are predominantly, defined with respect to price fluctuations resulting from changes in either the demand or supply side of the international oil market (Hamilton, 1983; Wakeford, 2006). These changes have been traditionally traced to supply side disruptions such as Organization of Petroleum Exporting Countries (OPEC) supply quotas, political upheavals in the oil-rich Middle East and activities of militant groups in the Niger Delta region of Nigeria. The shocks therefore could be positive (a rise) or negative (a fall) as the case may be.

The first oil price shock occurred on October, 1973 as the consequence of the attack of Syria and Egypt on Israel, which affected industrialized economies as oil importing countries and they swelled into stagflation (Elmi and Jahadi 2011).This exogenous shock ended and those countries had to start a long term planning to confront future oil shocks. Iran's revolution in 1979 and then Iraq-Iran war caused the oil price to increase. The third shock was a negative one and occurred in 1985-1986 due to the collapse of oil market and

remarkable reduction in world oil price. In 1990, following the Persian Gulf War and Iraq's attack on Kuwait, world oil market faced another shock.

Going by the foregoing, four oil shocks can be observed in Nigeria. Each of the shocks had connections with some movements in key macroeconomic variables in Nigeria. For instance, the 1973-74, 1979-80, and 2003-2006 periods were associated with price increases while the oil market collapse of 1986 and the 2014-2016 was an episode of price decrease. During the first oil shock in Nigeria (1973-74), the value of Nigeria's export measured in US Dollars rose by about 600 per cent with the terms of trade rising from 18.9% in 1972 to 65.3% by 1974. Government revenue which stood at 8 per cent of GDP in 1972 rose to about 20 per cent in 1975. This resulted in increased government expenditure owing largely to the need to monetize the crude oil receipts. Investment was largely in favor of education, public health, transport, and import substituting industries (Nnanna and Masha, 2003). During the oil price shock of 2003-2006, Nigeria recorded increases in the share of oil in GDP from about 80 per cent in 2003 to 82.6% in 2005. The shock was gradual and persisted for a while. This could be regarded as a permanent shock. The result of the shock was a favorable investment climate, increased national income within the period, although a slight decline was observed in the growth rate of the GDP.

THEORETICAL UNDERPINNING

There has been extensive theoretical work on the macroeconomic consequences of oil price shocks. Most of these studies argued that since the mid-1970s, oil price movements have been a major source of business cycle fluctuations, but they failed to reach consensus on the validity of a peculiar transmission channel that helps to explain the processes by which fluctuations in oil prices influence the macro economy (Akinlaye & Ekpo, 2013). According to Hunt B, Sard I., & Laxton, D. (2002), an increase in oil prices can influence

the economy through many channels. The first mechanism reflects the transfer of income from oil importing to oil-exporting countries, which leads to a decrease in global demand in the oil-importing nations. The decrease in demand in the oil-importing countries outweighs the increase in the oil-exporting countries because of an assumed low propensity to consume in the latter. Secondly, given the level of capital stock and assuming that wages are relatively inflexible in the short run, an increase in input costs of production will result in non-oil output being affected. In addition, since crude oil is a basic input in production, an increase in oil prices leads to an increase in production costs. The third channel is when workers and producers resist a decrease in their real wages and profit margins. This results in upward pressure on labour costs and prices. The fourth channel is through the definition of core inflation, an increase in energy prices raises the consumer price index, leading to calls for action from the central bank. According to economic theory oil price changes and influences economic activity through the following transmission channels:

Transmission Mechanisms (channels)

Several transmission channels through which oil price changes affect the performance of macroeconomic variables has been proposed in the literature. Specifically, six transmission channels have been identified (see Brown and Yucel, 2002; Jones, C. T. (1991); Yi-Yuan Tang, Qilin Lu, Xiujuan Geng, Elliot A. Stein, Yihong Yang, and Michael I. Posner (2010), the supply-side effect, demand side effect (wealth transfer effect), inflation effect, real balance effect, sector adjustment effect and the unexpected effect.

Supply Side Effect: -The supply side effects relate to the fact that crude oil is a basic input in production and commerce, and hence increase in oil price leads to a rise in production and distribution costs that induces firm to lower output. Under the supply-side channel, crude oil is viewed as a basic

input of production. An increase in oil prices has direct impacts on output via increased costs of production through the changing domestic capital and labor inputs and reducing capacity utilization. In other words, oil price shocks changes the marginal costs of production, and hence, contracts production. The decline in productivity reduces total output and increases unemployment. Figure 1 provides an illustration of the supply-side shock: increase in oil prices reduces output in the short-term due to a reduction in capacity utilization thus leading to an increase in unemployment and a fall in income.

Demand Side Effect (Wealth Transfer Effect): -The changes in oil price entail demand side effects on consumption and investment. Consumption affected through its positive relation with disposable income while investment adversely affected directly because such increase in oil price also affects firm's inputs, price and thereby increasing their costs. The wealth transfer effect is another mechanism, which captures the transfer of income from oil-importing nations to oil-exporting nations following an increase in oil prices. Oil price increase leads to windfall in oil revenue for oil-exporting countries; the transfer of income reduces the consumer demand in the oil-importing countries, and increases at the same time, the consumer demand in the oil-exporting countries though more proportionally because of an assumed higher marginal propensity to consume in the latter. From the perspective of an oil importing country, an oil price shock is transmitted through the demand-side of the economy by triggering a reduction in the demand for goods and services (or consumer spending). Oil price shocks affect consumer spending via four complementary mechanisms: the discretionary income effect, uncertainty effect, precautionary savings, and operating cost effects (see Kilian, 2010 for explanation).

EMPIRICAL REVIEW

The empirical literature on the macroeconomic impacts of oil supply shocks evolved as the new state of the oil market revealed itself gradually after 1973. One of the initial beliefs following the 1973-74 price shock was that the new, higher price of oil might be a permanent feature of a changed natural resource regime. Accordingly, one recurrent theme was the aggregate economy's response to a sudden, permanent price shock. How would an economy adjust to the new circumstances? Ebrahim, Inderwidi and King (2014) embarked on a theoretical investigation of macroeconomic impact of oil price volatility. The result showed that oil price volatility constitutes a fundamental barrier to economic growth due to its damaging and destabilizing effect on macro-economy. Precisely, they showed that oil price volatility adversely affects aggregate consumption, investment, industrial production, unemployment and inflation, particularly in non-OECD countries.Furthermore, Agri, Inusa and Kennedy (2015) studied the impact of oil price volatility on Macroeconomic variables and sustainable development in Nigeria using monthly data for the period 1990-2015. Their results confirmed the statistical significance of the impact of oil price volatility on macroeconomic variable. Oriakhi and Osaze (2013) examine the consequence of oil price volatility on the growth of Nigerian economy, their study found that, of the six variables employed, oil price volatility impacted directly on real Government real expenditure, real exchange rate and real import while impacting on real GDP, Real money supply, inflation and government expenditure.

Akinleye and Ekpo (2013) studied the oil price shocks and macroeconomic performance in Nigeria and their findings show that, symmetry shock to oil price shocks do not pose significant inflationary threat to the Nigerian economy in short run for asymmetric effect of oil price shock, only inflation real government expenditure in long run. However, for

fluctuation in real GDP positive oil price shocks have a stronger short run and long run role compared to negative oil price shock.

Abdullahi & Masih (2014) report that co-integration does exist between major macroeconomic variable and selected commodities from Malaysian macro-economy. The vector error correction result shows that crude oil price, gold, kualalumpur composite index (KLCI), industrial production, consumer price index (CPI) and Treasury bills are exogenous but industrial production and money supply are endogenous. Their findings of the study reveal that, the asymmetric model T-GARCH and E GARCH outperform the symmetric models GARCH 1, 1 and GARCH-M meaning that, the asymmetric effect is important in modeling the volatility in Nigeria. Oil price volatility also plays a significant role in the determination of macroeconomic volatility and Nigeria is vulnerable to both internal and external shocks. Omojolaibi (2013) examines volatility in crude oil price and macroeconomic performance in Nigeria, the impulse response functions and result suggests that domestic policies, instead of oil booms should be blamed for inflation. Again, oil price variations are driven mostly by oil shocks, however domestic shocks are responsible for a reasonable portion of oil price variations.

Kang, (2015), investigates the effect of oil price shocks on US stock market real return using a mixture innovation time-varying parameter model. It found that oil price shocks contain information for forecasting real stock return. The coefficient and the nature of shocks have changed over time. Abdullahi (2016) examines the impact of monetary policy on real-GDP, foreign-exchange (FX) reserves and inflation dynamics in Nigeria from 1970Q1 to 2014Q2 by estimating a time-varying parameter-VAR (TVP-VAR) with stochastic volatility model. The paper finds strong evidence of monetary policy playing a significant role in explaining the dynamics of inflation as the impulse responses for the variables to a monetary policy shock change significantly over time. However, monetary policy shocks exert less significant

influence than other exogenous non-policy shocks in explaining the dynamics in real-GDP and FX reserves.

Riggi and Venditti (2015) examine the time-varying effect of oil price shocks on euro-zone export. They find that from the 1980s onwards the relationship between oil prices and euro area exports has become less negative conditional on oil supply shortfalls and more positive conditional on foreign productivity shocks. Tuna (2015) analyses the time-varying causality between gold and oil prices using monthly data for the period of May 2005 to March 2016. The causality relationship from gold to oil is the concern in both positive and negative shocks and the periods of important economic, social or political events. However, the causality relationship from oil to gold is only valid for positive shocks, but it is not valid for negative shocks.

Plante and Traum (2012) estimated a stochastic volatility process for the real price of oil over the period 1986-2011 and utilized the estimated process in a non-linear approximation of the model. For realistic calibrations, an increase in oil price volatility produces a temporary decrease in durable spending, while precautionary savings motive lead investment and real GDP to rise. Baumeister and Peersman (2012) use vector auto-regressions with drifting coefficients and stochastic volatility to investigate how the dynamic effects of oil supply shocks on the U.S. economy have changed over time. They revealed a substantial decline in the short-run price elasticity of oil demand since the mid-eighties. Oil supply shocks contributed to some extent to the 1991 recession and slowed the economic boom of 1999-2000, but they do not explain other U.S. recessions nor do they help explain the "Great Inflation" of the 1970s and early 1980s.

Plakandaras (2017) studies the time-varying effect of macroeconomic shocks in the determination of house prices on the U.S. and the U.K. housing market. The study employed time-varying Vector Auto-regression models, using Bayesian methods and covering the periods of 1830-2016 and 1845-

2016 respectively. From the examination of the impulse responses of house prices on macroeconomic shocks, the study found that technology shocks dominate in the U.S. real estate market, while their effect is unimportant in the U.K. In contrast, monetary policy drives most of the evolution of the U.K. house prices, while transitory house supply shocks are unimportant in either country.

METHODOLOGY

Types and Sources of Data

Conventionally, for a time series study, secondary data is normally employed to establish the necessary link or otherwise among the variables of interest. The data were sourced from the National Bureau of Statistics (NBS) publications, Central Bank of Nigeria (CBN) Annual Report and Statistical Bulletin, World Bank and International Financial Statistics (IFS) of the IMF.

Techniques of Data Analysis

The study used Unit Root Test Vector Error Correction model and cointergration. Unit root test or rather checking the order of integration among the variables of interest gained prominence in time series study since Augmented Dickey-Fuller (ADF) test (1979, 1981) was developed and later it extended and the test assumed that error terms are statistically independent and have a constant variance. Other methods of testing for the existence of unit root problem was developed by Phillips-Perron (PP) test (1988), which takes into account the serial correlation and Heteroscedasticity. Another test for unit root was developed by Kwiatkowski-Phillips-Schmidt-Shin (KPSS) in 1992, the test assumed null hypothesis (Ho) to be stationary, unlike ADF and PP that assumed null hypothesis as non-stationary.

Augmented Dickey fuller equation model (ADF) is here specified as:

$$\Delta y_t = \alpha_o + \alpha_1 + \delta y_{t-1} + \sum_{i=1}^{k} \beta_1 \, \Delta y_{t-1} + \varepsilon_t \qquad (3.3.1)$$

Where α_o and α_1 are constant and deterministic trend, Δ is differencing operator,ε_t is serially uncorrelated error process and it requires that $\delta < 1$, if $\delta = 1$, then there is a unit root in the variable.

CO-INTEGRATION TEST

Because of the inadequacy of the differencing method, testing of the model co-integration is critical for the VECM. The Johanson test of co-integration was employed to test for co-integration in the model.. This test permits more than one co-integrating relationship, so, it is more generally applicable.

There are two types of Johanson test, either with trace or with eigenvalue, and the inferences might be a little bit different. The null hypothesis for the trace test is that the number of co- integrating vectors is $r = r^* < k$, vs. the alternative that $r = k$. Testing proceeds sequentially for $r^* = 1, 2$, etc. and the first non-rejection of the null is taken as an estimate of r. The null hypothesis for the *maximum eigenvalue* test is as for the trace test but the alternative is $r = r^* + 1$ and, again, testing proceeds sequentially for $r^* = 1, 2$, etc., with the first non-rejection used as an estimate for r.

VECTOR ERROR CORRECTION MODEL

To express the relationship between the variables with an ECM model, which will now have the advantage of including both short run and long run information, error correction model (ECM) shows how much of the disequilibrium is being corrected over a period. It is called adjustment effect. ECM model measures the correction from disequilibrium of the previous period, which has a very good economic implication. Furthermore, it resolves the problem of spurious regression because it eliminates trend in the variable involved (Austeriou & Hall, 2007).

Error correction model is specified as

$$\Delta y_t = \alpha_o + \beta_1 \Delta X_1 - \pi_{t-1} + \varepsilon_t \ldots\ldots \quad (3.3.2)$$

Where β_1 is the impact multiplier (short run effect), this measures the immediate effect on change in X_1 will have on achange in y_t on the other hand π is the feedback effect or adjustment effect, and how much of the disequalibrium being corrected.

Model Specification

The models are stated as:

Y_t= (ROP, RGDP, CPI, REXH)

$$ROP = f(REXH, CPI, RGDP) \quad (3.3.3)$$

Where ROP is real oil price

REXH is real exchange rate

CPI is consumer price index

RGDP is real gross domestic product

For econometric model

$$\boldsymbol{ROP_t = \alpha_o + \alpha_1 REXH_{t-1} + \alpha_2 CPI_{t-1} + \alpha_3 RGDP_{t-1} + u_{t-1}} \quad (3.3.4)$$

Where α_o is the intercept

t is present time

t_{-1} is lag or previous time impact

α_1 - α_3 is coefficient or parameters

$U_{t\,is}$ error term at present time

RESULT AND DISCUTIONS

Table 1: Unit Root Tests

VARIABLES	LEVEL				1ST DIFFERENCE			
	ADF (Prob. Value)	PP (Prob. Value)	KPSS	Status	ADF (Prob. Value)	PP (Prob. Value)	KPSS	Status
RGDP	2.333 (0.1)	2.40063 (0.142)	0.1211	Not Stationary	13.2101 (0.000)	13.2101 (0.000)	0.064321	Stationary
OP	2.0822 (0.25)	2.2973 (0.175)	0.7181	Not Stationary	12.8040 (0.000)	-12.77825 (0.000)	0.067314	Stationary
EXR	2.5623 (0.10)	2.7002 (0.075)	0.6573	Not Stationary	13.038 (0.000)	13.0352 (0.000)	0.069559	Stationary
CPI	2.1317 (0.23)	2.5572 (0.103)	0.418	Not Stationary	13.557 (0.00)	13.5509 (0.000)	0.062344	Stationary

Source: computed by the author using E-views. Version 10 (2018)

From the results obtained in table 1, it seemed necessary to test the stationarity of the variables at their first difference since the variables were not stationary at levels. The result of these difference series is presented in the three unit root tests in table 1 above. The result suggests that after differencing the series, the null hypothesis of non-stationarity in each of the series can be rejected at 5% level of significance. Thus, the series are now integrated of order 1, that is they are I(1).

ORDER OF LAG SELECTION CRITERIA

The choice of the lag length is a crucial part of empirical research based on the Vector autoregressive (VAR) model since all inferences in this model hinge on the correct model specification. The procedure requires that the

choice of deterministic variables and maximum lag length (k) be such as to prevent serial correlation in the disturbance processes both within each equation of the VAR and also across equations. Table 2 presents the appropriate lag length for the Unrestricted Vector Auto regression Estimates.

Table 2: Order of Lag Selection Criteria table

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-473.3425	NA	0.001612	4.921057	4.988435	4.948340
1	394.0956	1690.163*	2.48e-07*	-3.856655*	-3.519763*	-3.720238*
2	401.2520	13.64885	2.72e-07	-3.765484	-3.159078	-3.519933

** indicates lag order selected by the criterion, **LR**: sequential modified LR test statistic (each test at 5% level), **FPE**: Final prediction error, **AIC**: Akaike information criterion, **SC**: Schwarz information criterion, **HQ**: Hannan-Quinn information criterion, Source: computed by the researcher using Eviews. Version 10.0*

Based on the order of selection criteria given in table 2, one lag has been selected for the estimation of the VAR model. The selected lags are based on AIC and HQ test statistic and also the fact that the lags have been able to satisfy the OLS assumptions of no serial correlation, and constant error variance (homoskedasticity).

JOHANSEN CO-INTEGRATION

The long-run relationship among variables is a crucial part of empirical research in order to estimate the VECM model. The Johansen cointegration test is conducted to test the long-run relationship between the variables and see if the variables are cointegrated and when the variable will be at equilibrium. Table 3 shows the summary of the Johansen Cointegration test.

Table 3: Johansen Cointegration Table

Trace Test			
No. Cointegration Equation	Statistic	5 % critical value	Prob
None *	51.51512	47.85613	0.0218
At most 1	48.03282	47.85613	0.0481
At most 2	10.96000	15.49471	0.2140
At most 3	2.008474	3.841466	0.1564
Maximum Eigenvalue			
No. Cointegration Equation	Statistic	5 % critical value	Prob
None *	25.38387	27.58434	0.0932
At most 1	15.17125	21.13162	0.2771
At most 2	8.951529	14.26460	0.2902
At most 3	2.008474	3.841466	0.1564

Source Computed by the Researcher Using E-views Version 10 (2018)

Table 3 shows the unrestricted Johansen Co- integration Rank Test. The test hypothesized No Co integration equations. From the probability, values are less than 0.05, which means rejecting the Null Hypothesis of No Co-integration among the variables. The trace statistic is more than the 0.05 critical values at none. The result from the two tests therefore means there is one Co-integration relationship among variables and we cannot accept the null hypothesis that there is no co-integrating equation at 0.05 levels. Thus, this outcome confirms the presence of a long run relationship among the variables of our model. As such, we estimate the Normalized co-integrated coefficients and VECM models.

VECM LONG RUN ANALYSIS

Having established the fact the there is a long relationship between the variables using the Johansen Co-integration test. The next step is to estimate the VECM long-run relationship between the co-integrating variables. The table 4.5 below presents the VECM long-run estimates of variables.

VECTO ERROR CORRECTION MODEL (VECM) ANALYSIS

After analyzing the long-run relationship between the variables, the study further estimates the short-run relationship between the variables as illustrated in Table 4 with delta sign showing the changes with the lag-operators that have effect on the dependent variable.

Table 4: Results of Vector Error Correction Model (VECM)

Dependent Variable = D(LOGRGDP)			
Variables	**Coefficients**	**Standard error**	**t-statistics**
D(LOGOP(-1))	-0.023380	0.01129	-2.07047
D(LOGCPI(-1))	-0.152099	0.12301	-1.23645
Constant	-0.015211	0.02238	-0.67970
ECT_{t-1}	-0.337843	0.06653	-5.07805

Note: **** Statistical significance at the 1 per cent levels, **Statistical significance at the 5 per cent levels*Statistical significance at the 10 per cent levels, Source: computed by the author using E-views. Version 10 (2018)*

The result shows that lag values of real growth in the previous year can be described as statistically influential factors that positively affect current real GDP in the short run. A 1% increase in the value of the real GDP insignificantly changes current real GDP by approximately 0.29%.

The past value of oil price is negative and statistically significant at 5% linked with real GDP. A 1% fall in the value of the oil price significantly changes current real growth by approximately 0.02%. This finding is consistent with the study of Agri, Inusa and Kennedy (2015), who found that there is a statistical significance of the impact of oil price volatility on macroeconomic variable and consistent with Ebrahim, Inderwidi and King (2014), Oriakhi and Osaze (2013) and Omisakin et al. (2009),. However, the finding is at variance with the study of Tang *et al.* (2010) who concluded that oil-price increase negatively affects output and investment, but positively affects inflation rate and interest rate and relates with the findings of Riggi and Venditti (2015) and Azeez, Kolapo, and Ajayi (2012).

The past value of exchange rate is positive and statistically insignificant at 5% which affects real growth in the short-run. A 1% increase in the value of the EXR insignificantly changes current real GDP by approximately 0.103%.

The past value of consumer price index is negative and statistically insignificant at 5% and affects real GDP in the short-run. A 1% increase in the value of the CPI insignificantly decreases current real GDP by approximately 0.15%.The value of the ECM is negative and statistically significant. The estimate of the lagged ECM is -0.337843. This indicates that short-run deviations towards long-run would be corrected by 33.8% in real gdp function. This implies it would take almost two years and nine months to reach the stable log-run equilibrium path in level in real GDP model in the case of Nigeria. Empirically this implies that for any disequilibrium in the system, the system will automatically adjust itself back to the equilibrium position after two years and nine months.

RESIDUAL DIAGNOSTICS

Table 5 Residual Diagnostics

Lags	VAR Residual Serial Correlation LM Test		VAR Residual Heteroskedasticity Test			VAR Residual Normality Test			
	Lm-Stat	Prob	Chi-square	Df	Prob	Component	Jarque-Bera	Df	Prob
1	16.42998	0.4234	76.29339	100	0.9627	Joint	130054.4	8	0.0000

Source: computed by the researcher using Eviews. Version 10.0 (2019)

Residual diagnostic check tests have been conducted for the lag selected to ensure that the selected lags are free of serial correlation and heteroskedasticity and that the residuals of the selected lags are normally distributed. Based on the residual serial correlation test result using LM test, given in Table 5, the null hypothesis of no serial correlation for all the lags at 5% level given the LM statistics and the probability values of greater than 0.05 could not be rejected.

Similarly, the test for heteroskedasticity indicates that, the residuals are homoscedastic given the chi-square of 76.29339 with the probability value of 0.9627 which makes it impossible to reject the null hypothesis of homoscedasticity. Jarque-Bera test for the normality of the residual indicates that, there is a departure from normality. This is evident from the Jarque - Bera statistics for the joint test and the probability value of 0.000 which is less than the critical value of 0.05 at the 5% level of significance

CONCLUSION

The result obtained from estimation of the VECM model has shown that there is a long-run interdependence of oil price shocks and this has a significant impact on Real Growth Domestic Product, Consumer Price Index and Real Exchange Rate in Nigeria. The major source of revenue and foreign

earnings to the economy are mainly from the sales of crude oil, the economy is entirely dependent on level of global oil prices, as such most of the macroeconomic indicators of the economy directly or indirectly being affected by the oil price fluctuation in the economy.

RECOMMENDATIONS

Since Nigeria does not have the power to control oil prices in the world market, it is required that government should diversify the economy to reduce the adverse effect of shocks emanating from the fluctuation of global oil prices. The country should diversify its export from oil exports to non-oil export. Diversification of the economy is necessary in order to reduce the consequences of external shocks. Again, diversifying the oil revenue base as a means of minimizing reliance on crude oil and petroleum product, for example, through embarking on sustainable policies that could help to improve agriculture and industries, will further shield the economy from the impact of oil price shocks and thus prevent the negative effect of the shocks from attaining a statistical significance level.

REFERENCES

Abdullah, M.A., & Masih, M. A. (2014). "The Impact of Crude Oil Price on Macroeconomic Variables: New Evidence From Malaysia" University of Kuala. *Malaysian Finance Association Conference*, ID:MFA-FM-118

Abdullahi, B. D. (2016). "Time-Varying VAR with Stochastic Volatility and Monetary Policy Dynamics in Nigeria", Department of Economic Engineering, Kyushu University, Fukuoka, Japan. *Economics Bulletin*, 36(4), pp. 2237-2249.

Abdulkareem, A., & Abdulkareem, K. (2016). Analyzing Oil Price Macroeconomic Volatility in Nigeria. *CBN Journal of Applied Statistics, Vol. 7* No. 1(a)

Agri, M. E., Inusa, D. M., & Kennedy, N. D. (2015). Oil Price Volatility on Macroeconomic Variables and Sustainable Development in Nigeria. *International Journal of Economics and Financial Research volume,* 2, pp. 33-40.

Akinleye, O. S., & Ekpo, S. (2013). Oil Price Shocks and Macroeconomic Performance in Nigeria. *Unpublished master's thesis.*

Akpan, E. O. (2009).Oil Price Shocks and Nigeria's Macroeconomy, paper presented at the Annual Conference of CSAE Conference. *Economic Development in Africa*, 22nd - 24th March, Oxford.

Aliyu, S. U. R. (2009b). Oil Price Shocks and the Macroeconomy of Nigeria: A Non-linear Approach: Online at http://mpra.ub.uni-muenchen.de/18726/s

Anashasy, E. A., *et al.* (2005)."Evidence on the Role of Oil Prices in Venezuela's Economic Performance: 1950-2001" *Working Paper*, University of Washington.

Anshasy, A. A., & Bradley, M. D., (2012).Oil prices and the fiscal policy response in oil-exporting countries. *Journal of Policy Modeling, 34*(5), pp. 605-620.

Anshasy, A., Bradley, M., & Joutz, F. (2005). Evidence on the Role of Oil prices in Venezuela's Economic Performance. Proceedings of the 25th Annual North American Conference. *International Association of Energy Economics, Denver*, pp. 18-21 September.

Ayadi, O. F., (2005). Oil Price Fluctuations and the Nigerian Economy, *OPEC Review*, pp. 199- 217 Sept.

Backus, D. K., & Crucini, M. J. (2000)."Oil Prices and the Terms of Trade", *Journal of International Economics, 50*, pp. 185-213.

Berument, M. H., Ceylan , N. B., & N. Dogan (2010). "The Impact of Oil Price Shocks on the Economic Growth of Selected Mena Countries", *Energy Journal,* 31, pp. 149-176.

Bhattacharya, B. B., & Kar, S. (2005). *Economic Growth and the Indian Economy*. Institute of Economic Growth Working paper.

Blanchard, O., & Gali, J. (2007). "The Macroeconomic Effects of Oil Price Shocks: Why Are the 2000s So Different from the 1970s?, NBER Chapters. *International Dimensions of Monetary Policy, National Bureau of Economic Research*, pp. 373-421.

Brown, S. P. A., & Yücel, M. K. (1999). Oil Prices and US Aggregate Economic Activity: A Question of Neutrality. *Economic and Financial Review, Federal Reserve Bank of Dallas, Second Quarter*, pp. 16-23. Central Bank of Nigeria (2011), http://www.statistics.cbn.gov.ng/statsonline [retrieved November 16th, 2011].

Bruno, M., & Sachs, J. (1982, 1985). Input Price Shocks and the Slowdown in Economic Growth: The Case of U.K. Manufacturing. *Review of Economic Studies, 49*, 679–705.

Central Bank of Nigeria (2010). Statistical Bulletin. *50 Years Special Anniversary Edition, Abuja.*

Central Bank of Nigeria (2011). *Understanding Monetary Policy,* Series No.1, What is Monetary Policy?

Central Bank of Nigeria (2015). *Quarterly Economic Report*, Nigeria.

Cogley, T., & Sargent, T. S. (2005). Drifts and Volatilities: Monetary Policies and Outcomes in the Post WWII US. *Review of Economic Dynamics,* 8, 262–302.

Cologni, A., & Manera, M. (2008). "Oil Prices, Inflation and Interest Rates in a Structural Cointegrated VAR Model for G7 Countries", *Energy Policy*, 30, pp. 856-888.

Chuku, C. A., Usenobong, R. S., & Ekpeno, L. E. (2011), "Oil Price Shocks and the Dynamics of Current Account Balances in Nigeria", *OPEC Energy Review, 35 (2),* pp. 119-139.

Dahl, C. A., & Yücel, M. (1991). Testing Alternative Hypotheses of Oil Producer Behavior. *Energy Journal* 12(4): 117-138.

Darby, M. (1982). The Price of Oil and World Inflation and Recession. *American Economic Review*, 72: 738-751.

D'Agostino, A., Gambetti, L. & Giannone, D. (2010). Macroeconomic Forecasting and Structural Change. *ECB Working Paper*, No. 1167, European Central Bank.

Del Negro, M., & Primiceri, G. E. (2015). Time Varying Structural Vector Auto-regressions and Monetary Policy: A corrigendum. *Manuscript.*

Elmi, Z. M., & Jahadi, M. (2011). Oil Price Shocks and Economic Growth: Evidence from OPEC and OECD. *Australian Journal of Basic and Applied Sciences, 5 (6)*, pp. 627-635.

Eltony, M. N., & Al-Awadi, M. (2001). Oil price Fluctuations and their Impact on the Macroeconomic Variables of Kuwait: A Case Study Using a Var Model. *International Journal of Energy Research, 25 (11),* pp. 939-959.

Energy Information Administration (2009). Country Analysis: Briefs on Nigeria. *Official Energy Statistics from the United States Government* at: http://www.eia.doe.gov/emeu/cabs/OpEC_Revenues/Factsheet. html.

Farzanegan, M. R., & Markwardt, G. (2009). The Effects of Oil Price Shocks on the Iranian Economy. *Energy Economics Journal, 31(1),* pp. 134-151.

Ferderer, P., (1996). Oil Price Volatility and the Macroeconomy. *Journal of Macroeconomics, 18,pp*1-26.

Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-Spectral Methods. *Econometrica, 37*, pp. 424-438.

Gounder, R., & Bartleet, M. (2007). Oil Price Shocks and Economic Growth: Evidence for New Zealand, 1989-2006. Paper presented at the *New Zealand Association of Economists Annual Conference*, Christ church, 27-29th June.

Guo, H., & Kliesen, K. L. (2005). Oil Price Volatility and US Macroeconomic Activity. *Review-Federal Reserve Bank of St. Louis, 57 (6), pp.* 669-683.

Gottschalk, P., (2001). Benefit from Information and Communication Technology Facilitating Inters Organizational Knowledge Networks: The Case of Eurojoris Law Firms in Norway. *Journal of information law and technology.*

Griffin, J. M. (1985). OPEC Behavior: A Test of Alternative Hypotheses. *American Economic Review* 75, pp. 954-963.

Herrera, A. M., Lagalo, L. G., & Wada, T. (2011). Oil Price Shocks and Industrial Production: Is the relationship linear? *Macroeconomic Dynamics, 15*(3), 472-497.

Hamilton, J. (1996). This is What Happened to the Oil Price-Macroeconomy Relationship. *Journal of Monetary Economics, 38,* pp. 215-220.

Hamilton, J. D. (2009). Causes and Consequences of the Oil Shock of 2007-08. Brookings Papers on Economic Activity, Economic Studies Program. *The Brookings Institution*, 40 (1), Spring, pp. 215-283.

Hamilton, J. D., & Herrera, A. M. (2001). Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary policy. *Mimeo, Department of Economics, University of* California, San Diego.

Hamilton, J. D. (1994). *Time Series Analysis, Princeton*. New Jersey: Princeton University press.

Hamilton, J. D. (1983). Oil and the Macroeconomy since World War II. *Journal of Political Economy 91*: 228-248

Hoffman, D. L., & Rasche, R. H. (1996). Assessing Forecast Performance in a Coinintegrated System. *Journal of Applied Econometrics,* 11, pp. 495-517.

Hooker, M. A. (2002). "Are Oil Shocks Inflationary? Asymmetric and Nonlinear Specifications Versus Changes in Regime", *Journal of Money, Credit and Banking, 34,* pp. 540-561.

Hunt, B. P., Sard, I., & Laxton, D. (2002)."The Macroeconomic Effects of Higher Oil Prices", National Institute of Economic Review, 179 (1), pp. 87-103.

International Financial Statistics (2011). IFSCD-Rom Dataset.

International Monetary Fund (2000), The Impact of Higher Oil Prices on the Global Economy. *Paper prepared by the IMF Research Department,* December 8th, Washington, D. C.

Iwayemi, A., & Fowowe, B. (2011). Impact of Oil Price Shocks on Selected Macroeconomic Variables in Nigeria. *Energy policy, 39*(2), 603-612.

Jbir, R., & Zouari-Ghorbel, S. (2009). Recent Oil Price Shocks and Tunisian Economy. *Energy Policy Journal, 37,* pp. 1041-1051.

Jiménez-Rodríguez, R., & Sánchez, M. (2005). Oil Price Shocks and Real GDP Growth: Empirical Evidence for Some OECD Countries. *Journal of Applied Economics,* 37, pp. 201-228.

Jones, C. T. (1991). OPEC Behavior Under Falling Prices: Implications for Cartel Stability. *Energy Journal,* 11(3): 117-129.

Kapetanios, G., Mumtaz, H., Stevens, I., & Theodoridis, K. (2012). Assessing the Economy Wide Effects of Quantitative Easing. *The Economic Journal, 122,* F316–F347.

Killian, L., & Hicks, B. (2009). Did Unexpected Strong Economic Growth Cause the Oil Price Shock of 2003-2008? *Mimeo, Department of Economics University of Michigan.*

Kilian, L., & Vigfusson, R. J. (2011). Are the Responses of the US Economy Asymmetric in Energy Price Increases and Decreases? *Quantitative Economics, 2*(3), 419-453.

Koop, G., Leon-Gonzalez, R., & Strachan, R. W. (2009). On the Evolution of the Monetary Policy Transmission Mechanism. *Journal of Economic Dynamics and Control, 33,* PP. 997–1017.

Liu, Y., & Morley, J. (2014). Structural Evolution of the Postwar U.S. Economy, Australian School of Business Working Paper No. 2013 ECON15A.

Lutkepohl, (2005). *New Introduction to Multiple Time Series Analysis.* https// www.springer.com/de/book/9783540401 728.

Masih, M., Al-Elg, A., & Madani, H. (2008). Causality Between Financial Development and Economic Growth: An Application of Vector Error Correction and Variance Decomposition Methods to Saudi Arabia. *Applied Economics*, 41(13), 1691-1699.

Masih, M., Al-Sahlawi, M., & DeMello, L. (2010). What Drive Carbon-Dioxide Emissions: Income or Electricity Generation? Evidence from Saudi Arabia. *The Journal of Energy and Development*, 33(2), 201-213

Mork, K. A. (1989). Oil and the Macroeconomy When Prices Go Up and Down: An Extension of Hamilton's Results. *Journal of Political Economy, 97*, pp. 740-744.

Mork, K. A. O., Olsen, O., & Mysen, H. (1994). Macroeconomic Responses to Oil Price Increases and Decreases in Seven OECD Countries. *Energy Journal, 15:* 19-35.

Mory, J. (1993). Oil Prices and Economic Activity: Is the Relationship Symmetric? *Energy Journal, 14:* 151–161.

Nnnanna, O. J., & Masha, I. (2003). Oil Price Fluctuation, Macroeconomic Behaviour and Policy Response in Nigeria: A VAR Specification. *West African Journal of Monetary and Economic Integration.* Vol. 3, No. 1, pp. 85-113.

Olomola, P. A., & Adejumo, A. V. (2006). Oil Price Shock and Macroeconomic Activity in Nigeria. *International Research Journal of Finance and Economics, 3*, pp. 28-34.

Omisakin, O., Adeniyi, O., &. Omojolaibi, A. (2009). A Vector Error Correction Modeling of Energy Price Volatility of an Oil Dependent Economy: The Case of Nigeria. *Pakistan Journal of Social Sciences, 6 (4)*, pp. 207-213.

Plakandaras, A. (2017). Time-Varying Role of Macroeconomic Shocks on House Prices in the US and UK: Evidence from Over 150 Years of Data. *University of Pretoria Department of Economics Working Paper Series.*

Primiceri, G. E. (2005). Time Varying Structural Vector Auto-regressions and Monetary Policy. *The Review of Economics and Statistics*, 72, 821–852.

Raguindin, C. E., & Reyes, R. G. (2005). The Effects of Oil Price Shocks on the Philippine Economy: A VAR Approach. *Working paper, University of the Philippines School of Economics.*

Rasche, R., & Tatom, J. (1981). Energy Price Shocks, Aggregate Supply and Monetary Policy: The Theory and the International Evidence. In K. Brunner and A. H. Meltzer, (eds.), *Supply Shocks, Incentives and National Wealth, Carnegie-Rochester Conference Series on Public Policy* 14: 9-93.

Riggi, M., & Venditti, F. (2015). The Time Varying Effect of Oil Price Shocks on Euro-Area Exports. *Working paper.*

Simatele M.C.H (2004). Financial Sector Reforms and Monetary Policy in Zambia. *MPRA*, PP 58: 20-50.

Sims, C. A. (1988). Bayesian Skepticism on Unit Root Econometrics. *Journal of Economic Dynamics and Control, 12*, 463–474.

Sims, C. A. (1991). Understanding Unit Rooters: A Helicopter Tour. *Econometrica, 59,* 1591– 1599.

Sims, C. A. (1992). Interpreting Macroeconomic Time Series Facts: The Effects of Monetary Policy. *European Economic Review, 36,* 975–1011.

Ter¨asvirta, T., Tjostheim, D., & Granger, C. W. J. (2010). Modelling Nonlinear. *Economic Time Series.* Oxford University Press.

FINANCIAL DEEPENING AND ECONOMIC GROWTH IN NIGERIA

Yerima Gimba Alhassan
Department of Economics and Development Studies,
Federal University of Kashere, PMB 0182,
Gombe State-Nigeria
e-mail address: ygalhassan@gmail.com
(+234)8036329326

Kabiru Muhammed
Department of Economics and Development Studies,
Federal University of Kashere, PMB 0182,
Gombe State-Nigeria

Sani Abubakar
Department of Economics and Development Studies,
Federal University of Kashere, PMB 0182,
Gombe State-Nigeria

Naziru Yusuf Abdullahi
Department of Economics and Development Studies,
Federal University of Kashere, PMB 0182,
Gombe State-Nigeria

Abstract

Despite decades of financial reform through the Structural Adjustment Programme (SAP), and subsequent reforms, the relationship between financial deepening and economic growth has remained a contentious and unresolved issue. This paper investigated the relationship between financial deepening and economic growth in Nigeria, covering the period 1981-2017. The time series data were analysed using the ARDL model and VECM technique in establishing the short-run and long-run relationship among variables of interest. The results indicated that in the short-run and long-run, positive and significant relationship exist among market capitalization, interest rate and inflation at 10%, 1% and 1% level of significance respectively while credit to private sector is insignificant. The paper supports the supply-leading hypothesis which asserts that financial development has positive effect on economic growth. It is recommended that policy-makers should attach importance to capital market as a funding option in the area of granting of credits that catalyzes growth. This can be piloted through enhanced supervision of the capital market to enable it operate optimally. The paper concludes that financial development leads to economic growth in Nigeria.

Keywords: ARDL, capital market, economic growth, financial deepening, Nigeria.

JEL Classification: O09, O11

INTRODUCTION

The financial deepening-growth nexus has received attention in economic literature. The divergent views between the proponents of supply-leading hypothesis (Schumpeter, 1911; Gurley & Shaw, 1967) and the demand-following hypothesis (Robinson, 1952; Patrick, 1966) centre on: what causes economic growth? Between 1986 and 2007, Nigeria witnessed a fall in its Gross Domestic Product (GDP) from an annual growth rate of 10.5 percent to 3.2 percent in 2007, despite the financial reform in the mid 1980s. Unemployment and poverty have worsen and the country was plunged into recession in 2016.In addition, Nigeria is among the countries with lowest access to bank credits and a decline in market capitalization (World Bank, 2014). In an attempt to make the banking sector sound, and to strengthen its ability to provide credit to the private sector, the Central Bank of Nigeria (CBN) embarked on recapitalization of banks. At the end of the exercise, only 25 groups of banks emerged. However, a good number of literature suggest that it is only when a country has financial assets that such country will be able to approximate financial deepening (Levine, Loyola& Beck, 2000; Meltzer, 1969).

This has prompted resurgence of interest on the factors responsible for growth of the Nigerian economy, particularly in the financial system. Previous studies on growth-financial deepening nexus produced diverse results with two main strands: the supply-leading hypothesis and demand-following hypothesis. However, most of these studies suffered from error of measurement. Further, earlier studies do not consider the effect of inflation and interest rate as important variables in the measurement of financial system (see Ghildiyal, Pokhriya, & Mohan, 2015;Karimo&Ogbonna, 2017; Nwanna & Chinwudu, 2016; Agu & Chukwu, 2008; Okafor, Onwumere & Chijindu, 2016). It is against this background that this paper intends to

establish the short-run and long-run relationship among market capitalization, credit to private sector, interest rate and inflation.

The rest of the paper is divided into sections as follows: the next section offers the review of literature and theoretical framework; Section 3 is methodology; Section 4 deals with the empirical findings and Section 5 presents the conclusion and policy recommendations for policy action.

LITERATURE REVIEW

Conceptual Review:

i) Economic Growth

Economic growth, according to Todaro & Smith (2006) is the steady process by which the productive capacity of the economy is increased over time to bring about rising levels of national output and income. It is a long-term change in an economic productive capacity, particularly output that could be produced if all the economy's resources were fully and efficiently employed. Economic growth could be achieved when the citizens use resources efficiently and rearrange them in ways that make them more productive overtime. It is the continued improvement in the capacity to satisfy the demand for goods and services, resulting from increases in product and processes.

ii) Financial System

The financial system refers to the set of rules and regulations and the aggregation of financial arrangements, institutions and agents that interact with each other and the rest of the world to foster economic growth and development of a nation (CBN, 1993). According to Levine (1997), the financial system facilitates trading, allocates resources, exerts corporate

control, mobilizes savings, and facilitates the exchange of goods and services thereby supporting economic growth. Thus, expansion of the financial system is expected to lead to increased variety of financial instruments in the system.

iii) Interest Rate

Keynes (1936) conceptualized interest rate as the percent of principal charged by the lender for the use of its money. The principal is the amount of money lent. Banks charge borrowers a little higher interest rate than they pay depositors so that they can earn profit. A bank will charge higher interest rates if it thinks there is a lower chance the debt will get repaid. In general, interest rate rises in terms of inflation, great demand for credit, high money supply, or due to higher reserve requirements for banks. A rise in interest rates for any reason tends to dampen business activities.

THEORETICAL REVIEW

Economic Growth

Kuznets (1973), defined a country's economic growth as a long-term rise in capacity to supply increasingly diverse economic goods to its population, based on advancing technology and the institutional and ideological adjustments that it demands. In a similar vein, the Solow-Swan model of economic growth postulates a continuous production function linking output to the inputs of capital and labour which leads to the steady state equilibrium of the economy.

Interest Rate

According to Keynes (1933), interest rate is the reward for parting with liquidity for the specified period. The basic theoretical framework of interest rate started with the classical school of thought. However, in the modern theory of interest rate, saving, investment, liquidity preference and

the quantity of money are integrated at various levels of income for a synthesis of the loanable funds theory with the liquidity preference theory to construct two curves. That is, the IS curve representing the flow variable of the loanable funds formulation and the LM curve representing the stock variable of liquidity preference formulation. The equilibrium between the IS and the LM curves provides a determinate solution. However, the IS curve as a flow variable is inconsistent with LM curve as stock variable. So, savings will change the stock of wealth. This inconsistency has been addressed by the logical framework of Romer (2000).

EMPIRICAL REVIEW

Essentially, several empirical literature abound on financial deepening and economic growth. These literature differ in terms of time, space, setting and methodology. For instance, Shu-Chen & Cheng-Hsein (2012) investigated the threshold cointegration effect of financial deepening on economic growth in Taiwan over the period 1981 to 2010. The result shows that in the short-run, economic growth has a significant and positive effect on financial deepening. Similarly, Waqabaca (2004) examined the causal relationship between financial development and growth in Fiji between 1970 and 2000. The study employed cointegration technique within a bivariate VAR framework. Empirical results suggest a positive relationship between financial development and economic growth for Fiji, with causality running from economic growth to financial development. In both developed and developing economies, the results of the relationship between financial deepening and economic growth have been mixed. For example, using the Geweke decomposition test on pooled data of 109 developing and industrial countries from 1960 to 1994, the result of a study by Calderon & Liu(2003) support the view that financial development has a positive effect on economic growth, especially in developing countries than industrialized countries.On the other

hand, Karl & Pentecost (2000); Ndlovu (2013), and Omotor (2007) concluded in their studies that financial development only responds to improvements in the economy. As a result, there will be increased demand for financial services by the real sector. This means that an increase in economic growth will bring about increased demand for financial services and this may result in the expansion of the financial sector. However, financial systems have long been recognized to play an important role in economic development (Goldsmith, 1955; Cameron, 1967; McKinnon, 1973; and Shaw, 1973). The authors posited that the financial sector could be a catalyst of economic growth if it is developed and healthy.

In Sub-Saharan African countries, Ndebbio (2004) investigated financial deepening, economic growth and development. The result revealed that sustainable economic growth was as a result of development in the financial sector. Similar result was arrived at in a study by Johannes, Njong and Cletus (2011) who established a positive relationship between financial development and economic growth in both the long run and short run in Cameroon for the period 1970–2005.

Applying Fully Modified Ordinary Least Squares (FMOLS) and Two Stage Least Squares (2SLS), Michael (2012) studied financial development and economic growth using South Africa as a case study. The empirical result suggests that financial development does not promote economic growth in either the short run or the long run. In another study, Ndlovu (2013) examined financial sector development and economic growth in Zimbabwe for the period 1980–2006.The study employed a multivariate Granger causality test, the study found a unidirectional causality running from economic growth to financial development.

In Nigeria, Maduka and Onwuka (2013) examined the relationship between financial deepening variables and economic growth by analyzing their long run properties and short run dynamics. The result showed that

financial deepening has negative and significant impact on economic growth in Nigeria. Similar study was carried out by Okafor, et al (2016). The result of their study revealed that while broad money has positive and non-significant impact on economic growth, private sector credit has negative and non-significant impact on growth. The Granger causality test result showed that neither broad money supply nor private sector credit granger cause economic growth and vice versa. However, different results were arrived at in a study by Karimo and Ogbonna (2017) who examined the direction of causality between financial deepening and economic growth in Nigeria for the period 1970–2013. The study employed the Toda–Yamamoto augmented Granger causality test and the result 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. In line with economic theory, Nwanna and Chinwudu (2006) studied the effect of financial deepening and economic growth in Nigeria using the Ordinary Least Square (OLS) technique of analysis. The result revealed that both bank based and stock market financial deepening proxies had significant and positive effect on economic growth and that the banking sector and stock market in Nigeria had an important role in the process of economic growth. Adopting the ARDL model in their study, Ghildiyal, et al (2015) study suggested that financial deepening causes economic growth in the long run and also in the short run. Nkoro and Uko (2013) examined the nexus between financial sector development and economic growth in Nigeria by employing the Error Correction Mechanism. The empirical results show that there is a positive effect of financial sector development on economic growth in Nigeria. Similarly, Osuji and Chigbu (2012) investigated the impact of financial development variables on economic growth in Nigeria. The study employed Granger causality test, the Error Correction Method and Johansen cointegration test. The results revealed that money supply and credit to private sector are positively related to economic growth of Nigeria. The

Johansen and Granger tests show that money supply and credit to private sector are cointegrated with GDP in Nigeria within the studied period.

Adeniran (2014) investigated the impact of interest rate fluctuation on the Nigerian economic growth using the OLS technique. The result indicated that interest rate and rate of inflation have negative impact on economic growth but not significant. Similarly, Udoka and Roland (2012) used OLS technique to investigate the effect of interest rate fluctuation on the economic growth of Nigeria. The result of the findings revealed that: there existed an inverse relationship between interest rate and economic growth in Nigeria, meaning that increase in interest rate will decrease Ac GDP of the country, thus retarding the growth of the real sector. Also, Babalola (2015) adopted OLS technique to determine the effect of inflation and interest rate on economic growth in Nigeria for the period 1981-2014. Their study found out that inflation and interest rate have negative effect on economic growth but neither inflation nor interest rate granger causes economic growth. Hidayat and Suman (2014) studied the effect of inflation, interest rates and government expenditure and economic growth in Indonesia during the period 2005-2012. The study found out that the independent variables have about 99% influence on economic growth. However, most of the studies were based on financial measures but ignored the effect of inflation on economic growth which could be as a result of the level of economic activities in the economy. Secondly, only few previous works reviewed in developing countries like Nigeria and developed economies considered the importance of stock-market-based variables. Therefore, this paper will fill the underlying knowledge gap in the previous studies.

THEORETICAL FRAMEWORK

This paper was anchored on the supply-leading and demand-following hypotheses of the financial deepening–growth nexus. The supply-leading hypothesis asserts that financial development has a positive effect on economic growth (Calderon & Liu, 2003; Gurley & Shaw, 1967; King & Levine, 1993; & McKinnon, 1973). Thus, the effect runs from financial development to economic growth. On the other hand, demand-following hypothesis states that financial development only responds to changes in the real sector. Thus, an increase in economic growth causes a rise in demand for financial services and these results in the expansion of the financial sector (Goldsmith, 1955; Jung, 1986; Karl& Pentecost, 2000; Lucas, 1988; Ndlovu, 2013; Omotor, 2007).

METHODOLOGY

This paper adapted a model by Adekunle, Ganiyu and Adedipe (2013) who investigated the impact of financial sector development on the Nigerian economic growth. The model is of the form:

$$gt = f(FD) = \lambda o + \lambda 1(FDt) + \varepsilon t \quad \text{..... (1)}$$

Where;

gy is growth in per capita,

$\lambda_0 = \alpha_0 + \beta_0$,

$\lambda_1 = \alpha_1 + \beta_1$,

FD is financial sector development and

ε_t is the error term.

The model was modified for the purpose of this paper and it takes the form:

$$GDP = f(CPS, MCAP, INF, INTR) \quad \text{..... (2)}$$

Where;

GDP is gross domestic product, CPS is credit to the private sector, MCAP is market capitalization, INF is inflation, and INTR is interest rate. Statistically, the mathematical model is re-written and presented in equation (3)

$$LGDPt = \beta 0 + \beta 1LCPSt + \beta 2MCAPt + \beta 3LINFt + \beta 4LINTRt + Ut \ldots\ldots\ldots\ldots (3)$$

Where the parameter, β_ii= 1,2,...4 are the coefficient of the explanatory variables, U_t stands for stochastic disturbance term.

ESTIMATION METHODS

The time series data for this paper was analyzed using Autoregressive Distributed Lag (ARDL) and Vector Error Correction Mechanism (VECM) technique. The model by Pesaran and Shin (1999); Pesaran and Pesaran (1997) for testing the existence of cointegration is applicable when there is a mixture of relationship among variables. Further more, this paper considered both the short-run and long-run relationship simultaneously. Therefore, the empirical model for this paper is as follows:

$$\Delta lGDPt=\alpha_0+\sum_{i=1}^{n}\alpha_{1i}\Delta lCPS_{t-1}+\sum_{i=1}^{n}\alpha_{2i}\Delta lMCAP_{t-1}+\sum_{i=1}^{n}\alpha_{3i}\Delta lINTR_{t-1}+\sum_{i=1}^{n}\alpha_{4i}\Delta lINF_{t-1}+\beta_1 lCPS_{t-1}+\beta_2 lMCAP_{t-1}+\beta_3 lINTR_{t-1}+\beta_4 lINF_{t-1}+\lambda ECT_{t-1}+\varepsilon_{1t} \ldots\ldots\ldots\ldots (4)$$

Where;

Δ represents the first difference operator, *l* represents log-transformation, ε_{1t} is the residual, α_0 is the drift component, α_1. α_4 denotes the short-run coefficient, the β's symbolize the long-run coefficient, and λ is the speed of adjustment parameter while *ECT* is the residual obtained from the estimated cointegration model of equation (4).

Unit Root Test

The Augmented Dickey-Fuller test was conducted on two different equations based on the behaviour of the data.

Diagnostic Test

Diagnostic test was carried out for serial correlation, heteroskedasticity, normality and stability.

SOURCES OF DATA

Time series data on credit to the private sector and nominal GDP were sourced from Central Bank of Nigeria (CBN) statistical bulletin while data on interest rate and inflation were sourced from World Development Indicators (WDI). Data on market capitalization were sourced from the Nigerian Stock Exchange (NSE). The study covered the period from 1981 to 2017.

RESULTS AND DISCUSSION

The result of the unit root test depicted in Table 1 shows that the series are integrated of mixed order, that is; I(0) and I(1). This confirmed the relevance and justification for the use of the ARDL cointegration approach and VECM technique of estimation.

Table 1: Augmented Dickey Fuller Unit Root Test

Series	Intercept without trend		Intercept with trend	
	Level	1st Difference	Level	1st Difference
LRGDP	-1.5817	-6.7665***	-1.9762	-6.9335***
LCPS	-2.5981	-6.2660***	-2.8447	-6.2962***
LMCAP	-1.4024	-6.2596***	-2.5476	-6.1835***
LINTR	-6.2705***	-4.9080***	-5.1883***	-5.0236***
LINF	-6.1636***	-7.2460***	-6.1646***	-7.1460***

Note: *** represent significance level at 1%. The figures are the *t*-statistics for testing the null hypothesis that the series has unit root. The lag length is determined and fixed as 2 based on Schwarz (1987). The critical values for intercept without trend are -3.479, -2.883 and -2.578 whereas, for intercept with trend the values are -4.028, -3.443 and -3.146 for 1%, 5% and 10% respectively.

Source: *Researcher's Computation from output of Eviews version 9.*

The ARDL bound test in Table 2 below indicates cointegration among variables of interest. Thus, the null hypothesis of no long-run relationship is rejected.

Table 2: Bound Cointegration Test

Model	*F*-Stat.	Sig. Level.	Critical Value	
			I(0)	I(1)
LRGDP = *F*(*LCPS,LMCAP,LINTR,LRINF*)	9.134***	10%	2.26	3.35
LCPS = *F*(*LRGDP,LMCAP,LINTR,LINF*)	2.117	5%	2.62	3.79
LMCAP = *F*(*LCPS,LRGDP,LINTR,LINF*)	2.127	1%	3.41	4.68
LINTR = *F*(*LMCAP,LCPS,LRGDP,LINF*)	2.484			
LINF = *F*(*LMCAP,LCPS,LRGDP,LINTR*)	2.600			

Note: *** represents significance level at 1%. The critical values are based on Narayan (2005), case III for T = 35 due to small sample size of the study.

Source: Researcher's Computation from output of Eviews version 9.

The result in Table 3 shows that there is short-run relationship among market capitalization, inflation and interest rate at 5%, 1% and 1% respectively while credit to private sector is insignificant. Similarly, in the long-run, a positive and significant relationship exist among market capitalization, interest and inflation at 10%, 10% and 1% respectively. The result in this paper is consistent with the study by Ghildiyal, et al (2015); Karimo and Ogbonna (2017); Calderon & Liu (2003); Gurley and Shaw(1967); King& Levine (1993); and Mckinnon (1973); Nkoro and Uko (2013) who concluded that financial deepening causes economic growth in the short-run and long run. This means that the result in this paper supports the supply-leading hypothesis which asserts that financial development has a positive effect on economic growth (Calderon & Liu, 2003; Gurley & Shaw, 1967; King & Levine, 1993, and McKinnon, 1973).

However, despite financial sector reforms, the banking sector could not sustain a high level of intermediation in the system. This could be as a result of weak banks, the underdeveloped nature of the financial system, lack of interest rate elasticity, unresponsiveness of rates to changes in business cycle, and the huge fiscal deficits by the public sector over the years (Nzotta, 2004). According to Soludo, (2008)only about 40 percent of the population have access to financial services while more than 60 percent of the poor do not have access to formal finance and are forced to rely on expensive informal financial services. This helps to explain the low level of credit to the private sector which constrained growth especially in the real sector. For instance, credit to the private sector as % of GDP in Nigeria in 2013 was 12.59 compared to South Africa where banks' credit to the private sector as % of GDP was 67.38 (World Bank, 2015).However, the result in this paper is inconsistent with the result in a study by Maduka and Onwuka (2013); Karl and Pentecost (2000); Ndlovu (2013), and Omotor (2007) who found a negative relationship between financial deepening and economic growth in Nigeria. Also, the result is inconsistent with the result in a study by Shu-Chen and Cheng-Hsein (2012) whose result indicated that economic growth has a significant and positive effect on financial deepening in Taiwan, and Waqabaca (2004) whose result showed that there is a positive relationship between financial development and economic growth for Fiji, with causality running from economic growth to financial development. Perhaps, the speed of adjustment is slow, such that adjustment in the long-run after a shock was approximately 4%.

Table 3: Long Run and Short Run Coefficients

Variables	*Long Run Coefficients*	*Short Run Coefficients*		
LMCAP	-0.0934***	D(LMCAP)	-0.039**	
	(-2.094)		(2.094)	
LCPS	-2.282	D(LCPS)	-0.193**	
	(--3.406)		(-2.616)	
LINTR	0.052**	D(LINTR)	0.002***	
	(1.639)		(3.302)	
LINF	0.015***	D(LINF)	0.001***	
	(1.199)		(3.617)	
CONSTANT	1.456	CointEq(-1)	-0.041*	
	(1.691)		(0.0425)	
Diagnostic Test	**LM**	**RESET**	**JB**	**HET**
Chi-Square	0.483	0.854	1.457	0.9656
P-value	0.573	0.123	0.635	0.953

Note: ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The figures in parentheses are the T-statistics. Serial correlation was examined using Lagrange Multiplier test of residual (LM), functional form was based on Ramsey's RESET (RESET) test, normality test is based on skewness and kurtosis (JB) while Heteroscedasticity was based on squared residuals on squared fitted values (HET).

Source: Researcher's Computation from output of Eviews version 9.

The diagnostic test shows robust results. The result from Breusch-Godfrey test for serial correlation and from Breusch-Pagan-Godfrey test for heteroskedasticity revealed that there is no problem of serial correlation and heteroskedasticity respectively. Similarly, the CUSUM of recursive residuals and CUSUM of squares presented in Figures 1 and 2 show that the data were

stable during the period under study since the statistics is confined within the 5% critical bounds of parameter stability.

Figure 1

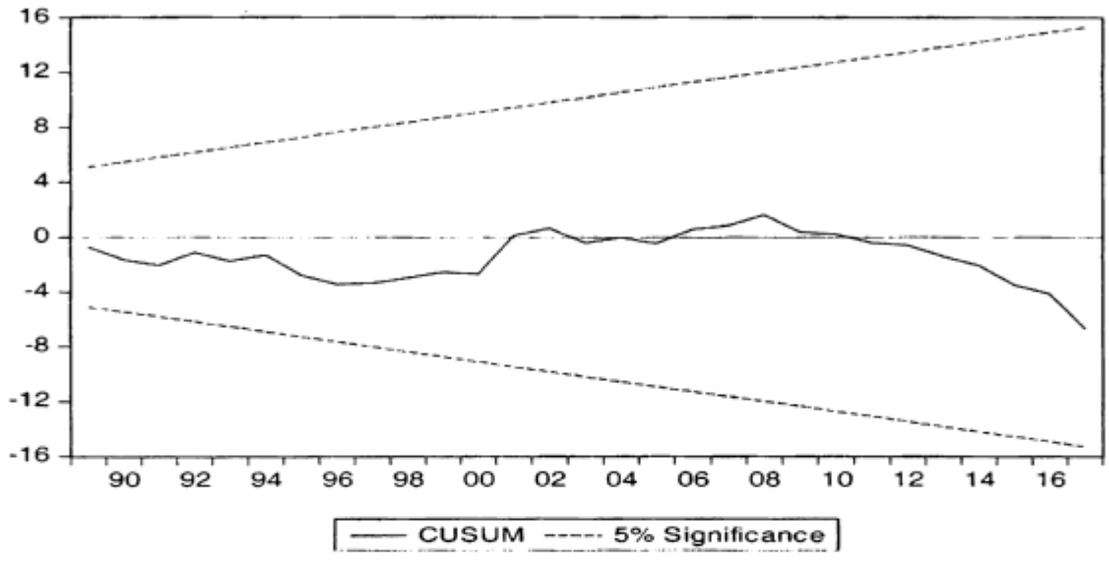
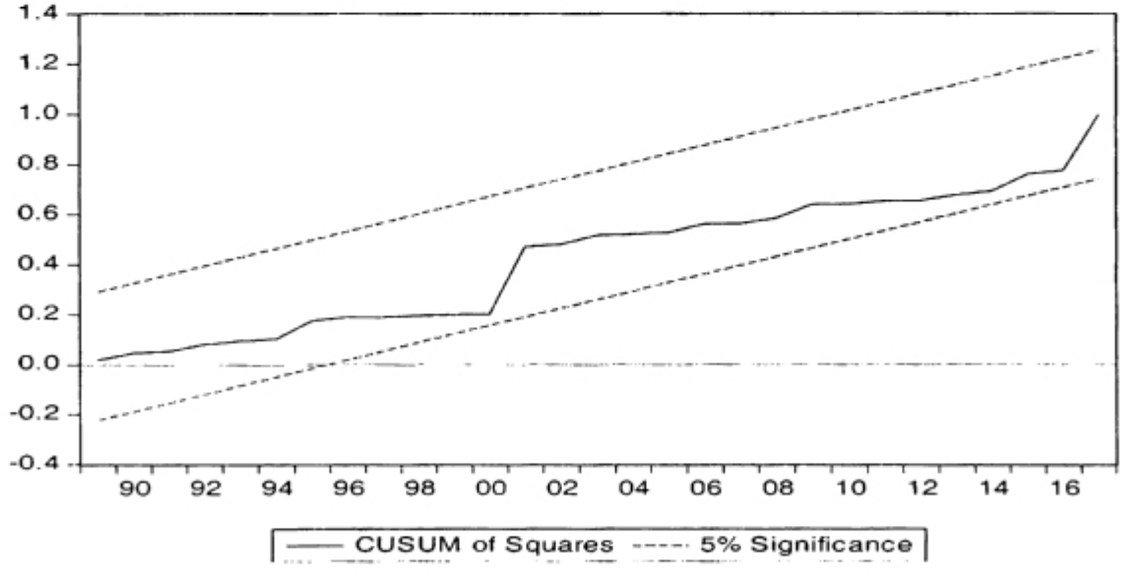


Figure 2



CONCLUSION

The conclusion drawn in this paper is that the relationship between economic growth and financial deepening in Nigeria follows the supply-leading hypothesis. That is, the paper supports the views of the supply-leading proponents who assert that financial development has a significant and positive effect on economic growth. A major contribution is the establishment of the short-run and long-run relationship among market capitalization, inflation, credit to private sector and interest rate. However, the level of private sector credits have not sustained the desired level of new investments necessary to facilitate growth in the economy. This means that only the market based variable has positive and significant effect on economic growth in Nigeria.

RECOMMENDATIONS

This paper has examined the existence of both short-run and long run equilibrating relationship between economic growth and its determinants (market capitalization, inflation, and interest rate).

In the light of the findings in this paper, it is recommended that policy-makers should attach importance to capital market as a funding option in the area of granting of credits that catalyzes growth. This can be piloted through enhanced supervision of the capital market to enable it to operate optimally. Again, there should be proper supervision of capital market to ensure that they meaningfully contribute to the economy by operating the right lending policies. The monetary authority should ensure that private sector credits are channeled to the real sector of the economy, and at the same time strengthen risk management in the financial system. Likewise, the monetary authority should formulate and implement financial policies that will enhance investment-friendly rate of interest rate since it is growth enhancing. In

addition, the monetary authority should pursue macroeconomic stability by moderating inflation since it is an important determinant of economic growth.

REFERENCES

Adekunle, O., Ganiyu, S., & Adedipe, O. (2013). Impact of Financial Sector Development on the Nigerian Economic Growth. *American Journal of Business and Management*, 2(4):347-356.

Agu, C. C., & Chukwu, J .O. (2008).Toda and Yamamoto Causality Tests between Bank-Based Financial Deepening and Economic Growth in Nigeria. *European Journal of Social Sciences*, 7(2):11-24.

Babalola, O.O. (2015). Inflation, Interest Rates and Economic Growth in Nigeria. *European Journal of Business and Management*, 7(30).

Calderon, C. & Liu, L. (2003). The Direction of Causality between Financial Development and Economic Growth. *Journal of Development Economics.*72: 371–394

Cameron, R. (1967). *Banking in the early stages of industrialization: A study in comparative economic history*. New York: Oxford University Press.

Central Bank of Nigeria (1993). *Annual Report and Statement of Accounts.*

Dickey, D.A.& Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association, 74:*427-431.

Ghildiyal, V., Pokhriya, A.K., & Mohan, A.(2015). Impact of Financial Deepening on Economic Growth in Indian Perspective: ARDL bound testing approach to cointegration. *Asian Development Policy Review*, 3(3):49-60

Goldsmith, R. W. (1955). Financial Structure and Economic Growth in Advanced Countries. In M. Abramovitz, (ed). *Capital Formation and Economic Growth.*Princeton, New Jersey: Princeton University Press.

Gurley, J. & Shaw, E. (1967). Financial Structure and Economic Development. *Journal of Economics Development and Cultural Change, 32:*333–346.

Hidayat & Suman, (2014). Effect of Interest Rate, Inflation Rate, and GDP on Macroeconomic Growth in Jordan. In O. O. Babalola, (2015). Inflation, Interest Rates and Economic Growth in Nigeria. *European Journal of Business and Management,* 7(30).

Johannes, A. T., Njong, A. M., & Cletus, N. (2011). Financial Development and Economic Growth in Cameroon, 1970–2005. *Journal of Economics and Finance*. 3: 367–375.

Jung, W.S. (1986). Financial Development and Economic Growth: International evidence. *Journal of Economic Development and Cultural Change,* 34:346-355.

Karimo, T. M. & Ogbonna, O. E. (2017). Financial Deepening and Economic Growth Nexus in Nigeria: Supply-Leading or Demand-Following? *Economie,* .5(4). doi:10.3390/economies5010004

Karl, M., & Pentecost, E. J. (2000). Financial development and economic growth in Turkey: Further Evidence on the Causality Issue. *Economic Research Paper,* No.00/27. Loughborough University: Loughborough, UK, 2000

Keynes, J. M. (1933). The General Theory of Employment, Interest and Money, In M. L. Jhingan (2012*). Macroeconomic Theory*. 12th Edition. Vrinda Publishing (P) Ltd.

King, R.G., & Levine, R. (1993). Finance and Growth: Schumpeter Might Be Right. *Quarterly Journal of Economics.* 717–737.

Levine, R., Loyola, N., & Beck, T. (2000).Financial Intermediation and Growth: Causality and causes. *Journal of Monetary Economics*. 46:31-77

Levine, R. (1997), Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature,* 35: 688–726.

Lucas, R. E. (1988). On the Mechanics of Economics Development. *Journal of Monetary Economics,* 22: 3–42

Maduka, A. C., & Onwuka, K. O. (2013). Financial Market Structure and Economic Growth: Evidence from Nigeria data. *Asian Economic and Financial Review.* 3(1): 75-98

McKinnon, R. (1973). *Money and Capital in Economic Development. Brookings Institution.* Washington, DC: USA.

Meltzer, A.H.(1969). Money, Intermediation, and Growth. *Journal of Economic Literature*, 7(1): 27-56.

Michael, A. (2012). Financial Development and Economic Growth: Is Schumpeter right? *Journal of Economics, Management and Trade,* 2, 265–278.

Ndebbio, J. E. (2004). Financial Deepening, Economic Growth and Development: Evidence from Selected Sub-Saharan African Countries. *African Economic Research Consortium Nairobi, Kenya*.

Ndlovu, G. (2013). Financial Sector Development and Economic Growth: Evidence from Zimbabwe. *International Journal of Economics and Financial Issues*. 3: 435–446.

Nkoro, E. & Uko, A. K. (2013). Financial Sector Development-economic Growth Nexus: Empirical Evidence from Nigeria. *International Journal of Contemporary Resources,* 3, 87–94.

Nzotta, S. M. (2004). *Money, Banking and Finance, Theory and Practice*. Owerri: Hudson Jude publishers.

Okafor, G. I., Onwumere, J. U. J., & Chijindu, E. H. (2016). Financial Deepening Indicators and Economic Growth in Nigeria: A Causality and Impact Analysis. *Asian Journal of Economics, Business and Accounting.* 1(2): 1-11.

Omotor, D. (2007). Financial Development and Economic Growth: Empirical evidence from Nigeria. *Nigerian Journal of Economics and Social Studies*. 49: 209–234.

Osuji, C. C. & Chigbu, E. E. (2012). An Evaluation of Financial Development and Economic Growth of Nigeria: A Causality Test. *Journal of Business Management,* 1, 27–44.

Patrick, H. T. (1966). Financial Development and Economic Growth in Underdeveloped Countries. *Journal of Economic Development and Cultural Change,* 14, 174–189.

Pesaran, M. H., & Shin, Y. (1999). The Ragner Frisch Contennial Symposium. In S. Storm, (Ed.) *An autoregressive distributed lag modelling approach to cointegration analysis: econometrics and economic theory in 20th century.* Cambridge, NY, USA: Cambridge University Press 354–391

Pesaran, M. H., & Pesaran, B. (1997). *Working with Microfit 4.0: Interactive Econometric Analysis.* Oxford: Oxford University Press.

Robinson, J. (1952). *The Generalization of the General Theory in Rate of Interest and other Essays.* London: Macmillan, UK

Romer, P. M. (2000). Increasing Returns and Long Run Growth. *Journal of Political Economy,* 94(5), 1002-1037.

Schumpeter, J. A. (1911). *The Theory of Economic Development.* Cambridge: Harvard University Press USA.

Shaw, E. (1973). *Financial Deepening in Economic Development,* Oxford: Oxford University Press.

Shu-Chen, C., & Cheng-Hsein, W. (2012). *The Relationship Between Financial Deepening and Economic Growth in Taiwan.* Graduate Institute of Business and Management, National Formosa University, Taiwan, 205-220.

Soludo, C. C. (2008). *The Global Financial Meltdown: Briefing of the Senate*; the Senate Chambers: Federal Capital Territory, Abuja.

Todaro, M. P., & Smith, S. C. (2011). *Economic Development.* Pearson Education Limited, England.

Waqabaca, C. (2004). Financial Development and Economic Growth in Fiji. *Working Papers*, No. 03, Economics Department, Reserve Bank of Fiji: Suva, Fiji.

World Bank (2014). Explore. Create. Share: Development Data. Available online: *http://databank.worldbank. org/data/home.aspx*.

THE IMPACT OF EXCHANGE RATE DYNAMICS ON AGRICULTURAL PERFORMANCE IN NIGERIA 1981 TO 2016

Wasiu Adekunle
Centre for Econometric and Allied Research (CEAR)
University of Ibadan, Ibadan, Nigeria
wasiuademola10@gmail.com
08176308263

Kehinde A. Tiamiyu
Department of Social Science Education,
University of Jos, Jos, Nigeria
ajaous@yahoo.com, ajaot@unijos.edu.ng
08039797929

Taiwo H. Odugbemi
Department of economics
University of Abuja, FCT-Abuja, Nigeria
taiwohassan1437@gmail.com
08037019119

Ndukwe, C. Innocent
Department of Economics
University of Ibadan, Ibadan, Nigeria
emekan2001@yahoo.com
08168338222

Abstract

The study investigated the possible asymmetric effect of real exchange rate dynamics on agricultural performance in Nigeria over the period of 1981 to 2016, due to limited data constraints. The Nonlinear Autoregressive Distributed Lag (NARDL) method was adopted. The study employed a combination of stationary and nonstationary variables as was established through the ADF unit root test. Based on the Bounds test for cointegration, a long-run relationship was absent between real exchange rate and agricultural output, having controlled some other variables. Findings showed that the significant fundamentals were real exchange rate (log-levels), real appreciation and depreciation (after some lags), industrial capacity utilization rate, and government expenditure on agriculture (after some lags) in the short-run. ACGSF loan exerted positive but insignificant influence on agricultural output. In addition, though the effect of real appreciation was larger than that of real depreciation, this study could not find any evidence in support of the asymmetric effect of real exchange rate dynamics on agricultural performance in the Nigerian economy within the period of this study. It is therefore recommended that fiscal and monetary authorities in Nigeria should work in unison at ensuring

that the full potentials of the agricultural sector are harnessed for the growth and development of the country.

Keywords: Real Exchange Rate, Agricultural Output, and Asymmetry

JEL Classification: F40, O13, and C32

INTRODUCTION

The Agricultural sector has been identified as the mainstay of the Nigerian economy since independence in 1960. Before the discovery and exploration of crude petroleum, the country depended on funds generated from agricultural export expansion for the development of other sectors of the economy. Owing to its important role in nation building, the agricultural sector has continued to be a target of government policies over time (Eyo, 2008). The agricultural sector, like any other sector, remains largely affected by exchange rate fluctuations. This is usually in respect of the sector's importation of raw materials and other modern farm implements, and the exportation of its output. Changes in exchange rate policy, therefore, have significant consequences for a country's domestic relative prices and economic growth through their effects on the real exchange rate. The real rate is a measure of the terms of trade between the traded and non-traded sectors of the economy, which provides the signal for resource movements (Oyejide, 1986).

Theoretically, in economic development, agriculture is assumed to play a passive supporting role such that as an economy develops, the relative importance of agriculture gets smaller. It is expected that as a country develops, the agricultural sector supplies excess labour to the industrial sector, which only causes a fall in the relative and not the absolute contribution of agriculture to the country's gross domestic product (GDP).

Specifically, the decline in agricultural output level and its contribution to the growth of the Nigerian economy does not mean that the sector has been displaced by the attractive oil sector, but has recorded low output due to neglect by the government as the oil sector became the major foreign exchange earner of the economy (Michael, 2017). From the 1970s, Nigeria's agriculture has been characterized by excess demand over supply due primarily to high population growth rates, stagnant or declining growth, high rate of urbanization, increased demand for agricultural raw materials by an expanding industrial sector and rising per capita income stimulated by an oil export revenue boom (Kwanashie, Garba, Ajilima, 1997).

A notable problem peculiar to a capital-deficit oil exporting country, like Nigeria, is that the high rates of capital inflows that normally accompany an oil boom tend to drive the real exchange rate down. In other words, rapid capital inflows tend to cause the currency to appreciate. A policy that keeps the exchange rate low impedes growth of tradable goods sector, particularly agriculture. For instance, between 1974 and 1978, Nigeria allowed the Naira to appreciate against the US Dollar and the British Pound, and the resulting overvaluation substantially reduced production incentives for non-oil tradables, particularly agricultural products. This explains why some countries with an oil boom have adapted policies to prevent the tradable/non-tradable price ratio from continuing to fall as the oil boom proceeds (Oyejide, 1986). Moreover, the Nigeria's agricultural sector performance has been greatly affected by not just the nominal exchange rate (₦/$), but also by large swings in the real exchange rate. Owing to the calls from various quarters that the country should de-emphasize her focus from crude oil production to promoting non-oil production, there is need to conduct an empirical study to evaluate the impact of real exchange rate dynamics (depreciation and appreciation) on the agricultural sector in Nigeria, since the sector relies mostly on intermediate imports and exports of primary agricultural products.

To this end, the present study seeks to provide answers to the following research questions: (i) Do real exchange rate fluctuations have any influence on agricultural output in Nigeria? (ii) Is there a causal relationship between real exchange rate dynamics (depreciation and appreciation) and agricultural output in Nigeria? (iii) Are there intervening factors affecting the relationship between real exchange rate and agricultural output in Nigeria? The rest of the paper is arranged as follows: Section 2 reviews theoretical issues, Section 3 contains the review of the literature. Sections 4 and 5 entail the underlying methodology and empirical analysis, respectively. Lastly, section 5 concludes the paper.

THEORETICAL ISSUES

In the Development Economics literature, the linkage between real exchange rate and agricultural output is best explained by the phenomenon of Dutch Disease Syndrome (DDS). In this paper, the core model of the Dutch Disease as developed by Corden (1984) is reviewed. The model assumes that (i) there are three sectors: the **booming sector (B)**, which is equivalent to the **oil and gas sector** in Nigeria; the **lagging sector (L)**, which is equivalent to the **agricultural sector** in the Nigerian case, and the **non-tradable sector (N)**, which is equivalent to the **services sector** in Nigeria; (ii) the first two sectors (B and L) produce traded goods facing given world prices; (iii) output in each sector is produced by a factor specific to that sector, and by labour, which is mobile between all three sectors and moves between sectors so as to equalize wages, and (iv) all factor prices are flexible and all factors are internationally immobile. Given the underlying assumptions, this model generates two distinct effects, namely the spending effect and the resource movement effect resulting from a boom in B. This boom has the initial effect of raising aggregate incomes of the factors initially employed there.

i. **The spending effect**: If some part of the extra income in B is spent, whether directly by factor owners or indirectly through being collected in taxes and then spent by the government, and provided that the income elasticity of demand for non-traded goods (N) is positive, the price of N relative to the prices of traded goods must rise. This is called **real appreciation**. This effect works by drawing resources out of B and L into N, as well as, shifting demand away from N towards B and L.

ii. **The resource movement effect**: In addition, the marginal product of labour rises in B as a result of the boom so that, at a constant wage in terms of traded goods, the demand for labour in B rises, and this induces a movement of labour out of L and out of N. This effect has two parts: (a) The movement of labour out of L into B lowers output in L. This can be called **direct de-industrialization**, because it does not involve the market for N, and thus does not require an appreciation of the real exchange rate. (b) There is a movement of labour out of N into B at a constant real exchange rate. The resource shift creates excess demand for N in addition to that created by the spending effect, and so brings about additional real appreciation. This therefore causes an additional movement of labour out of L into N, reinforcing the de-industrialization resulting from the spending effect. This second effect is termed **indirect de-industrialization**. From the foregoing, it becomes imperative to ascertain the impact of exchange rate changes (appreciation and depreciation) on the performance of agricultural sector so far.

REVIEW OF THE EMPIRICAL LITERATURE

The literature is replete with the investigation of the possible determinants of agricultural output/exports in Nigeria. A considerable number of previous studies are reviewed in this paper. Odior (2014) examines

the effect of macroeconomic policy on Nigerian Agricultural performance between 1970 and 2012 by adopting one-step dynamic forecast analysis. Similarly, Imoughele and Ismaila (2015) analyse the impact of exchange rate on non-oil exports in Nigeria between 1986 and 2013 also with the aid of OLS technique. Odior (2014) identifies the significant determinants of agricultural GDP as including real monetary aggregate and technological change, whereas credit to agriculture and government expenditure on agricultural had insignificant effects on agricultural GDP in Nigeria. By contrast, Imoughele and Ismaila (2015) found that exchange rate, money supply, credit to private sector and real GDP have significant impacts on the growth of non-oil exports, whereas appreciation in exchange rate has negative impact on Nigeria's non-oil exports.

Brownson, Vincent, Emmanuel, and Etim, (2012) investigate the effect of macroeconomic variable fluctuation on agricultural productivity in Nigeria over the period of 1970 and 2010 using the techniques of cointegration and error correction model (ECM). In a similar vein, Akpan, Udoka and Patrick (2015) adopted the techniques of cointegration and error correction model (ECM) to quantify the role of macroeconomic variables on agricultural diversification in Nigeria over the period of 1960 to 2014. Brownson et al (2012) showed that in both long run and short run, real exports, real external reserves, inflation, and external debt have significant negative effects on agricultural productivity, whereas industrial capacity utilization and nominal exchange rate promote agricultural productivity in Nigeria. On the other hand, Akpan et al (2015) reported that long-run positive drivers of agricultural diversification include inflation, viable manufacturing sector, credit to agricultural sector, external reserves, per capita income, unemployment and energy consumption, whereas crude oil prices, lending capacity of commercial banks, FDI in agriculture, and non-oil imports constitute negative long-run drivers in the Nigerian economy.

Omojimite (2012) examined the role of institutions and macroeconomic policy on the growth of agricultural sector in Nigeria between 1970 and 2008 with the aid of fully modified ordinary least squares (FMOLS). On their own part, Oluwatoyose, Applanaidu and Abdul Rasak (2016) examined the macroeconomic factors affecting the Nigeria's agricultural sector between 1981 and 2013 using multivariate cointegration approach and vector error correction model (VECM). Omojimite (2012) found that the volume of credit to agricultural sector, deficit financing and institutional reform positively and significantly affect agricultural output. However, interest rate spread has negative and insignificant effect on agricultural output in Nigeria. Equally, Oluwatoyese et al (2016) showed that commercial bank loan to agriculture, interest rate and food imports are significant factors affecting agricultural output, whereas exchange rate, inflation rate and unemployment rate turned out to be insignificant factors driving Nigeria's agricultural output.

Udensi, Orebiyi, Ohajianya and Eze (2012) investigated the determinants of macroeconomic variables affecting agricultural production in Nigeria by adopting the technique of two-stage least squares (2SLS). In a similar study on Nigeria, Udah and Nwachukwu (2015) investigated the determinants of agricultural output growth between 1960 and 2010 using the technique of ordinary least squares (OLS). Udensi et al (2012) showed that all the determinants of agricultural production index examined in their study were positive and significant, except for world agricultural commodity prices and inflation rate that were negatively related to agricultural production index in Nigeria. In the same vein, agricultural labour, infrastructural development, and total factor productivity (TFP) had positive effect on agricultural GDP, whereas land area harvested, inflation rate and agricultural GDP in the previous were negatively related to agricultural GDP in Nigeria (Udah Nwachukwu, 2014).

In another study by Akinlo and Adejumo (2014), the effect of exchange rate volatility on non-oil exports in Nigeria between 1986 and 2008 was examined using the error correction model (ECM) technique. Essien, Dominic and Sunday (2011) quantified the effects of price and exchange rate fluctuation on agricultural exports (specifically, cocoa exports) in Nigeria using the ordinary least squares (OLS) technique. Akinlo and Adejumo (2014) found that lagged foreign income and real exchange rate had positive and significant effects on non-oil exports. According to the authors, exchange rate change is only significant in the long run, but not in the short run. In addition, exchange rate fluctuations and agricultural export credit affect cocoa exports positively, whereas relative price of cocoa was negatively and insignificantly related to cocoa exports in the Nigerian economy (Essien et al, 2011).

In addition, Obayelu and Salau (2010) applied the techniques of cointegration and VECM to response of agricultural output to price and exchange rate between 1970 and 2007. Olarinde and Abdullahi (2014) examined the implications for food security of the role of macroeconomic policy in agricultural sector performance in Nigeria over the period of 1978 to 2011 by employing the VECM technique. Obayelu and Salau (2010) reported that in the short run and long run, total agricultural output responds positively to increases in exchange rate (that is, exchange rate depreciation), but negatively to increases in food prices. Meanwhile, Olarinde and Abdullahi (2014) found that the long-run determinants of agricultural output include government spending, agricultural credit, inflation rate, interest rate and exchange rate. On their own part, Oyinbo, Abraham and Rekwot (2014) examined the nexus between exchange rate deregulation and Agricultural share of gross domestic product in Nigeria over the period 1986-2011 by employing Granger causality test and VECM. The authors found that there was unidirectional causality from exchange rate to agricultural share of real GDP.

They also showed that exchange rate deregulation has negative influence on agricultural share of real GDP.

From the above review, it can be observed that literature abounds on the relationship between agricultural output and macroeconomic aggregates, such as, inflation, loans/credit, fiscal and monetary policy instruments. The present study differs from previous studies by investigating the possible role of movements in real exchange rate (positive and negative changes in real exchange rate) on agricultural output having controlled for some other significant factors already documented in the literature. The study also extends the coverage period till year 2016 so as to capture the recent happenings in the Nigerian economy; an instance is the fall out of the economic recession in the second quarter of 2016.

METHODOLOGY AND MODEL SPECIFICATION

The study adopts the framework of non-linear autoregressive distributed lag model (NARDL) for some reasons (that are discussed subsequently). First and foremost, an autoregressive distributed lag (ARDL) is a least squares regression that contains lags of the dependent variables (called the *autoregressive terms*) and of the explanatory variables (called the *distributed lag terms*). ARDL models are usually denoted in notational terms as ARDL (p, q_1.... q_K), where p is the number of lags of the dependent variable, q_1 is the number of lags of the first explanatory variable, q_K is the number of lags of the K^{th} explanatory variable, and K is the number of explanatory variables (X_1...X_K).

As developed by Shin, Yu and Greenwood-Nimmo (2014), the non-linear ARDL model differs from the symmetric ARDL model by decomposing the regressors Xs into a partial sum of positive and negative changes in each regressor (that is, $X_i = X_i^+ + X_i^-$ for i= 1,...,K). NARDL was adopted for the

following reasons: *First*, NARDL model (as in eq. 2 below) allows for both the static and dynamic effect(s) of the independent variable(s) on the dependent variable unlike a static model that accounts for static or fixed effect(s) only. *Second*, NARDL framework offers a technique for checking the existence of a long-run relationship between variables, and that is referred to as the *Bounds test*. Bounds test is flexible as it accommodates both stationary and integrated series unlike other tests of cointegration, such as, Engle-Granger and Johansen tests, which considers only non-stationary series that are integrated of the same order. *Lastly*, NARDL allows one to capture the dynamic effect of both positive and negative changes in an explanatory variable on a particular dependent variable.

Before model estimation using the ordinary least squares (OLS) technique, it is important to check the time-series properties such as unit root and cointegration tests to avoid estimating spurious regression. To achieve this, this study adopts the Augmented Dickey-Fuller (ADF) unit root test and the Bounds test for cointegration. The ADF unit root test is conducted to check if series are stationary or not. The null hypothesis is that a series has a unit root or is nonstationary. If the ADF tau statistics is greater, in absolute terms, than the MacKinnon critical values at any chosen level of significance, the null hypothesis is rejected; otherwise, we will fail to reject the null hypothesis of a unit root.

Similarly, the Bounds test for cointegration tests the null hypothesis that there is no cointegration between agricultural share of real GDP and real exchange rate, after controlling for other factors, such as, Agricultural Guarantee Credit Scheme Fund (AGCSF) loan, maximum lending rate, average industrial capacity utilization rate, and government expenditure on agriculture in the Nigerian context. To conclude the presence or absence of cointegration, there is need to compare the computed F-statistics with the critical bound values, that is, I(0) bound (the lower bound) and I(1) bound

(the upper bound) at any chosen level of significance. If the F-statistics is less than the I(0) critical value at any chosen level of significance, then there is no cointegration. However, if the F-statistics is greater than the I(1) critical value at any chosen level of significance, then there is cointegration. However, if the F-statistics lies between the I(0) and I(1) critical values at all levels of significance, then the test result is inconclusive.

In addition, post-mortem tests are carried out to check if the estimated models are adequate for valid and reliable statistical inferences to be made there from. In the light of this, the study investigates whether some assumptions underlying the CLRM hold or not, specifically, linearity, normality, serial correlation, and heteroscedasticity tests are conducted. The associated null hypotheses are, respectively, that the estimated model is linear, has residuals that follow normal distribution, does not suffer from non-serial correlation in the residuals, and does not suffer from non-constant residual variance. The decision rule is that if the probabilities associated with the test statistics of all the tests are greater than 0.1, then the estimated models do not suffer from inadequacy, otherwise, they are said to be inadequate for policy prescription. Of major interest is the test for asymmetry (short-run and/or long-run) using the Wald test. The null hypothesis in this case is that both exchange rate appreciation and depreciation have similar effects on agricultural share of real GDP. The decision rule is that if the probability associated with the Wald test is greater than 0.1, then null of no asymmetry is not rejected. Conversely, if the associated probability is less than or equal to 0.1, then there is evidence of asymmetric effects of exchange rate appreciation and depreciation on agricultural share of real GDP in Nigeria.

To this end, this paper adopts and modifies the model of Obayelu and Salau (2010), who applied the technique of cointegration and VECM to the dynamic effect of real exchange rate change on agricultural responses in Nigeria, so as to account for the asymmetric effect of real exchange

appreciation and depreciation on the share of agriculture in real gross domestic product as follows:

$$AGDP_t = \beta_0 + \beta_1^+ RER_t^+ + \beta_1^- RER_t^- + \beta_2 ICU_t + \beta_3 MLR_t + \beta_4 LOAN_t + \beta_5 GEXP_t + \mu_t \quad (1)$$

Based on the works of Shin, Yu and Greenwood-Nimmo (2014), the nonlinear ARDL version of the effect of real exchange rate dynamics on agricultural output is expressed as:

$$\begin{aligned}\Delta AGRIC_t = {} & \gamma AGRIC_{t-1} + \alpha_1^+ RER_{t-1}^+ + \alpha_1^- RER_{t-1}^- + \alpha_2 ICU_{t-1} + \alpha_3 MLR_{t-1} + \alpha_4 LOAN_{t-1} + \\ & \alpha_5 GEXP_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta AGRIC_{t-i} + \sum_{j=0}^{q_1-1} \varnothing_j^+ \Delta RER_{t-j}^+ + \sum_{j=0}^{q_2-1} \varnothing_j^- \Delta RER_{t-j}^- + \\ & \sum_{j=0}^{q_3-1} \pi_j \Delta ICU_{t-j} + \sum_{j=0}^{q_4-1} \rho_j \Delta MLR_{t-j} + \sum_{j=0}^{q_5-1} \delta_j \Delta LOAN_{t-j} + \sum_{j=0}^{q_6-1} \psi_j \Delta GEXP_{t-j} + \mu_t \quad (2)\end{aligned}$$

Eq. (2) can be re-parameterized to derive the unrestricted error correction version as follows:

$$\begin{aligned}\Delta AGRIC_t = {} & \gamma [AGRIC_{t-1} - \left(-\frac{\alpha_1^+}{\gamma} RER_{t-1}^+ - \frac{\alpha_1^-}{\gamma} RER_{t-1}^- - \frac{\alpha_2}{\gamma} ICU_{t-1} - \frac{\alpha_3}{\gamma} MLR_{t-1} - \frac{\alpha_4}{\gamma} LOAN_{t-1} - \right. \\ & \left. \frac{\alpha_5}{\gamma} GEXP_{t-1}\right) + \sum_{i=1}^{p-1} \theta_i \Delta AGRIC_{t-i} + \sum_{j=0}^{q_1-1} \varnothing_j^+ \Delta RER_{t-j}^+ + \sum_{j=0}^{q_2-1} \varnothing_j^- \Delta RER_{t-j}^- + \\ & \sum_{j=0}^{q_3-1} \pi_j \Delta ICU_{t-j} + \sum_{j=0}^{q_4-1} \rho_j \Delta MLR_{t-j} + \sum_{j=0}^{q_5-1} \delta_j \Delta LOAN_{t-j} + \sum_{j=0}^{q_6-1} \psi_j \Delta GEXP_{t-j} + \mu_t \quad (3)\end{aligned}$$

By letting,

$$\begin{aligned}\varepsilon_{t-1} = {} & AGRIC_{t-1} - \beta_1^+ RER_{t-1}^+ - \beta_1^- RER_{t-1}^- - \beta_2 ICU_{t-1} - \beta_3 MLR_{t-1} - \beta_4 LOAN_{t-1} - \\ & \beta_5 GEXP_{t-1} \quad (4)\end{aligned}$$

Where,

$$\beta_1^+ = -\frac{\alpha_1^+}{\gamma}, \beta_1^- = -\frac{\alpha_1^-}{\gamma}, \beta_2 = -\frac{\alpha_2}{\gamma}, \beta_3 = -\frac{\alpha_3}{\gamma}, \beta_4 = -\frac{\alpha_4}{\gamma}, \beta_5 = -\frac{\alpha_5}{\gamma} \quad (5)$$

Eq. (3), then, becomes

$$\begin{aligned}&\Delta AGRIC_t = \\ &\gamma \varepsilon_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta AGRIC_{t-i} + \sum_{j=0}^{q_1-1} \varnothing_j^+ \Delta RER_{t-j}^+ + \sum_{j=0}^{q_2-1} \varnothing_j^- \Delta RER_{t-j}^- + \sum_{j=0}^{q_3-1} \pi_j \Delta ICU_{t-j} + \\ &\sum_{j=0}^{q_4-1} \rho_j \Delta MLR_{t-j} + \sum_{j=0}^{q_5-1} \delta_j \Delta LOAN_{t-j} + \sum_{j=0}^{q_6-1} \psi_j \Delta GEXP_{t-j} + \mu_t \quad (6)\end{aligned}$$

DEFINITION OF TERMS

Δ = first difference operator; t = time period; AGRIC = Share of agriculture in real GDP (%);

ε_{t-1} = error correction term with the adjustment coefficient γ being expected to be negative, less than one in absolute value and be statistically significant;

RER = a linear measure of real exchange rate; RER^{+} = Positive changes in real exchange rate (representing real depreciation); RER^{-} = Negative changes in real exchange rate (representing real appreciation);

ICU = Average industrial capacity utilization% (to account for intersectoral linkages);

MLR = Maximum lending rate (%), which is a proxy for the role of monetary policy;

LOAN = Natural log of Agricultural Guarantee Credit Scheme Fund (AGCSF) loan

GEXP = Natural log of Government expenditure on agriculture (a proxy for the role of fiscal policy in the agricultural sector development)

θ_j, ϕ^{+}_j, ϕ^{-}_j, π_j, ρ_j, δ_j, and $\psi_j$are short-run parameters, while $\beta_1,\ldots,\beta_5$ are long-run parameters

p is the lag length for the dependent variable, while $q_1,\ldots,q_6$ are the lag lengths associated with the explanatory variables, andμ = random error term.

A priori Expectations/Expected Results

$\phi^{+}_{j} > 0$ or < 0, $\phi^{-}_{j} > 0$ or < 0, $\pi_j > 0$, $\rho_j < 0$, $\delta_j > 0$, $\psi_j > 0$

$\beta^{+}_{1} > 0$ or < 0, $\beta^{-}_{1} > 0$ or < 0, $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 > 0$, $\beta_5 > 0$

DATA DESCRIPTION AND SOURCES

The study is limited to Nigeria and seeks to collect annual data on the variables to be used covering the period between 1981 and 2016, due to limited data constraints, from various sources. The data on the share of agriculture in real GDP, Agricultural Guarantee Credit Scheme Fund (AGCSF) loan, maximum lending rate, average industrial capacity utilization rate, and government expenditure on agriculture were collected from the Central Bank of Nigeria's Statistical Bulletin (CBN, 2016) and CBN Quarterly Reports, while real exchange rate were obtained from variables including official exchange rate, Nigeria's GDP deflator and United States' GDP deflator, upon which data were collected from the World Bank's World Development Indicator (WDI, 2016).

EMPIRICAL RESULTS

Descriptive Statistics

Table 1 presents the summary statistics on the eight variables used throughout this study collected for the period between 1981 and 2016, implying a totality of 36 observations. The variable with the highest mean is the average industrial capacity utilization rate (47.01%), whereas the variable with the lowest mean is the positive changes in real exchange rate (2.06%). In terms of the deviation of the series from their means, the most volatile series is industrial capacity utilization rate with the highest standard deviation of

10.96%, while the least volatile series is the natural log of real exchange rate with the lowest standard deviation of 0.66%.

Table 1: Summary Statistics

Variable	No. of Observation	Mean	Maximum	Minimum	Standard Deviation
AGDP	36	21.2545	26.9948	15.4959	3.2179
RER	36	4.9016	5.737	3.4277	0.6591
RER^{+}	36	2.0551	5.737	0.0000	2.5143
RER^{-}	36	2.7512	5.6479	0.0000	2.5217
ICU	36	47.0058	73.3	29.29	10.9558
GEXP	36	21.3805	24.9038	16.3626	2.9236
LOAN	36	13.2254	16.3377	10.1127	2.1477
MLR	36	21.3747	36.09	10	5.8599

***Source**: Authors' Computation*

The Unit Root Test Result

Table 2 shows the result of the Augmented Dickey-Fuller (ADF) unit root test. Results indicate that only three variables including, positive and negative changes in real exchange rate, and maximum lending rate are stationary at levels, implying that they are integrated of order zero, and do not require differencing. The remaining five variables including, the agricultural share of real GDP, natural log of real exchange rate, industrial capacity utilization rate, government expenditure on agriculture, and ACGSF loan, however, became stationary after first differencing, implying that they are integrated of order one.

Table 2: Result of the ADF Unit Root Test

Variable	Level			First Difference			I(d)
	A	B	C	A	B	C	
AGDP	-2.434	-1.762	0.820	-6.454***	-6.501***	-6.378***	I(1)
RER	-2.033	-2.405	0.637	-4.877***	-4.782***	-4.753***	I(1)
RER^{+}	-5.396***	-5.181***	-1.369	.....†			I(0)
RER^{-}	-5.229***	-4.786***	-1.346	.....	.....	.....	I(0)
ICU	-3.153	-2.419	-0.695	-2.823	-3.149**	-3.192***	I(1)
GEXP	-2.174	-1.921	2.113	-6.269***	-8.168***	-7.321***	I(1)
LOAN	-2.089	-0.566	2.207	-5.573***	-5.678***	-4.947***	I(1)
MLR	-3.112	-2.926*	0.607	.....	.....	.....	I(0)

Note: ***, **,* indicate the rejection of the null hypothesis of a unit root at 1%, 5% and 10%, respectively; I(d) is the order of integration and it refers to the number of differencing required for a series to become stationary; †implies that a series that is stationary at levels does not require its first difference being reported; a, b and c denote models with intercept and trend, with intercept only and with none, respectively.

Source: Authors' Computation

The ARDL Bounds Cointegration Test Result

Table 3 shows the result of Bounds test for cointegration performed on the non-linear relation between agricultural output and its possible determinants (positive and negative changes in real exchange rate, industrial capacity utilization rate, government expenditure on agriculture, maximum lending rate and ACGSF loan). Since the F-statistic associated with the first model is less than the lower I0 critical bound at 5% level of significance, it can be concluded that there is no long-run relationship between agricultural output and its determinants The absence of cointegration warrants the

estimation of a linear and a non-linear autoregressive distributed lag models, respectively, in each of both cases.

Table 3: Result of ARDL Bounds Cointegration Test

Non-linear relation between real exchange rate and agricultural output		
F-stat	**2.0984**	
Critical Values		
Significance levels	**I0 Bound**	**I1 Bound**
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Source: Authors' Computation

The Regression Results

This sub-section presents and discusses the results of model estimation to examine the non-linear impact of real exchange rate dynamics on agricultural output in Nigeria over the short term since there is no long-run relationship between real exchange rate and agricultural output. Table 4 presents the results of the non-linear relation between real exchange rate and agricultural output in Nigeria.

Non-linear Relation between Real exchange rate and Agricultural output

The determination of agricultural share of real GDP was found to be adaptive as the overall autoregressive coefficient (that is the sum of coefficients of first, second, third and fourth lags of agricultural output share) is positive. The coefficients are also statistically significant at the conventional

levels (1%, 5%, and 10%). Similarly, as expected, industrial capacity utilization is positively related to agricultural output share, as the impact coefficient (0.1358) implies that for every 1 percentage point increase in capacity utilization rate, agricultural output share increases on average by 0.1358 percentage point, keeping other variables constant. The coefficient is also significant at 5% level of significance. This implies that accounting for the asymmetric effect of real exchange rate on agricultural output improves significantly the forward and backward linkages between the agricultural sector and other sectors in the economy.

There is an expected positive relationship between government expenditure on agriculture and agricultural output share, as the impact coefficient (0.3437) implies that for every 1% increase in government expenditure, agricultural output increases on average by (0.3437/100) 0.003437 percentage point, keeping other variables constant. The coefficient is however not statistically significant at the 10% level. By implication, government expenditure on agricultural sector is yet to produce the desired outcomes in the sector. In the same vein, there is an expected positive relationship between the ACGSF loan and agricultural share of real GDP, as the impact coefficient (0.0866) implies that for every 1% increase in the amount of loanable funds, agricultural output share increases on average by (0.0866/100) 0.00086 percentage point, keeping other variables constant. The coefficient is not significant at 10% level of significance, implying that the loan provided by the scheme is yet to significantly stimulate agricultural production in Nigeria.

Likewise, there is an expected negative relationship between maximum lending rate and agricultural output share, as the impact coefficient (-0.1294) implies that for every 1 percentage point increase in the lending rate, agricultural output share decreases on average by 0.1294 percentage point, keeping other variables constant. The coefficient is also significant at 10%

level of significance. By implication, the high cost of borrowing through the deposit-money banks discourage prospective farmers from investing in the agricultural sector, and by extension, agricultural output is expected to decline. Moreover, there is an overall positive impact of real depreciation (that is, positive changes in real exchange rate) on agricultural share of real GDP, as the coefficients current value and lags of real depreciation take opposite signs. In other words, real depreciation increases domestic agricultural production. While the coefficient on current real depreciation is not statistically significant at the 10% level, the coefficients on the first and second lags are significant at 10% and 5%, respectively. This result indicates that agricultural output does not respond instantly to real depreciation, but it does after some lag. Real depreciation makes domestic agricultural products competitive relative to its imported substitutes. These results confirmed some of the findings of Obayelu and Salau (2010), Omojimite (2014), Akpan et al (2015)

In the same vein, there is an overall positive relationship between real appreciation (that is, negative changes in real exchange rate) and agricultural output share, as the coefficients on the current value, first and second lags of real appreciation take opposite signs. In other words, real appreciation is harmful to the agricultural sector. Just with real depreciation, the coefficient on current real appreciation is not statistically significant at the 10% level, on the other hand, the coefficients on the first and second lags are of real appreciation at 10% and 5%, respectively. By implication, agricultural output responds with lags to negative changes in real exchange rate (that is, real appreciation). Real appreciation makes domestic agricultural product lose international competitiveness relative to imported substitutes; hence the shift in demand from domestic agricultural products to imported ones, and its attendant negative impact on agricultural sector performance in Nigeria. The

overall positive impact of real appreciation outweighs the overall positive impact of real depreciation, implying the effectiveness of the former over the latter. This result paralleled the findings of Oyinbo et al, (2014)

In addition, the adjusted R^2 of 0.8784 implies that approximately 88% of the total variation in agricultural output share of real GDP is being explained by positive and negative changes in real exchange rate, industrial capacity utilization rate, government expenditure on agriculture, ACGSF loan, and maximum lending rate, having accounted for the number of degrees of freedom. The very high F-stat of 16.9986[0.0000] implies that all the partial slope coefficients on the explanatory variables listed above are jointly statistically significant at the 1% level; hence, the overall model is significant. Lastly, results of diagnostic/post-estimation tests showed that the model did not suffer from non-linearity, non-normality of the residuals, non-serial correlation in the residuals, and non-constant residual variance, since the probabilities associated with the various test statistics are greater than 0.1. It can therefore be concluded that the asymmetric-effect model is adequate for policy prescription. Of important interest is the result of Wald test for short-run asymmetry. Since the associated probability is greater than 0.1, the null hypothesis of a symmetric effect of real exchange rate on agricultural output cannot be rejected. In other words, real exchange rate dynamics (appreciation and depreciation) have no asymmetric impacts on agricultural output performance in Nigeria.

Table 4: Non-linear/Asymmetric Effect of Real exchange rate on Agricultural output

Dependent variable	$AGDP_t$
$AGDP_{t-1}$	0.6491***(0.1741)
$AGDP_{t-2}$	-0.6921***(0.2134)
$AGDP_{t-3}$	0.4412*(0.2166)
$AGDP_{t-4}$	-0.3361*(0.1637)
ICU_t	0.1358**(0.0589)
$GEXP_t$	0.3437(0.3443)
$LOAN_t$	0.0866(0.6084)
MLR_t	-0.1294*(0.0633)
RER_t^+	1.6586(1.3658)
RER_{t-1}^+	-2.5753*(1.3644)
RER_{t-2}^+	2.2700**(0.9192)
RER_t^-	1.8759(1.4538)
RER_{t-1}^-	-2.8905*(1.4157)
RER_{t-2}^-	2.5315**(0.9299)
C	1.0346(2.7547)
Adjusted R^2	0.8784
F-stat	16.9986[0.0000]
Ramsey RESET linearity test	1.3155[0.2069]
Jarque-Bera normality test	0.3509[0.8391]
Breusch-Godfrey serial correlation LM test	0.5329[0.5976]
ARCH LM heteroscedasticity test	0.9402[0.3403]
Wald test for short-run asymmetry	-0.6835[0.5035]

Note: ***, **, * indicate the statistical significance of coefficients at 1%, 5% and 10%, respectively; the values in parentheses and block brackets are, respectively, the standard errorsand the probabilities.

Source: Authors' Computation

CONCLUSIONS

The study investigated the asymmetric effect of real exchange rate dynamics on agricultural output performance in Nigeria over the period between 1981 and 2016. Our findings showed that the significant positive fundamentals of agricultural output share are real appreciation and real depreciation (after some lags), industrial capacity utilization, and government expenditure on agriculture (after some lags) in the short run. Maximum lending rate is the only significant negative fundamental of agricultural output. The ACGSF loan is a positive but insignificant determinant of agricultural output. In addition, though the effect of real appreciation is larger than the effect of real depreciation, the study could not find any evidence in support of the asymmetric effect of real exchange rate dynamics on agricultural output performance in the Nigerian economy.

POLICY RECOMMENDATION

Based on the findings of this study, the following policy options could be found useful: (i) since real exchange rate exerts positive effect on agricultural production, it is suggested that the Nigerian government explores the increased competitiveness of the sector in its economic diversification efforts. In other words, the agricultural sector could provide an avenue to expand the revenue base of the government; (ii) Much emphasis should be laid on local sourcing of raw materials so that the positive spill-over effects embedded in forward and backward inter-sectoral linkages could be absorbed; (iii) The Nigerian government at all levels should provide inputs and loan facilities to genuine farmers at subsidized rates. The inputs and loan facilities should also be available at the right time and in right amounts at the door-steps of prospective farmers. This is because lack of sufficient funds and adequate input provision had been the major source of failure for most of the agricultural policies of the Nigerian government in the past, and (iv) The CBN

should, through its monetary policy tools, such as, the monetary policy rate (MPR) and selective credit control, ensure that loans through the deposit-money banks are made accessible to genuine and credit-worthy farmers at the lowest possible cost. This would in turn stimulate investment in the agricultural sector with the attendant positive effect on the sector's output performance.

REFERENCES

Akinlo, A. E., & Adejumo, V. A. (2014). Exchange Rate Volatility and Non-oil Exports in Nigeria: 1986-2008. *CS Canada International Business and Management*, 9(2), 70-79.

Akpan, S. B., Udoka, S. J., & Patrick, I.V. (2015). Roles of Macroeconomic Variables on Agricultural Diversification. *American Journal of Economics and Business Administration*, 7(2), 77-93.

Brownson, S., Vincent, I., Emmanuel, G., & Etim, D. (2012). Agricultural Productivity and Macroeconomic Variable Fluctuation in Nigeria. *International Journal of Economics and Finance*, 4(8), 114-125.

Central Bank of Nigeria (CBN). *Quarterly Report for Quarter 4 of 2016.*

Corden, W.M. (1984). Booming Sector and Dutch Disease Economics: Survey and Consolidation. *Oxford Economic Papers, New Series*, 36(3), 359-380.

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

Eyo, E. O. (2008). Macroeconomic Environment and Agricultural Sector Growth in Nigeria. *World Journal of Agricultural Sciences*, 4(6), 781-786.

Imoughele, L. E., & Ismaila, M. (2015). Impact of Exchange Rate on Non-oil exports. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 5(1), 190-198.

Kwanashie, M., Garba, A., & Ajilima, I. (1997). Policy Modelling in Agriculture: Testing the Response of Agriculture to Adjustment Policies in Nigeria. AERC Research Paper Series 57

Michael, E.O. (2017). Agricultural Sector Performance and Nigeria's Economic Growth. *Asian Journal of Agricultural Extension, Economics and Sociology*, 15(1), 1-13.

Obayelu, A. E., & Salau, A.S. (2010). Agricultural Response to Prices and Exchange Rate in Nigeria: Application of Cointegration and VECM. *Journal of Agricultural Science*, 1(2), 73-81.

Odior, E. S. (2014). The Macroeconomic Policy Effect on Nigerian Agricultural Performance: One-Step Dynamic Forecasting Analysis. *International Journal of Economics and Finance*, 6(9), 190-198.

Olarinde, M. O., & Abdullahi, H. (2014). Macroeconomic Policy and Agricultural output in Nigeria: Implication for Food Security. *American Journal of Economics*, 4(2), 99-113.

Oluwatoyose, O. P., Applanaidu, S. D., & Abdulrasak, N. A. (2016). Macroeconomic Factors and Agricultural Sector in Nigeria. *Procedia Social and Behavioural Sciences*, 219, 562-570.

Omojimite, B.U. (2012). Institutions, Macroeconomic Policy and the Growth of the Agricultural Sector in Nigeria. *Global Journal of Human Social Science*, 12(1), 1-8.

Oyejide, T.A. (1986). The Effects of Trade and Exchange Rate Policies on Agriculture in Nigeria. International Food Policy Research Institute (IFPRI) Research Report 55.

Oyinbo, O., Abraham, F., & Rekwot, G. Z. (2014). Nexus of Exchange Rate Deregulation and Agricultural Share of Agricultural Share of Gross Domestic Product in Nigeria. *CBN Journal Applied Statistics*, 15(2), 49-64.

Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework In R. C. Sickles and W.C. Horrace (eds.), *Festschrift in Honour of Peter Smidht: Econometric Methods and Applications*. DOI 10.1007/978-1-4899-8008-3_9, Chapter 9, pp. 281-314.

Udah, S. C., & Nwachukwu, I.N. (2015). Determinants of Agricultural GDP Growth in Nigeria. *International Journal of Agricultural Research and Review*, 3(3), 184-190.

Udensi, A. I., Orebiyi, J. S., Ohajianya, D. O., & Eze, C. C. (2012). Determinants of Macroeconomic variables that affect Agricultural Production in Nigeria. *International Journal of Agricultural and Rural Development*, 15(3), 1169-1173.

THE IMPACT OF OIL PRICE ON THE GROWTH OF NIGERIAN ECONOMY

Idowu Daniel Onisanwa

Ali Madinamm Dankumo

Benjamin Shido-Ikwu Sunday

and

Osong Ofem Akpama

All of the Department of Economics and Development Studies
PMB 0182, Federal University of Kashere,
Gombe State, Nigeria
Email & Tel: onidandino@gmail.com , +2348036428218

Abstract

Changing oil price and its impacts on economic growth have continued to generate controversies among economic researchers and policymakers. Some studies suggest that oil can enhance the growth of an economy, while others are of the view that it dampens the growth of the economy. The study employed the ARDL approach to examine the relationship between oil price changes and Nigeria's economic growth using time series data from 1983 to 2017. The findings revealed the existence of a relationship between crude oil price and economic growth in Nigeria. The study showed that rising oil price has a negative impact on economic growth in the short run and long run. Therefore, for the country to achieve sustainable growth over time, policymakers should not only be abreast with the movement of oil prices, but the government should also diversify the productive base of the economy to other sectors in order to facilitate the higher inflow of income to the economy.

Keywords: Oil price, Economic Growth, ARDL, Nigeria

JEL Code: O4, Q4, L7

INTRODUCTION

The importance of oil in the development of a country cannot be overemphasized; it is an essential commodity that influences the formal and informal sectors of the global economy. This makes the price of oil responsive to the global market forces of demand and supply, hence, frequent fluctuation

in the price of oil. However, issues of changing oil price and its effect on the growth of the economy have been a subject of controversies in the literature. Some studies (Olomola (2006); Aliyu (2009); Gunu and Kilishi (2010)) were of the view that oil can enhance the growth of the economy, while Cerralo (2005) on the contrary, was of the view that it dampens the growth of the economy.

The first school of thought (Olomola (2006); Aliyu (2009); Gunu and Kilishi (2010) opined that an increase in price has a significant positive effect on the real gross domestic product of oil-exporting countries, given that export earnings are higher than import. On the other hand, the second group as in the case of Cerralo (2005), argued that countries that are major importers of oil could experience the rising cost of inputs, reduction in the demand for oil and rising inflation. Other negative influences of changing oil price include a reduction in capital stock and declining revenues from taxes as well as the rising budget deficit, and these tend to reduce human wellbeing Luk (2017).

The influence of variation in the price of oil on any economy is a function of whether the country is a net exporter of oil or net-importer of oil, and depends on the nature and frequency of variation in prices. For instance, severe falls in the price of crude oil in the global market adversely impact the economies of exporting nations (Odularu and Okonkwo, 2009). The smash in the price of oil globally from $147 to $46 per barrel in 2008, and the excess supply of oil in 2014 that led to the fall in oil price from $110 to below $60 imply a fall in the real gross domestic product of exporting countries. The decline in oil price hurts the Nigerian economy, given that the price of crude oil is the benchmark for budgetary revenue and expenditure. On the contrary, Nigeria is both an oil-exporting and importing country, the country exports crude oil, and imports refined petroleum products. Therefore, the impact of variation in oil price on the Nigerian economy is ambiguous. Nigeria depends mainly on revenues from crude oil export which accounts for approximately

90% of her overall export earnings and about 70% of the annual government revenue on the average Odularu and Okonkwo (2009). However, not much is known about the impact of oil price changes on the economic growth of net oil-exporting countries like Nigeria. Iwayemi and Fowowe (2011) argued that most literature on oil and macro analysis dwell majorly on developed and oil-importing nations. Given the gaps mentioned above, it is imperative to analyze the potential effects of this variation on the Nigerian economy. Thus, this study investigates the relationship between oil price changes and the growth of the Nigerian economy. Specifically, the study answered the question: what are the short-run and long-run relationship between oil price changes and economic growth of Nigeria?

We structure the paper in the following sections; section one is the introduction of the study, section two reviews related literature. Section three dwells on the Research Methodology. We present empirical results and discuss it in section four, while the final section is Summary, Conclusion and Recommendation.

REVIEW OF RELATED LITERATURE

The association between oil price and economic growth has received surfeit of theoretical and empirical research over the past decades. Theoretical works on the nexus between crude oil price and economic growth include works of Brown and Yucel (2002); Hamilton (2009); Idris et al. (2015); Nwani, Ihenacho and Okagbue (2016). Idrisov et al. (2015) likened rising oil price to the growth rate of saving in the Solow growth model. The study argued based on the classical theory, which suggests that steadily rising oil prices do not affect economic growth in the long-term rather it pre-planned the direction of change within a short period in the long-term state of equilibrium. Ghalayini (2011) used the neoclassical theory in ascribing the economic importance of increasing oil price to macroeconomic phenomena

such as labour market dispersion, inflationary pressure, smoothing of good durable consumption and unstable investment climate. They are the macroeconomic channels through which increased oil price influences the economic.

The empirical nexus between oil price and economic growth in low-income economies revealed that the rising price of oil has both demand and supply side effects on the economy. Households' expenditure on goods and services as well as firms investment expenditure are the primary channels through which the demand-side impacts the economy. An increase in the price of oil is passed on to the consumers in the form of high commodity price, as a result of the rising costs of transportation (Jayaraman and Choong, 2009).

On the supply-side, increase in oil prices increases the costs of production and dampens the willingness to invest in production activities, hence a fall in output. Therefore, an increase in oil price has an overall constraint on the supply of goods, given that high costs of inputs limit firms' profit. Firms tend to cut back production, reduce investment on capital good and reduction in aggregate output over a long period (Asian Development Bank, 2005; Ghalayini, 2011).

Rising oil prices have a negative influence on the growth of importing and low-income countries without an alternative source of energy Jayaraman and Choong (2009); Olomola and Adejumo (2006); Chuku, Effiong and Sam (2010); Iklaga and Evbuomwan (2012). The persistent rise in commodities prices, worsening terms of trade and distortion of the balance of payment are some of the adverse economic effects of increased oil price.

Meanwhile, Algahtani (2016) investigated the impacts of changing oil price on the economic growth of Saudi Arabia and found the existence of a positive and long relationship between oil prices and economic growth. Similarly, Alkhathlan (2013) revealed that oil revenue has a significant

influence on economic growth both in the immediate term and in the long-run. Jayaraman and Choong, 2009 examined the relationship between the price of oil and economic growth of Pacific Island countries. The finding showed that oil price changes have a significant impact on the economic growth of oil-importing countries. The study specifically revealed long term relationship among gross national income, foreign reserve and price of oil. Similarly, Prasad, Narayan and Narayan (2007) suggest that an increase in oil price positively impact economic growth in Fiji. They justified the result on the ground that Fiji is producing below the threshold output level that could be associated with the adverse effect of the oil price increase.

In Nigeria, Nwani, Ihenacho and Okagbue (2016) investigate the nexus between the price of crude oil and the development of financial sector intermediary. The study found that financial intermediary's development and the crude oil price has a positive long-run relationship, while the relationship is negative in the immediate term. The findings further suggested that after controlling for rising commodity price, growth of gross domestic product and the ratio of export-import in GDP, oil price still pose an essential influence on the development of financial intermediaries in Nigeria. Iwayemi and Fowowe (2011) analyzed the impacts of fluctuation in the price of oil on the economic growth of Algeria, Egypt, Libya and Nigeria. The result indicates that oil price volatility has minimal influence on macroeconomic variables in the short-run. The findings further revealed that macroeconomic variables suffer an initial overshooting phenomenon in response to oil price shock. The study concludes that contrary to expectation, increases in the global price of oil did not transform into economic growth, despite rising foreign exchange earnings and more revenue at the government disposal.

Olomola and Adejumo (2006) and Chuku, Effiongand Sam(2010) argued that oil price fluctuations have no positive impact on the Nigerian economy, while Ogunsola, Olofinle and Adeyemi (2017) suggested, oil price

changes have a negative and insignificant impact on economic growth. These studies based their explanation on the impact of oil price on the economy via monetary variables such as money supply and interest rates.

METHODOLOGY AND DATA

The underpinning theory for the study is the endogenous growth theory, as advanced by Arrow (1962) and as used in Romer (1986) and Lucas (1988). The theory assumed that sustainable growth is attainable, and the main determinants of growth are endogenous to the system in the long-run. These determinants include human capital development, policies, quality of the existing institution and avenues for technological advancement. We express the endogenous theory in this functional form as:

$$y = ak \tag{1}$$

Where y is the gross domestic product (GDP), k is capital stock, and a represents technology, this model is characterized by increasing returns to scale. According to Romer (1986), capital stock comprises physical capital (k_p) and human capital (k_h). Introducing human capital into equation (1) becomes

$$y = ak_p k_h \tag{2}$$

Given that oil price is an essential driver of the economy of Nigeria, the price of oil is included in equation 2, however, to account for the correct association among the selected series, we already discuss several mechanisms by which variation in oil price influences economic growth in the literature on oil price and economic growth. Some of the identified channels are the exchange rate, inflation, and trade openness.

The relationship between oil prices and economic growth, therefore, can be represented as:

$$RGDP = F\ (OP,\ RER,\ INF,\ TOP) \qquad (3)$$

Where $RGDP$ is real GDP, OP denotes oil price, RER is the real exchange rate, TOP represents trade openness and INF is inflation rate measured by the consumer price index.

The econometrics representation of equation (1) is presented as

$$RGDP_t = \beta_0 + \beta_1 OP + \beta_2 RER + \beta_3 INF + \beta_4 TOP + \varepsilon_t \qquad (4)$$

whereas, ε_t is the stochastic error term.

β_0, β_1, β_2, β_3 and β_4 are the parameters to be estimated.

On a priori ground: β_0 and $\beta_4 > 0$, while β_1, β_2 and $\beta_3 < O$

The study presumed that changes in the price of oil are negatively associated with economic growth based on previous empirical findings. This is because the rise in oil price is an indication of rising scarcity of energy and the fact that oil is an essential input in the production process. Scarcity of oil implies a reduction in labour productivity and declining growth rate in the economy. Meanwhile, improved foreign reserves coupled with foreign aids as well as rising returns from the export of other commodities and activities imply that the adverse effect of rising oil prices on economic growth can be alleviated.

The study adopted the Autoregressive Distributed Lag (ARDL) approach to establish the influence of oil price on economic growth in Nigeria. Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001) developed the ARDL cointegration framework. The ARDL was utilized in this study because it does not compel all the data series under investigation to be of the same order of integrations, that is, it is useful in the scenario where the series is

$I(0)$ and $I(1)$ Pesaran and Pesaran (1997). Furthermore, coefficients that emanate from ARDL framework are super consistent for not too large sample sizes, thereby making it more relevant in this study given that, the data series is of 36 annual observations. Also, the ARDL framework is devoid of endogeneity issue since there is no correlation among the residuals.

Meanwhile, Pesaran and Shin (1999) argued further that the ARDL technique distinguishes between regressors and regressand. Similarly, Pesaran and Pesaran (1997); Pesaran *et al.* (2001) argued that estimation is feasible and coefficients unbiased in the presence of endogeneity among the independent variables. This issue is germane when considering the impact of oil price on economic growth in Nigeria. Therefore, this study utilized the ARDL modelling procedure.

The ARDL framework for equation (2) is stated as follows:

$$\begin{aligned}\Delta \ln RGDP_t = \alpha_0 &+ \sum_{i=1}^{p} \alpha_1 \Delta \ln RGDP_{t-i} + \sum_{i=1}^{p} \alpha_2 \Delta \ln OP_{t-i} + \sum_{i=1}^{p} \alpha_3 \Delta \ln RER_{t-i} \\ &+ \sum_{i=1}^{p} \alpha_4 \Delta \ln INF_{t-i} + \sum_{i=1}^{p} \alpha_5 \Delta \ln TOP_{t-i} \\ &+ \lambda_1 \ln RGDP_{t-1} + \lambda_2 \ln OP_{t-1} + \lambda_3 \ln RER_{t-1} + \lambda_4 \ln INF_{t-1} + \lambda_5 \ln TOP_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

The expression from λ_1 to λ_5 is the long-run relationship among the variables, while the notation α_1 to α_5 with the summation sign depicts the dynamics of the variables in the short-run. α_0 denotes the drift parameter and ε_t is the stochastic error term. The short-run dynamics and long-run are derived through the various steps involve in ARDL bounds test.

The null hypothesis is that; $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$, this connotes the absence of a long-run relationship, while the alternative is $\lambda_1 \neq 0, \lambda_2 \neq 0, \lambda_3 \neq 0, \lambda_4 \neq 0, \lambda_5 \neq 0$.

The value of the computed F-statistic is weighed against the upper and lower critical magnitudes defined by Pesaran et al. (2001). Whenever the magnitude of the computed F-statistic is higher than the upper critical figure, the alternative hypothesis of long-run relationship cannot be rejected with no reference to the order of integration of the variables. The second step entailed the analysis of the long-run relationship with the chosen ARDL framework through the Schwarz Criterion (SBC). The study further estimated the error correction model specified as;

$$\Delta RGDP_t = \beta_0 + \sum_{i=1}^{p}\delta_i \Delta RGDP_{t-1} + \sum_{i=1}^{p}\varnothing_i \Delta OP_{t-1} + \sum_{i=1}^{p}\omega_i \Delta RER_{t-1} + \sum_{i=1}^{p}\lambda_i \Delta CPI_{t-1} + \sum_{i=1}^{p}\theta_i \Delta TOP_{t-1} + \alpha ECM_{t-1} + \varepsilon_t \quad (6)$$

The error correction model result shows the speed of adjustment from a short-run shock back to a long-run state of equilibrium. Diagnostic tests are performed to ascertain suitability of the specified model. These include verification of the reliability of the error correction model. The post-estimation residual-based tests conducted for the selected model in this study include Serial Correlation test (using the LM test) and Stability test (using CUSUM test).

This study uses annual time series data spanning for 1983 to 2017, the study period is based on data availability and to capture the various effects of distortions in the price of oil experienced in Nigeria. The data, real effective exchange rate, real Gross Domestic Product (RGDP), trade Openness (% of GDP) and inflation were sourced from World Development Indicators (WDI) of World Bank, while the oil price was obtained from the United States-Energy Information Administration (EIA).

RESULTS PRESENTATION AND DISCUSSION

The result of the descriptive statistics of real gross domestic product, oil price, real exchange rate, consumer price index and trade openness is presented in the table below.

Table 1: Descriptive Statistics of the Variables Included in the Model

	RGDP	OP	RER	CPI	TOP
Mean	26.06101	3.536146	4.738310	2.697166	3.403851
Median	25.85435	3.382354	4.605170	2.555410	3.539736
Maximum	26.86376	4.602667	6.294278	4.288204	3.975523
Minimum	25.40412	2.667228	3.915386	1.683102	2.212206
Std. Dev.	0.492591	0.630690	0.597122	0.720096	0.497058
Skewness	0.376491	0.427101	1.216595	0.808424	-1.251263
Kurtosis	1.691784	1.781443	3.659974	2.648037	3.588990
Jarque-Bera	3.322685	3.229541	9.269135	3.993031	9.638923
Probability	0.189884	0.198936	0.009710	0.135808	0.008071
Observations	35	35	35	35	35

Source: Authors' computation

The average values for real gross domestic product, oil price, real exchange rate, consumer price index and trade openness are presented in table 1 including the minimum and maximum values. An observation of the table shows that given the rejection criteria, all the variables except LTOP and LRER are normally distributed, since the probability values computed for Jacque Bera Chi-square distribution are higher than the conventional statistical significance levels, the null hypothesis that the series is normally distributed cannot be rejected. That is, the series is normally distributed. This result is further evidenced by the skewness and kurtosis statistics of the series. All the variables are positively skewed except trade openness that has negative skewness. This implies all the distribution has a long-right tail except TOP with a long-left tail.

Variables such as real gross domestic product, oil price, and consumer price index are platykurtic. While the real exchange rate and trade openness, whose kurtosis value is higher than three are leptokurtic. The standard deviation indicates that consumer price index has the highest deviation from its mean among the series under consideration, while real gross domestic product, despite having the highest - maximum value has the least variation from its mean.

ARDL estimators are only useful when series are of mixed orders of integration, I (0) and I (1), but none is I(2), hence, the need to determine the level of stationarity of the series. The study utilized the Augmented Dickey-Fuller (ADF) and Phillip Peron (PP) estimators with the tests options (restricted constant and no trend) to determine the stationarity of the series. The ADF and PP tests results are shown below

Table 2: Unit Root Tests Results

Variable	ADF Constant	Const. & Trend	PP Constant	Const. & Trend
		Levels I(0)		
RGDP	0.041319	-2.343845	0.497166	-1.779712
OP	-1.092030	-2.283806	-1.089361	-2.310127
RER	-2.543021	-2.311172	-2.558430	-2.321900
CPI	-3.866086***	-4.206602**	-2.854581*	-2.713752
TOP	-2.549251	-2.078234	-2.523491	-1.723574
1st Difference I(1)				
RGDP	-4.169106***	-4.060334*	-4.127531***	-4.017297*
OP	-5.792008***	-5.710596***	-5.792008***	-5.710487***
RER	-4.531144***	-4.660818***	-4.546265***	-4.670300***
CPI	-5.081357***	-5.000602***	-9.432431***	-9.153727***
TOP	-7.483657***	-8.239423***	-7.451416***	-12.56200***

Note: *The numbers show the t-statistics value of the variables, whereas ***, ** and * denotes significant at 1%, 5% and 10% significance level, respectively. It is*

therefore apparent that all the variables are stationary at the 5% levels and with a restricted constant for both the ADF and PP unit root test.

Source: Authors' computation

The results show a mixed order of integration, RGDP, OP, RER, and TOP are integrated of order one, while CPI is stationary at level. Given that the series is of a different order of integration, and the regress and is stationary after the first difference, the appropriate cointegration test is the Bounds test developed by Pesaran et al. (2001). Thus, a justification for using the ARDL bounds test in establishing the long-run relation that exists, if any, among real gross domestic product, oil price, real exchange rate, consumer price index and trade openness in Nigeria.

ARDL Bounds Test

The ARDL Bounds test result shows that the computed F-statistic (18.8669) is higher than the upper bound I(1) value of 5.532 at the general critical significance levels of 1 percent, this denotes the existence of long-run relationship among the variables, i.e., RGDP, OP, CPI, RER, and TOP are cointegrated. Therefore, we reject the null hypothesis of no cointegration among the series of the model and estimate the long-run coefficients and short-run model.

Table 3: Bounds test for the existence of long-run relationship

Model			F-statistic
RGDP= f(OP, RER, TOP, CPI)			**18.8669*** **
		(n= 35, k=4)	
Narayan (2005)	Critical Value	Lower Bound I(0)	Upper Bound I(1)
	1%	4.093	5.532
	5%	2.947	4.088
	10%	2.46	3.46

Note: *, **, *** depicts 10%, 5% and 1% levels of significant, respectively. The critical bounds values are extracted based on Pesaran et al (2001). Optimal lag length of 3 was chosen using Schwarz criterion.

The long-run coefficient results

The long-run coefficient is presented in the former part of table 4

Table 4: Long-run and short-run ARDL Estimates

Long-run Results		**Short-run Results**	
Variable	Coefficient	Variable	Coefficient
OP	0.45478(2.64225)	ΔOP	0.03189(1.85223)
CPI	$-0.78391(-2.50846)$	ΔCPI	$-0.03962(-5.72630)$
RER	$-0.16874(-0.80342)$	ΔRER	0.043236(3.38727)
TOP	0.16581(0.74176)	ΔTOP	0.011623(0.760404)
		$ECM(-1)$	$-0.070098\ (-11.69551)$
Diagnostic test result			
Breuch-Godfrey Serial Correlation LM Test		0.73427	
ARCH Test		0.00831	
Ramsey RESET Test		(0.152859)	
CUSUM		Stable	
CUSUMSQ		Stable	

Note: t-statistics in parenthesis

Source: Authors' Computation

Table 4 reveals the coefficient of a long-run relationship among real gross domestic product, oil price, real exchange rate, inflation and trade

openness. The result shows that oil price is positively signed, implying that the relationship between the price of oil and growth of the Nigerian economy in the long-run is positively related. The magnitude of the estimated coefficient, which implies an elasticity of the price of oil, suggests an increase in oil price will lead to increase in the real gross domestic product of Nigeria in the period of the study. The probability value suggests that oil price is an essential determinant of economic growth in Nigeria; hence, rising oil prices will generate additional income which can aid the growth of the economy. Since Nigeria is an oil-exporting country the vibrancy of its economy is a function of global oil prices. This result is in line with the work of Algahtani (2016) which found a positive relationship between oil price and the growth of GDP in Saudi's economy in the long run. It is also in conformity with the work of Alley, Asekomeh, Mobolaji & Adeniran (2014) which found that oil price significantly improves economic growth in Nigeria.

Some critical covariates such as exchange rate, inflation rate, and trade openness were also estimated. The result reveals that trade openness is positive but insignificant to economic growth, which implies that trade openness is vital in explaining the changes in the size of the economy. That is, the revenue accruing to Nigeria from the sales of crude oil promotes economic growth in the country. The positive relationship could be attributed to an excess of exported crude oil over imported refined product for domestic consumption. The finding that trade openness does not have a significant influence on the growth of the Nigerian economy is in agreement with the works of Gbadebo (2008), and Udoh (2014) that suggest crude oil export does not play a significant role in improving the growth of the economy owing to several other factors that constrain growth.

The coefficient of the exchange rate is negatively signed, but not statistically significant in influencing economic growth in Nigeria in the long run. The result tends to suggest that the rate at which naira exchanges dollar

is not necessary for explaining economic growth in Nigeria. This seems to suggest that exchange rate does not play a significant role in improving the growth of the economy owing to several other factors that constrain growth. This study conforms to the work of Akpan &Atan (2011) that reported an insignificant relationship between exchange rate and economy of Nigeria. On the contrary, studies such as Aliyu (2009) and Afolabi, Belford, Yemisi, and Ehinomen (2016) have found a positive and significant association between exchange rate and growth of output.

The result also reveals that the coefficient of inflation is negatively related to the real gross domestic product with a coefficient of 0.78, and statistically significant in explaining changes in the economy. This result is consistent with the outcome of the study of Osigwe (2015) who reported a negative association between inflation and economic growth in Nigeria.

Short-run Estimates

The results of the short-run analysis are presented in Table 4. This suggests that the variables of the model tend to have more influence on economic growth in the long-run than in the short-run.

The coefficient of the error correction model (ECM_{t-1}), is negatively signed and statistically significant. It reveals the speed at which the model converges to long-run equilibrium after an initial distortion in the stability of the model. The coefficient -0.070098 of ECM_{t-1}, implies the model will converge back to the long-run equilibrium state, at a speed of 7%, which is very low, after a distortion from the equilibrium state in the previous year. This means that the model would take a period of 14 years 3 months to adjust back to the long-run equilibrium state. In the short run, only inflation and exchange rate are statistically significant with negative and positive sign respectively.

The adequacy of the long-run model was ascertained using Jarque-Bera statistics, Breusch-Godfrey serial correlation LM test, the Breuch-Pagan-Godfrey and ARCH heteroscedasticity tests as well as the Ramsey RESET test. The outcomes of the diagnostic tests affirmed that the long-run model is statistically valid over time. The model has the correct specification, and serial correlation is absent as well as heteroscedasticity among the residuals as shown by the insignificant statistics of the respective tests. Besides, the CUSUM and CUSUMSQ plots lie within the critical bounds, meaning that the error-correction model coefficients are stable (see Figures 1(a) and 1(b)).

Therefore, the model can be relied on for the formulation of economic policy and future forecasting on issues relating to oil price in Nigeria.

Figure 1(a): Plot of the cumulative sum (CUSUM)

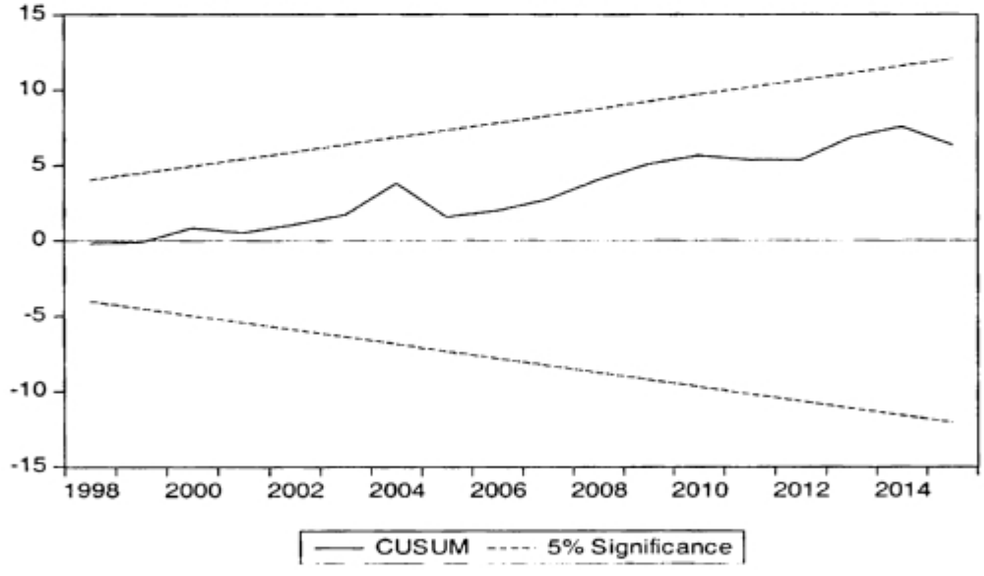
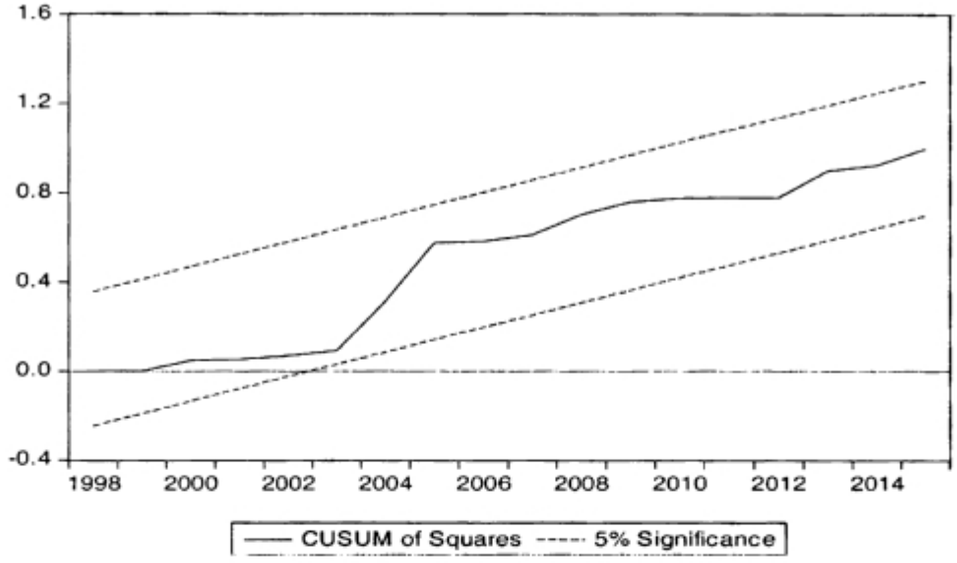


Figure 1(b): Plot of the cumulative sum of square (CUSUMSQ)



CONCLUSION

This study examined the long-run relationship between oil price and Nigeria's economic growth for the period 1983 to 2017 using the ARDL model. The estimates of the ARDL model revealed that oil price and inflation rate have a significant effect on real GDP in the long run. The error correction term was negatively signed and statistically significant. The effect of oil price increase on output, in the long run, is, however, more fabulous than the short-run effect, even though it is minimal. The study concludes that rising oil price is significant to the growth of the Nigerian economy. Therefore, policymakers should embark on a policy that minimize the effect of oil price rise and reduce the vulnerability of the economy to risks associated with fluctuation in oil price through the diversification of the economy.

REFERENCES

Afolabi, B., Belford, A., Yemisi, E., & Ehinomen, C. (2016). Exchange Rate and Economic Growth: The Nigerian Experience. *International Research Journal of Finance and Economics, 153* (1), 85-94.

Algahtani, G. J. (2016). The Effect of Oil Price Shocks on Economic Activity in Saudi Arabia: Econometric Approach. *International Journal of Business and Management, 11*(8), 124-133.

Akpan, E. O., & Atan, J. A. (2011). Effects of Exchange Rate Movements on Economic Growth in Nigeria. *CBN Journal of Applied Statistics, 2*(2), 1-14.

Aliyu, S. U. (2009). Impact Of Oil Price Shocks and Exchange Rate Volatility on Economic Growth in Nigeria: An empirical investigation. *University Library of Munich, Germany, MPRA Paper.*

Alkhathlan, K. A. (2013). Contribution of Oil in the Economic Growth of Saudi Arabia. *Applied Economics Letters, 20* (4), 343-348.

Alley, I., Asekomeh, A., Mobolaji, H., & Adeniran, Y. A. (2014). Oil Price Shocks and Nigerian Economic Growth. *European Scientific Journal, ESJ, 10*(19), 375-391.

Arrow, K. J. (1962). The Economic Implications of Learning by Doing. *Rev. Econ. Studies,* 29, 155–173.

Asian Development Bank (ADB) (2005). Asian Development Outlook 2005 Update, Chapter on the Challenge of Higher Oil Prices. ADB, Manila, pp. 65–86.

Brown, S. P., & Yücel, M. K. (2002). Energy Prices and Aggregate Economic Activity: An Interpretative Survey. *The Quarterly Review of Economics and Finance, 42*(2), 193-208.

Cerralo, J. (2005). Do Oil Price Shocks Matter? Evidence from some European Countries. *Energy Economics, 25*(2), 137–154.

Chuku, C., Effiong, E., & Sam, N. (2010). Oil Price Distortions and their Short- and Long-Run Impacts on the Nigerian Economy.

Gbadebo, O. O. (2008). Oil and the Nigerian Economic Performance. *Oil and Gas Business, Nigeria.*

Ghalayii, L. (2011). The Interaction Between Oil Price and Economic Growth. *Middle Eastern Finance and Economics*, 13.127-141

Gunu U., & Kilishi A. (2010). Oil Price Shocks and the Nigerian Economy: A Variance Autoregressive (VAR) Model. *International Journal of Business and Management,5*(8),39-48

Hamilton, J. D. (2009). Understanding Crude Oil Prices. *The Energy Journal, 30*(2).

Idrisov, G., Kazakova, M., & Polbin, A. (2015). A Theoretical Interpretation of the oil Prices Impact on Economic Growth in Contemporary Russia. *Russian Journal of Economics, 1*(3), 257–272.

Iklaga, F. O., & Evbuomwan, O. P. (2012, July). Macroeconomic Impact of oil Price Shocks on Oil Rich Economies: Evidence from Nigeria Using a Structural VAR Approach. In *Proceedings of the 31st USAEE/IAEE North American Conference.*

Iwayemi, A., & Fowowe, B. (2011). Oil and the Macroeconomy: Empirical Evidence from Oil-Exporting African Countries. *OPEC Energy Review, 35*(3), 227-269.

Jayaraman, T. K., & Choong, C. K. (2009). Growth and Oil Price: A Study of Causal Relationships in Small Pacific Island Countries. *Energy Policy, 37*(6), 2182-2189.

Lucas Jr, R. E. (1988). On the Mechanics of Economic Development. *Journal of monetary economics, 22*(1), 3-42.

Luk, M. (2017). How Oil-Exporting Countries Navigate Low Price Environments. *IEEJ Energy Journal, 12 (1)*, 1-26.

Nwani, C., Iheanacho, E., & Okogbue, C. (2016). Oil Price and the Development of Financial Intermediation in Developing Oil-Exporting Countries: Evidence from Nigeria. *Cogent Economics& Finance, 4*(1), 1185237.

Odularu, O., & Okonkwo, C. (2009). Does Energy Consumption Contribute to Economic Performance? Empirical evidence from Nigeria. *Journal of Economics and International Finance, 1*(2), 044-058.

Ogbonna, G., & Ebimobowei, A. (2012). Impact of Petroleum Revenue and the Economy of Nigeria. *The Social Sciences 7*(3), 405-411.

Ogunsola, A. J., Olofinle, G. D., & Adeyemi, P. A. (2017). Effect of Oil Price and Exchange Rate Volatility on Economic Growth in Nigeria International *Journal of Economics, Commerce and Management, 5*(2), 312-328

Olomola, P. A. (2006). Oil Price Shock and Aggregate Economic Activity in Nigeria. *African Economic and Business Review, 4*(2), 40-45.

Olomola, P., & Adejumo, (2006). Oil Price Shocks and Aggregate Economic Activity in Nigeria. *African Economic and Business Review, 4*(2), 40-45.

Osigwe, A. C. (2015). Exchange Rate Fluctuations, Oil Prices and Economic Performance: Empirical Evidence from Nigeria. *International Journal of Energy Economics and Policy, 5*(2), 502-506.

Pesaran, M.H., & Pesaran, B. (1997). *Working with Microfit 4.0.: Interactive Econometric Analysis.* Oxford University Press, Oxford.

Pesaran, M. H., & Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. In S. Strom (Ed.), *Econometrics and Economic Theory in 20th Century: The Ragnar Frisch Centennial Symposium, Chapter 11.* Cambridge: Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Relationships. *Journal of Applied Econometrics,* 16, 289–326

Prasad, A., Narayan, P. K., & Narayan, J. (2007). Exploring the Oil Price and Real GDP Nexus for a Small Island Economy, the Fiji Islands. *Energy Policy, 35*(12), 6506-6513.

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy, 94*(5), 1002-1037.

Udoh, D. (2014). The Impacts of Foreign Direct Investment (FDI) and Oil Export on Economic Growth in Nigeria from 1970 -2011. *Research on Humanities and Social Sciences, 4*(24), 113-124

COMPARATIVE ANALYSIS OF THE EFFECTS OF FUEL SUBSIDY REMOVALS ON THE NIGERIAN GOVERNMENT REVENUE: A STRUCTURALIST COMPUTABLE GENERAL EQUILIBRIUM MODEL

Ernest Simeon O. Odior, PhD
Department of Economics, Faculty of Social Sciences
University of Lagos, Akoka, Lagos, Nigeria
Phone: +2348G-62088200; +2347058074040/
Email: odiore@yahoo.com; eodior@unilag.edu.ng

Abstract

This paper did a comparative study of the effects of 0, 20, 50 and 66.5% fuel subsidy removals on the Nigerian Government revenue. By 0, 20, 50 and 66.5% fuel subsidy removals, the premium motor spirit (PMS) will sell at ₦97.00, ₦111.43, ₦133.07 and ₦145.00 respectively. Methodologically, the study used a Structuralist Computable General-Equilibrium (SCGE) model to run simulations that indicate the nature of the effects over the period 2015 – 2020. The comparative empirical findings from the results reveal that 0, 20, 50 and 66.5% increases in the pump price of fuel in Nigeria have different effects on government income and government account balance. Specifically, the findings show that, both government income and government account balance witnessed positive effects. The study recommends that appropriate monetary, fiscal and exchange rate policy responses should be the basis for fuel subsidy removal and there is that need to institute measures to reduce oil dependence and improve the non-oil sector considerably.

Keywords: Comparative Analysis, Fuel Subsidy, Government Revenue, SCGE

JEL classification: P52, H20, C68

INTRODUCTION

In recent years, fuel subsidy has taken up over a third of the recurrent budget, constituting a huge waste of resources that could have been spent more effectively on pro-poor interventions in the economy (John, Louis, Christopher & Kieran (2016). Since government is the primary provider of subsidies, it is expedient that policymakers are well equipped to decide, where and when to provide subsidies. It is equally important that any such subsidy injection should adequately recognize the costs to the

economy of distorting competition when assessing subsidies and to identify where, if possible, such costs may be minimized.

The reform of the fuel subsidy regime is fundamental to the overhaul of the Nigerian economy and achievement of inclusive and sustainable economic diversification and growth. As the cost of the fuel subsidy continues to grow exponentially, the government is compelled to spend even more in order to keep domestic prices low. This is necessitated by Nigeria's increasing population which resulted in increased fuel consumption; together these pressures made the cost of the fuel subsidy unsustainable.

With the major buyers of crude oil becoming increasingly self-sufficient, the prices of crude oil have witnessed downward slide in June, 2014, with Brent tumbling from $115 per barrel in June 2014 to a four-year low of $80.60, after a record peak of $147 in July 2008. As the prices are falling, the Organization of the Petroleum Exporting Countries (OPEC) has not yet indicated any plan to curb production to drive prices back up and the United States crude inventories have risen by 7.11 million barrels, more than double the 2.7 million-barrel increase analysts had predicted, according to Energy Information Administration (EIA). With this scenario, it is expected that the prices will tumble below $80 per barrel, a prediction that has forced the Nigerian Government to benchmark the 2015 budget to $78 per barrel, up from $77.50 in 2014 (**Ejiofor,** 2014).

Nigeria is the world's 14th largest producer of crude oil. The country has an installed production capacity of 445,000 barrels of fuel per day, adequate to meet its domestic needs with a surplus for export. Yet the country is a large net importer of gasoline and other petroleum products. As the country's four refineries are in a poor state of disrepair, most often Nigeria witnessed a drop in importation of refined petroleum products, leading to acute scarcity of the products across the country on the basis that the country relies on importation for most of its fuel needs. With the consumption of 48

million litre of fuel per day, the country is expected to spend about N2.2 billion on fuel subsidy annually (Emeka, 2011; Izielen, 2012).

In 2010, fuel subsidy gulped ₦1.3 trillion according to the Nigerian Government. Also, in 2015, the Nigerian Government claimed that it spent ₦1.69 billion daily to subsidise petrol consumption despite the decline in the country's oil exports and the resultant squeeze on the nation's revenues. Some analysts who argued in support of subsidy removal said that even if the government doesn't remove subsidy now, it must certainly remove if sometime in the future, adding that Nigerians' refusal of subsidy removal is mere delay of the evil day (*Esiedesa, 2015)*

Subsidy on premium motor spirit (PMS) has remained a challenge to the country for the past decades and has dominated public debate in recent times. The fear of the political consequences of large price increases coupled with widespread corruption and pressure from those benefiting from the fuel subsidy regime have made successive governments hesitant to reform the system. However, there has been a growing consensus on the imperative of a reform, at the heart of which is the elimination of fuel subsidies. The debate over the removal of the subsidy on petroleum products is not about its effectiveness (as an intervention program) or its sustainability (among other conflicting economic demands), but it is about the effects on government revenue.

This research examines aspects of fuel subsidy and tries to develop new and easy means of understanding the cost-benefit implications on government revenue. Generally, most of the studies carried out on this study focused on the qualitative analysis of the fuel subsidy removal particularly in the developed economies (see Centre for Public Policy Alternatives, 2011; Uzonwanne, et al., 2015). Few studies exist yet on the quantitative analysis and the effects of the removal of fuel subsidy on government revenue in

Nigeria. This study intends to fill this gap by comparing the effects of 0, 20, 50 and 66.5% fuel subsidy removals on the Nigerian government revenue.

In view of the stated gap, this study is set to address the following relevant policy questions. How much gain will the removal of fuel subsidy accrue to government revenue (income and account balance)? What are the comparative effects of fuel subsidy removal on government income and account balance in an oil exporting and importing country like Nigeria both on the short and long run period.

BRIEF LITERATURE REVIEW

Subsidies affect government accounts, the balance of payments and government budgets by imposing fiscal burdens, which in turn reduce the amount of money available to spend on social programs (Saunders & Schneider, 2000; World Bank, 2010). According to International Monetary Fund (IMF) latest survey titled "Counting the Cost of Energy Subsidies", most of these energy cost arises from countries setting energy taxes below levels that fully reflect the environmental damage associated with energy consumption. IMF projects subsidies to remain high despite sharp declines in international energy prices. The International Monetary Fund has revealed that subsidies in energy are projected at $5.3 trillion in 2015, or 6.5 per cent of global Gross Domestic Product (GDP) (IMF, 2015).

Coady, Gillingham, Ossowski, Piotrowski, Tareq and Tyson (2010) offer a very useful explanation on fuel subsidy. According to them, fuel subsidy is measured as the sum of two components: pre-tax subsidy and tax subsidy. By definition, the pre-tax subsidy is the amount by which the opportunity cost of supplying fuel is greater than the domestic price (excluding any consumption taxes).

The tax subsidy, on the other hand, represents a lower tax than the "optimal" fuel tax. It must be noted that the notion of optimal fuel tax will vary across countries and would, to a large extent, depend on revenue requirements of the government as well as the environmental externalities associated with fuel consumption. It is reasonable to assume that the optimal tax should at least be as large as the consumption tax in a country.

Burniaux and Chateau (2010) viewed the economic implications of removing fuel subsidies in non-Organisation for Economic Co-operation and Development (OECD) countries. According to Burniaux and Chateau (2010), if each non-Organisation for Economic Co-operation and Development country were to remove its fuel subsidies unilaterally, it would generally bring about gains in welfare. Most regions or most countries report gains in welfare ranging from 0.3% in the rest of the world regional aggregate to more than 4% in the oil-exporting countries. These gains are corresponded to the improvement of welfare associated with the removal of fuel subsidy. Therefore, from this perspective, the removal of fuel subsidies brings in both economic and environmental benefits.

METHODOLOGY

Model Specification

The analysis is based on a structuralist CGE model of a small open economy. The primary interest of this study is to ascertain the comparative effects of removal of 0, 20, 50 and 66.5% fuel subsidy on government revenue. The analysis and specifications of the removal scenarios in this model are done with a standard model structure derived from Dervis et al (1984), Devarajan, et al, (1993). It is a general equilibrium model in which the tradable sector is divided into importables and exportables.

Specification of Equations of the Model

A non-linear programming (NLP) model of five blocks and of twenty-eight (28) simultaneous complete equations model were used in this work, but only the government equations are specified as follows;

Income Equation

YGEQ == Government income

YGEQ: YG =E= TARIFF + STAX + HTAX + (govwor*ER) (1)

TOTSAVEQ == Total savings

TOTSAVEQ: TOTSAV =E= (CAPHOSH*(YH*(1-TY)))+(CAPWOR*ER)+CAPGOV (2)

Expenditure Equation

GOVSUEEQ = Government fuel subsidy expenditure

GOVSUEEQ : GOVSUE=E=(TMS*pwm*ER*DD) (3)

Market Clearing equation

CAPGOVEQ = Government account balance (internal balance)

CAPGOVEQ: CAPGOV =E= YG – (PQ*GD) – hogovconst –GOVSUE (4)

Elasticity Related Parameters

Trade substitution elasticity: rhoc = $\rho c = \left(\frac{1}{\sigma}\right) - 1$ (5)

Export transformation elasticity: rhot = $\rho t = \left(\frac{1}{\Omega}\right) + 1$ (6)

Where σ =sigma and Ω =omega

Fuel subsidy Variable Initialisation

GOVSUE.L = (TMS.L*pwm*ER.L*DD.L) (7)

pwm = PM0/((1+TMS0)*ER0) (8)

Equation (7) captures the fuel subsidy variable initialization

DEFINITION OF VARIABLES AND PARAMETERS OF THE MODEL

Variable Listing

CAPGOV = Government Account Balance

CAPHOSH = Household Savings Rate

CAPWOR = Current Account Balance

DD = Domestic Demand for Commodity

E = Domestic Output Exported by Activity

ER = Exchange Rate (Domestic per World Unit)

GOVSUE = Government fuel Subsidy Expenditure

GD = Government Consumption Volume

HTAX = Household Direct Tax Revenue

PM = Domestic Price of Competitive Imports of Commodity

PQ = Domestic Price and Quantity of Imports of Commodity

STAX = Sales Tax Revenue

TARIFF = Tariff Revenue

TMS = Import Subsidy Rate

TOTSAV = Total Savings

TY = Household Income Tax Rate

YG = Government Income

YH = Income to Household

PWM = World Price of Imports of oil

Parameter Listing

CAPGOV0 = Government Account Balance

CAPWOR0 = Current Account Balance

DD0 = Domestic Demand for Commodity

E0 = Domestic Output Exported by Activity

ER0 = Exchange Rate (Domestic per World Unit)

govwor = Transfers from Row to Government

hogovconst = Transfers from Government to Households

HTAX0 = Household Direct Tax Revenue

PM0 = Domestic Price of Competitive Imports of Commodity

Pwm0 = World Price of Imports of oil

STAX0 = Sales Tax Revenue

TARIFF0 = Tariff Revenue

GOVSUE0 = Government fuel Subsidy Rate

TMS = Import Subsidy Rate

TOTSAV0 = Total Savings

TY0 = Household Income Tax Rate

YG0 = Government Income

YH0 = Income to Household

MODEL STRUCTURE AND DESCRIPTION OF THE CGE MODEL

The model is flexible and can capture the complex realities of the economy of Nigeria. In order to apply the framework to the Nigerian economy, the model was modified to fit the real data and to handle the policy issues and it is calibrated using data for 2014 and the Existing Social Accounting Matrices (SAMs) of the Nigerian economy, when the price of fuel was relatively stable (₦97per litre). The SAMs have the following accounts: activity accounts, commodity accounts, household accounts, value-added accounts (export duty and sale tax accounts, capital (savings- Investments) accounts), government accounts and Rest of the World accounts. The Nigerian's SAMS is updated to 2014 base values to suit our current analysis. In updating the Macro SAM data, the SAM is weighted by GDP share and its average annual growth rate from 1999-2014 (IFS, 2014, WDI, 2014). The entry was normalized to shares of GDP at market prices. The constant elasticity of transformation (CET) and constant elasticity of substitution (CES) and) values used in the calibration of

the model were obtained from literatures of past studies (Deverajan et al, 1999).

MODEL CALIBRATION

Whether government income and account balance decrease or increase in response to the removal of fuel subsidy depends on the Constant Elasticity of Substitution (CES). The paper analysed the impact of 0, 20, 50, 66.5 percent fuel subsidy removal effects on government income and account balance in Nigeria based on the trade elasticities, which fall within the range $0< \sigma < 1$ for the world price of imports of oil (PWM*)* and $0 < \Omega < 2$ for the world price of exports (PWE*)*. The growth rate of any economy by destination is defined by arbitrary constants (α_{0s}), the accelerators (α_{1s}), and the elasticities (β_{1s}). So model is calibrated with respect to Government fuel subsidy expenditure (GOVSUE), and World Price of Imports of oil, (PWM), is the elasticity with respect to the level of Government subsidy payment (γ_1) it's capacity utilization (u_i) and World Price of Exports of oil (PWE).

DEFINITION OF POLICY SIMULATION EXPERIMENTS

The policy analysis examines the comparative effects of different increases in the price of fuel on government income and government account balance, if these variables decline or increase. Because it is hypothesised that government revenue would rise if government continues subsidising fuel at 0%, since no government money is paid to subsidy. That is, effect of fuel subsidy or removal may cause large changes also on government revenue. It is also believed that 0% fuel subsidy removal slow down rates of economic growth and has had a stagflationary effect on the economy

The study carried out four comparative scenarios of fuel subsidy removal on the Nigerian economy, including the base experiment of 2014/2015. The "base" in the set serves as comparator. These experiments change the scaling factors on the fuel subsidy removal. These experiments assign values to the

world price of fuel import. The other three (3) simulations involve maintaining constant decrease of subsidy value or increasing the percentage of removal by the Nigerian government and ascertaining the short, the medium and long run distributional effect from 2015 to 2020. Each member of the simulation experiments needed one assignment value.

i. Stimulate with the base-run price ₦97.00 per litre in 2014/2015, using different elasticity of fuel import (elasticity demand) and allowing 100% no reduction in subsidy removal. That is the base value has an index of 1.00 (see Appendix 1 and 2) ascertaining the base run distributional effect from the base year 2014/2015, 2016, 2017, 2018, 2019 and 2020.

The other three simulations involve maintaining constant reduction in fuel subsidy rate, and ascertaining the medium and long run distributional effect. These are,

ii. Stimulate with the removal of subsidy by 20%, 50% and 66.5% adding to base-run ₦97 per litre, using different elasticity of fuel import (elasticity demand) and ascertaining the short, the medium and long run distributional effect from 2014/2015, 2016, 2017, 2018, 2019 and 2020

Table 1: Fuel Subsidy Reduction

Base Year Subsidy (₦)	Subsidy Reduction (%)	Reduction (₦)	Base Year Price (₦)	Pump Price (₦)	Index	Remark
72.13	0.0	0.0	97	97.00	Base Year Normalized index Price = 1.00	Zero Subsidy Removal
72.13	20.0	14.43	97	111.43	20% over the base year price = 1.20	14.43 Reduction from 72.13
72.13	50.0	36.07	97	133.07	50% over the base year price = 1.50	36.07 Reduction from 72.13
72.13	66.5	47.97	97	145.00	66.5% over the base year price = 1.67	47.97 Reduction from 72.13

Source: Author's Computation, 2019

i. With Zero reduction of fuel subsidy, a litre of fuel was sold for ₦97.00

ii. With 20% reduction of fuel subsidy, a litre of fuel was sold for ₦111.43

iii. With 50% reduction of fuel subsidy,a litre of fuel will sell for ₦133.07

iv. With 66.5% reduction of fuel subsidy, a litre of fuel sells for ₦145.00

DATA REQUIREMENT AND SOURCES

Data were obtained for income, expenditure, trade export supply, import demand, government, investment, balance of payment, among others. Secondary data for growth and poverty measures for Nigeria is compiled from International Agencies such as the World Bank's Economic and Social Database, IMF CD-ROMs, International Financial Statistics(IFS) CD-ROMs, etc., and other relevant sources. Other sources include data from the Nigerian National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN).

Analysis of Comparative Simulated SCGE Results

Four fuel subsidy reduction simulations experiments are considered under our scenarios. Our starting point is a static base simulation which provides a benchmark against which the other scenarios are compared. Base parameter values are simulated from social accounting matrix. The base year period parameter share is maintained throughout the simulation period for the variables given the rate changes. The base scenarios for capital prices (including the elasticity of world price of crude oil export and world price of fuel import are normalized, at values of one in the base year period 2014/2015. The results of the simulations indicate the net effect, of fuel subsidy removal on the Government Revenue (income and account balance).

The results of this study revealed that an unexpected increase in PMS will have effect on the variables of interest, that is, Government Income and Government Account Balance. *These findings from this comparative study*

seem to partially confirm to the apriori expectations. The a priori expectations which stated that non-removal of fuel subsidy will affect. The Nigerian government revenue.

The results of marginal effects of reduction of fuel subsidy of the policy simulations for all the Government Income and Government Account Balance are summarized in Appendices 1 to 4. Appendices 1, 2, 3 and 4 show both the summary of parameters results in percentage deviation from base period values and magnitudes of the parameter growth rates of the stated variables. The short run comparative effects are capture in 2016-2017, the intermediate comparative effects captured 2018–2019, while the long run aggregate comparative effects are captured in 2020. The policy simulations experiments are performed under a flexible exchange rate regime with depreciation of Naira. That is with constant exchange rate fluctuation and falling oil price.

Simulation with 0% Reduction of Fuel Subsidy: A Litre of Fuel sells for ₦97.00

The simulated results of the effect of 0% fuel subsidy reduction simulation scenarios on government income and government account balance are reported in Appendix 1. Given the fuel subsidy reduction simulation scenarios of 0%, which is the base period value ₦97.00 of 2014/2015, the paper ascertained the distributional effects from 2016 to 2020, for the short run, intermediate run and long run. The effect follows the transmission mechanism on government income and government account balance.

Appendix 1 shows the government income in short, intermediate and long run with percentage deviation value. *The simulations show that between 2016 and 2020 the cumulative level of Government income was 0.256%, 0.416%, -0.442%, -1.678% and -1.786% in 2016, 2017, 2018, 2019 and 2020 respectively, under the 0% (*₦97.00*) and the flexible exchange rate regime.* That is, the short run distributional impacts, the intermediate effect and long run distributional effects. *It could be seen that there is an increase and decrease in*

the change in government income in the short and the long run. This implies that government income will continue to decrease under the 0% fuel subsidy reduction because government income is independent of fuel subsidy reduction. The results reveal that the accumulated growth rate of government income decreased by 178.8% from a cumulative basis for the period of 2014/2015 to the long run period of 2020, *under the 0% (*₦97.00 PMS sale) fuel subsidy removal.

Government account balance in short, intermediate and long run with percentage deviation value of -0.749 and -0.716 in 2016 and 2017 respectively in the short run while -0.233 in 2018 and -0.662 in 2019, the intermediate run and -0.617 in 2020 the long run, *under the 0% (*₦97.00) *and the flexible exchange rate regime.* The accumulated effect shows -2.977 decrease compared to the base value period of 2014/2015 to 2020. The results indicate that accumulated growth rate of government account balance decreased by 61.7% from a cumulative basis for the period of 2014/2015 to the long run period of 2020 respectively, *under the 0% (*₦97.00 PMS sale) fuel subsidy removal. *This implies that 0% fuel subsidy reductions have negative effect on government account balance, that is, if government continues to subsidise fuel by ₦72.13 per litre.*

Simulation with 20% Reduction of Fuel Subsidy: Litre of Fuel sells for ₦111.13

The fuel subsidy reduction simulation scenarios under a 20% reduction of fuel subsidy over base period value ₦97.00 of 2014/2015, resulted from a litre of fuel selling for ₦111.43. This suggests that ₦14.43 was removed from fuel subsidy causing an increase to a litre of fuel selling for ₦111.43. The simulated results of the effect of 20% fuel subsidy reduction simulation scenarios on government income and government account balance are reported in Appendix 2. The study ascertained the distributional effects

from 2016 to 2020, for the short run, intermediate run and long run. With the fuel subsidy reduction simulation scenarios under 20%, Appendix 2 shows government income distributional impacts percentage deviation value from 2016 to 2020. The distributional impacts show 0.13 in 2016 and 0.182 in 2017 for the short run while, 0.228 in 2018 and 0.303 in 2019 for the intermediate effect and 0.372 in 2020 in the long run with the accumulated effect of 1.166. The results indicate that the accumulated growth rate of government income is 37.2% from a cumulative basis for the period of 2014/2015 to the long run period of 2020, *under the 20% (*₦111.43 PMS sale) fuel subsidy removal.

Government account balance in short, intermediate and long run with percentage deviation value of 0.627 and 0.562 in 2016 and 2017 respectively in the short run while 0.526 in 2018, 0.459 in 2019 the intermediate run and 0.377 in 2020 the long run. With the accumulated effect of 2.651. The distributional effects show declining positive deviations. The results show accumulated growth rate of government account balance 37.7% from a cumulative basis for the period of 2014/2015 to the long run period of 2020, *under the 20% (*₦111.43.00 PMS sale) fuel subsidy removal. *This implies that 20% fuel subsidy reductions have positive effect on government account balance, that is, if government reduced fuel subsidy by ₦14.43 (see Appendix 2).*

Compared to the 0% reduction of fuel subsidy, it could be observed that there is an increase in government income and government account balance *in the short to the long run. This implies that government income and* government account balance *may be better off with successive fuel subsidy reduction. The* simulation results show that the removal of fuel subsidy does lead to a greater increase in *government income and* government account balance compared to 0% non-removal.

Simulation with 50% Reduction of Fuel Subsidy: Litre of Fuel sells for ₦133.43

Appendix 3 presents the simulated results of the effect of 50% fuel subsidy reduction scenarios on government income and government account balance. The fuel subsidy reduction simulation scenarios under a 50% reduction of fuel subsidy over base period value ₦97.00 of 2014/2015, results in a litre of fuel selling for ₦133.07. The implication of this is that ₦36.07 was removed from fuel subsidy, causing an increase in a litre of fuel selling for ₦133.07. The paper determined the distributional effects from 2016 to 2020, for the short run, intermediate run and long run.

With the fuel subsidy reduction simulation scenarios under 50%, Appendix 3 presents government income distributional impacts percentage deviation value from 2016 to 2020. The distributional effects show 0.21 in 2016 and 0.381 in 2017 for the short run, 0.275 in 2018 and 0.437 in 2019 for the intermediate effect and 0.367 in 2020 long run with the accumulated effect of 1.67. The results show that the accumulated growth rate of government income is 36.7% from a cumulative basis for the period of 2014/2015 to the long run period of 2020, *under the 50% (*₦133.07 PMS sale) fuel subsidy removal.

Government account balance in short, intermediate and long run have percentage deviation values of 0.705 and 0.61 in 2016 and 2017 respectively in the short run while 0.558 in 2018, 0.463 in 2019 in the intermediate run and 0.348 in 2020 in the long run with the accumulated effect of 2.684. The distributional effect shows declining positive deviations. The results indicate accumulated growth rate of government account balance of 35% from a cumulative basis for the period of 2014/2015 to the long run period of 2020, *under the 50% (*₦133.07 PMS sale) fuel subsidy removal. *This implies that 50% fuel subsidy reductions have positive effect on government account balance, that is, if government reduced fuel subsidy by ₦36.07 (see Appendix 3).*

Compared to the 0% and 20% reduction of fuel subsidy, it could be seen that there is an increase in government income and government account balance *in the short to the long run. This implies that government income and* government account balance *will be better off with successive fuel subsidy reduction, all things being equal.*

Simulation with 66.5% Reduction of Fuel Subsidy: Litre of Fuel sells for ₦145.00

Reduction of fuel subsidy by 66.5% over base period value ₦97.00 of 2014/2015 led to a litre of fuel selling for ₦145.00, implying that ₦47.97 was added to the pump price of fuel per litre and the fuel subsidy reduction simulation scenarios is presented in Appendix 4. The effect of such reduction on *government income and* government account balance is thus examined and compared.

Appendix 4 reveals the simulated results of the effect of 66.5% fuel subsidy reduction scenarios on government income and government account balance. With the fuel subsidy reduction simulation scenarios under a 66.5% reduction of fuel subsidy over base period value ₦97.00 of 2014/2015, which resulted in a litre of fuel selling for ₦145.00. The implication of this is that ₦36.07 was removed from fuel subsidy causing an increase in a litre of fuel selling for ₦145.00. the paper ascertained the distributional effects from 2016 to 2020, this for the short run, intermediate run and long run.

Appendix 4 shows government income distributional impacts percentage deviation value from 2016 to 2020. The short run distributional effects show 0.13 in 2016 and 0.246 in 2017, while, 0.283 in 2018 and 0.428 in 2019 for the intermediate effect and 0.668 in 2020 in long run with the accumulated effect of 1.755. The results show that the accumulated growth rate of government income is 66.8% from a cumulative basis for the period of

2014/2015 to the long run period of 2020, *under the 66.5% (₦145.00* PMS sale) fuel subsidy removal.

Government account balance in short, intermediate and long run have percentage deviation values of 0.683 and 0.559 in 2016 and 2017 respectively, in the short run while 0.493 in 2018, 0.373 in 2019 the intermediate run and 0.231 in 2020 the long run. With the accumulated effect of 2.339. The distributional effects indicates declining positive deviations. The results show accumulated growth rate of government account balance 23% from a cumulative basis for the period of 2014/2015 to the long run period of 2020, *under the 66.5% (₦145.00* PMS sale) fuel subsidy removal. *This implies that 66.5% fuel subsidy reductions have positive effect on government account balance, that is, if government reduced fuel subsidy by ₦47.97 (see Appendix 4).*

Compared to the 0%, 20% and 50% reduction of fuel subsidy, it could see that there is an increase in government income and a decrease in government account balance *in the short to the long run. This implies that government income may is better off with successive fuel subsidy reduction.*

In comparison with other previous studies, there is little significant difference between results obtained from this study and other past studies such as Stephen (2015), Adenikinju (1998) & Adebiyi (2011), who did a study each to evaluate the level of effect the fuel price increase has on the Nigerian economy. These studies concluded that, removing the subsidy on fuel will have grievous economic implications for this entire sector in terms of increasing their cost of production which will ultimately lead to general price increase. And further reiterated by Plante (2013) that subsidies especially on petroleum products are an important policy issue for many developing and emerging market economies because of the steep costs they impose on the governments that provide them. Adewunmi, Remy and Iyewumi's;. (2014) theory presumes that relaxing government control over economic activities such as fuel subsidy, would only ensure maximum welfare of the people through its multiplier effects. While,

Sambe, Ahule and Agba (2013) who conducted a study on the impact of fuel subsidy removal on food security in Nigeria discovered that the Nigerian economy is not developing because of the effect of fuel price hike on purchasing power and finally the finding showed that there is significant relationship between increase in pump price of petroleum and food security.

CONCLUSION AND POLICY RECOMMENDATIONS

With the use of SCGE methodology, this study has examined the effects of the removal of the fuel subsidy on *government income and* government account balance in Nigeria from 2015 to 2020, which is transmitted through decreased prices of oil exports and depreciation and devaluation of the Naira to the Nigerian government revenue. This study carried out four experiments of fuel subsidy reduction scenarios, including the base experiment of 2014/2015, on the Nigerian economy. The "base" in the set serves as comparator. According to economic theory, the removal of fuel subsidy in form of increase in pump price of petrol increases government revenue. This study shows that the Nigerian government revenue is very sensitive to the removal of fuel subsidy. This sensitivity is measured by the study experiments by using 0%, 20%, 50% and 66.5%. The findings from this study tend to confirm a *priori expectations which stated that non-removal of fuel subsidy affects the Nigerian government revenue.*

The results of government income and government account balance reveal that the accumulated effects on government income and account are better off by 66.5% than other lower percentages. The study confirmed that the higher the percentage increase in fuel subsidy removal the higher the Nigerian government revenue. These have many implications for the growth rate of the Nigerian economy. The deterioration in the effects on government revenue is highest for the non-removal (0%) than others, and this has greater implications on the economy.

The removal of fuel subsidy however, tends to put less pressure on government revenue and reduces the budget deficit. Therefore, Nigeria governments may need to turn to targeted assistance as was introduced by Ghana in 2005 when it embarked on eliminating fuel price subsidies. But then, countries would need to properly identify the poor households and develop a delivery mechanism for income transfer and other types of compensation that target low-income households. Subsidies can be provided by a number of different mechanisms which include direct subsidies to users, indirect subsidies through the reduction of taxes on petroleum products, and targeted income subsidies.

Finally, in view of the serious effects of fuel subsidy removal on the Nigerian economy the government needs to determine the appropriate monetary, fiscal and exchange rate responses. Also, and very importantly, Government needs to institute measures to reduce oil dependence, as some other countries have tried to do, and improve the non-oil sector considerably

REFERENCES

Adebiyi, O. (2011). Fuel Subsidy: The True Story Desert Herald Newspaper, November 10, 2011.

Adenikinju, A, F. (1998). Energy Supply Institutions and the State in an Oil Exporting Country, International Association for Energy Economics Experimenting with Freer Markets: Lessons from the last 20 Years and Prospects for the Future: Conference Proceedings, Volume 1. Quebec: International Association for Energy Economics. pp.121 – 128

Adewunmi, M., Remy, H., & Iyewumi, T. (2014). The Impact Of Fuel Subsidy Removal On Socioeconomic Development In Nigeria an Econometric Investigation, International Journal of Economics, Commerce and Management, 2(12)14

Burniaux, J. & Jean, C. (2010). An Overview of the OECD ENV-*Linkages Model, OECD Background Paper, OECD, Paris.*

Coady, D., Gillingham R., Ossowski, R., J. Piotrowski J., Tareq S., & J. Tyson, J. (2010). Petroleum Product Subsidies: Costly, inequitable, and rising, International Monetary Fund staff position note, SPN/10/05 (Washington: International Monetary Fund).

Dervis, K., Melo, J. D., & S. Robinson, S. (1984). Computable General Equilibrium Models for the Development Policy, the World Bank Washington, D.C

Devarajan, S., & Go, D.S. (1993). The Simplest Structuralist General Equilibrium Model of an Open Economy." Paper presented at the 4th International Computable General Equilibrium Modeling Conference, University of Waterloo, Canada, October 28-30, processed.

Ejiofor, A. (2014). Falling Oil Price as Window for Subsidy Removal in This live 28 October

Emeka, W. (2011). Fuel Subsidies Gulp N3.566t in Six Years in the Nation, 1 November.

Esiedesa, O. (2015). Petrol Subsidy Drops to N1.7b daily, *Daily independent*

Hérault, N. (2005). Trade Liberalization, Poverty and Inequality in South Africa: A CGE-Microsimulation Analysis, Melbourne Institute Working Paper Series, No. 17/05

IMF (2015). Global Subsidy IMF PPPRA: IMF Projects $5.3tr Global Subsidy on Fuel.

International Monetary Fund (2014). IFS CD-ROM

Izielen, A. (2012). IMF and "Fuel Subsidy" Removal in Nigeria, seunfakze.wordpress.com/2012/01/22/imf-and-fuel-subsidy-removal-in-nigeria-by-izielen-agbon

John, O. A., Louis, C., Christopher, B., & Kieran, C. (2016). Compensation Mechanisms for Fuel Subsidy Removal in Nigeria, Global subsidies initiative report

Plante, M. (2013). The Long-run Macroeconomic Impacts of Fuel Subsidies. Journal of Development Economics. 107, 129-143

Sambe, N, Ahule, B. G., & Agba, S. A. (2013). The Impact of Fuel Subsidy Removal on Food Security in Nigeria, Journal of Social Sciences and Public Affairs 3,(2) 10

Saunders, M., & Schneider, K. (2000). Removing Energy Subsidies in Developing and Transition Economies", ABARE Conference Paper, 23rd Annual IAEE International Conference, International Association of Energy Economics, June 7-10, Sydney.

Stephen, I. (2015). Impact of Fuel Price Increase on the Nigerian Economy. *Mediterranean Journal of Social Sciences,* 6(1)10

The Centre for Public Policy Alternatives (CPPA) (2011). *Nigeria: Fuel Subsidy.*

Uzonwanne, M. C., Ezenekwe, R. U., & Iregbenu, P. C. (2015). Fuel Subsidy Removal and the Nigerian Economy. *Australian Journal of Business and Management Research*, New South Wales Research Centre Australia (NSWRCA), Pp 15-25

World Bank (2010). Phasing out energy subsidies: a decision tree and evidence from case studies. *World Bank Background Paper*, World Bank, Washington DC, forthcoming.

World Bank (2010). Subsidies in the Energy Sector: An Overview Background. *Paper for the World Bank Group Energy Sector Strategy.*

HUMAN CAPITAL DEVELOPMENT AND ECONOMIC GROWTH IN NIGERIA (1986-2017)

Yusuf Anuwa
Research Student
Department of Economics,
University of Maiduguri,

Alhaji Bukar Mustapha, PhD
Department of Economics
University of Maiduguri

Shuaibu Muhammad
Lecturer, Department of Economics
Nigerian Army University Biu

Abstract

This study examined the relationship between human capital development and economic growth. The study used Pairwise Granger Causality as its tool of analysis. The finding of the study reveals that one-way causation exists between human capital development and economic growth. The direction of the relationship flows from human development index to economic growth. The study recommends that government allocation to education and healthcare sectors should be reviewed upward according to UNESCO and Abuja declaration of 2001 which recommended 26% and 15%, respectively.

Keywords: Economic Growth, Human Development Index, Education expenditure and Health expenditure.

INTRODUCTION

Economic growth is fundamental for sustainable development which is why countries around the globe are putting more efforts to improve the factors that would enhance growth. A study on the United States economy shows that before the great depression of the 1930s, the rate of economic growth was low, while in the post-depression, the economy experienced average growth rate of about 2.23% (Jones, 2016). This was associated with human capital development which has long been recognized as an agent of

national development, providing education and health services are considered as the major ways of improving the quality of human resources.

World Economic Forum Report (2016) ranked Finland first in terms of human capital development. This may not be unconnected with the priority given to education and health sectors. Finland attained 85.86% human capital index (HCI).Norway was ranked second with 84.72% (HCI) and Ghana has 64.24% (HCI) while Nigeria has 48.86% (HCI) in 2016. In Nigeria, government commitment to human capital development (HCD) was demonstrated by large sums of money expended on education and health sectors. From 1996 to 2005, ₦491,384.8 billion was expended while between 2006 and 2017 government expenditure on education further increased to ₦625,838.6 billion (CBN, 2010, 2015 and 2017).

On the other hand, government expenditure on health sector between 1986 and 1995 was ₦45,325 billion, between 1996 and 2005 it was increased to ₦120,056 billion and from 2006 and 2017 the figure increased to ₦ 762,247 billion. Despite the efforts of Nigerian government in developing the education and health sectors, the human development index (HDI)is low as it was mentioned above and this has affected the performance in the economy, as the economy recorded an average growth rate of less than 1 per cent between 2016 and 2017 when the price of crude oil fell below $40 in the international market (Dabwor, Ezie & Jiddah, 2017). It is against this backdrop that the paper seeks to examine the impact of human capital development on economic growth in Nigeria.

LITERATURE REVIEW

Adam Smith (1776) was the first classical economist to include human capital in his definition of capital. He included in the capital stock of a nation the inhabitants' acquired and useful talents. He believes that human skills

increase the wealth of a society as well as that of the individual. Along the line, the concept of human capital was largely forgotten until the coming of scholars like Mincer (1981), Becker (1964), and Schultz (1961; 1962). These economists rekindled the concept by re-affirming the links which human capital and economic growth has by emphasizing its importance in explaining earning differentials among workers. According to Babalola, 2003 cited in Lawanson (2009) the rationality behind investment in human capital is based on three arguments; first is that the new generation must be given the appropriate parts of the knowledge which has already been accumulated by previous generations; second is that the new generation should be taught how existing knowledge should be used to develop new products, to introduce new processes of production and social services; and thirdly that people must be encouraged to develop entirely new ideas, products, processes and methods through creative approaches. Also, Ejere (2011) and Mba et al (2013) conceptualized human capital as a factor in the production process which also serve as resources to a country. It then means that without human capital meaningful production cannot take place, because what organizes the line of operation of other factors is human capital.

The concept of human capital as put forward by many empirical literature, largely hinge on knowledge and skills acquired through education (whether formal or informal) development and sound health, which eventually result to economic growth of a nation. In other to ameliorate the concept of human capital, this study defined human capital as a general knowledge gain by individual or group of individuals for immediate or future benefit. This can come either as organized formal knowledge, innate abilities or nurtured influence knowledge.

On the other hand, economic growth has been defined by many empirical literatures such as; Lipsey (2009) explains that economic growth is a positive trend in the nation's total output over long term. This implies a

sustained increase in gross domestic product (GDP) for a long time which will eventually lead to development. According to Dolan (1991) economic growth measures growth in relation to gross domestic product (GDP) from one period to another and adjusted for inflation. The real economic growth rate is expressed as a percentage that shows the rate of change in a country's GDP, typically, from one year to the next. According to Gbosi and Omoke (2004) gross domestic product refers to the total market value of all final goods and services produced in an economy within a given period. Furthermore, Lipsey and Chrystal (2007) regard economic growth as the engine for generating long-term increase in the overall standard of living. This justifies why every economy aims at achieving economic growth annually. Economic growth is also defined as the increase in the market value of the goods and services produced by an economy over time. It is conventionally measured as a percent rate of increase in real gross domestic product (GDP). Furthermore, Jhinghan (2011) state that economic growth is the quantitative sustained increase in a country's per capita output or income, accompanied by expansion in its labour force, consumption, capital and volume of trade. While economic development is economic growth plus change. An economy can grow but may not develop. However, it is difficult to imagine economic development without economic growth. Therefore, there is a need to understand the theoretical view of scholars.

Harrod-Domar Model is an economic growth model that stresses the importance of the level of national savings and the productivity of capital investment. This model assumed that if there is 10% rate of savings in a country with a corresponding 2% capital output ratio then it is expected that the country will grow at the rate of 5% (Ghatak, 2003). The emphasis here is that investment is a prime mover of the economy. Schultz introduced his theory of human capital by arguing that, both knowledge and skills are forms of capital, and that this capital is a product of deliberate investment. He

argued that education, training and investments in health open up opportunities and choices that otherwise would be unavailable to many individuals (Schultz, 1961). Becker (1964) research was fundamental in arguing for the expansion of human capital when his research was considered very controversial as some considered it debasing. However, he was able to convince many that individuals make choices of investing in human capital based on rational benefits and cost that include a return on investment as well as a culture aspect. His research included the impact of positive and negative habits such as punctuality and alcoholism on human capital. He explored different people and the resulting macroeconomic implications. He also distinguished between general to specific education and their influence on job lock and promotions. Beckers' idea of human capital embodied the knowledge, skills and health of an individual or group of people who choose to invest in anticipation of future returns.

Empirical researches on the relationship between human capital and economic growth in the past, mostly highlight growth in labour and the stock of physical capital as the key determinants of economic growth. But recent empirical works emphasize the contribution of human capital development the economic growth. In the developed countries, human capital is the main driver of the economy as technology is advancing fast. In recent time the developing countries are also following the track of the developed world to advance the human capital (Jones, 2016). Altiner and Toktas (2017) investigated the relationship between human capital and economic growth in developing countries using panel data. They found that human capital has positive impact on economic growth. EyyupEcevit and Ayhan Kuloglu (2016) examined the relationship between human capital and economic growth in Turkey for the period of 1990 and 2013. The study employed Autoregressive Distributed Lagged (ARDL) model and its main findings show that the variables are co-integrated in the short and long run. Both measures of human

capital have positive effect on economic growth. Patricia and Olugu (2016) examined the effect of human capital development on economic growth in Nigeria and found that gross fixed capital formation and labour force exert positive influence on output. This means that physical and human components contribute to output growth. Khan et al (2015) analyzed the nexus between human capital and economic growth in Pakistan for the period 1971 and 2012 with the use of Granger Causality test technique. The results showed that human capital in form of research and development (R&D) Granger caused economic growth. The study reports that unidirectional causal relationship exists among different levels of education, physical capital, R&D and economic growth. Another study by Ammassoma and Nwosa (2011) was carried out on the causal relationship between human capital investment and economic growth in Nigeria. They used Vector Error Correction (VEC) and Pairwise granger causality methodologies. The findings revealed that there is no causality between human capital development and economic growth. Johnson (2011) examined human capital development and economic growth in Nigeria using ordinary least square (OLS) to analyse the relationship between gross domestic product (GDP),total government expenditure on education and health, enrolment pattern of tertiary, secondary and primary schools as proxy for human capital. The analysis confirmed that there is strong positive relationship between human capital development and economic growth. Eigbiremolen and Anaduaka (2014) investigated the impact of human capital development on national output, where proxy for economic growth was quarterly time- series data from 1999-2012. Also, the augmented Solow human-capital-growth model was employed. The study showed that human capital development, in line with theory exhibited significant positive impact on output level. This implied that human capital development is indispensable in the achievement of sustainable economic growth in Nigeria, as there is an increase in economic performance for every increase in human capital development.

Sankey et al (2010) investigated the impact of human capital development on economic growth in Nigeria from 1970 – 2008. Johansen cointegration technique and Vector Error Correction were used to analyze the relationship. The result indicated that human capital development has significant impact on Nigeria's economic growth. Adenuga (2006) examined the relationship between human capital development and economic growth using Nigerian data from 1970 to 2003. They applied co-integration analysis incorporating the Error Correction Mechanism and found that investment in human capital through the availability of infrastructural requirements in the education sector accelerate economic growth. This study concluded that there will be no significant economic growth in any economy if there is no human capital development.

Onyinyechi and Azubike (2016) studied Government expenditure on education and economic development in Nigeria (2000 - 2015). Multiple regression analysis and student t-test were the statistical tools applied. The result indicated that expenditure on education is significant and has impact on the economy, while the result for social and community service and enrolment showed a significant relationship with the GDP but, it has little impact. The conclusion of the study is that, the anti-graft fight by the present Government should be encouraged so that proper use of resources allocated to education sector will be used efficiently and effectively so that the number of school drop-outs will reduce significantly.

Muhammad and Benedict (2015) analyzed empirically the impact of education expenditure on economic growth in Nigeria over the period of 1981-2010. Co-integration and Granger causality tests were used to analyze the causal nexus between education expenditure and economic growth. They found that there is co-integration between real growth rate of gross domestic product, total government expenditure on education, recurrent expenditure on education and Primary school enrolment. The result also revealed that

there is no causality between real growth rate of gross domestic product (RGDPG) and total government expenditure on education (TGVTEE) but there is bi-directional causality between recurrent expenditure on education (REDEXP) and total government expenditure on education (TGVTEE).

Obi and Obi (2014) examined the impact of education expenditure on economic growth as a means of achieving the desired socio-economic change needed in Nigeria. Time series data from 1981 to 2012 were employed. The Johansen's co-integration analysis and ordinary least square (OLS) econometric techniques were the statistical tool applied to analyze the relationship between gross domestic product (GDP) and recurrent education expenditure. The result indicated a positive relationship between education expenditure and economic growth, but a long run relationship does not exist over the period under study. The study observed that this puzzle is attributable to labour market distortions, redundancy of the workforce, industrial dispute and job discontinuities as well as leakages in the Nigerian society such as brain drain, among others. It invariably concluded that educational sector in Nigeria has not performed as expected. The half-baked graduates, cultism and the rate at which people drop-out of schools is alarming.

Oluwatoyin and Fagbeminiyi (2010) investigated government spending on education and health and its effect on the economic growth of Nigeria. The study utilized econometric methods to determine the relationship between education, health and labour productivity. The regression results, however, showed that capital and recurrent expenditure on health as well as recurrent expenditure on education have positive impact on labour productivity while capital expenditure on education has little or no impact on labour productivity in Nigeria. Gupta and Verhoeven (2001) applied Free Disposable Hull (FDH) techniques to measure the efficiency of public expenditure in social sector in developing countries. The study utilized the

FDH analysis taking government expenditure on education as the input and literacy, primary enrolment as output. Results showed that there was an increase in efficiency in expenditure over time in Asia and Latin America. Oni (2014) equally verified the relationship between health expenditure and economic growth in Nigeria, she made use of multiple OLS regression. Her results showed that labour force productivity, total health expenditure and gross capital formation are important determinants of economic growth in Nigeria while life expectancy rate has negative impact on growth for the period covered by the study. Onisanwa (2014) analysed the impact of health on economic growth in Nigeria. The study employed cointegration and Granger causality techniques where he uses quarterly time series data from 1995 – 2009. According to his finding, GDP has positive impact on health indicators in the long-run.

Although several scholars have conducted researches on the relationship between human capital development and economic growth, it is evident in the empirical reviews that majority of the research laid emphasis on the impact of the determinants of human capital development such as; public government expenditure on education, health outcomes, health status, maternal mortality rate, life expectancy rate at birth, primary, secondary and tertiary schools enrolment on economic growth. Also, these studies didn't cover the period up to 2017. However, this research looks at human development index of Nigeria over the years so as to ascertain the direction of the relationship between human capital and economic growth in Nigeria between 1986 and 2017.

METHODOLOGY

The data were sourced from World Development Indicators (WDI, 2016), National Bureau of Statistics (NBS, 2016) and CBN Statistics Bulletins. The Granger Causality technique was employed to analyze the data.

Model Specification

In order to appropriately capture the relationship between human capital and economic growth in Nigeria, this study employed Granger Causality test as used by Khan et al (2015) a study conducted in Pakistan. The study assumed that, if two variables 'Xi' and 'Yi' are cointegrated, then there are four possibilities. The first possibility is that 'Xi' may cause 'Yi'. Secondly, 'Yi' may cause 'Xi'. Similarly it is possible that 'Xi' may cause 'Yi' and 'Yi' may cause 'Xi'. In the first two cases the causality is unidirectional while in the third case the causality is bidirectional. The fourth case may be such that neither 'Xi' causes y nor 'Yi' causes 'Xi' which shows the existence of no causal relationship (Granger, 1969). The study uses primary school education and economic growth, secondary school education and economic growth, health expenditure and economic growth and research and development (R&D) and economic growth (Khan et al 2015). But for this research, government expenditure on education and economic growth, government expenditure on healthcare and economic growth, life expectancy rate at birth and economic growth and labour force and economic growth are employed.The general form of the model is thus:

$$yi = \sum_{i=1}^{n} \beta o \, Xi - 1 + \sum_{i=1}^{n} \beta 1 \, \gamma i - 1 + \mu i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

$$Xi = \sum_{i=1}^{n} yo \, \gamma t - 1 + \sum_{i-1}^{n} y1 \, Xt - 1 + \mu j \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where n is the maximum number of lagged observations included in the model (the model order), the matrix β contains the coefficients of the model (i.e., the contributions of each lagged observation to the predicted values of the Yi and Xi).

RESULTS AND DISCUSSION

Table 1 shows a descriptive summary analysis of the data for all the variables used in the study. The total number of observations of the variables is 32. These are real gross domestic product (RGDP), recurrent expenditure in education (REE), capital expenditure in education (CEE), recurrent expenditure in healthcare (REH), capital expenditure in healthcare (CEH), labour force (LABF) and life expectancy rate at birth.Real Gross Domestic Product (RGDP) has a maximum value of 33.7 and minimum value of -10.8 for the periods under consideration, with a central tendency single observation mean value of 4.39. The measure of dispersion of (RGDP) is indicated by standard deviation value of 7.15. The Jacque-Bera probability value of 0.00 and the skewness value of 1.76 indicate that the variable is positively skewed and not normally distributed.

Recurrent Expenditure in Education (REE) has a maximum value of 394 and minimum value of 0.22 for the periods under study, with a central tendency single observation mean value of 116. The measure of dispersion of (REE) is indicated by standard deviation value 137. The Jacque-Bera probability value 0.06 and the skewness value of 0.97 indicate that the variable is positively skewed and normally distributed. Capital Expenditure in Education (CEE) has a maximum value of 879 and minimum value of 225 for the periods considered, with a central tendency single observation mean value 241. The measure of dispersion of (CEE) is indicated by standard deviation value 230. The Jacque-Bera probability value 0.181 and the skewness value of 0.79 indicate that the variable is positively skewed and normally distributed. Recurrent Expenditure in Healthcare (REH) has a maximum value of 257 and minimum value of 0.04 with a central tendency single observation mean value of 68.0. The measure of dispersion of (REH) is indicated by standard deviation value of 85.2, the Jacque-Bera probability value of 0.04 and the skewness

value of 1.05 shows that the variable is positively skewed and normally distributed.

Capital Expenditure in Healthcare (CEH) has a maximum value of 559 and minimum value 69.5 with a central tendency single observation mean value of 155. The measure of dispersion of (CEH) is indicated by standard deviation value of 166, the Jacque-Bera probability value 0.04 and the skewness value 1.05 shows that the variable is positively skewed and not normally distributed. Labour Force (LABF) has a maximum value of 589 and minimum value 295 with a central tendency single observation mean value of 423. The measure of dispersion of (LABF) is indicated by standard deviation value of 882, the Jacque-Bera probability value 0.41 and the skewness value 0.29 shows that the variable is positively skewed and normally distributed. Life Expectancy at Birth (LEP AT B) has a maximum value of 52.7 and minimum value 5.30 with central tendency single observation mean value of 44.0. The measure of dispersion of (GFCF) is indicated by standard deviation value of 12.8, the Jacque-Bera probability value 0.00 and the skewness value -2.62 shows that the variable is skewed negatively and not normally distributed.

Human Development index (HDI) has a maximum value of 0.53 and minimum value 0.31 with central tendency single observation mean value of 0.46. The measure of dispersion of (HDI) is indicated by standard deviation value of 0.05, the Jacque-Bera probability value 0.00 and the skewness value -1.40 shows that the variable is skewed negatively and not normally distributed.

Table 1: Descriptive Statistics

	RGDP	CEE	REE	CEH	REH	LABF	LEP_AT_B	HDI
Mean	4.39	242	116	155	68.0	423	44.0	0.46
median	4.35	172	61.3	137	28.8	413	46.3	0.47
max	33.7	879	394	559	257	589	52.7	0.53
min	-10.8	225	0.23	69.5	0.04	295	5.30	0.31
Std. Dev	7.15	231	137	166	85.2	882	12.8	0.05
Skewness	1.76	0.79	0.98	1.05	1.05	0.29	-2.62	-1.40
Kurtosis	10.5	2.83	2.39	3.28	2.60	1.92	8.27	4.94
Jacque-Bera.	93.0	3.40	5.56	6.08	6.13	1.76	74.0	15.54
Prob.	0.00	0.18	0.06	0.04	0.04	0.41	0.00	0.00
Sum	140	774	374	498	217	1.19	140	14.77
Sum sq. Dev	158	1.65	588	8.61	225	2.10	510	0.09
Observations	32	32	32	32	32	32	32	32

Unit-Root Test

This study applied unit-root test to determine the stationarity of the data. The variables were subjected to ADF test in order to establish the stationarity status of the data series. Table 2 presents the results of the stationary test based on Augmented Dickey-Fuller test. The variables of RGDP, LABF and LEP AT B are found to be I (0) variables, that is stationary series while CEE, REE, REH and CEH* are integrated on order I(1).

Table 2: Unit Root Test Result

Variables	ADF Statistics.	Critical Value at 5%	No of diff.	Prob.
RGDP	-4.443570	-2.960411	I(0)	0.0014*
CEE	-6.752315	-2.967767	I(1)	0.0000*
REE	-4.859811	-2.963972	I(1)	0.0005*
REH	-3.591961	-2.998064	I(1)	0.0143*
CEH	-5.658602	-2.967767	I(1)	0.0001*
LABF	-24.90211	-2.976263	I(0)	0.9999
LEP AT B	-4.113110	-2.991878	I(0)	0.0042*

Note *, ** denotes significant at 5%, 10% level respectively

Source: Own Computation Using E-Views 10.0

RESULTS FOR PAIRWISE GRANGER CAUSALITY TEST BETWEEN HUMAN CAPITAL AND ECONOMIC GROWTH

The granger causality test between human capital and economic growth is presented in Table 3.The test was applied to determine the direction among real GDP and human capital. The result revealed that one-way causation was found to exist between human capital and real GDP. The causation is running from human capital to real GDP. This simply means that an increase in the level of human development index through education, training, provision of adequate healthcare facilities among others in Nigeria could cause economic growth. The result disagrees with the findings of Ammassoma and Nwosu (2011) who found no causality between human capital development and economic growth in Nigeria. On the other hand, the findings of this paper are in line with those of Khan et al (2015) who discovered a unidirectional causality between human capital development and economic growth in Nigeria.

Table 3: Pairwise Granger Causality Test

Null hypothesis	Obs	F-Statistics	Prob.
HDI does not Granger cause REAL_GDP	27	5.23700	0.0049
REAL_GDP does not Granger cause HDI	27	0.25108	0.9331

Source: Author's computation using E-Views 9.0

CONCLUSION

This study investigated the relationship between human capital development and economic growth in Nigeria over 1986 – 2017. The results revealed unidirectional relationship between human capital and economic growth in Nigeria, using the causation. The causation is running from human capital to economic growth. This suggests that human capital development in Nigeria is an important factor for the growth of the economy. Therefore, in the light of the findings of this study we recommend that both government and the private sector should improve on education and training for industrial sector growth and the economy in general.

REFERENCE

Adam, S. (1776). An *Inquiry inti the Nature and Causes of Wealth of Nations* (First Edition). London: Printed for W. Strahan; and T. Cadell 1776. Item number: RRB-5760.

Altiner, A., & Toklas, Y. (2017). Relationship between Human Capital and Economic Growth: An Application to developing countries. *Euresian Journal of Economics and Finance*, 5(3), 87-98.

Ammassoma, D., & Nwosa, P. I (2011). Investment in Human Capital and Economic Growth in Nigeria: A Causality Approach. *Canadian Journal of Social Science. 7*(4), 114-120.

Becker, G. S. (1964). *Human Capital; a Theoretical Analysis, with Special Reference to Education*. Chicago: University of Chicago Press.

Central Bank of Nigeria (CBN, 2015). *Statistical Bulletin 18.*

Central Bank of Nigeria (CBN, 2017). Statistics Bulletins. Annual report draft. 1597-2976. www.cbn.gov.ng

Central Bank of Nigeria (CBN, 2010). *Statistical Bulletin 4.*

Central Bank of Nigeria (CBN, 2010). Statistics Bulletin: *Annual report. Retrieved from www.cenbank.org/out/2011/publications/statistics/2010/partB/partB.html*

Dabwor, T. D., Ezie. O., & Jiddah, M. A. A. (2017). Assessment of the strength of Phillip's curve in the Nigerian context. *Journal of Economics and Finance, 1(1),* 214-224.

Dolan, E. (1991). Foreign Investment as a Tool for Accelerating growth in Less Developing Countries: The Nigeria experience.

Ejere, S. I. (2011). Human Capital Development as Catalyst for National Development: Nigerian Perspective. *International Journal of Business and Management,* 2(2), 98- 104

Eigbiremolen, G. O., & Anaduaka, U. S., (2014). Human Capital Development and Economic Growth Nigeria Experience. *Journal of Science Research,*4(4), 2222-6790

EyyupEcevit, & AyhanKuloglu, (2016). The Relationship between Human Capital and Economic Growth in Turkey. *Journal of Economic and Finance Review, 7*(6), 69 – 72.

Gbosi, A. & Omoke, P. (2004). Inflation-impacts on the Economic Growth of Nigeria. Pack Publishers.

Ghatak, S., (2003). Introduction to Development Economics, (edition, illustrated). Publisher Psychology Press Kingston University, England.

Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross Spectral Methods. *Econometrica, 37*(3), 428 – 438

Gupta, S. M., & Verhoeven, F. (2001). The Efficiency of Government Expenditure: Experiences from Africa. *Journal of policy modeling,* 23(4), 6 -12.

Johnson, A. O. (2011). Human Capital Development and Economic Growth in Nigeria. *European Journal of Business and Management,* 3(9), 29-38.

Jhinghan, M. L. (2011). *The Economic Development and Planning.* New Delhi: Vrinda Publications Ltd.

Jones, C. I. (2016). *The Facts of Economic Growth.* NBER, Cambridge, MA, United States Retrieved from http://dx.doi.org/10.1016/bs.hesmac.

Khan, J., Khattak, N. R., & Khan, A. (2015). Human Capital–Economic Growth Nexus: A Causality Analysis for Pakistan. *City University Research Journal, 5*(7), 21 -32.

Lawason, O. I. (2009). *Human Capital Investment and Economic Development: The role of Education and Health.*, Oxford, UK: St Hugh's College, Oxford University.

Lipsey, R. E., & Chrystal, K. (2007). *Economics.* Oxford: Oxford University Press.

Lipsey, R. E., (2009). Measuring International Trade in Services, NBER Chapters in International Trade, Services and Intangibles in Era of Globalization. *Journal of National Bureau of Economic Research, 2(3):* 27-70.

Mincer, J. (1981). Human Capital and Economic Growth. *Working Paper Series; National Bureau of Economic Research.* Cambridge: Massachusetts Avenue, MA 02138.

Mba, I. C., Mba, E. I., Ogbuabor, J. E., & Ikpegbu, C. H. (2013). Human Capital Development and Economic Growth in Nigeria. *Journal of Economic and Sustainable Development, 18*(4), 10–20.

Muhammad, M. Y., & Benedict, N. A. (2015). Education Expenditure and Economic Growth in Nigeria: Granger Causality analysis. *Journal of Business Management and Economics, 3*(4), 1 -12.

National Bureau of Statistics, (2016). The Nigeria Poverty Profile 2010 Report of the National Bureau of Statistics Harmonized Nigeria Living Standard Survey (HNLSS).

Onyinyechi, O. C., & Azubike, J. U. (2016). Empirical Review of Government Expenditure on Education and Economic Development in Nigeria: published by European Centre for Research, Training and Development UK. 4(5): 13 - 25. (www.eajournals.org)

Onisanwa, I. D., (2014). The Impact of Health on Economic Growth in Nigeria. *Journal of Economics and Sustainable Development,* 5(19): 34-42.

Oluwatoyin, M., & Fagbeminiyi, F. (2010). Implications of Government Expenditure on Education and Health on Labour Productivity: African Journal of social policy and Administration: 3(3): 96–103.

Oni, L. B. (2014) Analysis of the Growth Impact of Health Expenditure in Nigeria. *Journal of Economic Finance,* 3(1), 77–84.

Patricia, O., & Olugu, K. N. (2016). Human Capital Development and Economic Growth: The Nigeria Experience. Journal of Humanities and Social Science. 21(5): 78-84.

Sankey, O. J., Ismail, R. &Shaari, A.H. (2010). The Impact of Human Capital Development on Economic Growth in Nigeria: Economic Prosidingperkem. 1(2): 63–72.

Schultz, T. W. (1962). Investment in Human Beings; Chicago University of Chicago; *University of Chicago Press. 5(6):7890-*21.

Schultz, T. W. (1961). Investment in Human Capital: *The American Journal of Economic Review,* 1(2), 1-17.

World Development Indicator (2016). *World Data Bank.* http://www.wdidatabank.org.com/in.

World Economic Forum Report, (2016). *Human Capital Indices.* ISBN 978-1-944835-02-6.

EMPIRICAL ANALYSIS OF EXPORT DIVERSIFICATION AND ECONOMIC GROWTH IN NIGERIA: 1986 - 2017

Malachy A. Ugbaka, PhD
Department of Economics
University of Calabar

Solomon E. Effiong
Department of Economics
Wellspring University Benin City.

Abstract

This paper examines the impact of export diversification on economic growth in Nigeria. The paper argues that export diversification has succeeded in achieving economic growth in several countries partly because of the policies adopted. The method of data analysis employed is Ordinary Least Squares (OLS). The study found that GDP per capita, non-oil exports, natural resource endowments, institutions and real exchange rates had positive and significant impact on economic growth while the Herfindahl export concentration index and oil export had negative impact on economic growth measured by GDP per capita. The study submits that good macroeconomic management policies including running a counter-cyclical fiscal policy (low inflation, realistic exchange rate, and low fiscal and external deficits), anti-export bias policies and measures to mitigate adverse social effects of reforms needed to align domestic to international prices. Consequently, trade policies in Nigeria need to be reasonably open so that traded sectors can compete internationally. And again, since diversification would not occur overnight but be driven by effective infrastructural development especially in the non-oil sector, it has to be accompanied by an appreciating exchange rate to help diversify the export base of the economy

Keywords: Economic Growth, Export Diversification, OLS, Exchange Rate, GDP per Capita.

JEL CODE: F43, F19, O26

INTRODUCTION

The continuing evolution of the concept of economic diversification as an operational term in public policy has been reflected in the wider recognition of the complexities of the technical and policy issues involved (Hesse, 2008).

The wider investigation of the impact of export diversification on economic growth and development together with the role of government in bailing out a mono-product economy like Nigeria to ensure economic stability and sustainability found no separate place for export diversification as an organizing framework for action (Olaleye. Edun, & Taiwo, 2013). Instead, the focus is on the wider construct of diversification which has many distinct components such as revenue expansion and value addition. Stressing the importance of export diversification, the World Trade Organization(2010) opined that diversification of countries' export base increases local production, employment, income and economic growth. It warned that developing countries that export large amounts of a small number of products have export revenues that are quite volatile. Economic diversification is not a new strategy in Nigeria. As a matter of fact, it has been on the political agenda since oil and gas became the main and almost the sole source of revenue to the government for over half a century ago.

The export diversification index computed using the Herfindahl-Hirschman Index concentration ratio reported by United Nations Conference on Trade and Development (UNCTAD, 2012) positioned the country among the least countries in export diversification with a Herfindahl-Hirschman Index of concentration (0.78), for diversification (0.783) and ranked 176 out of the 216countries in the world. The situation as presented contradicts the usual assertion that the non-oil sector (especially agriculture) remains very important in the socio-economic development of Nigeria.

While it is plausible that the recent political focus on diversification is motivated by multiple problems arising from the developmental issues pertaining to the unpredictability of prices of oil and gas at the international market, the allocative state model currently being practiced in Nigeria relies on the sale of hydrocarbons with almost near neglect and underdevelopment of other productive assets. This state of affairs fails to support further

development efforts across the states in Nigeria in two important respects. First, it fails to generate a stable and sufficient income for the population, and second, it fails to create job opportunities for the swiftly growing and well-educated groups of young citizens due to the fact that Nigeria's oil and gas sector primarily focuses on extraction and export of the basic commodities and does little in processing and refining crude to finished products and the derivatives there-from.

The clamour for export diversification along the path of economic growth and development has recently been touched upon deeply in trade literature, especially empirical. The argument of how countries with different levels of per capita income manage to diversify their economic structures is important in terms of policy implication for at least two reasons. First, the ongoing process of diversification attests to the structural change as an aspect of economic development and second, as Kalenali-Ozcan, Sorensen, and Yosha(2003) put it, concentration of resources in one sector (high degree of overall specialization) may be risky in the case of sectoral shocks which De Ferranti, Perry, Lederman and Maloney (2002) observed, can limit economic growth. While issues of export diversification as a means of development and growth became important in economics only in the 1950s when the world began to view dependence on primary products as harmful to growth occasioned by volatile price and low elasticity of demand, the portfolio effect theory of Ross(1999) shows evidence of an extent to which export instability problem can be managed with a mix of investment and its variances.

The objective of this paper is to empirically analyse the impact of export diversification on economic growth in Nigeria. The paper is structured into five segments. The first segment is the introduction to the study, which introduces a general review of the paper. The second segment is the literature review; the third segment is the methodology and model specification. The

fourth segment is results and discussion while the last segment concludes the paper and presents recommendations for further research.

LITERATURE REVIEW

Theoretical Framework

The theoretical foundations for the empirical studies on exports are among others, the conventional trade theories based on the Hechscher-Ohlin (H-O) framework, new trade theories and the endogenous growth theories as posited by Liu and Shu (2003). While the Hechscher-Ohlin model believes that a country should export those products that it has comparative advantages in in both production and exports, the new trade theories consider imperfect competition, economies of scale and trade costs as important factors affecting export performance as the basis for diversification. A pool of these theories gave birth to the endogenous growth theories of Barro (1991), Romer (1994) and Barro and Sala-i-Martin (2003), amongst others, based on the endogenous nature of the diversification decision. The paper adopts the endogenous growth theory to explain the relationship between export diversification and economic growth in Nigeria. This is because, it is the only growth theory that holds that the long run growth rate of an economy depends on policy measures and not on exogenously determined factors such as unexplained technical progress. Here exogenous technological changes are not necessary in explaining long-term economic growth. Instead, growth is due to indefinite investment in human capital which had spillover effect on economy and reduces the diminishing returns to capital accumulation. Another advantage of the endogenous growth, model is that it uses the assumption that the production function does not exhibit diminishing returns to scale to lead to endogenous growth on the premise that agents optimally determined the consumption and saving, and optimizing the resource allocation to research and development leading to technological progress. By this, endogenous

growth model tries to build macroeconomic models out of microeconomic foundations, hence, its relevance to the paper.

According to the endogenous growth theory, labour productivity and investments can affect both the level of growth and per capita output. Based on the Harrod-Domar "AK" model which works on the property of absence of diminishing returns to capital, the starting point is to project the simplest form of the production function given as $Y = AK$. By this equation, Y is the level of output, A is the positive constant that affects the level of technology, K is the capital (to include human capital). $Y = AK$, means that output per capita and the average and marginal product are constant at the level $A > 0$.

From that equation, $f^1(K)/K = A$. in an equation of transitional dynamics of Solow (1956) model, this shows how an economy's per capita income converges towards its own steady-state equilibrium value and to the per capita incomes of other nations. In such a transitional dynamic equation where growth rate on K is given, then $\Delta K = K/K = s. f^1(K)/K - (n+\delta)$. Substituting A, gives $\delta K = sA - (n + \delta)$. At $x = 0$, it can be shown that per capita growth can now occur in the long run even without exogenous technological change.

EMPIRICAL REVIEW

While a large body of theoretical and empirical studies has been devoted to the understanding of export diversification on economic growth and development in developing countries, some works such as Imbs and Waczlarg(2003), De Benedictis, Gallegati, and Tamberi(2009), Parteka (2007), Parteka and Tamberi(2011), Cadot, Carrere and Strauss-Khan(2007) and Koren and Tenreyro(2007), using per capita income (PCI) variable suggest that, in developing countries, there is a monotonic increasing relationship between the level of development and export diversification. This is consistent with the theoretical stand of Acemoglu and Zilibotti(1997) which stresses the

limited diversification opportunities at lower levels of development, namely because of scarcity of capital and indivisibility of investment project.

Feentra and Kee(2008) examined the relationship between changes in export variety and economic growth across sixteen (16) sectors in South Korea and Taiwan over the period 1975 – 1991 in order to ascertain the linkages between changes in export variety and growth in total factor productivity. The study found positive and significant impact of export variety on productivity.

Agosin (2006) also have investigated the explanatory power of export diversification using cross-sectional data for Asian and Latin American countries for the period 1980 – 2003. The study adopted a growth model and found that export growth was not enough to propel economic growth, but that growth together with impact of diversification appears to be significant. According to the study, diversification and export growth have the expected sign and are statistically significant with strong explanatory power. The study concludes that export diversification will enhance economic growth through changes in export composition and expanded comparative advantage.

The Economic and Social Commision for Asia and the Pacific (ESCAP, 2004) confirms the presence of positive relationship between diversification and economic growth and concluded that diversification is a significant factor that determines economic growth in three Asian countries of Bangladesh, Nepal and Myanmar. The result shows that export growth accelerates the process of development in the three countries.

Matthee and Naude(2008) examine export diversity and regional growth in a developing country context across South Africa's region using export data from sub-national districts and found that regions with lower levels of export specialization and more diversified exports tended to experience higher

economic growth rates, and contributed more to South Africa's overall exports.

Also, Lyakurwa(1991) has examined the trade policy and promotion in sub-Sahara Africa and found that export diversification is important because it helps in reducing the variability of export earnings of developing countries and raising the growth rate of both exports and domestic output.

Many more empirical studies and evidences have also confirmed the validity of the link between export diversification and economic growth in many economics. The study of 91 countries conducted by Al-Marhubi(2000) using data between 1961-1988 to examine the possible link between export diversification and growth found out that countries with greater export diversification and lower export concentration have faster rate of growth, and also that export diversification is a positive stimulus for capital accumulation.

Lederman and Maloney (2003) used the influence of natural resources, export concentration and intra-industry trade to analyse the empirical relationship between trade structure and economic growth. The authors utilized panel data of 25 year period. One of the most interesting findings of the report is that resource abundance adversely affecting growth which is in line with the assertion of the Solow growth model that the Marginal efficiency of natural resources is negative and, that export concentration is also detrimental to growth, and conclude that export concentration hampers growth in countries where the export base is largely undiversified.

METHODOLOGY AND MODEL SPECIFICATION

The study relies on annual data from 1986 to 2017, sourced from the Central Bank of Nigeria Statistical Bulletin, and employs the Ordinary Least Squares (OLS) to analyse the impact of export diversification on economic growth in Nigeria. Export diversification mostly argued widely as one of the

available measure of economic growth. In this section, we present the philosophy and model of the paper. This study is undertaken with the main aim of examining the impact of export diversification on economic growth in Nigeria. To accomplish this objective, an econometric instrument dependent on ordinary least squares (OLS) is used to analyze the variables. We equally examine the properties and behaviour of the macroeconomic data employed using stationarity tests and report the results of the estimated model using OLS technique of analysis.

Since this is not a study to identify the determinants of export diversification in Nigeria, we focus on the impact of export diversification on economic growth. This constitutes the main contribution of the study. Following Parteka and Tamberi (2011) and starting with the usual symbolic representation of the final goods production function in this strand of literature,

$$Y = A.L_i^{1-\alpha}.\sum_{i=1}^{N}(X_{ij})^{\alpha} \qquad 1$$

Where: Y is a final product of type i, L is the labour input; j refers to differentiated intermediate inputs and $0 < \alpha < 1$.

To determine the productivity of labour and capital, and its efficient utilization as part of total output, a decomposition of aggregate GDP growth is computed. The overall GDP is broken down into labour, capital and productivity components. Since total factor productivity (TFP) is not explained by growth in factor inputs as part of GDP, it is instead defined by technical progress. By first assuming constant returns to scale, competitive markets, and neutral technical progress, the neoclassical production function of Solow (1956) is then used to determine the productivity of inputs to total

output growth so that the production model and estimated growth rate as in Haouas and Hesmati (2014) is written as:

$$Y = AK^{\alpha}L^{(1-\alpha)} \quad 2$$

which in log linear form is transformed as:

$$\log Y = A + \alpha \log K + (1 - \alpha) \log L \quad 3$$

The neoclassical production function in equation (2) defines Y as the rate of output. A represents the total factor productivity growth rate (TFPG). The elasticity of output α equals the capital income share defined by the ratio of K to L (i.e., K/L). The log Y, log K and log L in equation (3) denote the growth rate of output, capital formation, and labour use respectively. From equation (3), the growth rate of commodity Y can be derived so that the determinants of economic growth without exogenous technological change can be written in econometric form as:

$$RGDPPC = \beta_0 + \beta_1 HIREXIN + \beta_2 NONOILEXP + \beta_3 NREND + \beta_4 INST + \beta_5 REXRATE + \lambda GDPPC_{t-1} + \mu \quad 4$$

Where: RGDPPC is the real gross domestic product per capita, HIREXIN is the Hirschman concentration Index, OILEXP is value of oil export; NONOILEXP is the value of non-oil export; NREND is the natural resource endowments; INST is the Institution (proxied by contract intensive money (CIM) and REXRATE is the real exchange rate while ε is the error term with its assumed normality. All variables are in their logarithmic form so as to harmonize the unit of measurement and provide an opportunity to interpret the coefficients as elasticities. Hence, the logarithmic form of equation (4) becomes:

$$\text{Log } RGDPPC = \beta_0 + \beta_1 \log HIREXIN + \beta_2 \log OILEXP + \beta_3 \log NONOILEXP + \beta_4 \log NREND + \beta_5 \log INST + \beta_6 REXRATE + \lambda \log GDPPC_{t-1} + \varepsilon \quad 5$$

On a priori, $\beta_1, \beta_2, < 0$; $\beta_3, \beta_4, \beta_5, \beta_6$ and $\lambda > 0$

RESULTS AND DISCUSSION

This section presents and discusses the empirical results for this study beginning with the pre-estimation unit root test to check the stationrity properties of the variables of the model.

Unit Root Test

Before performing the analysis, it was essential to check for the stationarity of the data series used. The stationarity property of the variables were checked using the Augmented Dickey Fuller (ADF) and the result presented in Table 1.

Table 1: Result of Unit Root Test

Variables	Critical value	ADF	Status
GDPPC	- 2.9320**	- 4.202011	1(1)
HIREXIN	- 2.9303**	- 3.811577	1(0)
OIL EXP	- 2.9320**	- 5.148182	1(1)
NON-OIL EXP	- 2.9320**	- 4.040437	1(1)
NREND	- 2.9320**	- 6.698987	1(1)
INST	- 2.9320**	- 4.176809	1(1)
EXR	- 2.9320**	- 4.027400	1(1)

Source: Authors' computation, using E-views 8.1. ** indicates the 0.05 level of significance

From Table 1, it is obvious that all the variables are integrated of order 1 or 1(I). In other words, all the variables are said to be stationary at first difference. Only HEREXIN real exchange rate is stationary at level (with constant, constant and trend and under none). Therefore, we can safely conclude that first differencing is sufficient for modeling the time series adopted in this study.

Table 2: Estimates for the Export Diversification and Economic Growth

Regressor	Coefficient	t- value
Constant	4.966638	6.780673
HIREXIN	- 0.862944**	- 2.242361
LOGOILEXP	- 0.479219**	- 2.764539
LOGNONOILEXP	0.125337**	0.490134
NREND	0.057795	2.110082
INST	0.150526**	0.607274
REXRATE	0.008206**	3.250667
GDPPCt – 1	0.336667**	4.612358

Summary Statistics:

$R^2 = 0.813505$ $\quad$ Adj$R^2 = 0.77822$

Dw stattistics = 1.526097 $\quad$ F-Statistics = 23.05661

Source: Authors' computation from E-Views 8.1; ** represent the 0.05 significant level

On the whole, the regression results are plausible because the estimated t-ratios corresponding to the coefficients are statistically high while the coefficient of determination (defined by R^2) which measures the suitaibility? of the model is equally high. It explained that about 81 per cent of the total variation in per capita GDP is accounted for, by the regressors of the model while, only about 19 per cent are not accounted for. This means that the explanatory powers of the regression equations are high. Since the value of the Durbin-Watson (D-W) statistic is 1.526097, autocorrelation is not a serious problem.

Table 2 reveals an overwhelming evidence that GDPPC would decrease by about 0.86 percent (- 0.862944) for every one unit increase in the export concentration on one sector, holding other variables constant. In other words, a rise in per capita income of 1 percent is associated with a decline in the measure of concentration by about 0.86 percent to show that export diversification process takes place along the path of growth but that such growth is rather slow. Conversely, a 1 percent rise in per capita income will bring about 0.13 percent (0.125337) in export diversification. By this, the result rejects the null hypothesis that exports diversification has no positive and significant relationship with economic growth in Nigeria.

Again, the results showed that GDP per capita would decrease by about 0.48 percent (- 0.479219) for every one unit increase in oil export, holding other variables constant. The negative contribution of oil exports to GDP per capita clearly indicates diminishing returns to scale in the exploitation of oil resources in Nigeria. Renter economy created by oil wealth and the laziness it creates has made the economy uncompetitive with poor income distribution that increases the rate of poverty in the country. In essence, the road to export diversification would involve difficult policies to convey the importance of decreased concentration on the oil and gas sector and more productive allocation of resources to the non-oil sector as the results indicate

The relationship between export diversification and economic growth in Nigeria was also examined in the model, bearing in mind the contribution of nonoil sector to GDPC. The result showed that GDP per capita would rise by about 0.13 percent (0.125337) for every one percent increase in the non-oil exports of the economy, holding every other variable constant. Interestingly, economic growth in the non-oil sector is very high compared to oil exports as indicated in the regression result. This implies that there is a strong growth trend in the non-oil sector than the oil sector, especially when the non-oil sector is properly developed.

According to the findings, GDP per capita would marginally rise by about 0.6 percent (0.057795) for every one unit change in the natural resources endowment, holding other variables constant. Usually, natural resource abundance is often found in most cases to have negative impact on economic growth due to the theory of the Dutch disease. The result indicated that GDP per capita would rise by about 0.15 percent (0.150526) for every one percent improvement in the quality of institutions, holding other variables constant. This implies that the quality of institutions has significant direct relationship with economic growth in Nigeria.

The result showed that GDP per capita would rise by less than0.1 percent (0.008206) for every one unit change in the real exchange rate, holding every other variable constant. This result is in line with most studies that found a small but less significant relationship between exchange rate and economic growth. GDP per capita depends more fundamentally on its past value ($GDPPC_{t-1}$) than any of the variables in the model. As a matter of fact, the result showed that GDPPC would rise by about 0.34 percent (0.336667) for every one unit change in the previous year's GDPPC holding every other variable constant. It implies that about 0.34 percent of the disequilibrium in per capita gross domestic product (GDP) in the previous year is corrected in the current period, with the speed of adjustment $(1 - \lambda)$ of 0.66 percent. This also demonstrated the fact that both the predicted and the predictor variables go a long way in explaining the level of economic growth in Nigeria. It should be noted that the result was estimated at 5 percent level of significance to show the relationship between per capita gross domestic product (GDPPC) and the major regressors of the model.

CONCLUSION AND RECOMMENDATIONS

The study showed that the Nigerian economy's high concentration on oil exports has a deleterious effect on economic growth and on the

development of the non-oil sectors. Whereas the non-oil sectors as revealed by the study have over 0.12 percent potential to positively impact growth, concentration has been on oil exports. The reasons for the high degree of export concentration could be due largely to institutional weakness to drive the process of diversification, lack of value-addition in the production of primary products and poor infrastructure, among other factors.

This is an interesting relationship for policy. Thus, government should evolve policies that will help develop the non-oil sectors to derive competitive advantage in the international market, and enjoy a competitive cost advantage. A policy such as would improve the country's institutional quality, general respect for the rule of law as opposed to arbitrary behaviour, efficient contract enforcement process and quick determination of contract dispute could spur the development of the non-oil sector and unlock the 0.15 percent growth potential. When this is not the case, domestic spending of rent will definitely raise prices of goods and services as well as domestic cost of production. Consequently, this would shrink investments in productive sectors, reduce employment and lower productivity and products for exports. Therefore, successful export diversification should try to address issues relating to behind the borders and beyond the borders. Addressing the constraints of behind the borders implies tackling the supply-side constraints as well as the policy and competitiveness constraints. On the other hand, the beyond the borders constraints implies addressing market access barriers to export goods, having effective negotiation skills across bilateral, regional and multilateral levels.

REFERENCES

Acemoglu, D., & Zilibotti, F. (1997). Risk, Diversification and Growth. *Journal of Political Economy, 105* (4), 709-751.

Agosin, R. (2006). Export Diversification and Economic Growth: An analysis of Columbia's Export. *Working Paper No.233. Department of Economics, University of Chile* .

Al-Marhubi, F. (2000). Export Diversification and Growth: An empirical investigation. *Applied Economics Letters, 7*, 559-562.

Barro, R. G. (1991). Economic Growth in a Cross-section of Countries. *Quarterly Journal of Economics, 106*, 407-443.

Barro, R., & Sala-i-Martin, X. (2003). *Economic Growth* (2nd ed.). Cambridge, Mass.: MIT Press.

Cadot, O., Carrere, C., & Strauss-Khan, V. (2007). Export Diversification: What's behind the whom? *Centre for Economic Policy Research (Discussion paper N0. 6590)* .

De Benedictis, R., Gallegati, M., & Tamberi, M. (2009). Overall Specialization and Development: Countries Diversity. *The Review of World Economic, 145* (1), 37-55.

De Ferranti, D., Perry, G., Lederman, D., & Maloney, W. (2002). *From Natural Resources to the Knowledge Economy: Trade and Job Quality.* Washington D.C: World Bank.

Economic and Social Commision for Asia and the Pacific, E. (2004). *Export Diversification and Economic Growth: The Experience of Selected Lease Developed.* New York: United Nations.

Feentra, R., & Kee, H. (2008). Expert Variety and Country Productivity: Estimating the Monopolistic Competition Model with Endogenous Productivity. *Journal of International Economics, 74* (2), 500-516.

Hesse, H. (2008). *Export Diversification and Economic Growth.* Washington, DC: The International Bank for Reconstruction and Development (The World Bank), On behalf of the Commission on Growth and Development (Working Paper No. 21).

Imbs, J., & Waczlarg, R. (2003). Stages of Diversification. *American Economic Review, 93* (1), 63-86.

Kalenali-Ozcan, S., Sorensen, B., & Yosha, O. (2003). Risk sharing and Industrial Specialization: Regional and Internation Evidence. *American Economic Review, 93* (3), 903-918.

Koren, M., & Tenreyro, S. (2007). Volatility and Development. *Quarterly Journal of Economics, 122* (1), 243-287.

Lyakurwa, W. M. (1991). Trade Policy and Promotion in Sub-Sahara Africa. *Africa Economic Research Consortiium* . Kenya.

Matthee, M., & Naude, W. A. *Export Diversity and Regional Growth in a developing country context: expirical evidence.* Paper submitted to the Regional Studies Association International Conference: "Regions: the dilemmas of integration and competition". Prague, 27-29 May, 2008.

Olaleye, S. O., Edun, F., & Taiwo, S. B. (2013). Export Diversification and Economic Growth in Nigeria: An Empirical Test of Relationship using Granger Causality Test. *Journal of Emerging Trends in Economics and Management Science, 5* (1), 70-79.

Organization, World Trade. (2010). *Ten Benefits of the WTO Trading System.* WTO.

Parteka, A., & Tamberi, M. (2011). Export Diversification and Development: An Ampirical Assessment. Working Paper No. 327.

Romer, P. M. (1994). The Origins of Endogenous Growth. *Journal of Economic Perspectives, 8 (1)*, 3-22.

Ross, S. (1999). Adding Risks: Samuelson's Fallacy of Large Numbers Revisited. *Journal of Financial and Quantitative Analysis, 34*, 323-339.

Solow, R. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics, 70 (1)*, 65-94.

MACRO-PRUDENTIAL POLICY INSTRUMENTS, PRO-CYCLICALITY OF CAPITAL AND BANK LENDING IN NIGERIA: FROM POST GLOBAL FINANCIAL CRISIS

Onyebuchi Iwegbu
Department of Economics,
Faculty of Social Sciences
University of Lagos, Lagos, Nigeria
Phone: +2348080668000
Email: oiwegbu@unilag.edu.ng

Ernest Simeon O. Odior, PhD
Department of Economics,
Faculty of Social Sciences
University of Lagos, Lagos, Nigeria
Phone: +23480-62088200; +2347058074040
Email: odiore@yahoo.com; eodior@unilag.edu.ng

Abstract

This study empirically examined the tendency of macro-prudential policy in reducing the pro-cyclicality between capital and bank loans during the post global financial crisis. The study employed the ARDL Model in estimating the model specified. The study found that macro-prudential policies help in reducing the pro-cyclicality between bank loans and the extent of capital available for banks. And this is found to be less effective during the crisis than when the financial industry is not in crisis. Also, in the short run, capital and bank loans are countercyclical in nature however this is reversed in the long run. The policy implication of this study is that the regulatory authority's macro-prudential policy is effective in reducing the pro-cyclicality between bank loans and capital adequacy of banks. Also, short term crisis does not deter banks from issuing out loans, however, in the long run, loans are greatly affected by the crisis within the system. There is a need for policymakers and the regulatory authority to focus attention on regulatory capital framework so that macro-prudential policies will have a greater impact in reducing the credit growth pro-cyclicality and strengthen their macro-prudential supervision measures, especially during the period of crisis.

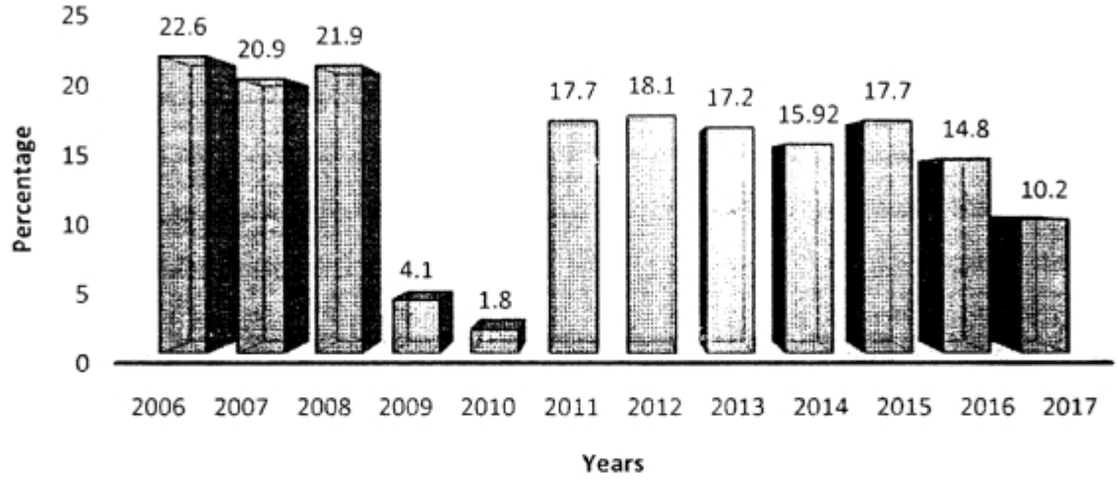
Keywords: Macro-prudential Policy Instruments, Bank's Capital, Bank Loans, ARDL

JEL Classification: E58, G28

INTRODUCTION

The capital base of banks especially for deposit money banks plays a significant role in banking operations as well as its financial stability. Theoretical literature abounds (Labonne & Lame, 2014; Olszak, Pipień, Kowalska & Roszkowska, 2015) that point to the fact that higher capital adequacy of banks increase their financial prowess and thus, also increases their lending ability. Furthermore, the banks' capital requirements play two significant roles. First is that it helps to act as a buffer in absorbing potential losses that may occur due to financial crunches coming from internal or external shocks. Second is that the capital requirement acts as a regulatory framework in the control of money in circulation. Questions on the first purpose have been raised of recent after the global financial crisis of 2008.

The Central Bank of Nigeria under her Guidance notes on regulatory framework maintains that a minimum regulatory capital adequacy ratio (CAR) of 15% will be applicable to banks with international authorisation and Systemically Important Banks (SIBs) while a CAR of 10% will be applicable to other banks. Immediately after the global crisis of 2008, the capital adequacy ratio of banks collapsed as the Nigerian banking sector was also the recipient of the external shock arising from the financial crisis. Figure 1 shows that from 21.9% of capital adequacy ratio recorded in 2008, it fell to 4.1% in 2009 and this deepened in 2010 to 1.8%. The shocks to the bank's capital base have been adjudged to be a key determinant of bank's lending behavior and this is pro-cyclical in nature (Kishan & Opiela, 2006). Evidently, during this period, the lending ability of banks has been greatly affected as well as increasing the systemic risks associated with banking behaviours. After 2010, there was a capital adequacy recovery as it went up to 17% in 2011 but declined in 2017 to 10.2%. A major conclusion that can be drawn from this trend is that the aftermath of the global financial crisis has kept the capital adequacy ratio of banks below the pre-global financial crisis for a decade now.



Source: Census and Economic Information Center, (2019)

Fig. 1: Capital Adequacy Ratio of Commercial Banks in Nigeria

Macro-prudential Policies are the strategies and policies taken by the regulatory authorities of an economy in managing all the possible risks that are associated with the financial system as well as its operations; this will ensure that risks, shocks or crisis that are likely to occur are mitigated (International Monetary Fund, 2013; Viñals, 2011). With the global financial crisis, policymakers and monetary experts opine that new macro-prudential policy instruments have the tendency to reduce the pro-cyclical nature of banks' capital cum lending rate. Increased resilience of the banking sector implies that banks are able to absorb losses which are of greater consequences arising from their ability to accumulate higher capitals or have access to better funding. Whichever case, this will ultimately reduce the tendency to experience a costly disruption in the supply of credit (Olszak, Roszkowska & Kowalska, 2019).

The Central Bank of Nigeria also pays attention to the macro-prudential regulations under the financial stability reference unit. The regulatory authority (CBN) has adopted some financial soundness indicators in monitoring the financial stability of the whole banks, thus, those financial soundness indicators are all pointers to how well macro-prudential regulations are effective in monitoring and avoiding systemic risk. In all, there are asset-based indicators comprising the ratio of non-performing loans to total loans, core liquid assets to total assets and liquid assets to short term liabilities. The capital-based indicators are the ratio of regulatory capital to risk-weighted assets, the ratio of tier one capital to risk-weighted assets. Lastly, the income and expenses-based indicators are ratio of interest margin to gross income, personnel costs to non-interest expenses and then the ratio of non-interest expenses to gross income (Muo, 2012).

The MPIs are set of regulations and policy adherence measures to ensure financial stability within banking operations. The macro-prudential policy has a short-term objective of preventing financial distress from spreading while its long term-objective is on preventing the costs of systemic crises in the economy. The risk nature focuses on collective behavior among financial institutions and follows a top-down approach in dealing with systemic risk (Zulkhibri, 2018).

Most times, those banks that do not have adequate capital always suffer crisis during recession and period of financial crunches. Most works have been conducted in examining the extent of such crisis since the first Basel Accord was introduced as an international capital standard. However, the micro-prudential policy measures are insufficient in controlling these crises both in developed and developing economies like Nigeria. Researchers and policymakers thus argue that the macro-prudential approach towards regulation and supervision will likely reduce the pro-cyclicality which banks suffer. It is against this backdrop that this study seeks to examine the

interactive effect of macro-prudential policy instruments and capital adequacy ratio on bank loans. That is, this study seeks to answer the question: does the use of macro-prudential policy instruments in Nigeria impact on the link thereby reducing the pro-cyclicality between loans growth and capital adequacy ratio of banks in Nigeria? The relevant hypothesis to test in this paper is that macro-prudential policy instrument does not reduce the pro-cyclicality between loans growth and capital adequacy ratio in Nigeria from the post-global financial crisis period to 4th Quarter, 2018.

Empirically, studies including Goujon and Sawadogo (2016); Fan and Keregero (2017), have examined the relevance of macro-prudential policy measures on financial stability in selected low income countries and Nigeria respectively; however, there is scanty literature on how macro-prudential policy instruments can interact with capital availability ratio to affect the credit lending capacity of banks in Nigeria, most especially in the aftermath of the global financial crisis. To the best of our knowledge, no extant empirical studies have conducted this using Nigeria as a case study; the closest was the one conducted in Africa by Guérineau, Goujon and Sawadogo (2016) for the WAEMU region. This study will also be different as it will incorporate all the macro-prudential policy measures into a single index called macro-prudential policy index using the principal component analysis.

REVIEW OF RELEVANT LITERATURE

The macro-prudential policy approach has become imperative since the occurrence of the global financial crisis of 2008. With this crisis, the regulatory authority has shifted their attention from the micro-prudential policy approach to a more robust and encompassing macro-prudential approach. The micro-prudential policy approach is majorly concerned with the individual institution's financial stance by taking up individual supervisory

measures in ensuring that the individual risks are controlled and avoided. The regulation in micro-prudential approach is partial equilibrium (Duniya, 2012); that is, it aims at preventing an overbearing financial failure that can be attributed to an individual financial institution.

There are various strands of theoretical insight that provides an explanation of how macro-prudential policy can affect the cyclicality between loans and capital ratio. Notably, we start with the agency paradigm. The agency theory emphasizes the relationship that exists between the principal and the agent. The agents act on behalf of the principal and receive an agent commission. The agent takes a different form depending on the institution concerned. In this context, the agent is the management board of financial institutions and the principal is the shareholders. Most times, the agents do not act in the interest of the principal, leading to moral hazard, as such, there can be a financial crisis with respect to the particular financial institution (Duniya, 2012).

Another theory that is making the light of the day is the externalities paradigm. According to Greenwald and Stiglitz (1986) who championed this theoretical strand of literature, the externalities paradign explains the situation when financial crisis from one bank or financial institution causes emission of bad signals to other sectors of the economy which can only be mitigated if there is an effective macro-prudential policy. As established in the literature, an externality is the emission of a signal from one economic agent's action to the other economic agent. That is, it is the attendant consequence of one's action on the other person within an economic space. The monetary externality is that which arises when one economic agent's action emits a signal on the welfare of another economic agent through effects on prices. Distortions in the market can be the case when the agents face borrowing constraint; that is, decline in loans growth rate by commercial banks or existence of financial frictions (especially during financial crisis). This,

therefore, results into pecuniary externalities such as various market distortions in the form of excessive risk-taking, excessive levels of short-term debts and over borrowing (Duniya, 2012).

Another theoretical construct that is pronounced in literature is the mood swings paradigm. This theory places attention on the behavior of the managers. In the light of this theory, rationality, as well as greed, are core influencing factors that affect the behavior of managers in the financial institutions. The Rationality and greed cause a mood swing in the optimistic behavior of the managers thereby making them to be over-optimistic in good times and sudden risk retrenchment on crisis period. Thus, pricing signals in the financial market may be inefficient and this increases the chances of systemic trouble. Thus, there is a need to have managers who are forward-looking as well as having macro-prudential supervisors that will help in moderating uncertainties and informing the regulatory authorities in terms of crisis and risks. This theory can be applied when examining the effectiveness of macro-prudential policy measures at the firm level.

Olszak, Roszkowska, and Kowalska (2019) examine the tendency of macro-prudential policies in reducing the pro-cyclicality of capital ratio on bank lending in 60 countries. Their study employed the system Generalized Methods of Moments to examine the extent and possibility of its potency during the economic crisis, as well as whether the size of banks plays a significant role. The studies found that macro-prudential policies play a significant role in reducing the cyclicality of bank lending and capital, even during the period of the financial crisis as well as its effect on large banks

Fan, Keregero and Gao (2017) investigate how macro-prudential capital requirements affect systemic risk in Nigeria. The study acknowledges that amongst other risks, the capital requirement is one of the major risks that affect the stability of banks. Owing to this, their study dedicated attention to

understanding the role which macro-prudential capital requirement plays in managing the risk. The study employed vector autoregression analysis and the results from the findings indicated that when there is no financial crisis, more of the capitals are owned and however, in the time of shocks in the form of crisis, banks hold little capital for risk allocations. Also, there are studies that have examined the relationship between credit and the level of banks' capital. Notable is the study of Labonne and Lame (2014) who investigated the relationship between credit growth and bank capital requirements in France for the period 2003 and 2011. The study employed the panel data regression technique. Their findings reveal that there exists a pro-cyclical relationship between capital and credits given out.

Ayyagari, Beck, and Peria (2018) studied the micro impact of macro-prudential policies on firm level by examining over 900,000 firms between the periods 2003 and 2011 in 48 countries across Europe and South America. The study used panel data estimation technique and the result found that macro-prudential policies were effective in reducing the credit growth of micro, medium and small-scale enterprises. Also, the study shows that young firms within the country are greatly influenced by lower credit growth with macro-prudential policies in place; implying that the policy is effective for financial stability.

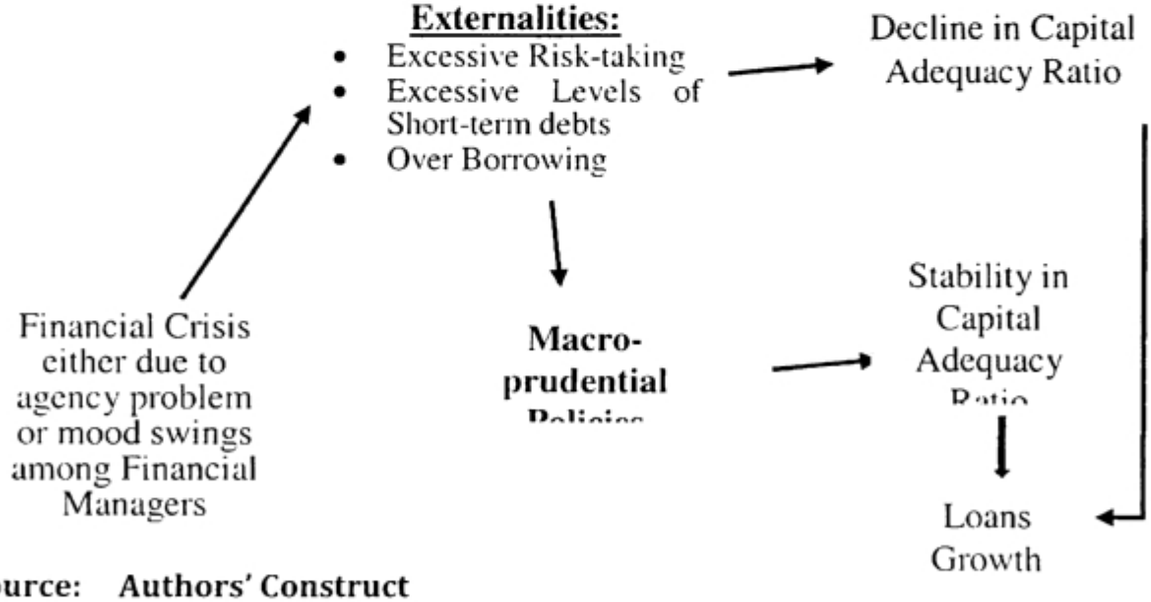
For Indonesia, Alegria, Alfaro and Cordova (2017); Claessens and Kose (2013); Zhang and Zoli (2016); Pramono Hafidz, Maulana, Muhajir, Alim, Adamanti and Alim (2015); Purnawan and Nasir (2015) and Fendoğlu (2017) found that macro-prudential policy measures are effective in reducing the risk systemic credit growth in emerging markets using probit regression and Generalised Method of Moment. In all of these studies, to the best of our knowledge, none has been done in the context of Nigeria.

RESEARCH METHODOLOGY AND THEORETICAL FRAMEWORK

Distortions in the market can be the case when the agents face borrowing constraint; that is, the decline in loans growth rate by commercial banks or existence of financial frictions (especially during financial crisis); This, therefore, results into pecuniary externalities such as various market distortions in the form of excessive risk-taking, excessive levels of short-term debts and over borrowing (Duniya, 2012). Hence, we have it that:

$$Loans\ Growth = f(capital\ adequacy\ deline : excessive - risk, over\ borrowing) \quad (1)$$

According to International Monetary Fund Policy (2010), this risk externality which arises between the financial institutions and from them to the real economy, triggers market failure and this will then justify the need for macro-prudential policies. Thus, the macro-prudential policies will act as a preventive independent agent in mitigating externalities arising from the financial crisis. To represent this in a more detailed chart, Figure 2 will lend credence.



Source: Authors' Construct

Figure 2: Macro-prudential Policies Intermediating between Externalities, Capital Adequacy Ratio, and Loans Growth

Modeling the determinants of bank loans can be somewhat difficult, especially during crisis period, this is the to the fact that during the period and post -experiences, not only does the loan supply decline, but also the loans demanded by households arising from bank's liquidity as well as capital crunches. Olszak et. al. (2019) examined the effectiveness of macro-prudential policy instruments in reducing the pro-cyclicality of capital ratio and bank lending rate. The early studies of Olszak et. al. (2019) developed the following functional relationship between loans, capital ratio and the macro-prudential policy instruments:

Loans = f(Capital Ratio, Capital ratio*crisis, Macroprud, Macroprud*crisis, Macroprud*Capital ratio, Macroprud*Capital ratio*crisis) (2)

Where loans are the loans rate deflated with the consumer price index, capital ratio is the capital adequacy rate as defined in the Basel I agreement, the crisis is the dummy variable for periods of crisis. Our studies modify equation (2) and extend it to include other factors that could determine the loans growth such as the extent of investment in the economy, exchange rate policies which are very applicable to a developing country that is heavily dependent on import. Thus, equation (2) is transformed into an Autoregressive Distributed Lag Model of *p* order as presented in equation (3).

$$\begin{aligned}\Delta Loans = {} & \beta_0 + \beta_1 CAP_t + \beta_2 MPI_t + \beta_3 crisis_t + \beta_4 CAP_t * MPI_t + \beta_5 CAP_t * MPI_t * crisis_t \\ & + \beta_6 INV_t + \beta_7 EXCH_t + \beta_8 \sum_{i=1}^{n} \Delta CAP_{t-i} + \beta_9 \sum_{i=1}^{n} \Delta MPI_{t-i} + \beta_{10} \sum_{i=1}^{n} \Delta crisis_{t-i} \\ & + \beta_{11} \sum_{i=1}^{n} \Delta CAP_{t-i} * \Delta MPI_{t-i} + \beta_{12} \sum_{i=1}^{n} \Delta CAP_{t-i} * \Delta MPI_{t-i} * \Delta crisis_{t-i} + \beta_{13} \sum_{i=1}^{n} \Delta INV_{t-i} \\ & + \beta_{14} \sum_{i=1}^{n} \Delta EXCH_{t-i} + \varepsilon_t\end{aligned} \quad (3)$$

The macro-prudential index is estimated using a principal component analysis on all the macro-prudential indicators used. Broadly, the most commonly used

macro-prudential policy indicators (MPIs) include tools to address threats to financial stability that may arise from excessive credit expansion and asset price booms (dynamic capital buffers, dynamic provisions, loan-to-value (LTV), debt service-to-income, reserve requirements, ceilings on credits); tools to address core amplification mechanisms to systemic risk due to leverage (caps on foreign currency lending, limits on net open currency positions, levy on non-core funding); tools to avoid structural vulnerabilities in the financial system and reduce systemic spillovers with respect to stress and then infrastructural policies (disclosure policy for markets as well as institutions that are targeting systemic risk and resolution requirements for SIFIs) (IMF, 2011; Financial Stability Board, FSB, 2011; Bank for International Settlement, BIS, 2011). IMF classification noted also that there are core indicators that are applicable to most economies and then encouraged indicators.

However, Selialia, Mbeleki, and Matlapeng (2010) elucidated three main approaches of identifying MPIs, these are following the standards established by international organisations (IMF, 2011; Financial Stability Board, FSB, 2011; Bank for International Settlement, BIS, 2011). Following the underpinning economic theories of financial instability (monetary approach, risk of bank runs, uncertainty, credit rationing and asymmetrical information and theories of financial fragility) and the third approach is the interactions between the financial sector and other sectors of the economy. This follows that indicators used in measuring financial instability can serve as proxy for MPIs although they are a little different in that financial instability measures cover the whole economy while MPIs cover other parts of the economy as

counterparties to the financial sector, then MPIs were fallout from the 1980s, 1990s crisis, and financial instability indicators are fallout from the EU integration (Muo, 2012). IMF (2011) guide has greatly narrowed the two indicators and can thus be used interchangeably given that both measures have the same goal. Selialia et. al. (2010) have noted that there should be sensible basis for choosing an indicator, it must be empirically robust and such indicator must have a strong relationship with financial instability as well as have predictive powers.

This study thus follows the second approach of determining the MPIs by using the measures of financial stability as defined by the financial stability and financial policy regulation department of CBN. Thus, following Muo (2012), the Macro-prudential Policy Indicators employed are ratio of non-performing loans to total loans, core liquid assets to total assets, liquid assets to short term liabilities, ratio of regulatory capital to risk-weighted assets, ratio of tier one capital to risk-weighted assets, ratio of interest margin to gross income, personnel costs to non-interest expenses and then the ratio of non-interest expenses to gross income.

DATA SOURCES

The measures of the macro-prudential policy instruments in the Nigerian context is sourced from the framework as provided by CBN (2012). Quarterly data spanning from the first quarter of 2007 to the fourth quarter of 2018, 48 data points are employed

Table 1: Measures, Sources and Appriori Expectations of Variables Employed

Variable	Definition	Measures	Appriori Expectation	Source
Loans	Loans growth at time t	Changes in the total loans made by commercial banks.	Dependent Variable	CBN, 2018 4th Quarter Bulletin
CAP_t	Capital ratio at time t	Capital ratio defined by total equity divided by total assets.	(+)	CBN, 2018 4th Quarter Bulletin
MPI_t	Macro-prudential Policy Index at time t.	Derived from Principal component analysis of the various Macro-prudential policy instruments used	(+)	CBN, 2018 Financial Soundness Indicators
$crisis_t$	Financial Crisis at time t.	Dummy variable with 1 assigned to periods which at least one commercial bank merged and 0 otherwise.	(-)	
INV_t	Investment Growth rate at time t	Gross fixed capital formation as a ratio of Gross Domestic Output	(+)	CBN, 2018 4th Quarter Bulletin
$EXCH_t$	Exchange Rate at time t.	The official rate of Nigeria naira to a dollar	(+)	CBN, 2018 4th Quarter Bulletin

Source: Authors' Construct

EMPIRICAL FINDINGS AND DISCUSSION

To estimate equations (3), the study employs the Autoregressive distributed lag model. The ARDL estimation technique is preferred and novel in estimating a short run and long run components of the model. More also, the ARDL is very much applicable in estimating models that have a different order of integration of variables, I(0) and I(1) variables. When variables are found to be non-stationary at level, one option in order to get the short run

dynamic is to estimate the model by differencing the variables if these differences are stationary. However, this method will lead to a considerable loss of long-run properties of the data. Alternatively, economic variables may be combined together in levels provided that they are co-integrated. The issue of co-integration then applies when two series are integrated after the first difference I(1), but a linear combination of them is stationary at level I(0); in this case, the regression of one on the other is not spurious, but instead, tells us something about the long-run relationship between them (Wooldridge, 2004).The study uses the Kwiatkowski-Phillips-Schmidt-Shin, KPSS (1992) unit root test statistic to examine the stationarity of the variables while the Peseran, Shin and Smith (2001) bound co-integration technique is employed in determining the co-integration of the series. The results are presented in Table 2.

Table 2: Unit Root Test Result

Variables	KPSS at Level		KPSS at First Difference		Decision
	Test Statistics	5% Critical Value	Test Statistics	5% Critical Value	
CAP	0.085886	0.463000	-	-	Stationary at Level
Crisis	0.177381	0.463000	-	-	Stationary at Level
EXCH	0.737651	0.463000	0.180461	0.463000	Stationary at 1st Difference
log(INV)	0.367851	0.463000	-	-	Stationary at Level
log(LOANS)	0.841983	0.463000	0.333918	0.463000	Stationary at 1st Difference
MPI	0.186167	0.463000	-	-	Stationary at Level

*** Implies Statistically Significant at 1%, * Implies Statistically Significant at 5%*

Source: Authors Construct using Data extracted from CBN Bulletin

Examining Table 1, we can conclude that the variables CAP, crisis, log(INV) and MPI are stationary at levels as their test statistics are less than the 5% critical value thereby failing to reject the null hypothesis of the variables which are stationary at level for the described variables. The null hypothesis of the variables stationary at level is rejected for EXCH and log (LOANS) and as such, the variables are further tested at first difference. The result from the first difference shows that the test statistics for the two variables are less than the 5% critical value and we thus fail to reject the null hypothesis but conclude that the two variables are stationary at first difference. Given that the order of integration are mixed such that some of the variables are integrated at levels and others are integrated at first difference, there is a need to test for the co-integration of the variables, this is done by conducting the ARDL bound test for co-integration as explained by Pesaran, Shin and Smith (2001) which is presented in Table 3.

Table 3: ARDL Bounds Co-integration Test Result

F-statistics	Degree of Freedom	I0 Bound at 5%	I1 Bound at 5%
5.823080	7	2.32	3.5

***** Implies Statistically Significant at 1%, * Implies Statistically Significant at 5%***

Source: Author's Construct using Data extracted from CBN Bulletin

The ARDL Bounds co-integration test is useful for testing for co-integration of variables that are integrated at varying levels which are I(0) and I(1). It is important for co-integration to exist for there to be stability in the long run. To do this, we compare the f-statistics and the critical values at 5% for both the lower bound (I(0) and the upper bound I(1). If the f-statistics is less than the I(0) lower bound critical value, we conclude that there is no co-integration associated with the model; if the f-statistics is above the I(1) upper bound critical value, we conclude that there is co-integration and as such, stability can be achieved in the long run. However, if the f-statistics is between

the lower bound I(0) 5% critical value and the upper bound I(1) 5% critical value, the decision is inconclusive. From Table 3, we can thus see that the f-statistics is higher than the upper bound 5% critical value, hence there is co-integration associated with the regression result. Having identified that there is co-integration, we proceed to estimate the Autoregressive Distributed Lag Model (ARDL).

Table 4: ARDL) Result: Dependent Variable: $\Delta\log(LOANS)_{t-1}$

Long Run				Short Run			
Variable	**Coefficient**	**t-Stat**	**Prob.**	**Variable**	**Coefficient**	**t-Stat**	**Prob.**
CAP_t	0.008084**	3.31	0.0012	$\Delta\log(LOANS)_{t-1}$	-0.339855	-2.02	0.0541
MPI_t	0.368113	0.72	0.4785	ΔCAP_t	-0.003856	-0.82	0.4177
$CRISIS_t$	0.355815	1.43	0.1649	ΔCAP_{t-1}	-0.006528*	-2.10	0.0457
$CAP*MPI_t$	-0.009078*	-2.34	0.0394	ΔMPI_t	-0.049414	-0.80	0.4324
$CAP*MPI*CRISIS_t$	-0.008251*	-2.14	0.0257	$\Delta CRISIS_t$	-0.018025**	-3.80	0.0006
$LOG(INV)_t$	-0.53469**	-2.82	0.0093	$\Delta CRISIS_{t-1}$	-0.049695	-1.79	0.0862
$EXCH_t$	0.000746	0.36	0.7189	$\Delta(CAP*MPI)_t$	0.003342	0.99	0.3294
C	13.63877**	7.56	0.0000	$\Delta CAP*CRISIS*MPI_t$	-0.001262**	-3.17	0.0071
				$\Delta\log(INV)_t$	0.054217	1.51	0.1445
				$\Delta\log(INV)_{t-1}$	0.063227	1.62	0.1175
				$\Delta EXCH_t$	0.001419*	2.54	0.0175
				$CointEq_{t-1}$	-0.152996**	-3.06	0.0052

Diagnostic Test Result

R-squared	0.993356	BG f-Stat	1.643464
Adjusted R-squared	0.988572	BG f-Prob	0.2152
F-statistic	207.6496**	J-B stat	14.645**
Prob(F-statistic)	0.000000	J-B Prob	0.0007
Durbin-Watson stat	2.358870	AIC Model Selection	(2, 2, 1, 2, 1, 0, 2, 1)
Ramsey RESET f-stat	0.007180	Wald test (long run $\beta's\ \chi^2_{stat}$)	20.80959**
Ramsey RESET Prob.	0.9332	Wald test (long run $\beta's\ \chi^2_{Prob}$)	0.0041
BPG χ^2_{stat}	0.595120		
BPG χ^2_{Prob}	0.8702		

*** Implies Statistically Significant at 1%, * Implies Statistically Significant at 5%*

Source: Authors Construct using Data extracted from CBN Bulletin

The result from Table 4 shows that there is a negative and significant impact of macro-prudential policies interacting with capital adequacy on banks' lending rate. The implication of this is that with macro-prudential policies, the cyclicality between banks' lending and capital strength is counter. Thus, we can conclude that macro-prudential policies reduce the pro-cyclicality between capital and bank lending. For the period during crisis, the coefficient which is given as -0.008251 is lower than the coefficient when macro-prudential policies interact with banks' lending without crisis in absolute terms (-0.009078) and thus, it shows that the potency of macro-prudential policies in reducing the pro-cyclicality between banks' lending and her capital is affected during crisis, although it reduces the cyclicality, but is affected during crisis. The result supports the finding of Olszak, Roszkowska and Kowalska (2019) who found that macro-prudential policies reduce the pro-cyclicality between loans and banks' lending in 60 countries. Other relevant studies that support our findings are Labonne and Lame (2014); Gambacorta and Murcia (2018); Cerutti, Claessens and Leaven (2017). However, it is not in tandem with their findings that it is more effective during crisis. A possible reason for their findings is that the countries examined are developed countries in Europe and the Baltic nations. The implication of this is that the regulatory authority needs to be more proactive during the period of crisis so that the macro-prudential policies will be effective in reducing the pro-cyclicality between loans and capital adequacy ratio during crisis.

We can easily analyze our results as reported in table 4. From table 4, it can be seen that there is a positive impact of capital adequacy on bank lending as this is statistically significant in the long run. However, in the short run, there is a negative impact of capital strength of the bank on bank lending which shows the counter-cyclicality of the relationship between bank lending and capital adequacy, although this is statistically significant at 10%. The implication of this finding is that, in the short run, shortages in the capital for

banks do not deter them from giving out loans, but in the long run, banks cannot continue to buffer the shortage in the capital and thus, will be pro-cyclical in the long run.

The result shows that in the period where at least one of the banks is in crisis, its lending rate is not affected in the long run, although this is not statistically significant. However, in the short run, crisis results in a decrease in the lending rate of banks. A possible reason why in the long run, the crisis does not deter banks from lending is that the Central Bank of Nigeria has consistently taken proactive measures to counter the effect that crisis has on banking rate and the economy as a whole. Also, the managements of those banks are risk lovers and as such believe that lending can still create a positive externality towards the banks' recovery from the crisis. Further findings from the result show that the level of investment does not correlate with increases in loans given out by banks. However, exchange rate depreciation increases the intensity of banks' lending.

Also, the error correction term from Table 4 reveals that it is negative, statistically significant and as well less than one. The implication of this result is that the model is well formulated and any disequilibrium that is likely to arise in the share to medium run will adjust itself and thus be corrected in the long run. Better put, the degree of adjustment is -0.153, implying that about 15.3% of the disequilibrium is corrected in the long run. The result also shows that about 98.9% of the variations in the dependent variable (bank loans) is explained by the variations in the independent variables all put together. Also, the f-statistics result shows that there is a considerable harmony that is associated with the regression result as this is statistically significant at 1%. The result further shows that there is likely no serial correlation of first order associated with the regression result as the coefficient is close to 2. For higher order serial correlation, the Breusch Godfrey serial correlation test is conducted and from Table 4, it can be revealed that there is no serial

correlation of higher order as chi-square statistics fails to reject the null hypothesis of higher order correlation. The Jarque-Berra statistics test for the null hypothesis of the estimated trend being normally distributed as against the alternative hypothesis of not normal distribution. From the result, it can be revealed that the Jarque-Berra statistics is not normally distributed as the probability value suggests that we reject the null hypothesis of normal distribution.

CONCLUSION AND POLICY RECOMMENDATION

This study examined the possibility of macro-prudential policies in reducing the cyclicality encountered between capital and bank loans both during the banking crisis and without crisis. It has been rightly established in the literature that periods of low capital structure for banks follow a decline in bank loans and is more severe during the banking crisis. However, the monetary and the banking regulatory authority implement macro-prudential policies which will reduce this cyclicality. The case for Nigeria has been examined and the study finds that macro-prudential policies help in reducing the pro-cyclicality between bank loans and the extent of capital available for banks. The reduction in pro-cyclicality has however been found to be less effective during the crisis than when the financial industry is not in crisis.

Further to the aforementioned findings, the study discovered that in the short run, capital and bank loans are countercyclical in nature, however, this is reversed in the long run. The policy implication of this is that efforts made by banks to buffer the shortage in the capital by increasing lending cannot be sustained in the long run and thus, regulatory authority's macro-prudential policies are effective in reducing the pro-cyclicality between banks loans and capital adequacy of banks. Furthermore, exchange rate depreciation stimulates increases in bank loans in the short run, however, domestic

investment increases do not increase the tendency for bank loans to increase. Also, further policy implication that can be drawn from this study is that short term crisis does not deter banks from issuing out loans, however, in the long run, loans are greatly affected by the crisis within the system. It is also recommended that a quarterly appraisal of deposit money banks' loan structure be carried out by the monetary authority in order to ensure that loans issued out do not fall below the loans to deposit ratios; and default DMBs should be adequately sanctioned.

Our finding reveals that macro-prudential policies are able to ameliorate the impact which capital will have on lending, however, this is reduced during the period of crisis. There is a need for policymakers and the regulatory authority to focus attention on areas in which the macro-prudential policies will have a greater impact in reducing the pro-cyclicality. Also, the regulatory authority must strengthen their measures especially during the period of crisis.

REFERENCES

Alegria, A., Alfaro, R., & Córdova, F. (2017). The Impact of Warnings Published in a Financial Stability Report on Loan-to-Value Ratios. *BIS Working Paper No.* 633. Retrieved from

Ayyagari, M., Beck, T., & Peria, M.S.M. (2018). The Micro Impact of Macro-prudential Policies: Firm-Level Evidence. *IMF Working Paper*, WP/18/267.

Bank for International Settlement, (2011). *Macro-prudential Policy Tools and Frameworks:*

Census and Economic Information Center, (2019). Nigeria Capital Adequacy Ratio 2004 – 2017, Yearly.

Cerutti, E, Claessens, S., & Laeven, L. (2017). The Use of Macro-prudential Policies: New Evidence. *Journal of Financial Stability*, 28, 203-224.

Claessens, S., & Kose, M. A. (2013). Financial Crises: Explanations, Types, and Implications. *IMF Working Paper* No. 65. Retrieved from

Drehmann, M., & Tsatsaronis, K. (2014). The Credit-to-GDP Gap and Countercyclical Capital Buffers: Questions and Answers. *BIS Quarterly Review,* retrieved from:

Duniya, Y.B. (2012). Macro-Prudential Policies and Financial Stability: A Theoretical Background, *Economic and Financial Review,* 50(4), 184 – 192.

Fan, H., Keregero, C.M., & Gao, Q. (2017). The Application of Macro-prudential Capital Requirements in Managing Systemic Risk. *Complexity*, 1, 1 - 15

Fendoğlu, S. (2017). Credit Cycles and Capital Flows:Effectiveness of The Macro-prudential Policy Framework in Emerging Market Economies. *Journal of Banking and Finance.* 79,110–128.

Financial Stability Board, (2011). *Macro-prudential Policy Tools and Frameworks: ProgressReport to G20,* 27 October.

Gambacorta, L., & Murcia, A. (2018). The Impact of Macro-prudential Policies and their Interaction with Monetary Policy: An Empirical Analysis using Credit Registry Data. *Bank of International Settlement Working Papers,* No 636.

Duniya, Y.B. (2012). Macro-Prudential Policies and Financial Stability: A Theoretical Background, *Economic and Financial Review,* 50(4), 184 – 192.

Guérineau, S., Goujon, M., & Sawadogo, R. (2016). Macro-prudential Policies in the *Report of the FERDIDFID-ESRC Growth Research Programme.*

IMF, (2011). *Macro-prudential Policy Tools and Frameworks: Progress Report to G20,* 27 October.

Kishan, R., & Opiela, T. (2006). Bank Capital and Loan Asymmetry in the Transmission of Monetary Policy. *Journal of Banking and Finance*, 30, 259–285. doi:10.1016/j.jbankfin.2005.05.002

Kwiatkowski, D., Phillips, P.C.B., Schmidt, P., & Shin, Y. (1992). Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. *Journal of Econometrics*, 54, 159-178.

Labonne, C., & Lame, G. (2014). Credit Growth and Bank Capital Requirements: Binding or not?*Banque de FranceWorking Paper* 481.

Muo, I. (2012). Systemic Surveillance and Use of Macro-Prudential Indicators. *Economic and Financial Review,* 50(4), 86 – 106.

Olszak, M., Pipień, M., Kowalska, I., & Roszkowska, S. (2015). The Impact of Capital on Lending in Publicly-Traded and Privately-Held Banks in the EU. *Faculty of Management Working Paper Series*, (WPS7/2015), 1–25.

Olszak, M., Roszkowska, S., & Kowalska, I. (2019). Do Macro-prudential Policy Instruments Reduce the Pro-cyclical Impact of Capital Ratio on Bank Lending?Cross-Country Evidence. *Baltic Journal of Economics*, 19(1), 1-38,

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001).Bounds Testing Approaches to the Analysis of Level Relationship. *Journal of Applied Econometrics*, 16(3) 289–326.

Pramono, B., Hafidz, J., Maulana, J. A., Muhajir, H., Alim, M. S., Adamanti, J., & Alim, S. (2015). Dampak Kebijakan Countercyclical Capital Buffer Terhadap Pertumbuhan Kredit Di Indonesia (The Impact of Countercyclical Capital Buffer Policy to Credit Growth in Indonesia). Jakarta: Bank Indonesia*Working Paper No. WP/4/2015.*

Purnawan, M. E., & Nasir, M. A. (2015). The Role of Macro-prudential Policy to Manage Exchange Rate Volatility, Excess Banking Liquidity and Credits. *Buleting Ekonomi Moneter Dan Perbankan*, 18(1), 21–44.

Seliälia, F, Mbeleki, T., & Matlapeng, K. (2010). Macro-prudential Analysis of the Financial System: The Case of South Africa.*IFC Bulletin*, 33, 110 – 133.

Zhang, L., & Zoli, E. (2016). Leaning Against the wind: Macro-prudential policy in Asia. *Journal of Asian Economics*, 42, 33–52.

Zulkhibri, M. (2018). Macro-prudential Policy and Tools in a Dual Banking System: Insights from the Literature. *Borsa Istanbul Review.* Accepted Manuscript,

FOREIGN AID AND ECONOMIC GROWTH: DOES NON-LINEARITY MATTER?

Kehinde A. Tiamiyu
Department of Social Science Education,
University of Jos, Jos, Nigeria
ajaous@yahoo.com, ajaot@unijos.edu.ng
08039797929

Abstract

The age-long consensus in the literature, that lower level of foreign aid contributes positively to growth while higher level contributes negatively due to diminishing return and absorptive capacity issues brings to the fore the need; to investigate the possible non-linear relationship between foreign aid and growth over the period of 1981 and 2017 using threshold analysis approach; and to determine optimal foreign aid threshold for Nigeria. The conventional Augmented Dickey-Fuller (ADF) and Break-point unit root tests were both employed and compared for consistence. The overall findings showed that there exists one threshold upon which growth impact of aid can be felt, implying that the impact of net foreign aids received depends on the level of foreign aids. This therefore justifies the existence of a non-linear relationship between net foreign aids received and economic growth. Specifically, this is attributed to the fact that productive sectors of economy are not armed with enough liquidity, and by implication the role of domestic investment in output growth is undermined. Similarly, results showed that the only significant determinant of growth in Nigeria is government final consumption expenditure, implying that government spending boosts aggregate demand with positive multiplier effect on output in line with the Keynesian theory. The policy implication from this study: optimal levels of foreign aids above 0.11% of GDP should be considered effective for growth, generated, adhered to, and directed to productive sectors of the economy; strong institution, robust financial sector and conducive macroeconomic environment should be built to attract and make efficient use of higher aid flows. Besides, government spending should be biased towards stimulating the productiveness of the non-oil sector in the Nigerian economy.

Keywords: Foreign aid, Economic growth, and Threshold

JEL Classification: F21, F43, and C22

INTRODUCTION

The concept of official development finance or foreign aid takes root in the Charter of the United Nations adopted during Conference of San Francisco

in June 26th 1945. Members were committed to promote social progress and better standards of life in larger freedom, and to employ international machinery for the promotion of the economic and social advancement of all peoples. Rebuilding the world economy destroyed by the Second World War and promoting economic development worldwide has been the main concern of the world leaders since the 1950s. The first foreign aid was provided by the United States to its European allies through the Marshall Plan in the 1950s. The economic motive behind this was that economic recovery, particularly growth, was hampered by the deficiency of productive capacity, and aid affects the level of production by increasing capital stock as well as foreign exchange reserve (Ramiarison, 2010).

Developing countries are often trapped in the vicious circle of poverty as their growth is constrained by low savings and lack of adequate foreign exchange reserve. Indeed for the majority of developing countries, ex ante investment needs, determined by the Incremental Capital Output Ratio (ICOR), to generate long-run growth cannot always find a source of finance due to insufficient savings. In addition, their exports are limited mainly to primary goods where the terms of trade deteriorate in the long term, exacerbating foreign exchange shortfalls and thereby restricting imports of capital goods. This approach, known as the dual gap model, is used to determine the financing requirement gaps that must be removed in order to achieve the minimum required economic growth rate. Owing to the high risk of doing business and the imperfection of international capital market, poor countries find it difficult to attract private capital and to borrow on international markets. Consequently, foreign aid is considered as the appropriate means to ease these constraints by providing investible resources to supplement domestic savings (Ramiarison, 2010).

Similarly, developing countries, such as Nigeria, have been found to lack the necessary absorptive capacity to make good use of foreign aid inflows.

In the literature (see Agbloyor, Abor, Adjasi and Yawson (2014), Adeniyi, Omisakin, Egwaikhide and Oyinlola (2012), Ramiarison (2010), Durham (2004), Feeny and McGillivray (2009), Clemens, Radelet, Bhavnani, and Bazzi (2004), and Easterly, Levine and Roodman (2004)), the absorptive capacity is defined in terms of advanced technology, modern infrastructure, the necessary human capital, financial sector development, some degree of complementarity between foreign aid and domestic investment, and stable political and macroeconomic environments, to attract and make efficient use of aid flows. According to Ramiarison (2010), the absorptive capacity issues have two major implications, on the one hand, a relatively high level of aid inflows is more likely to lead to Dutch disease, weaker institutions, diminishing returns, low tax efforts, high level of consumption, low investment, large current account deficit, widening saving and foreign exchange gaps, and high aid dependency. On the other hand, country-specific strategies are needed to address these constraints at the first place before increasing aid inflows, and Harrod-Domar model (dual gap model) was not sufficient to determine the amount of aid to be given to a particular country. Being strongly motivated in pursuing self-interests, aid donors often bypass the absorptive capacity issue and tend to give aid irrespective of recipient's absorptive capacity.

In addition, there is a growing amount of literature (see Feeny and McGillivray (2009), Burnside and Dollar (2000), Collier and Dollar (2002), Collier and Hoeffler (2004) and Pattilo, Poirson and Ricci (2002)) on the newly discovered non-linear or *"inverted U-shaped"* relationship between foreign aid and economic growth. This finding indicates that there are diminishing returns to foreign aid due to recipient country having absorptive capacity constraints. The inverted U-shaped relationship between foreign aid and growth implies that at higher levels of aid, the marginal rate of return of aid on growth may fall to zero, or to less than zero, since recipients of foreign

aid, mostly developing countries, are unable to use such large aid flows productively (Feeny and McGillivray, 2009).

Furthermore, the next strand of argument is the possibility of macroeconomic variables having structural breaks and outliers. As Perron (1989) once said, "the series that were found to be non-stationary using the conventional unit root test (ADF) might turn out to be stationary around a deterministic trend usually attributed to a one-time shock such as recession, financial crisis, and oil price shock, among others." The advantages of unit root test that allow for structural breaks are two-fold: *first*, it prevents yielding a test result which is biased towards non-rejection as suspected by Perron (1989), and *second*, since this procedure (that is, breakpoint unit root test) can identify when possible presence of structural break occurred, then it would provide valuable information for analyzing whether a structural break on a certain variable is associated with a particular government policy, economic crises, war, regime shifts or other factors (Glynn, Perera and Verma, 2007). Hence, the need for a unit root test that allows structural breaks.

The present study contributes to the literature by investigating whether the relationship between foreign aid and growth in Nigeria is linear or non-linear and ascertaining the possible cause if the relationship eventually turns nonlinear. The paper is structured as follows: Section two discusses theoretical issues; section three contains a review of empirical literature; section four discusses the methodology and results of empirical analysis; and section five concludes the study.

THEORETICAL ISSUES

The Two-gap model of foreign aid was first developed by Chenery and Strout (1966) who identified the need to attract foreign capital, mostly foreign aid, to fill two gaps, namely; savings gap and foreign exchange gap. The savings

gap is the excess of domestic investment opportunities over domestic savings, causing investments to be limited by the available foreign exchange. The other gap, foreign exchange gap or constraint exists if a country supplies more foreign exchange to the rest of the world through imports than it receives foreign exchange from the rest of the world through exports. The result is the shortage of foreign exchange to import the inputs necessary for domestic production; hence the need to attract foreign capital to fill the foreign exchange gap.

The savings gap and foreign exchange gap can be derived from a typical open-economy national income accounting identity as follows:

Given that:

$$Y = C + I + G + X - M \qquad (1)$$

Where Y is output/income; C is consumption; I is investment; G is government expenditure; X is exports and M is imports, such that (X-M) represents net exports.

Subtracting C and G from both sides gives,

$$Y - C - G = I + (X - M) \qquad (2)$$

Where the left-hand side expression is the closed-economy national savings (which is the sum of private and public savings), that is,

$$S^N = S^{PR} + S^{PU} \qquad (3)$$

$$S^N = (Y - T - C) + (T - G) = Y - C - G \qquad (4)$$

Therefore, eq. (2) becomes,

$$S^N = I + (X - M) \qquad (5)$$

Subtracting investment (I) from both sides and multiplying by (-1), we have,

$$I - S^N = (M - X) \quad (6)$$

From eq. (6), the left-hand side expression is the **savings gap** while the right-hand expression is the **foreign exchange gap**. Since both gaps are mutually exclusive, foreign aid is required to fill them, that is,

$$I - S^N = F \quad (7)$$

$$(M - X) = F \quad (8)$$

Equivalently, eq. (8) and eq. (9) can be rewritten as:

$$I - S^N = (M - X) = F \quad (9)$$

Where F is the required amount of foreign aid.

When domestic investment (I) exceeds domestic savings (S^N), the domestic economy needs foreign aid to augment domestic savings so as to finance the required amount of investment. In this wise, foreign investors lay claims to future returns on domestic assets. The inflow of foreign capital can be in form of foreign direct investment, foreign portfolio investment and foreign remittances. On the other hand, when the country imports more than it exports, it requires some amount of foreign exchange to finance its import bill not covered by its export proceeds. The inflow of foreign exchange can be in form of foreign aid and grants, and external debts. Savings gap is prevalent mostly in developing countries which are capital-scarce, and therefore require some form of foreign capital to augment the little domestic savings. Also, these countries are usually faced with foreign exchange constraints because they rely mostly on primary product exports which command low prices on the global market.

Moreover, the Harrod-Domar growth model corroborates the Two-gap model by Chenery and Strout (1966) by emphasizing that countries experiencing a shortage in savings relative to investment should seek external capital in form of foreign aid or foreign private investment (that is, foreign direct investment and foreign portfolio investment) to fill the so-called investment-savings gap (Todaro and Smith, 2012). The Harrod-Domar growth model postulates that a positive relationship between savings and economic growth on the one hand, and a negative relationship exists between capital-output ratio and output growth. The model gave no role to labour force and technological progress later introduced and explained as determinants of output growth by the neo-classical and the endogenous growth models. However, it was able to identify the constraints faced by poor countries in their pursuit of development objectives since they have relatively low level of capital formation resulting from their low savings strength. The Harrod-Domar model, therefore, posits that poor countries can seek alternative ways of financing domestic investment by not only mobilizing more savings locally, but by also resorting to external ways of financing domestic investment so as to achieve their set development goals. Hence, the conclusion of seeking external capital in form of foreign aid brings to the fore the need to examine the extent to which aid can cause growth.

REVIEW OF THE EMPRICAL LITERATURE

Kolawole (2013) examines the impact of FDI and Official Development Assistance (ODA) on growth in Nigeria, using the Two-Gap model framework capturing the period 1980-2011. Results showed that while FDI impacts on growth negatively, ODA has no effect on real growth in Nigeria. A possible explanation behind the latter result might be that the bulk of foreign assistance meant for infrastructural development in the country were either siphoned or channeled to unproductive uses. Amassoma and Mbah (2014)

also examined the linkage between foreign aid and economic growth in Nigeria over the period 1981-2012 and found that foreign aid has a negative and non-significant impact on Nigerian economy thereby generating adverse effect on Nigeria's economic growth on the ground of weak institution. The insignificant result was attributed to unproductive use of the aid.

Orji, Uche, and Ilori (2014) have investigated the implications of four different types of foreign capital inflows, namely, FDI, Official Development Assistance (ODA), foreign portfolio investment, and remittances on output growth of West African Monetary Zone (WAMZ) over the period 1981-2010. The WAMZ countries captured in the study include, Nigeria, Liberia, Ghana, Gambia, Sierra Leone and Guinea. Their results showed that more than one form of foreign capital flows (mainly, FDI and ODA) contributed positively to output growth in Nigeria, whereas only ODA contributed positively to output growth in Sierra Leone and Ghana. It was also found that FDI was more growth enhancing in Nigeria and Gambia. Lastly, remittances had the highest contribution to growth in Liberia, whereas, none of the flows has positively impacted on the Guinean economy over the study period.

In a study conducted by Ugwegbe, Okafor and Akarogbe (2016), it was found that in the short run, external debt has a positive and insignificant effect on growth, whereas, foreign aid also have a positive and significant effect on growth. The reverse is the case in the long run, where external debt has a positive and significant effect on growth, whereas the effect of foreign aid on growth though, positive, is however not significant. This can be attributed to the fact that the bulk of foreign aid received is being channeled to meet consumption needs at the expense of productive investments that could stimulate growth.

Saibu and Obioesio (2017) also found that foreign aid impacts economic growth positively, though negligible, whereas the growth effect is

systematically conditioned on some factors among which include the quality of policies, the policy climate and quality of institution. Onakayo and Ogunade (2016) investigated foreign aid growth nexus in Nigeria over the period 1981 to 2010 and found strong evidence of foreign aid influence on economic growth in the long run but not in the short run. The findings parallel that of Olanrele and Ibrahim (2015), Fasanya and Onakoya (2012), and Nkoro and Furo (2012).

In addition, Burnside and Dollar (2000) examine the relationship among foreign aid, economic policies, and growth of per capita GDP. They found that aid has a positive impact on growth in developing countries with good fiscal, monetary and trade policies, but has little effect in the presence of poor policies. However, Easterly, Levine and Roodman (2004) replicated the study by Burnside and Dollar (2000) by extending the data end from 1993 to 1997 while retaining the latter's methodology. The authors did not find that aid promotes growth in good policy environment, in contrast, to the results obtained by Burnside and Dollar (2000). Also, Aurangzeb and Stengos (2010) in their investigation of aid-growth relationship in developing countries found no evidence that aid works better in better policy or geographical environments. They however found strong evidence that magnitude of aid is important for spurring the economic growth in recipient countries. Clemens et al (2004), on their own part, found that aid causes some degree of growth in recipient countries, though the magnitude of this relationship is modest, varies greatly across recipients, and diminishes at high levels of aid.

This paper investigates whether or not nonlinearity matters in the relationship between foreign aid and growth in Nigeria and possibly ascertains causes of those nonlinearities. It also offers a new approach in its investigation drawing evidence from Nigeria. Most studies examined the non-linear relation between foreign aids and economic growth using

quadratic or interactive terms.[1] This study differs from previous studies by employing the threshold regression to estimate the aids threshold and also to determine the presence of non-linearity in the nexus between foreign aids and output growth in Nigeria.

Methodology and Data Issues

Model Specification

To investigate the presence of non-linearities in the relationship between foreign aids and growth, this study adopts the threshold regression approach proposed by Hansen (1999) to time-series analysis of the Nigerian economy. Assume initially that the foreign aid-growth relation is specified in a linear regression model as below.

$$LRGDP_t = \alpha_0 + \alpha_1 AID_t + \beta Z + \varepsilon_t \qquad (10)$$

Where $LRGDP$ is the natural log of real GDP (a proxy for economic growth), AID is net foreign aid received (% of GDP), Z is a vector of control variables including gross capital formation government, final consumption expenditure and trade openness index and, α_0, α_1, β are regression parameters, and ε is the stochastic error term while subscript t is the time dimension.

Following the threshold framework developed by Hansen (1999), eq. (10) becomes

$$LRGDP_t = \alpha_0 + \alpha_1 X_t I(AID_t \leq \gamma) + \alpha_2 X_t I(AID_t > \gamma) + \beta Z + \varepsilon_t \qquad (11)$$

Where AID is the threshold variable and it is used to test for the presence of threshold effect of net foreign aid received on growth, γ denotes a threshold parameter. $I(.)$ is an indicator function that takes the value of 1 if AID is below a determined threshold value (γ) and 0 otherwise.

[1] Examples are Burnside and Dollar (2000), Collier and Hoeffler (2004), Clemens et al (2004), Easterly et al (2004), Levine and Roodman (2004), Feeny and McGillivray (2009), among others.

Eq. (11) can conveniently be divided into two regimes depending on whether the threshold variable is above or below the estimated threshold. The two regimes are distinguished by different regression slopes α_1 and α_2 in two equations as follows.

$$LRGDP_t = \alpha_0 \div \alpha_1 X_t + +\beta Z + \varepsilon_t \text{ if } AID_t \leq \gamma \quad (12)$$

$$LRGDP_t = \alpha_0 + \alpha_2 X_t + +\beta Z + \varepsilon_t \text{ if } AID_t > \gamma \quad (13)$$

Where eq. (12) represents the regime below the threshold, while eq. (13) describes the regime above the threshold. The vector of control variables (Z) is regime invariant.

Additionally, there is a need to identify the aid threshold and test for its presence. In order to identify the threshold, the first step eq. (11) is estimated by ordinary least squares (OLS). Then, the sum of squared errors (S_1) is computed for all possible values of the threshold variable (net foreign aids received in the present case), where $S_1 = \hat{\varepsilon}(\gamma)\hat{\varepsilon}(\gamma)$. In the second step, the threshold parameter is obtained by minimizingS_1, such that $\hat{\gamma} = argmin\gamma\, S_1(\gamma)$. Similarly, once the endogenous threshold is estimated, it is essential to test whether the threshold effect is statistically significant. The null hypothesis is that there is no threshold effect, that is,

$$H_0: \beta_1 = \beta_2 \quad (14)$$

The null hypothesis implies that the slope coefficients are equivalent in the two regimes. Therefore, under the H_0, the threshold model (eq.(11)) is equivalent to the linear model (eq.(10)). The likelihood ratio test of the null hypothesis is based on the F-statistic:

$$F_1 = (S_0 - S_1(\hat{\gamma}))\Big/\widehat{\sigma^2} \quad (15)$$

Where S_0 and S_1 are the sum of squared errors under the null and alternative hypotheses, while $\widehat{\sigma^2}$ is the estimate of the regression error variance (σ^2). Given that the threshold value is not identified under the null hypothesis, the asymptotic distribution of F_1 is not standard. As a solution, Hansen (1999) proposed a bootstrap method to simulate the probability value for the F-statistic (F_1).

DATA SOURCES

The data on relevant variables employed in this study, such as, real GDP (a proxy for economic growth), net foreign aids received (% of GDP), and other growth determinants including gross capital formation (a proxy for domestic investment), government final consumption expenditure and trade openness were collected from the World Bank's World Development Indicators (WDI, 2017) over the period of 1981 and 2017.

EMPIRICAL RESULTS AND DISCUSSION

Here, the results of preliminary analysis including descriptive statistics and unit root test are presented. This section also discusses the Threshold regression results.

Descriptive Statistics

Table 1 presents the summary statistics on the main variables used in the study over the period of 1981 to 2017. The average value of real GDP (log-levels) is approximately 26.03. Other variables including net foreign aids received (% of GDP), gross capital formation (% of GDP), government final consumption expenditure and trade openness have their respective means as 0.61%, 3.65%, 37.11% and 32.24%. In terms of volatility as measured by the coefficient of variation of each variable, net foreign aids received was the most volatile while the natural log of real GDP is the least volatile. In terms of the

shape of the probability density of each variable as accounted for by Jarque-Bera statistic, all variables, except the natural log of real GDP and trade openness, follow normal distribution ($p > 0.1$). Despite that the majority of the variables are well-behaved statistically, it is important to check the stationarity status of the variables, the issue which is addressed in the next section.

Table 1: Summary Statistics

Variable	Obs.	Mean	Standard deviation	Coefficient of variation (%)	Jarque-Bera statistics
LRGDP	37	26.034	0.492	1.890	3.749[0.153]
AID	37	0.606	0.923	152.310	344.502[0.000]
GCF	37	37.108	19.291	51.986	6.667[0.036]
GCONS	37	3.647	2.896	79.408	5.683[0.058]
TOP	37	32.238	12.737	39.509	1.892[0.388]

Source: Authors' computation, 2019.

The Unit Root Test Results

The results of the conventional Augmented Dickey-Fuller (ADF) unit root test and Break-point unit root test are shown in Table 2. Here, only test regressions that are close to rejecting the null hypothesis of nonstationarity are reported. Based on the ADF test, it can be observed that net foreign aids received and gross capital formation are stationary at levels; hence, they are said to be integrated of order zero, that is, I(0). Meanwhile, other variables including the natural log of real GDP, government final consumption expenditure and trade openness become stationary after first differencing; hence, they are said to be integrated of order one, that is, I(1). However, accounting for either intercept or trend breaks in the ADF test regression

makes all variables stationary at levels. Overall, this study takes a cue from the cautionary note pointed out by Perron (1989) that:

> *"a rejection of the null hypothesis of a unit root conditional on the possibility of shifts in the underlying trend function at known dates does not imply that the various series can be modeled as stationary fluctuations around a completely deterministic breaking trend function; as a matter of general principle, a rejection of the null hypothesis does not imply acceptance of a particular alternative hypothesis."*

Table 2: Results of Unit root Tests

	Conventional ADF Unit Root Test			Breakpoint Unit Root Test		
Variable	**Level**	**First Difference**	**(d)**		**(d)**	**Break dates**
LRGDP	-1.488[a]	-3.672**[a]	(1)	-5.046**[i]	(0)	2001
AID	-4.259***[a]	----------†	(0)	-7.066***[i]	(0)	2008
GCF	-3.889***[c]	----------	(0)	-7.189***[t]	(0)	2014
GCONS	-2.555[a]	-5.358***[a]	(1)	-5.732***[i]	(0)	2003
TOP	-2.202[b]	-7.376***[b]	(1)	-4.346*[t]	(0)	1998

Note: ***, ** indicate the rejection of the null hypothesis of a unit root at 5% and 10%, respectively; I(d) is the order of integration and it refers to the number of differencing required for a series to become stationary; †implies that a series that is stationary at levels does not require its first difference being reported. Superscripts a, b and c denote model with intercept and trend, and model with intercept only and model with none, respectively. Superscripts i and t represent break specification for intercept only and trend only. The break dates were determined endogenously using Dickey-Fuller t-stat.

Source: Authors' computation, 2019.

Threshold analysis of foreign aids-growth nexus

Table 3 presents the results of threshold estimates of the impact of net foreign aids received on economic growth after accounting for other determinants including gross capital formation, government final consumption expenditure and trade openness.

Contrary to expectations, there is a significant negative relationship between gross capital formation and economic growth across the two regimes of foreign aids. For every one percentage point in gross capital formation, real GDP declines on average by 2.3% keeping other variables constant. The implication of this is that since the productive sectors are not armed with enough liquidity, the role of domestic investment in output growth is undermined. Government final consumption expenditure has a positive impact on growth. A 1 percentage point increase in government final consumption expenditure leads on average to a 5.2% increase in real GDP keeping other variables constant. The coefficient is statistically significant at the 1% significance level, implying that government spending boosts aggregate demand with positive multiplier effect on output in line with the Keynesian theory. There is an expected negative relationship between trade openness and output growth. For every one percentage point in openness index, real GDP falls on average by 0.4% keeping other variables constant. The impact coefficient is however not statistically significant at the 10% level. Nonetheless, the result suggests the vulnerability of the Nigerian economy to external shocks due to its heavy reliance on crude oil proceeds.

Moreover, the null hypothesis of a linear relation between net foreign aids and growth is rejected since the Bai-Perron scaled F-stat exceeds the 5% critical level. The test showed that there exists one threshold, implying that the impact of net foreign aids received depends on the level of foreign aids.

This therefore justifies the existence of a non-linear relationship between net foreign aids received and economic growth. It is observed that net foreign aids below the estimated threshold of 0.11% of GDP are not considered sufficiently enough to spur growth. Meanwhile, levels of foreign aids above this threshold are considered effective to stimulate output growth.[2] The insignificance of the associated impact coefficient at the 10% level implies that Nigeria requires appropriate policies and institutions that would help improve the impact of foreign aids on real GDP growth. In addition, based on the adjusted coefficient of determination and F-statistics, the overall threshold model of growth is significant at the 1% level with the explanatory variables (growth determinants) jointly accounting for approximately 88% of total variation in growth.

Table 3: Threshold regression of the nexus between net foreign aids received and growth

	Regime 1: ($AID_t < \gamma$)	**Regime 2: ($\gamma \leq AID_t$)**
AID_t	-33.403***(8.431)	0.022 (0.032)
GCF_t	-0.023***(0.003)	-0.023***(0.003)
$GCONS_t$	0.052***(0.015)	0.052***(0.015)
TOP_t	-0.004 (0.003)	-0.004 (0.003)
C	28.258***(0.514)	26.746***(0.210)
Estimated threshold (γ) = 0.11		
Adj. R^2	0.879	
F-stat	46.075[0.000]	
Bai-Perron scaled F-stat = 16.472	5% critical value = 11.47	

Note: ***, ** indicate the statistical significance of coefficients at 1% and 5%, respectively; the values in parentheses and block brackets are, respectively, the standard errors and the probabilities.

Source: Authors' computation, 2019.

[2] This result parallels the findings of Feeny and McGillivray (2009), Aurangzeb and Stengos (2010) that the relationship between aid and growth is non-linear. It however contradicts the findings of Kolawole that foreign aids had no significant impact on growth.

CONCLUSION AND POLICY RECOMMENDATION

The study has so far investigated the possible non-linear relationship between foreign aid and economic growth in Nigeria between 1981 and 2017 using the threshold regression analysis approach. The conventional Augmented Dickey-Fuller (ADF) and Break-point unit root tests were both employed and compared for consistence. The overall findings showed that there exists one threshold upon which growth impact of aid can be felt, implying that the impact of net foreign aids received depends on the level of foreign aids. This therefore justifies the existence of a non-linear relationship between net foreign aids received and economic growth. The cause of nonlinearity is attributed to the fact that productive sectors of economy are not armed with enough liquidity, and by implication the role of domestic investment in output growth is undermined. Similarly, results showed that the only significant determinant of growth in Nigeria is government final consumption expenditure, implying that government spending boosts aggregate demand with positive multiplier effect on output in line with the Keynesian theory. This result parallels the findings of Feeny and McGillivray (2009), Aurangzeb and Stengos (2010) that the relationship between aid and growth is non-linear. It however contradicts the findings of Kolawole that foreign aids had no significant impact on growth.

The policy implication, based on these findings, is that optimal levels of foreign aids above 0.11% of GDP should be considered effective for growth, generated, adhered to, and directed to productive sector of the economy; strong institution, robust financial sector, stable political and conducive macroeconomic environment should be built in to attract and make efficient use of higher aid flows. In addition, government spending should be biased towards stimulating the productiveness of the non-oil sector in the Nigerian economy. Researchers that are interested in carrying out similar study on the

Nigerian economy should try to identify a mechanism through which aid is generated.

REFERENCES

Adeniyi, O., Omisakin, O., Egwaikhide, F. O., & Oyinlola, A. (2012). "Foreign Direct Investment, Economic Growth and Financial Sector Development in Small Open Developing Economies". *Journal of Economic Analysis and Policy*, vol. 42(1), 105-127

Agbloyor, E., Abor, J., Adjasi, C., & Yawson, A. (2014). "Private Capital Flows and Economic Growth in Africa: The Role of Domestic Financial Markets". *Journal of International Financial Markets, Institutions and Money*, 2(3), 1-33

Amassoma, D., & Mbah, S. (2004). The Linkage between Foreign Aid and Economic Growth in Nigeria. *International Journal of Economic Practices and Theories.* 4(6), 2247-7225.

Aurangzeb, Z., & Stengos, T. (2010). Foreign Aid and Economic Growth in Developing Countries: Revisiting the Evidence by using a Threshold regression Approach. Retrieved from https://editorialexpress.com/cgiin/conference/download.cgi?db_name=CEA2010&paper_id=89

Burnside, C., & Dollar, D. (2000). Aid, Policies and Growth. *The American Economic Review*, 90(2), 847-868.

Chenery, H., & Strout, A. (1966). Foreign Assistance and Economic Development. *American Economic Review*, 56(4), 679-733.

Clemens, M., Radelet, S., Bhavnani, R., & Bazzi, S. (2004). Counting Chickens When They Hatch: Timing and the Effects of Aid on Growth. *Centre for Global Development Working Paper 44.*

Collier, P., & Dollar, D. (2002). Aid Allocation and Poverty Reduction. *European Economic Review*, 46, 1475-1500.

Collier, P., & Hoeffler, A. (2004). Aid, Policy and Growth in Post-Conflict Societies. *European Economic Review*, 48, 1125-1145.

Durham, J. B. (2004). "Absorptive Capacity and the Effects of Foreign Direct Investment and Equity Foreign Portfolio Investment on Economic Growth". *European Economic Review*, 48(1), 285-306

Easterly, W., Levine, R., & Roodman, D. (2004). Aid, Policies and Growth: Comment. *The American Economic Review*, 94(3), 774-780.

Fasanya, I. O., & Onakoya, A. B. (2012). Does Foreign Aid Accelerate Economic Growth? An Empirical Analysis for Nigeria. *International Journal of Economics and Financial Issues, 2(4),* 423-431.

Feeny, S., & McGillivray, M. (2009). Aid Allocation to Fragile States: Absorptive Capacity Constraints. *Journal of International Development*, 21, 618-632.

Glynn, J., Perera, N., & Verma, R. (2007). Unit Root Tests and Structural Breaks: a Survey with Applications. *Revista De Metodos Cuantitativos Para La Economica Y La Empresa*, 3(1), pp. 63-79.

Hansen, B. (1999). Threshold effects in non-dynamic panels: estimation, testing, and inference. *Journal of Econometrics, 93*, 345-368.

Kolawole, B. O. (2013). Foreign Assistance and Economic Growth in Nigeria: the Two-Gap Model Framework. *American International Journal of Contemporary Research*, 3(10), 153-160.

Nkoro, E., & Furo, A. O. (2012). Foreign Capital Inflows and Economic Growth in Nigeria: An empirical approach. *Academic Journal of Interdisciplinary Studies*, 1(2), 55-71.

Olanrele, I. A., & Ibrahim, T.M. (2015). Does Developmental Aid Impact or Impede on Growth: evidence from Nigeria. *International Journal of Economics and Financial Issues.* 5(1), 288-296.

Onakoya, A. B., & Ogunade, A. O. (2016). Foreign Aid and Economic Growth Nexus in Nigeria: Johansen Co-Integration Approach. *Nigerian Inquiry in the Humanities (NITH).* 2(1), 52-73.

Orji. A., Uche, A. S., & Ilori, E. A. (2014). Foreign Capital Inflows and Growth: an Empirical Analysis of WAMZ Experience. *International Journal of Economics and Financial Issues*, 4(4), 971-983.

Pattilio, C., Poirson, H., & Ricci, L. (2002). External Debt and Growth. IMF Working Paper No. WP/02/69.

Perron, P. (1989). "The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis". *Econometrica*, 57(6), 1361-1401.

Ramiarison, H. A. (2010). Assessing the Developmental Role of Foreign Aid in Developing Countries: a Special Reference to the Role of Japan's Aid in Far East Asia. *Institute of Developing Economies, Japan External Trade Organization, Visiting Research Fellows (VRF)*, Series No. 462.

Saibu, O., & Obioesio, F. (2017). Foreign Aid, Fiscal Optimality and Economic Growth in Nigeria. *SPOUDAI Journal of Economics and Business*, 67(4), 85-99

Todaro, M., & Smith, S. C. (2012). *Economic Development (*11th Edition*)*. USA: Pearson Education Incorporated.

Ugwebe, S. U., Okafor, I. G., & Akarogbe, C.A. (2016). The Effect of External Borrowing and Foreign Aid on Economic Growth in Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 6(4), 115-175.

APPENDIX A

Table 5: Data on Natural log of real gross domestic product (LRGDP), Net foreign aid received (AID), Gross capital formation (GCF), Government final consumption expenditure (GCONS) and Trade openness

YEAR	LRGDP	AID	GCF	GCONS	TOP
1981	25.60148041	0.023863779	89.38105309	1.776405725	18.17172618
1982	25.53102158	0.024480042	85.93389861	2.106434616	13.77983316
1983	25.41534038	0.048148764	75.75213499	2.077116614	10.04496861
1984	25.40412145	0.044077407	58.94737865	2.091335722	9.380541231
1985	25.46156952	0.042999047	46.39087543	1.939839163	10.39197861
1986	25.46217879	0.106047068	54.95058655	1.929235512	9.135845723
1987	25.49367867	0.128369554	49.98770883	1.632708798	19.49533511
1988	25.56445419	0.2378321	43.64421915	1.55269831	16.94060969
1989	25.58346613	0.781763794	52.48869056	1.315222341	34.18261725
1990	25.69480074	0.472057454	53.18668521	1.220140672	30.92474008
1991	25.69837786	0.525912542	48.40571697	1.220981843	37.02160486
1992	25.74364939	0.54152192	43.77938896	2.0476286	38.22738831
1993	25.72308826	1.039268797	44.48885975	2.148452483	33.71975493
1994	25.7047723	0.560576239	42.08362086	1.769021017	23.05923645
1995	25.70404539	0.47877484	37.23966698	1.166196047	39.52837841
1996	25.74514822	0.369548679	36.62555769	0.911234588	40.25772925
1997	25.77409615	0.366962806	38.47745854	0.912570547	51.46101079
1998	25.79958117	0.372389959	40.6149508	1.375668403	39.27860747
1999	25.80540544	0.255993447	38.34181136	1.383378315	34.45783118
2000	25.85434735	0.250256459	34.10954141	2.123442197	48.99559947
2001	25.9118394	0.226690766	30.92588983	1.990621474	49.68050029
2002	26.05445948	0.314040391	27.58250942	1.340487984	40.03516859
2003	26.12535769	0.29534291	29.38679832	0.951746573	49.33496486
2004	26.21383144	0.424361802	27.11796542	4.787637353	31.89587044
2005	26.27622877	3.634611621	26.18958967	4.54454697	33.05946007
2006	26.33505816	4.841917482	27.86558554	5.125841682	42.5665658
2007	26.39888828	0.710601409	21.24460887	9.448340036	39.33693151
2008	26.46434331	0.383852725	19.8969961	9.428957363	40.79683535
2009	26.54164619	0.561610543	22.04953582	8.649947944	36.05871041
2010	26.6186596	0.564828446	17.562103	8.848100208	43.32075684
2011	26.67037809	0.441069335	16.3605621	8.572152255	53.27795833
2012	26.71180848	0.417124489	14.95882591	8.228177843	44.53236805
2013	26.77639077	0.4885213	14.90390593	7.15521853	31.04885995
2014	26.83757729	0.435990261	15.80270277	6.464486121	30.88519372
2015	26.86375849	0.491634187	15.49010409	6.688120383	21.44692967
2016	26.84745766	0.617371288	15.36673615	5.384281786	20.72251888
2017	26.85548423	0.893900292	15.47432765	4.624482393	26.347599

Source: World Development Indicator (WDI, 2017)

VOLUME 8, NO.3, DECEMBER 2019

ARTICLES

ISSN 0189-0998