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## Effects of Exchange Rate Movements On Economic Growth in Nigeria

Eme O. Akpan<sup>1</sup> and Johnson A. Atan<sup>2</sup>

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*This study investigates the effect of exchange rate movements on real output growth in Nigeria. Based on quarterly series for the period 1986 to 2010, the paper examines the possible direct and indirect relationship between exchange rates and GDP growth. The relationship is derived in two ways using a simultaneous equations model within a fully specified (but small) macroeconomic model. A Generalised Method of Moments (GMM) technique was explored. The estimation results suggest that there is no evidence of a strong direct relationship between changes in exchange rate and output growth. Rather, Nigeria's economic growth has been directly affected by monetary variables. These factors have tended to sustain a pattern of real exchange rate, which has been unfavourable for growth. The conclusion is that improvements in exchange rate management are necessary but not adequate to revive the Nigerian economy. A broad program of economic reform is required to complement the exchange rate policy adopted.*

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**Keywords:** Exchange rate; Nigeria; output growth; simultaneous equations; VAR.

**JEL Classification:** E5; E6

### 1.0 Introduction

Exchange rate policies in developing countries are often sensitive and controversial, mainly because of the kind of structural transformation required, such as reducing imports or expanding non-oil exports, which invariably imply a depreciation of the nominal exchange rate. Such domestic adjustments, due to their short-run impact on prices and demand, are perceived as damaging to the economy. Ironically, the distortions inherent in an overvalued exchange rate regime are hardly a subject of debate in developing economies that are dependent on imports for production and consumption.

The debate rather focuses on the degree of fluctuations in the exchange rate in the face of internal and external shocks. There appears a consensus view on the fact that devaluation or depreciation could boost domestic production through stimulating the net export component. This is evident through the increase in international competitiveness of domestic industries leading to the diversion of spending from foreign goods whose prices become high, to domestic goods. As illustrated by Guitan (1976) and Dornbusch (1988), the success of currency depreciation in promoting trade balance largely depends on switching demand in proper direction and amount as well as on the capacity of the home economy to meet the additional demand by supplying more goods. On the whole, exchange rate fluctuations are likely, in turn, to determine economic performance. It is therefore necessary to evaluate the effects of exchange rate fluctuations on output growth and price inflation.

In Nigeria, the exchange rate policy has undergone substantial transformation from the immediate post-independence period when the country maintained a fixed parity with the British

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pound, through the oil boom of the 1970s, to the floating of the currency in 1986, following the near collapse of the economy between 1982 and 1985 period. In each of these epochs, the economic and political considerations underpinning the exchange rate policy had important repercussions for the structural evolution of the economy, inflation, the balance of payments and real income.

Hence, the focus of this research is to examine the effect of exchange rate movements on economic growth in Nigeria. Specifically, the possible direct and indirect relationships are investigated. Some previous attempts have been made to conduct econometric studies on exchange rate determination and the movements in output in Nigeria, Egwaikhide et al (1994), Ekpo (2004); Akinlo and Odusola (2001), among others. However, these earlier works were based on single equation regression approach. This study deviates from the previous ones in Nigeria by employing a simultaneous equation modeling approach and its structural variant in which movements in output are driven by several fundamental disturbances - monetary, exchange rates (official and parallel), and income.

The rest of the paper is presented in four sections. In section 2, exchange rate policies in Nigeria are discussed. Section 3 reviews related literature. The empirical model and estimation is presented in section 4, while section 5 summarizes, and concludes the paper.

## **2.0 Developments in Exchange Rate Policy in Nigeria**

The objectives of an exchange rate policy include determining an appropriate exchange rate and ensuring its stability. Over the years, efforts have been made to achieve these objectives through the applications of various techniques and options to attain efficiency in the foreign exchange market. Exchange rate arrangements in Nigeria have transited from a fixed regime in the 1960s to a pegged regime between the 1970s and the mid-1980s and finally, to the various variants of the floating regime from 1986 with the deregulation and adoption of the structural adjustment programme (SAP). A managed floating exchange rate regime, without any strong commitment to defending any particular parity, has been the most predominant of the floating system in Nigeria since the SAP.

Following the failures of the variants of the flexible exchange rate mechanism (the AFEM introduced in 1995 and the IFEM in 1999) to ensure exchange rate stability, the Dutch Auction System (DAS) was re-introduced on July 22, 2002. The DAS was to serve the triple purposes of reducing the parallel market premium, conserve the dwindling external reserves and achieve a realistic exchange rate for the naira. The DAS helped to stabilize the naira exchange rate, reduce the widening premium, conserve external reserves, and minimize speculative tendencies of authorized dealers. The foreign exchange market has been relatively stabilized since 2003.

As indicated by Mordi (2006), The conditions that facilitated the re-introduction of DAS in 2002 included, the external reserve position which could guarantee adequate funding of the market by the CBN; reduce inflationary pressures; instrument autonomy of the CBN and its prompt deployment of monetary control instruments in support of the DAS as well as the bi-weekly

auctions as against the previous fortnightly auctions, thus assuring a steady supply of foreign exchange.

In order to further liberalize the market, narrow the arbitrage premium between the official inter-bank and bureau de change segments of the markets and achieve convergence, the CBN introduces the Wholesale Dutch Auction System (WDAS) on February 20, 2006. This was meant to consolidate the gains of the retail Dutch Auction System as well as deepen the foreign exchange market in order to evolve a realistic exchange rate of the naira. Under this arrangement, the authorized dealers were permitted to deal in foreign exchange on their own accounts for onward sale to their customers. These exchange rate regimes have had some implication for economic performance. This is discussed in the ensuing section.

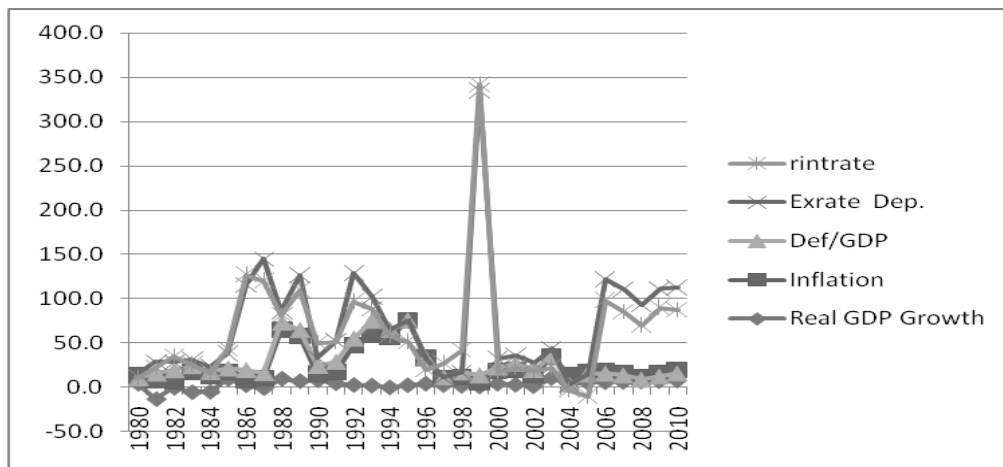
### **2.1 Exchange Rate Movement and Macroeconomic Performance**

Contained in Figure 1 is a graphical illustration of exchange rate movements and selected macroeconomic variables. Analysis of Nigeria's exchange rate movement from 1970-2010 suggests a causal relationship between the exchange rate movements and macroeconomic aggregates such as inflation, fiscal deficits and economic growth. Evidently, the persistent depreciation of the exchange rate trended with major economic variables such as inflation, GDP growth, and fiscal deficit/GDP ratio. In this context, the exchange rate movement in the 1990's trended with inflation rate. A close observation of Figure 1 indicates that during periods of high inflation rate, volatility in the exchange rate was high, which was also reversed in a period of relative stability. For instance, while the inflation rate moved from 7.5 per cent in 1990 to 57.2 per cent and 72.8 per cent in 1993 and 1995 respectively, the exchange rate moved from ₦8.04 to \$1 in 1990 to ₦22.05 and ₦81.65 to a dollar in the same period. When the inflation rate dropped from 72.8 per cent in 1995 to 29.3 per cent and 8.5 per cent, in 1996 and 1997 respectively, and rose thereafter to 10.0 per cent in 1998 and averaged 12.5 per cent in 2000-2009, the exchange rate trended in the same direction. A similar trend was observed for fiscal deficit/GDP ratio and GDP growth rate as shown in Figure 1.

In summary, a tentative conclusion emerging from the trend analysis is that exchange rate movements engender inflation and there is some association between exchange rate movements and economic growth. However, an empirical analysis is required to determine the exact relationship existing between the variables.

### **3.0 Theoretical Literature**

The earliest and leading theoretical foundation for the choice of exchange rate regimes rests on the optimal currency area (OCA) theory, developed by Mundell (1961) and McKinnon (1963). This literature focuses on trade, and stabilization of the business cycle. It is based on concepts of the symmetry of shocks, the degree of openness, and labor market mobility. According to the theory, a fixed exchange rate regime can increase trade and output growth by reducing exchange rate uncertainty and thus the cost of hedging, and also encourage investment by lowering currency premium from interest rates. However, on the other hand it can also reduce trade and output growth by stopping, delaying or slowing the necessary relative price adjustment process.



**Figure 1: Trend of Exchange Rate and Selected Macroeconomic Indicators in Nigeria (1980-2010)**

*Source: Underlying data from Central Bank of Nigeria Statistical Bulletin Various Years*

Later theories focused on financial market stabilization of speculative financial behaviour as it relates particularly to emerging economies. According to the theory, a fixed regime can increase trade and output growth by providing a nominal anchor and the often needed credibility for monetary policy by avoiding competitive depreciation, and enhancing the development of financial markets (see Barro and Gordon (1983), Calvo and Vegh (2004), Edwards and Savastano (2000), Eichengreen et al (1999), and Frankel (2003) among others).

On the other hand, however, the theory also suggests that a fixed regime can also delay the necessary relative price adjustments and often lead to speculative attacks. Therefore, many developing and emerging economies suffer from a “fear of floating,” in the words of Calvo and Reinhart (2002), but their fixed regimes also often end in crashes when there is a “sudden stop” of foreign investment (Calvo, 2003) and capital flight follows, as was evident in the East Asian and Latin American crises and some sub-Saharan African countries.

Not surprisingly, there is little theoretical consensus on this question of regime choice and subsequent economic growth in the development economics literature as well. While the role of a nominal anchor is often emphasized, factors ranging from market depth (or the lack of it), political economy, institutions and so on often lead to inclusive suggestions as to which exchange rate regime is appropriate for a developing country (Frankel et al (2001), Montiel (2003), Montiel and Ostry (1991)). The literature in development economics acknowledges the importance of the effects of the level of development to the relationship between regime and growth (see Berg et al (2002), Borensztein and Lee (2002), Lin (2001), McKinnon and Schnabel (2003), and Mussa et al (2000) among others).



### 3.1 Empirical Literature

There is a vast body of empirical literature on the impacts of exchange rate devaluation on output and prices. In many of the existing studies, it has been recognized that the possible effects of devaluation on output could be contractionary. To this extent, several channels through which devaluation could be contractionary have been identified.

First, Diaz-Alejandro (1965) examined the impacts of devaluation on some macroeconomic variables in Argentina for the period 1955–61. He observed that devaluation was contractionary for Argentina because it induces a shift in income distribution towards savers, which in turn depresses consumption and real absorption. He equally observed that current account improved because of the fall in absorption relative to output.

Cooper (1971) also reviewed twenty-four devaluation experiences involving nineteen different developing countries during the period 1959–66. The study showed that devaluation improved the trade balance of the devaluing country but that the economic activity often decreased in addition to an increase in inflation in the short term.

In a similar study, Gylfson and Schmidt (1983) also constructed a log-linear macro model of an open economy for a sample of ten countries, using different estimates of the key parameters of the model. Their results showed that devaluation was expansionary in eight out of ten countries investigated. Devaluation was found to be contractionary in two countries (the United Kingdom and Brazil). The main feature of the studies reviewed above is that they were based on simulation analyses.

The few studies on contractionary devaluation based on regression analysis include those of Edwards (1989), Agénor (1991), and Morley (1992). In a pool-time series/ cross-country sample, Edwards (1989) regressed the real GDP on nominal and real exchange rates, government spending, the terms of trade, and measures of money growth. He found that devaluation tended to reduce the output in the short term even where other factors remained constant. His results for the long-term effect of a real devaluation were more mixed; but as a whole it was suggested that the initial contractionary effect was not reversed subsequently. In the same way, Agénor (1995) using a sample of twenty-three developing countries, regressed output growth on contemporaneous and lagged levels of the real exchange rate and on deviations of actual changes from expected ones in the real exchange rate, government spending, the money supply, and foreign income. The results showed that surprises in real exchange rate depreciation actually boosted output growth, but that depreciations of the level of the real exchange rate exerted a contractionary effect.

Another study by Mireille (2007) argues that overvaluation of exchange rates have constituted a major setback in the recovery process of Nigeria and Benin Republic. In addition, the author suggests that devaluation accompanied with well-targeted measures alongside an upward adjustment in the domestic price of tradable goods, could restore exchange rate equilibrium and improve economic performance.

In a related study, Aliyu et al (2009) examined exchange rate pass-through in Nigeria for the period 1986 to 2007. Quarterly series was employed and a vector Error Correction Model estimation was used in the estimation process. The authors found that exchange rate pass-through in Nigeria during the period under consideration was low and declined along the price chain, which partly overturns the conventional wisdom in the literature that exchange rate pass-through is always considerably higher in developing countries than developed countries. The authors conclude that in the long run, pass through would likely increase and monetary policy should be designed to accommodate the effect.

### **3.2 Empirical Issues on Exchange Rate and Output**

Morley (1992) analyzed the effect of real exchange rates on output for twenty eight developing countries that have devalued their currencies using a regression framework. After the introduction of controls for factors that could simultaneously induce devaluation and reduce output including terms of trade, import growth, the money supply, and the fiscal balance, he discovered that depreciation of the level of the real exchange rate reduced the output.

Kamin and Klau (1998) using an error correction technique estimated a regression equation linking the output to the real exchange rate for a group of twenty seven countries. They did not find that devaluations were contractionary in the long term. Additionally, through the control of the sources of spurious correlation, reverse causality appeared to alternate the measured contractionary effect of devaluation in the short term although the effect persisted even after the introduction of controls. Apart from the findings from simulation and regression analyses, results from VAR models, though not focused mainly on the effects of the exchange rate on the output per se, are equally informative.

Ndung'u (1993) estimated a six-variable VAR—money supply, domestic price level, exchange rate index, foreign price index, real output, and the rate of interest—in an attempt to explain the inflation movement in Kenya. He observed that the rate of inflation and exchange rate explained each other. A similar conclusion was also reached in the extended version of this study (Ndung'u 1997).

Rodriguez and Diaz (1995) estimated a six-variable VAR—output growth, real wage growth, exchange rate depreciation, inflation, monetary growth, and the Solow residuals—in an attempt to decompose the movements of Peruvian output. They found that output growth could mainly be explained by “own” shocks but was negatively affected by increases in exchange rate depreciation as well.

Rogers and Wang (1995) obtained similar results for Mexico. In a five-variable VAR model—output, government spending, inflation, the real exchange rate, and money growth—most variations in the Mexican output resulted from “own” shocks. They however noted that exchange rate depreciations led to a decline in output. Adopting the same methodology, though with slightly different variables, Copelman and Wermer (1996) reported that positive shocks to the rate of exchange rate depreciation, significantly reduced credit availability, with a negative impact on the output. Surprisingly, they found that shocks to the level of the real exchange rate

had no effects on the output, indicating that the contractionary effects of devaluation are more associated with the rate of change of the nominal exchange rate than with the level of the change of the real exchange rate. They equally found that “own” shocks to real credit did not affect the output, implying that depreciation depressed the output through mechanisms other than the reduction of credit availability.

It is important to mention the work of Odusola and Akinlo (2001) who examined the linkage among exchange rate, inflation and output in Nigeria. A structural VAR model was employed which captured the interactions between exchange rate and output. Evidence from the contemporaneous models showed a contractionary impact of the parallel exchange rate on output only in the short term. Prices, parallel exchange rate and lending rate were found to be important sources of perturbations in the official exchange rate. In addition, output and parallel exchange rate were significant determinants of inflation dynamics in Nigeria. The authors concluded by suggesting more concerted efforts by the Central Bank towards taming the parallel exchange rate behavior and formulating monetary policies that enhance income growth. Largely the findings were informative. Batini (2004) and Mordi (2006) present similar arguments in different studies on Nigeria. On the contrary, Aliyu et al (2009) find that prices react less proportionately to exchange rate shock in Nigeria.

In conclusion, most of the econometric analyses indicated that devaluations (either increases in the level of the real exchange rate or in the rate of depreciation) were associated with a reduction in output and increase in inflation. The studies reviewed above equally supported the existence of a contractionary devaluation in the sampled countries. However, most cases of contractionary devaluations had been focused on Latin America and other developed nations. Only few studies had been conducted on the issue in sub-Saharan Africa, particularly Nigeria, thus, warranting research on the subject.

#### 4.0 Methodology

For the purpose of the analysis, Nigeria is treated as a small open developing economy, which is affected by world market fluctuations. The model employed in the research draws on the structural macroeconomic model of Edwards and Sebastein (2000)<sup>3</sup>. It includes all the basic elements of the financial programming framework used by the international Monetary Fund. This work enhances the original Sebastein (2000) model by adding exchange rate as an open economy indicator. The basic idea is to determine the relation between growth and exchange rate while allowing for other key influences on both variables. These are presented accordingly.

#### Output Equation

The output equation expresses real GDP as a function of monetary and fiscal variables such that;

$$\ln Yr_t = \beta_0 + \beta_1 \ln Ms_t + \beta_2 \ln ex_t + \beta_3 \ln ex_{t-1} + \beta_4 \ln inf_t + \beta_5 \ln yr_{t-1} + \varepsilon_t \quad (1)$$

where

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<sup>3</sup>See Edwards and Sebastein (2000) for detailed specification of the model.

$\ln inf_t$	rate of inflation (this is the Nigerian Consumer Price Index)
$\ln inf_{t-1}$	a proxy for the expected inflation rate at time t
$\ln Yr_t$	growth rate of real GDP
$\ln Yr_{t-1}$	Lag of real GDP
$\ln exr_t$	nominal exchange rate
$\ln Ms_t$	Growth rate of Money Supply ( $M_2$ )
$\ln$	Natural Logarithm
$t$	time subscript

$Yr$  is real output proxied by real GDP, and  $inf_t$  is inflation rate,  $ex$  is exchange rate, while  $yr_{t-1}$  represents the lag of real output and  $\varepsilon$  is the error term.

### Exchange Rate Equation

$$\ln EX_t = \mu_0 + \mu_1 \ln Yr_t + \mu_2 \ln inf_t + \mu_3 \ln ex_{t-1} + \mu_4 \ln Ms_t + \varepsilon_t \quad (2)$$

where  $Ms$  is money supply while other variables are as previously defined

$\ln inf_t$	rate of inflation (this is the Nigerian Consumer Price Index)
$\ln inf_{t-1}$	a proxy for the expected inflation rate at time t
$\ln Yr_t$	growth rate of real GDP
$\ln Yr_{t-1}$	Lag of real GDP
$\ln exr_t$	nominal exchange rate
$\ln Ms_t$	Growth rate of Money Supply ( $M_2$ )
$\ln$	Natural Logarithm
$t$	time subscript

### The Inflation Equation

The specification considers the monetarist perspective and expresses inflation as functionally related to money supply, real output, expected inflation and exchange rate, such that;

$$\ln inf_t = \alpha_0 + \alpha_1 \ln MS_t + \alpha_2 \ln Yr + \alpha_3 inf_{t-1} + \alpha_4 ex_t + \varepsilon_t \quad (3)$$

Where  $inf$  indicates inflation rate,  $MS$  is money supply (broadly defined);  $Yr$  is real output proxied by real GDP, and  $inf_{t-1}$  is a proxy for expected inflation while  $ex$  is exchange rate and  $\varepsilon$  is the error term.

$\ln inf_t$	rate of inflation (this is the Nigerian Consumer Price Index)
$\ln inf_{t-1}$	a proxy for the expected inflation rate at time t
$\ln Yr_t$	growth rate of real GDP
$\ln Yr_{t-1}$	Lag of real GDP
$\ln exr_t$	nominal exchange rate
$\ln Ms_t$	Growth rate of Money Supply ( $M_2$ )
$\ln$	Natural Logarithm
$t$	time subscript

## 4.2 Data and Sources

The study employs quarterly series covering the period 1986-2010. This period is chosen as it corresponds to the period where uniform and consistent data on the relevant variables are available. More importantly, this period witnessed several exchange rate regimes. Data for the work are drawn from the International Monetary Fund (IMF) Financial Statistics and the Central Bank of Nigeria (CBN) statistical Bulletins. As a working definition of the real exchange rate, the nominal exchange rate is nominal exchange rate adjusted with the ratio of the foreign price level (US CPI, as a proxy for the price of tradables) and the domestic price level (Nigerian CPI as a proxy for price of non-tradables). This definition follows the purchasing power parity condition.

## 5.0 Estimation Technique

The estimation technique begins with determining the time series properties of the data and followed by cointegration tests. Thereafter, the system estimation was performed using the Generalised Method of Moments (GMM) procedure. The GMM estimation technique is preferred given its inherent ability to produce unbiased estimators even with lagged dependent variables acting as instruments. It is capable of avoiding biased results due to correlation between the error term and the lagged endogenous variables. In addition it has the potential of obtaining consistent parameter estimates even in the presence of measurement error and endogenous right-hand side variables in a system equation estimation procedure.

### 5.1 Time Series Properties of the Variables

Prior to the estimations, unit root tests were performed on the series to determine their level of stationarity. The result of the stationarity test using the Augmented Dickey-Fuller (ADF) test is reported in Table 1. Evidently, all the variables were stationary after first differencing, indicating that they are I(1) variables. Specifically, the ADF statistic for Inflation rate (INF) is 2.945047 (in absolute terms) and is less than the critical value of the ADF statistic (3.540328). Similarly, the ADF statistic for real exchange rate (REXRA) is 2.627754 which is less than the critical value of the ADF statistic (3.202445) in absolute terms. This implies that all the variables were characterized by the presence of unit root at level but were found stationary at their first difference. The same trend is observed for all the series. However, for the first differences of the variables, the ADF test statistic of each of the series is greater than the 5 per cent critical value of the ADF statistic in absolute terms. This implies that all the variables are 1(1). Since most of the variables follow an I(1) process, the next step is to test if a long run relationship (cointegration) exists among the variables.

### 5.2 Co-integration Test Results

The existence of cointegration between the regressand and regressors were assessed. This required running a Johansen cointegration test based on VAR model of the equations. The Johansen Maximum Likelihood procedure is preceded by an estimation of a vector autoregressive (VAR) model at its optimal lag length since the procedure is very sensitive to the appropriate lag length. In the selection of appropriate lag length, VAR lag order selection criteria include:

**Table 1: Results of Unit Root Tests Based on Augmented Dickey-Fuller (constant, time trend included).**

Variable	Lags	ADF-Statistic	ADF-Critical Value	Conclusion
Inf	0	-2.945047	-3.540328	Unit Root
D(inf)	1	-6.014894	-3.548490	No Unit Root
exr	0	-2.627754	-3.202445	Unit Root
D(exr)	1	-4.687903	-3.204699	No Unit Root
yt	5	-1.926870	-3.562882	Unit Root
D(yt)	1	-5.157989	-3.548490	No Unit Root
Ms	0	-1.422362	-3.540328	Unit Root
D(Ms)	1	-4.865157	-3.548490	No Unit Root

*Note: The  $H_0$  is that a series is non-stationary against alternative hypothesis  $H_1$  of a series being stationary. The rejection of  $H_0$  for the ADF test is based on the MacKinnon critical values. The lag lengths were determined in accordance with the SIC.*

**Source:** Underlying data from unit root test

sequential modified Likelihood Ratio test (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQ). The appropriate lag length is the one supported by more of the five criteria. As a result of the small number of observations and the need to save the degrees of freedom, the highest and optimal lag length adopted was two for each of the equations.

As the result of the test statistics show, the hypothesis of no cointegration among the variables can be rejected and at least two cointegrating vectors exist among the variables of interest. Evidently, the max-Eigen value reveals two co-integrating equations in the analysis. The PT-matrix of the beta coefficients from the Johansen cointegrating analysis and the preferred cointegrating equations of the model are presented in Table 2.

**Table 2: Cointegration Test Results Using Johansen's Maximum Likelihood**

Model	Optimal lag length Selected	Trace Statistic		Maximum Eigen value		Conclusion
		Cointegration Rank	level of Significance	Cointegration Rank	level of Significance	
Output equation	2	1	1%	2	1%	Cointegrated
Exchange Rate Equation	1	2	1%	1	1%	Not Cointegrated
Inflation Equation	1	1	1%	1	1%	Cointegrated

### 5.3 System Estimation Results

Following the existence of cointegrating relations among the equations, the system was estimated using a Generalised Method of Moments (GMM) technique. The results are contained in Table 3. The results for each equation are presented below.

**Table 3: Estimation Results**

<p><b>1. Output-Equation</b></p> $\text{LnYr}_t = 1.746 + 1.209\text{yr}_{(t-1)} + 0.575\text{inf}_t + 0.4750\text{Ms}_t + 0.200 \text{Lnex}_t$ <p>T-Statistic: (2.667)* (3.2092)* (2.683)* (1.923)** (1.627)</p> <p><math>\bar{R}^2 = 0.6258</math>, DW= 2.078</p> <p>Instruments: <math>Y_t</math>; <math>y_{t-1}</math>; <math>\text{inf}(t-1)</math>; <math>\text{ex}(t-1)</math>; Constant</p>
<p><b>2. Exchange Rate Equation</b></p> $\text{Lnex}_t = 2.1196 - 0.3312\text{LnYr}_t - 0.2888\text{Inf}_t + 0.8153 \text{Lnex}(t-1) - 1.6906\text{Ms}_t$ <p>T-Statistic: (2.7785)* (1.4826) (1.9115)** (2.6603)* (2.5800)*</p> <p><math>\bar{R}^2 = 0.5379</math>; DW= 1.90</p> <p>Instruments: <math>Y_t(t-1)</math>; <math>\text{ex}</math>; <math>\text{inf}(t-1)</math>; <math>\text{MS}</math>; Constant</p>
<p><b>3. Inflation Equation</b></p> $\text{Ln Inf}_t = 3.2531 + 0.852\text{Ms}_t - 0.5521\text{LnYr}_t + 0.4253\text{LnInf}(t-1) + 0.3420 \text{Lnex}_t$ <p>T-Statistic: (4.1372)* (2.7298)** (2.5760)** (3.9112)* (2.3400)**</p> <p><math>\bar{R}^2 = 0.6143</math>; DW= 1.801</p> <p>Instruments: <math>\text{Inf}</math>; <math>\text{Inf}(t-1)</math>; <math>\text{Yr}(t-1)</math>; Constant</p>

Note: \*, \*\*, represent significance at 1% and 5% respectively

Source: From system estimations.

The interpretation begins with the result of the output equation. The result demonstrates that real output, is determined by the lag of real GDP, inflation and money supply, with a positive relationship existing among the variables. With an explanatory power of 62.6 per cent, it can be said that the exogenous variables fit reasonably well, while the D.W statistic of 2.01, indicates absence of first order serial correlation. This demonstrates that Nigeria’s economic growth has been directly affected by monetary variables.

A striking feature of the finding is the relationship between exchange rate and output. Exchange rate is significant in determining output in Nigeria. It is interesting to note that growth and real exchange rate were positively related, and the estimated coefficient was statistically significant. The result confirms what is normally expected, i.e. real exchange rate depreciation associated with an increase in growth. This outcome is repeated in the exchange rate equation. This suggests that slower income growth can put pressure on the exchange rate. Thus, within the context of the model, the direct relation between the real exchange rate and real income growth is negative. Money supply and lag of real exchange rate are significant in explaining variations

in real exchange rate and conform to the expected signs. Theoretically, increased supply of foreign exchange should lead to increased money growth, however, when the demand for foreign exchange exceeds its supply a depreciation of the local currency results.

From the result of the inflation equation it is evident that growth in money supply and real output have the expected signs and are significant at 5% level. The coefficient of lagged exchange rate is highly significant, indicating that depreciation of exchange rate exerts upward pressure on inflation.

Largely, some of the results confirmed theoretical expectations while others did not and not all coefficients were statistically significant. However, an interesting feature of the model is the use of lags and natural logarithms which made the model dynamic. A more disaggregated formation is suggested for further research to provide an alternative means of examining the issues.

## 6.0 Conclusions and Recommendations

Certain policy implications arise from the findings. Principal among them is that exchange rate depreciation affects both output and money supply. It demonstrates the need for a monetary policy framework that complements the existing exchange rate policy.

On the whole, this paper has provided empirical estimates of the relation between exchange rate and economic growth in Nigeria. The results suggest that there is a statistically significant direct relationship between the two variables. The vector auto regression results also demonstrate that real exchange rate and real income are significantly cointegrated. In the long run, the exchange rate and income may drift apart, but in a short run their relationship is strong and direct. Given this, there is need to improve on the existing exchange rate management framework in Nigeria. This can influence the rate of income growth, but only in the context of a broad based economic reform involving a complementary monetary policy.

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## Foreign Private Investment and Economic Growth in Nigeria: A Cointegrated VAR and Granger causality analysis

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*This research uses a cointegration VAR model to study the contemporaneous long-run dynamics of the impact of Foreign Private Investment (FPI), Interest Rate (INR) and Inflation rate (IFR) on Growth Domestic Products (GDP) in Nigeria for the period January 1970 to December 2009. The Unit Root Test suggests that all the variables are integrated of order 1. The VAR model was appropriately identified using AIC information criteria and the VECM model has exactly one cointegration relation. The study further investigates the causal relationship using the Granger causality analysis of VECM which indicates a uni-directional causality relationship between GDP and FDI at 5% which is in line with other studies. The result of Granger causality analysis also shows that some of the variables are Granger causal of one another; the null hypothesis of non-Granger causality is rejected at 5% level of significance for these variables.*

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**Keywords:** Cointegration, VAR, Granger Causality, FPI, Economic Growth

**JEL Classification:** G32, G24

### 1.0 Introduction

The use of Vector Autoregressive Models (VAR) and Vector Error Correction Models (VECM) for analyzing dynamic relationships among financial variables has become common in the literature, Granger (1981), Engle and Granger (1987), MacDonald and Power (1995) and Barnhill, et al. (2000). The popularity of these models has been associated with the realization that relationships among financial variables are so complex that traditional time-series models have failed to fully capture.

Engle and Granger (1987) noted that, for cointegrated systems, the VAR in first differences will be miss-specified and the VAR in levels will ignore important constraints on the coefficient matrices. Although these constraints may be satisfied asymptotically, efficiency gains and improvements in forecasts are likely to result from their imposition. Hence, Engle and Granger (1987) suggested that if a time-series system under study includes integrated variables of order 1 and satisfy the conditions of cointegration relations, then this system will be more appropriately specified as a vector error-correction model (VECM) rather than a VAR. Comparisons of forecasting performance of VECMs versus VARs for cointegrated systems are reported in Engle and Yoo (1987) and Lesage (1990). The results of these studies indicate that the VECM is a more appropriate specification in terms of smaller long-term forecast errors, when the variables satisfy cointegration conditions.

Subsequently, Ahn and Reinsel (1990) and Johansen (1991) have proposed various algorithms for the estimation of cointegrating vectors in full-order VECM models, which contain all non-

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zero entries in the coefficient matrices. There are many examples of the use of full order VECM models in the analysis of short-term dynamics and long-term cointegrating relationships Reinsel and Ahn (1992), Johansen( 1992, 1995).

Problems can arise in relation to the use of full-order VECM models, as such models assume nonzero elements in all their coefficient matrices. As the number of elements to be estimated in these possibly over-parameterized models grows with the square of the number of variables, the degrees of freedom is heavily reduced.

## 2.0 Materials and Method

Data used in this paper are annual figures covering the period 1970 – 2009 and variables of the study are FPI, GDP, INF and INT. This is obtained from the Central Bank of Nigeria (CBN) statistical bulletin. The theoretical model, which also serves as a basic frame work of our statistical analysis, is the Vector Autoregressive model of order p. VAR models are built based on the economic variables that are assumed to be stationary. However, many time series variables especially economic variables that occur in practice are non-stationary. Regressing two or more non-stationary variables may produce a spurious result.

As suggested by Box and Jenkins (1976), differencing such variables may make them stationary. Most economic variables are stationary in the first difference. However, differencing removes some long run information (Johansen, 1990). Engle and Granger (1987) introduced the concept of cointegration. Two or more non stationary series are cointegrated if their linear combination is stationary. Thus, the procedures for determining the order of integration as well as the cointegration rank are presented. Thereafter, causality analysis is carried out using Granger Causality approach. Finally, impulse response and forecast variance decomposition are discussed.

For a set of k variables,  $y_t = (y_{1t}, \dots, y_{kt})'$ , a VAR (p) model captures their dynamic inter relationships given by

$$y_t = \delta + \psi D_t + \phi_1 y_{t-1} + \dots + \phi_p y_{t-p} + \varepsilon_t \quad (1)$$

We can rewrite equation (1) as

$$\phi(L)y_t = \delta + \psi D_t + \varepsilon_t \quad (2)$$

where  $\phi(L) = 1 - \sum_{j=1}^p \phi_j L^j$ ,  $y_t = (y_{1t}, y_{2t}, \dots, y_{kt})'$  is a set of *k*th time series variables,  $\delta$  is the constant term,  $D_t$  denote the regressors associated with deterministic terms,  $\psi$  is the seasonal dummy and structural break,  $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{kt})'$  is a vector of an unobserved zero means independent white noise process with time invariant positive definite covariance matrix  $E(\varepsilon_t \varepsilon_t') = \Sigma_k$ , and  $\phi(L) = 1 - \phi_1 L - \phi_2 L^2 - \dots - \phi_p L^p$  is a matrix of a lag polynomial with k x k coefficient matrices  $\phi_j$ ,  $j = 1, 2, \dots, p$ . Equation (2) can be rewritten as:

$$(1 - \phi_1 L - \phi_2 L^2 - \dots - \phi_p L^p) y_t = \partial + \psi D_t + \varepsilon_t \tag{3}$$

where  $\phi(L) = (1 - \phi_1 L - \phi_2 L^2 - \dots - \phi_p L^p)$  is the characteristics polynomial. Each entry in the  $k \times k$  matrix is a polynomial in  $L$  of order  $p$ .

If there is a Cointegration relationship among the variables, the analysis of such process is easily done with a model called Vector Error Correction Model (VECM), which is given by:

$$\Delta y_t = \pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \dots + \Gamma_{p-1} \Delta y_{t-p+1} + \partial + D_t \psi + \varepsilon_t \tag{4}$$

where  $\pi = -(I_n - \phi_1 - \phi_2 - \dots - \phi_p)$  and  $\Gamma_j = -(\phi_{j+1} + \dots + \phi_p)'$  for  $(j = 1, 2, \dots, p-1)$ . We obtain Equation (4) by subtracting  $Y_{t-1}$  from both sides and rearranging Equation (2). Since  $\Delta Y_t$  does not contains stochastic trends by our assumption that all variances should be  $I(1)$ , the mean term  $\pi X_{t-1}$  is the only one which includes  $I(1)$  variables. Hence,

$\pi y_{t-1}$  must also be integrated of order 0,  $I(0)$ . This contains the  $\Gamma_j$ ,  $(j = 1, 2, \dots, 1-p)$

which are often referred to as the short-run dynamic or short-run parameters while  $\pi y_{t-1}$  is sometimes called the long-run part. The model in 4 is abbreviated as VECM (P-1). To distinguish the VECM from VAR model the latter is sometimes called the level version (Lutkepohl, 1991). If the VAR (p) has a unit root, that is; if  $\det(I_k - \phi_1 z - \phi_2 z^2 - \dots - \phi_p z^p) = 0$  for  $z = 1$ , then the matrix  $\pi$  is singular.

Suppose it has rank  $r$ , that is,  $\text{rank}(\pi) = r$ . Then it is well known that  $\pi$  can be written as product of  $\pi = \alpha \beta'$ , where  $\alpha$  and  $\beta$  are  $k \times k$  matrices with  $\text{rank}(\alpha) = \text{rank}(\beta) = r$ . Pre-multiplying  $\pi Y_{t-1} = \alpha \beta' Y_{t-1}$  by  $(\alpha' \alpha)^{-1} \alpha'$  shows that  $\beta' Y_{t-1}$  is  $I(0)$  and therefore contains the cointegrating relations. Hence, there are  $r = \text{rank}(\pi)$  linearly independent cointegrating relations among the components of  $Y_t$ . The matrices  $\alpha$  and  $\beta$  are not unique so there are many possible  $\beta$  matrices which contain the cointegrating relations or linear transformations of them. Consequently, relations with economic content cannot be extracted purely from the observed time series. Some non-sample information is required to identify them uniquely.

Assuming that all the short run dynamics, constant terms and deterministic terms are equal to zero we have:

$$\Delta Y_t = \pi Y_{t-1} + \varepsilon_t \tag{5}$$

Now, taking the expectation of equation 5 we have:

$$\begin{aligned} 0 &= E(\pi Y_{t-1}) + E(\varepsilon_t) \\ \Rightarrow 0 &= \pi Y_{t-1} \end{aligned} \tag{6}$$

As a set of  $r$  equilibrium conditions which guide the evolution of  $Y_t$  overtime and  $\alpha\beta'Y_{t-1}$  will contribute  $\alpha_{11}\beta_1'Y_{t-1} + \alpha_{12}\beta_2'Y_{t-1} + \dots + \alpha_{1r}\beta_r'Y_{t-1}$  to the explanation of  $\Delta Y_t$ . The linear combinations of  $Y_t$  will have zero expected values and finite variances so that not only will zero be the expected value of these terms but will also be meaningful in that there will be a non-trivial probability of being “close” to it. In contrast, if the variances are to go to infinity as the sample size increases, then the expected value would become important as it occurs with non-stationary linear combination (Engle and Granger, 1987), and translates this into a requirement measures should be zero mean and stationary.

Augmented Dickey-Fuller (ADF) Unit Root and the Dickey Fuller-Generalized Least Square (DF-GLS) tests are applied to test for level of integration and possible co-integration among the variables (Dickey and Fuller, 1979; Said and Dickey, 1984), and is given by the regression equation

$$\Delta Y_t = \mu_0 + \mu_1 t + \phi Y_{t-1} + \sum_{j=1}^p \alpha_j \Delta Y_{t-j} + \varepsilon_t, \quad t = p+1 \dots T \quad (7)$$

Where  $p$  lags of  $\Delta Y_{t-j}$  are added to remove serial correlation in the residuals.

### **Hypothesis:**

$H_0 : \phi = 0$  (there is unit root in the series).

$H_1 : \phi < 0$  (the series are stationary)

The hypothesis is tested on the basis of t-statistic of the coefficient  $\phi$

**Decision rule:** Reject  $H_0$  if test statistic is less than critical values, otherwise do not reject.

The ADF-GLS test is a variant of the Dickey Fuller test for unit root (for the case where the variable to be tested is assumed to have a non-zero mean or to exhibit a linear trend). The difference is that the de-meaning or de-trending of the variable is done using the GLS procedure suggested by Elliott et al. (1996). This gives a test of greater power than the standard Dickey-Fuller approach. Elliot et al (1996) optimized the power of the ADF Unit root test by detrending. If  $y_t$  is the series under investigation, the ADF –GLS Test is based on testing

$H_0 : \psi^* = 0$  against  $H_1 : \psi^* \neq 0$  in the regression equation:

$$\Delta y_t^d = \psi^* y_{t-1}^d + \psi_1 \Delta y_{t-1}^d + \dots + \psi_{p-1} \Delta y_{t-p+1}^d + u_t$$

where  $y_t^d$  is the detrended series. (8)

**Decision rule:** Reject  $H_0$  if test statistics is less than critical values.

(See Haris and Sollis, 2004 for details).

### 2.1 Estimation of VECM

Estimation of VECMs of the form:

$$\Delta Z_t = \Phi(B)\Delta Z_{t-1} + \mu + \beta e_{t-1} + v_t \tag{9}$$

is discussed in many texts (see Banerjee et al. 1993; Hamilton, 1994; Johansen 1995), and routines are available in most econometric packages. Without going into unnecessary details, ML estimates are obtained in the following way: Consider (9) written as

$$\Delta Z_t = \mu + \sum_{i=1}^{m-1} \Phi_i \Delta Z_{t-i} + \beta \alpha^T Z_{t-1} + v_t \tag{10}$$

The first step is to estimate (10) under the restriction  $\beta \alpha^T = 0$ . As this is simply a VAR (m-1) in  $\Delta Z_t$ . OLS estimation will yield the set of residuals  $\hat{v}_t$ , from which we calculate the sample covariance matrix

$$s_\alpha = T^{-1} \sum_{t=1}^T \hat{v}_t \hat{v}_t^T \tag{11}$$

The second step is to estimate the multivariate regression

$$Z_{t-1} = k + \sum_{i=1}^{m-1} \Xi_i \Delta Z_{t-i} u_t \tag{12}$$

and use the OLS residuals  $\hat{u}_t$  to calculate the covariance matrices

$$s_{11} = T^{-1} \sum_{t=1}^T \hat{u}_t \hat{u}_t^T \tag{13}$$

and

$$S_{10} = T^{-1} \sum_{t=1}^T \hat{u}_t \hat{v}_t^T = s_{01} \tag{14}$$

### 2.2 Cointegration Rank Test

If  $r = n$  and  $A$  is unrestricted, the maximized log-likelihood is given by Banerjee *et al.* (1993) as:

$$\ln = K - \left(\frac{T}{2}\right) \sum_{i=1}^n \log(1 - \lambda_i) \tag{15}$$

Where  $K = -(T/2)(n(1 + \log 2\pi) + \log |s_\infty|)$ . For a given value of  $r < n$ , only the first  $r$  Eigen values should be positive, and the restricted log likelihood is

$$L(r) = K - (T/2) \sum_{i=1}^r \log(1 - \lambda_i) \quad (16)$$

A likelihood ratio test of the hypothesis that there are  $r$  cointegration vectors against the alternative that there are  $n$  is thus given by

$$\eta_r = 2(L(n) - L(r)) = -T \sum_{i=r+1}^n \log(1 - \lambda_i) \quad (17)$$

This is known as the trace statistic, and testing proceeds in the sequence  $\eta_1, \eta_2, \dots, \eta_{n-1}$ . A cointegrating rank of  $r$  is selected if the last significant statistic is  $\eta_{r-1}$ , which thereby rejects the hypothesis of  $n - r + 1$  unit roots in  $A$ . The trace statistic measures the ‘importance’ of the adjustment coefficients  $\beta$  on the eigenvectors to be potentially omitted. An alternative test of the significance of the largest Eigen value is

$$\zeta_r = -T \log(1 - \lambda_{r+1}), \quad r = 1, 2, \dots, n-1 \quad (18)$$

which is known as the maximal-Eigen value or  $\hat{\lambda}$ -max statistic (Terence and Raphael, 2008)

**Decision rule:** Accept  $H_0$ : (there is no significant cointegration relationship) if t- statistic is greater than asymptotic critical - value or if the p – value is less than the level of significance, otherwise accept  $H_1$ : (there is significant cointegration relationship) if test statistic is less than the asymptotic critical values or if the p- value is greater than the level of significance. Testing sequence terminates if the null hypothesis cannot be rejected for the first time.

### 3.0 Empirical Results

Tables 1, 2 and 3 summarize the results of the unit root test. From the results all the variables are non-stationary at levels but stationary in the first difference since critical values are less than test statistics at the levels but critical values are greater than test statistics in the first difference for the ADF, ADF - GLS and KPSS tests leading to non-rejection of the null hypothesis at levels, but the null hypothesis is rejected at the first difference. Hence the series are integrated of order one  $I(1)$ .

#### 3.1 VAR Model Identification

We estimate the VAR model of GDP, IFR, FPI, and INR. With number of lags order of 3 based on information criteria, the values of AIC is given by VAR system, maximum lag order 3.

#### 3.2 Johansen Cointegration Rank Test

We applied Johansen trace test and L max test in order to determine the cointegration rank of our variables because one of the condition to model with VECM is that there must be cointegration relationship. The results for the test are presented in Table 4.



**Table1: The ADF Unit Root Test for Identification of Order of Integration of the Variables.**

Var	Level		First Difference		
	t -Stat	Const	Const & Trend	Const	Const& trend
logIFR	-3.0607		-2.9377	-4.4830	-4.6192
LogGDP	-0.1642		-1.5888	-5.3123	-5.2309
LogFDI	-0.4164		-1.8626	-5.1281	-5.0567
logINR	-1.4420		-0.07861	-4.9007	-5.5052
Critical Val	5%	-2.93	-3.50	-2.93	-3.50
	1%	-3.58	-4.15	-3.58	-4.15

**Table 2: ADF- GLS Test for Identification of Order of Integration**

VAR	Levels		First Difference	
	Const	Const & Trend	Const	Const &Trend
logIFR	-2.3621	-3.3470	-6.5064	-6.5883
Log GDP	1.9815	-1.6052	-5.3816	-5.3475
Log FDI	1.11858	-1.8846	-5.0374	-5.1329
logINR	-1.1494	-1.1194	-4.8077	-5.4711
<b>5%</b>	-3.58	-3.19	-3.58	-3.19
<b>1%</b>	-2.91	-3.77	-2.91	-3.77

**Table 3: KPSS Unit Root Test for Identification of Order of Integration**

Var	Levels		First Difference	
	Const	Const & Trend	Const	Const & Trend
logIFR	0.19369	0.1470	0.1476	0.0595
LogGDP	1.0911	0.1614	0.0913	0.0893
LogFDI	1.0802	0.1182	0.0628	0.0701
logINR	0.7434	0.2354	0.3751	0.1312
Crit. val.	0.574	0.146	0.463	0.146
<b>5%</b>				

**Table 4: Johansen Test for Cointegration Rank**

Rank	Eigenvalue	Trace test p-value	Lmax test p-value
0	0.57922	58.311 [0.0032]	32.895 [0.0071]
1	0.3084	25.417 [0.1515]	14.011 [0.3782]
2	0.2055	11.406 [0.1903]	8.7428 [0.3154]
3	0.06769	2.663 [0.1027]	2.6633 [0.1027]

From Table 4, the result of the cointegration rank is 1 based on the p-value since the first null hypothesis cannot be rejected at rank 1.

### Results of Cointegration Relations:

$$\hat{\beta} = \begin{pmatrix} 1.000 \\ -1.168 \\ -0.195 \\ 1.558 \end{pmatrix} \text{ and } \hat{\alpha} = \begin{pmatrix} 0.111 \\ 0.299 \\ 0.227 \\ 0.054 \end{pmatrix} \quad (19)$$

The above results show that the cointegration relation with restricted constant is

$$ec_t^{ML} = GDP - 1.168FDI - 0.195IFR + 1.558INR$$

*or*

$$GDP = 1.168FDI + 0.195IFR - 1.558INR \quad (20)$$

The equation above can be interpreted as follows: the coefficient of 1.168 value of foreign private investment in Nigeria (FPI) is the estimated output elasticity following that both Gross Domestic Product (GDP) and Foreign Direct Investment (FDI) appear in logarithms (Lutkepohl, 2005). A 1% GDP increase obtained in Nigeria will induce a similar 0.195% increase in inflation rate (IFR), and 1.558% decrease of interest rate (INR).

### 3.3 VECM Model Checking

The following tests on the residuals are applied to check for the adequacy of our VECM model (i) the Portmanteau LB test, (ii) Godfrey LM test for autocorrelation, (iii) Autoregressive conditional Heteroskedastic LM test for ARCH effect and (iv) Jarque-Bera test for Normality. The results are summarized in Tables 5 and 6:

**Table 5 Results of VECM Test for Serial Correlation and ARCH Effect.**

Residuals	P – values	Decisions
Portmanteau LB Test	0.9898	Accept $H_0$
Godfrey LM Test	0.0573	Accept $H_0$
ARCH LM Test	0.3098	Accept $H_0$

The results of Table 5 shows that the null hypothesis of no serial autocorrelation and conditional Heteroskedasticity will be accepted for portmanteau LB test, Godfrey LM and ARCH LM test since their p- values are greater than the significance values of 0.05 and 0.01 for the 5% and 1% significant levels.

**Table 6: Results of VECMJarque– Bera and Shapiro - Wilk Test for Normality**

Jarque-Bera		Test	Shapiro-Wilk test	
Residuals	P- value	Decisions	P – Value	Decisions
U1t	0.0976	Reject H <sub>0</sub>	0.0040	Reject H <sub>0</sub>
U2t	0.0149	Reject H <sub>0</sub>	0.0017	Rejected H <sub>0</sub>
U3t	0.8449	Reject H <sub>0</sub>	0.6133	Accept H <sub>0</sub>
U4t	0.7518	Reject H <sub>0</sub>	0.4408	Accept H <sub>0</sub>

Table 6 shows that in Jarque-Bera test H<sub>0</sub> are rejected for all residuals which indicate that they are all normal. However in Shapiro-Wilk test H<sub>0</sub> for residuals are accepted for U<sub>3</sub> and U<sub>4</sub> indicating that they are normal while U<sub>1</sub> and U<sub>2</sub> are not too far from normality and slight non-normality as documented by Juselius (2006) does not invalidate the test.

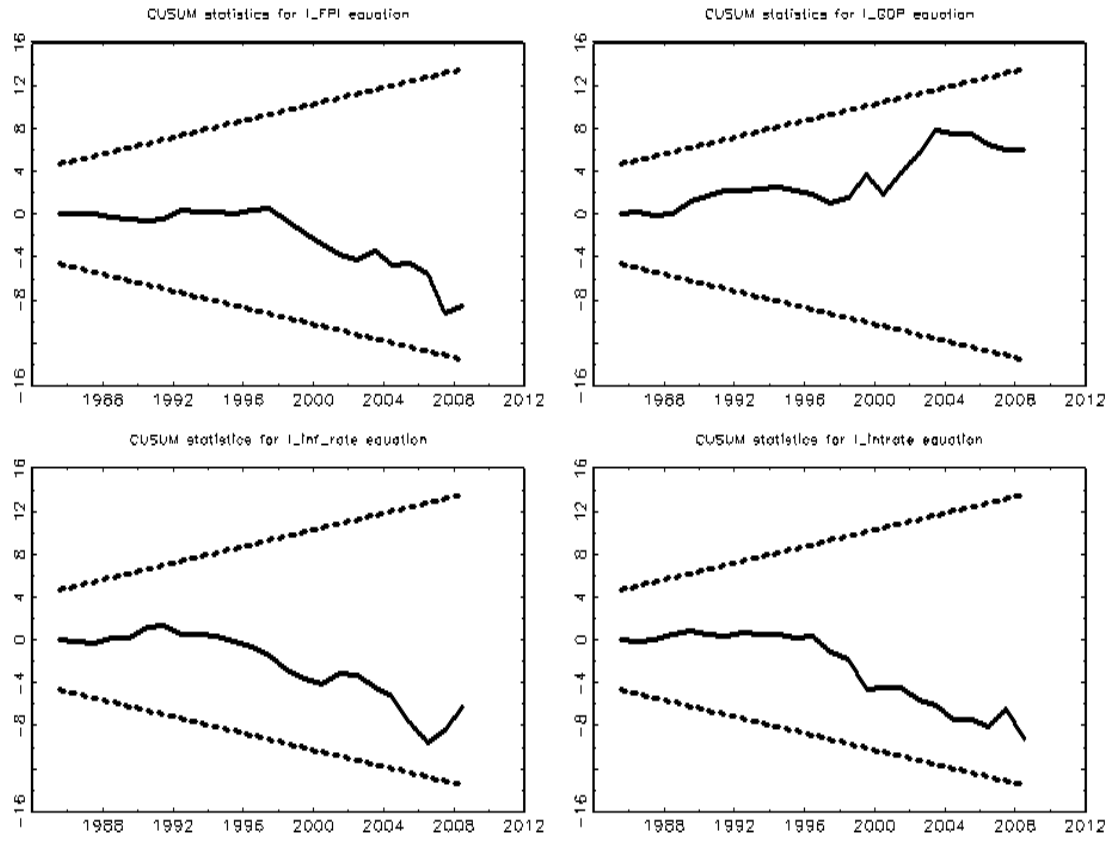
### 3.4 CUSUM and CUSUM – SQ Test for Stability

These two tests are applied to examine the stability of the long-run coefficient together with short run dynamics (Pearson and Pearson, 1997). CUSUM and CUSUM SQ test was proposed by Brown *et al.* (1975). The tests are applied on the residuals of all variables of VECM model (see the figure 2 below). If the plot of the CUSUM statistics stays within the critical bound of 95% level of significance, represented by a pair of straight lines drawn at 95% level of significance the null hypothesis is that all coefficients in the error correction model cannot be rejected. If any of the lines crosses, the null hypothesis of coefficient constancy at 95% level of significance will be rejected. A CUSUM-SQ test is based on the square recursive residuals, and a similar procedure is used to carry out this test.

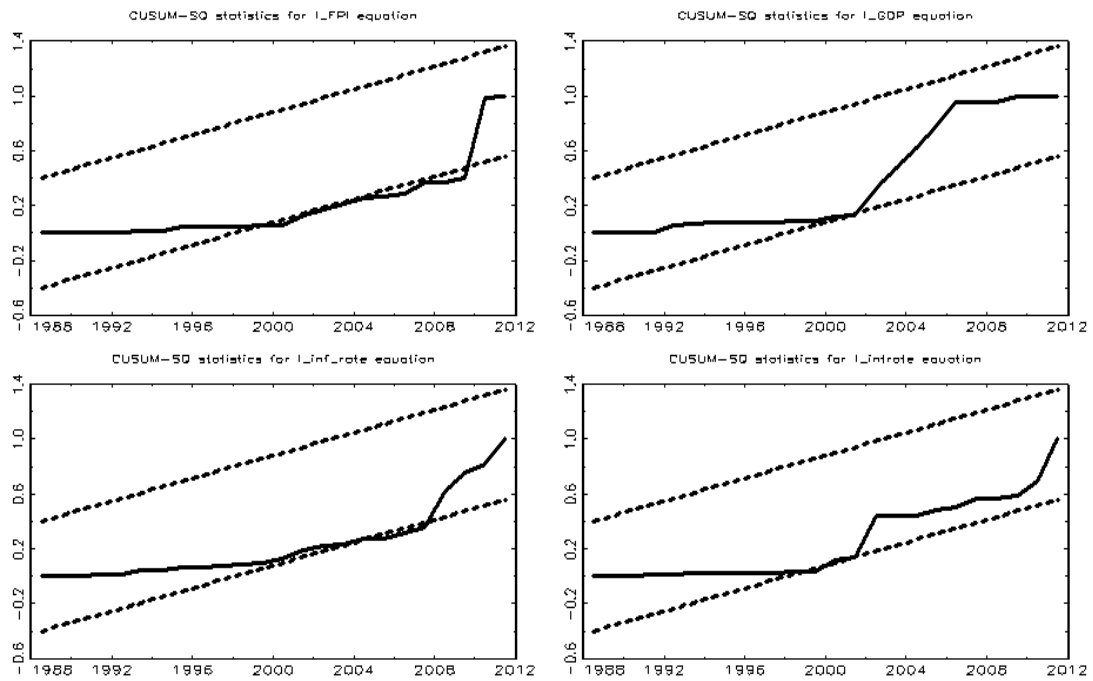
Figures 1 and 2 are graphical representations of CUSUM and CUSUMSQ plots, respectively, which are applied to the error correction model selected by the adjusted R<sup>2</sup> criterion. CUSUM plots of the variables do not cross critical bounds which indicate no evidence of any significant instability. However, in CUSUMSQ plot of figure 2, three plots slightly cross the critical bound indicating slight instability of these variables.

### 3.6 Granger Causality Analysis

Here, the results for the analysis of causality are presented and the causality between the variables (if any) and the direction of the causality of the systems are determined using Granger Causality test. The results of the test are presented in table 7. The result estimate shows that at 5% most of the variables are Granger–not causal for GDP. However, there is unidirectional causality between FPI and GDP, and INR and GDP between INF and FPI. But there is bi-directional causality between FPI and INR.



**Figure 1: Plots of Residuals CUSUM**



**Fig.2. Plots of Residuals CUSUMSQ**

**Table 7: Results of Granger- Causality Analysis**

Null hypothesis	F- stat	p – value	Decision rule
“GDP does not Granger – Cause FPI”	3.7001	0.0170	reject $H_0$ at 5%
“FPI does not Granger – Cause GDP”	2.1301	0.1071	do not reject $H_0$
“GDP does not Granger – Cause INR”	2.8787	0.0443	reject $H_0$
“INR does not Granger – Cause GDP”	4.0181	0.0118	reject $H_0$
“GDP does not Granger – Cause IFR”	1.8686	0.1459	do not reject $H_0$
“IFR does not Granger – Cause GDP”	0.8623	0.4663	do not reject $H_0$
“FPI does not Granger – Cause INR”	3.1550	0.0321	reject $H_0$
“INR does not Granger – Cause FPI”	2.2453	0.0935	do not reject $H_0$
“FPI does not Granger – Cause IFR”	0.7313	0.5378	do not reject $H_0$
“IFR does not Granger – Cause FPI”	2.1418	0.0336	reject $H_0$
“IFR does not Granger – Cause INR”	1.5539	0.2112	do not reject $H_0$
“INR does not Granger – Cause IFR”	0.6527	0.5847	do not reject $H_0$

#### 4.0 Summary and Conclusion

In this study, we have presented an analysis of the cointegration between the Foreign Private Investment (FPI) and Growth Domestic Product (GDP) with two other macroeconomic variables in Nigeria using data obtained from Central Bank of Nigeria Statistical Bulletin (2005) for the period of 1970 to 2005. In modeling Growth, these variables are chosen based of the fact that they are very important determinants of economic growth in Nigeria (Chette, 1998). The approach is important because developing countries in general, and Nigeria in particular is putting measures towards improving economic growth with emphasis on Foreign Direct Investment. The ADF, ADF – GLS and KPSS tests show that all the four variables are integrated of order one. VAR 3 and VECM 2 model were chosen based on Akaike criterion. The Johansen test shows that VECM 2 has a cointegration relationship with the rank of 1. Furthermore, the Granger Causality Analysis shows a unidirectional causality relationship between GDP and FPI which is in line with previous studies (Basuet *al.* 2003) and with two other macro-economic variables. The results support the theoretical contention and give strong support to the hypothesis that FPI inflows have impact on GDP.

In summary, our econometric estimates of the impact of FPI on GDP model for Nigeria suggest that there exists a long run relationship between FPI and GDP. Precisely, these findings suggest that the contribution of FPI to Nigerian economic growth is about 1.168% and all other variables have long run relationship with positive contribution in the growth model. However, interest rate has a negative contribution in the model.

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# Exchange Rate Volatility in Nigeria: Consistency, Persistency & Severity Analyses

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*The adoption of the International Monetary Fund (IMF) Structural Adjustment Programme (SAP) in 1986 resulted in the transition from fixed exchange rate regime to floating exchange rate regime in Nigeria. Ever since, the exchange rate of naira vis-à-vis the U.S dollar has attained varying rates all through different time horizons. On this basis, this study examines the consistency, persistency, and severity (degree) of volatility in exchange rate of Nigerian currency (naira) vis-a-vis the United State dollar using monthly time series data from 1986 to 2008. The standard Purchasing Power Parity (PPP) model was used to analyze the long-run consistency of the naira exchange rate while the time series properties of the data was examined using the ADF and PP approach, the stationary process, and order of the incorporated series. The ARCH and GARCH models were used to examine the degree or severity of volatility based on the first difference, standard deviation and coefficient of deviation estimated volatility series for the nominal and real exchange rate of naira vis-a-vis the U.S dollar. The result indicated the presence of overshooting volatility shocks. The econometric analyses further revealed that the nominal and real exchange rates of naira vis-a-viz the U.S dollar are not with the traditional long-run PPP model. All the incorporated measures of volatility indicated presence and persistency of volatility in the nominal and real exchange rate for naira vis-à-vis U.S dollar in Nigeria. This however proves the ineffectiveness of monetary policy in stabilizing exchange rate and therefore, calls for the need of more tightened measures especially in controlling the high demand for foreign currency.*

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**Keywords:** Exchange rate, volatility, Purchasing Power Parity (PPP), Consistency, Persistency, Severity/ Degree, ARCH, GARCH.

**JEL Classification:** C10, E3, F31.

## 1.0 Introduction

There is a widespread contention that volatility of the exchange rates of developing countries is one of the main sources of economic instability around the world. The impact of the global economy on emerging countries like Nigeria is driven significantly by swings in the currencies of the major economic powers like United State. In recent years these swings have been enormous, volatile and frequently unrelated to underlying economic fundamentals (Philippe *et al.*, 2006). This has prompted monetary authorities in developing countries that keep close trade ties with the developed nations to intervene on totally ad hoc and episodic basis, without any clear sense of a sustainable equilibrium. Such exchange rate stability intervention typically comes too late to prevent severe currency misalignment and volatility. These imbalances, in turn, trigger major economic distortions, protectionist trade pressures, and inevitably sharp currency reversals (Philippe *et al.*, 2006). Though, currency instability and volatility could only exist during flexible

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exchange rate regime where the cross-country exchange rate is determined by the forces of demand and supply.

The liberalization of capital flows in developing countries over the last three decades and the enormous increase in the scale and variety of cross-border financial transactions have clearly increased the magnitude of exchange rate movements in most countries with underdeveloped capital markets and where there is not yet a track record of consistently stable economic policies. Currency crises in emerging markets, which have become more frequent in the last two decades, are especially notable cases of large exchange rate volatility (Carrera and Vuletin, 2003). This has been of particular concern to developing countries and emerging market economies. In addition, the transition to a market-based system often involves major adjustments in the international value of these economies' currencies.

Other changes in the world economy may have reduced the impact of exchange rate volatility. The proliferation of financial hedging instruments over the last 20 years could reduce firms' vulnerability to the risks arising from volatile currency movements. In addition, for multinational firms, fluctuations in different exchange rates may have offsetting effects on their profitability (Carrera and Vuletin, 2003). As a growing fraction of international transactions is undertaken by these multinational firms, exchange rate volatility may have a declining impact on world trade. On the balance, it is not clear whether the major changes in the world economy over the past two decades have operated to reduce or increase the extent to which international trade is adversely affected by fluctuations in exchange rates. One aspect of this issue is the extent to which such volatility itself has changed, and another is the degree to which firms are sensitive to exchange rate risk and can take steps to mitigate it at low cost. It is therefore necessary to examine new empirical evidence at this issue, especially the consistency of exchange rate volatility.

Exchange rate regime varies with the level of financial development. Throughout the developing world, the choice of exchange rate regime stands as perhaps the most contentious aspect of macroeconomic policy (Calvo and Reinhart, 2002). Witness, on the one hand, the intense international criticism of Africa's inflexible exchange rate system and on the other hand, West African policy makers are chastised for not doing enough to stabilize their country's highly volatile currency. Empirical evidences have shown that exchange rate volatility in turn is caused by both real and financial aggregate shocks (Calvo and Reinhart, 2002). Yet, despite the perceived implications of the exchange rate regime to long-run growth and economic stability, the existing theoretical and empirical literature on Africa (Nigeria in particular considering the level of the country's economic integration through trade and foreign capital inflows) offers little guidance. The theoretical literature is mainly tailored to richer countries with highly developed institutions and markets (e.g., Garber and Svensson, 1995; Obstfeld and Rogoff, 1996), and there is almost no discussion of long-run growth.

The most known theoretical explanation of long-term stability and consistency of bilateral exchange rate is Purchasing Power Parity (PPP) hypothesis. Testing for long-run PPP is important for number of reasons: many monetary models *à la* Dornbusch (1986), hinges on the validity of long-run PPP theory, while many other macroeconomic models often use PPP to link domestic and foreign development especially in developing countries like Nigeria. Furthermore, although the PPP hypothesis may not be regarded as an explicit exchange rate theory, it may still serve to provide fundamental determinants that can be used to calculate the long-run exchange rates and assess the appropriate level of exchange rates when a long-run relationship exists. However, both nominal and real exchange rates are studied in this study since a sizable discrepancy often exists between these two exchange rates and often used alternatively in empirical research and considering an highly regulated environments like Nigeria where the supply of foreign exchange is often insufficient to meet the market demand.

On this basis, the objectives of this paper are highlighted as follows:

- To investigate the consistency of exchange rate volatility in Nigeria.
- To determine the existence and persistency of volatility in the nominal and real exchange rate of naira vis-a-vis U.S dollar.
- To establish the degree or severity of exchange rate volatility between 1986 and 2008 in Nigeria.

The volatility degree of exchange rate of naira to U.S dollar is critically examined across the three phases of exchange rate regime (SAP period, Lethargy era and Post-SAP era) in Nigeria between 1986:M1 and 2008:M12. The remaining section of this study is categorized into five sections. Section II presents a survey of relevant literature and conceptual issues. While the measurement and the description of data in respect of exchange rate volatility are contained in section III, section IV covers methodology. Section V presents empirical results and discussion, and the final section concludes the paper and proffer recommendation based on the empirical findings.

## **2.0 Survey of Literature and Conceptual Issues**

### **2.1 Survey of Literature**

Despite the saturation of the literature with studies on exchange rate volatility, the literature is still scanty with respect to developing countries. The few studies are panel data in nature and have traced the effects of macroeconomic shocks on exchange rate volatility. For instance, Carrera and Vuletin (2003) seek to analyze the relationship between exchange rate regimes and short-term volatility of the effective real exchange rate. The study sets out the relative importance of these links, specifically by analyzing the exchange rate regime influence on the RER volatility using a dynamic panel data analysis. For this ends a sample of 92 countries for the 1980-1999 period was considered. The study finds evidence on how other variables influence RER volatility and it also analyses the persistence of shocks in RER. The study further finds more evidence of

more openness, acceleration in per capita GDP growth, reduction in volatility. Conversely, positive monetary shocks and growth in capital inflows and in public expenditure increase this real volatility. Evidence from the study also supports the view that the analysis of the dynamics of the exchange rate regimes needs to differentiate between developed and developing countries.

Benita and Lauterbach (2007), studied the daily volatility of the exchange rate between the US Dollar and 43 other currencies in 1990-2001. The study uses several macroeconomic variables, that proxy for the domestic economy uncertainty, wealth, and openness to international markets, as controls in the analysis. The well-known GARCH statistical behavior of exchange-rate volatility was also accounted for. The main finding of the study was that exchange rate volatility was positively correlated with the real domestic interest rate and with the degree of central bank intervention. In the panel, the study finds *positive* correlations between exchange rate volatility, real interest rates and the intensity of central bank intervention

In Nigeria, studies have been conducted to estimate exchange rate volatility ( see Akpokodje, 2009; Aliyu, 2010; Aliyu, 2009a; Aliyu, 2009b; Ogunleye, 2009; Olowe, 2009; Yinusa & Akinlo, 2008; Yinusa, 2008; Yinusa, 2004). Most of the studies on exchange rate volatility in Nigeria measure the impacts of exchange rate volatility on trade balance with little attention to other internal macroeconomic variable shocks. For instance, Akpokodje (2009) explored the exports and imports effects of exchange rate volatility with specific reference to the non Communaute Financiere Africaine (non-CFA) countries of Africa during the period, 1986 – 2006. The countries chosen included Ghana, Lesotho, Malawi, Nigeria, Sierra Leone, South Africa, Uganda and Zambia. A GARCH approach was employed to generate on annual basis the real exchange rate volatility series for each country. The study reveals a negative effect of exchange rate volatility on exports and imports in the selected African countries. The adverse effect of exchange rate volatility on exports in the sampled countries, as found in the study suggests the need for policy interventions that will help to minimize and, where possible, eradicate exchange rate volatility.

Also, Yinusa (2008) investigated the relationship between nominal exchange rate volatility and dollarization in Nigeria by applying Granger causality test for the period 1986–2003 using quarterly data. The study reported a bi-causality between them but the causality from dollarization to exchange rate volatility appears stronger and dominates. He however concluded that policies that aim to reduce exchange rate volatility in Nigeria must include measures that specifically address the issue of dollarization. But, the exact measure of exchange rate volatility in the study was not reported.

In the same vein, Ogunleye (2009) investigated the relationship between exchange rate volatility and Foreign Direct Investments (FDI) inflows in Sub- Saharan Africa using Nigeria and South Africa as case studies. By endogeneizing exchange rate volatility, the study uses a two – stage

Least Squares methodology. The study finds that in Nigeria, there is a statistically significant relationship between the variables, with exchange rate volatility retarding FDI inflows and FDI inflows increasing exchange rate volatility. As revealed by the study, this relationship is however weak for South Africa. The possible reason adduced by the study is the sound capital flows management policy of the South African Reserve Bank.

Further attempts were made by Aliyu (2009a) and employed standard deviation measure of exchange rate volatility based quarterly observation and further assesses the impact of exchange rate volatility on non-oil export flows in Nigeria between 1986 and 2006. Empirical result revealed that exchange rate volatility decreased non-oil exports in Nigeria. In another study, Aliyu (2009b) examined the impact of oil price shock and exchange rate volatility on economic growth in Nigeria and measuring exchange rate volatility as the consumer price index based real exchange rate approach. But he failed to examine the degree and persistency of exchange rate volatility using standardized econometric.

However, among the entire studies on the macroeconomic effects of exchange rate volatility in Nigeria over the past three decades, it is only the study of Olowe (2009) that is found to investigate the volatility of Naira/Dollar exchange rates in Nigeria using several variants of Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. He used monthly data over the period January 1970 to December 2007 and found that all the GARCH family models indicated that volatility is persistent and reported similar evidence for the fixed exchange rate and managed float rate regimes.

The review so far shows that there exists a dearth of research on the consistency/ persistency analysis of the measures of exchange rate volatility in Nigeria which is the focus of this research.

## **2.2. Conceptual and Methodological Issues in Exchange Rate Volatility**

Despite huge body of literature literature on exchange rate volatility and trade, there is, however, no consensus on the appropriate method for measuring such volatility. There is no generally accepted model of firm behaviour subject to risk arising from fluctuations in exchange rates and other variables. Consequently theory cannot provide definitive guidance as to which measure is most suitable. Moreover, the scope of the analysis will to some extent dictate the type of measure used. If the focus is on advanced countries, for instance, then one could take into account forward markets for the assessment of exchange rate volatility on trade, whereas this would not be possible if the analysis extended to a large number of developing countries. In addition, one needs to consider the time horizon over which variability is to be measured, as well as whether it is unconditional volatility or the unexpected movement in the exchange rate relative to its predicted value, that is the relevant measure. Finally, the level of aggregation of trade flows being considered will also play a role in determining the appropriate measure of the exchange rate to be used.

IMF (2005) provided a comprehensive empirical review of measure of volatility in exchange rates across the entire Fund membership for which data are available. The study starts with an examination of the relationship between aggregate exchange rate volatility and aggregate trade. Recognizing the limitations of looking at the aggregate data, the paper then turns to analyzing the effect of exchange rate volatility on trade across different country pairs and over time. Methodologically, the switch to bilateral trade and volatility allows one to better control a variety of other factors that could affect trade other than volatility. As a consequence, the chance to detect an effect of exchange rate volatility on trade improves.

Given this methodological approach, the basic building block in the analysis is the volatility in the exchange rate between the currencies of each pair of countries in the sample. For the descriptive part of the study which looks at the exchange rate volatility facing a country as a whole, it is necessary to aggregate the bilateral volatilities using trade shares as weights to obtain what is referred to as the “effective volatility” of a country’s exchange rates. This ensures that the measures of volatility in the descriptive and econometric parts of the study are fully consistent.

Such a measure of “effective volatility” presupposes that the exchange rate uncertainty facing an individual firm is an average of the variability of individual bilateral exchange rates (Lanyi and Suss, 1982). However, if a trading firm engages in international transactions with a wide range of countries, any tendency for exchange rates to move in offsetting directions would reduce the overall exposure of the firm to exchange rate risk. This would argue for using the volatility of a country’s effective exchange rate as the measure of the exchange rate uncertainty facing a country. This would seem particularly appropriate for advanced economies where much trade is undertaken by diversified multinational corporations.

It is important to realize that the degree of exchange rate variability a country is exposed to is not necessarily closely related to the type of exchange rate regime it has adopted. A country may peg its currency to an anchor currency, but it will float against all other currencies if the anchor does as well. Thus, as with effective exchange rates, effective volatility is a multidimensional concept. Pegging can reduce nominal exchange rate volatility vis-à-vis one trading partner, but it can by no means eliminate overall exchange rate variability.

The choice between using nominal and real exchange rates depends in part on the time dimension that is relevant for the economic decision being taken. In the short- run where costs of production are known and export and import prices have been determined, the exchange rate exposure of a firm is a function of the nominal exchange rate. However, the decision to engage in international transactions stretches over a longer period of time during which production costs and export and import prices in foreign currency will vary. From this perspective, exchange rates measured in real terms are appropriate. Nonetheless, as nominal and real exchange rates tend to move closely together, given the stickiness of domestic prices, the choice of which one to use is not likely to

affect significantly measured volatility or the econometric results. Nonetheless, real rates are preferable on theoretical grounds and are used in the benchmark measures of volatility below. Consumer prices are used to construct the real rates, as they are the most widely available measures of domestic prices.

While exchange rates are often highly volatile, the extent to which they are a source of uncertainty and risk depends on the degree to which exchange rate movements are foreseen. When hedging instruments are available, the predicted part of exchange rate volatility can be hedged away and hence may not have much effect on trade. This suggests that the appropriate measure of risk should be related to deviations between actual and predicted exchange rates. One possibility along these lines would be to use the forward rate as a prediction of the future spot rate, and to use the difference between the current spot rate and the previous period forward rate as an indicator of exchange rate risk. One problem with this approach is that the forward rate is not a good predictor of future exchange rates.

More generally, there are a wide variety of methods (ranging from structural models to time series equations using ARCH/GARCH approaches, for example) that could be used to generate predicted values of exchange rates (McKenzie, 1999). However, as pointed out by Meese and Rogoff (1983), there are inherent difficulties in predicting exchange rates. The most widely used measure of exchange rate volatility is the standard deviation of the first difference of logarithms of the exchange rate. This measure has the property that it will equal zero if the exchange rate follows a constant trend, which presumably could be anticipated and therefore would not be a source of uncertainty. Following the practice in most other studies, the change in the exchange rate is computed over one month, using end of month data. The standard deviation is calculated over a one-year period, as an indicator of short-run volatility, as well as over a five-year period to capture long-run variability.

### 3.0 Exchange Rate Volatility in Nigeria: Measurement, Data Description and Trend Analysis

#### 3.1 Measurement of Volatility

There are several measurements of exchange rate volatility in literature<sup>3</sup>, but the three of the most common measures of exchange rate volatility are the first order difference measure (FD), standard deviation of the growth rates of exchange rate (SD) and the coefficient of variation measure (CV). The first order difference (FD) measure consider the difference between the current logarithm value of exchange rate<sup>4</sup> and previous. It is defined as:

$$FD_t = (\ln EX_t - \ln EX_{t-1}) - \ln \overline{EX} \quad (1)$$

<sup>3</sup>See McKenzie (1999) for a review of the alternative measures of volatility that have been used in literature on exchange rate volatility.

<sup>4</sup>The exchange rate can either be the nominal or price adjusted (real). Although most studies employed real exchange rate in their computations. This study use both form of hypothetical PPP bilateral exchange rates.

where  $EX$  is the bilateral exchange rate;  $\overline{EX}$  is the mean of the bilateral exchange rate and  $\ln$  is the natural log.

The second measure, standard deviation of the growth rates of exchange rate (SD)<sup>5</sup>, is approximated by time-varying measure defined as follows:

$$SD_{t+m} = \left[ \frac{1}{m} \sum_{i=1}^m (\ln EX_{t+i-1} - \ln EX_{t+i-2})^2 \right]^{1/2} \tag{2}$$

where  $m$  is the order of moving average.

The last alternative measure of the exchange rate volatility is defined as the time-varying twelve-month co-efficient of variation (CV) of the bilateral exchange rate (this is, in fact, a measure of dispersion of the real exchange rate). It is defined as:

$$CV_{t+m} = \frac{\left[ \frac{1}{m} \sum_{i=1}^m (EX_{t+i-1} - \overline{EX})^2 \right]^{1/2}}{\overline{EX}} \tag{3}$$

where  $\overline{EX}$  is the mean of the bilateral exchange rate between month  $t$  and  $t + m - 1$ .

### 3.2 Data Description

The bilateral nominal and real (price adjusted) exchange rates for naira vis-à-vis U.S dollar are used as the main sourced data set. The monthly data of nominal exchange rate (NR) and real exchange rate (RR) for naira vis-à-vis U.S dollar between 1986 (which marks the beginning of floating exchange rate) and 2008 are sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, Golden Jubilee edition, December, 2008. The data set (NR and RR) are used to compute each of the considered measures of volatility (FD, SD and CV) as defined above to make six data composition set for this study.

### 3.3 Trend

The adoption of the International Monetary Fund (IMF) Structural Adjustment Programme (SAP) facilitated the deregulation of the financial market that necessitated floating exchange rate regime in the wake of 1986 and prevail till the end of April 1993 for its first face (as shown in the gap before the shaded portion of figure 1). During this period (1986:M1 and 1993:M4), the nominal exchange rate exhibit steady increase with little spike but attained its first high spike in between the end of 1991 and March 1993. While, the real bilateral exchange rate of naira to a unit of U.S dollar witnessed high deterioration within the first nine months of the commencement of floating exchange rate regime and later depreciated steadily till April 1990 before it spike up in May 1990 and make a downward steep from December 1990, through the second phase of fixed and

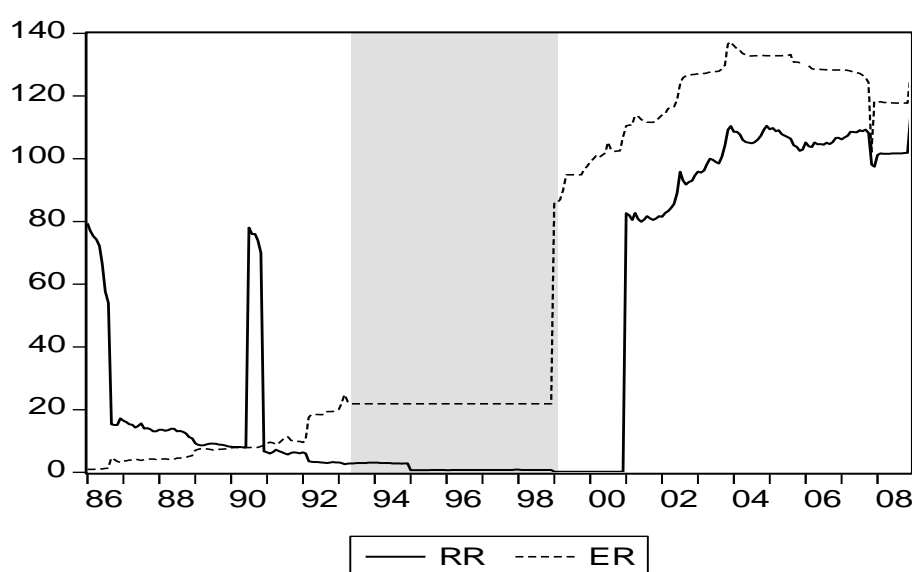
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<sup>5</sup>It worth noting that some authors have use this indicator as if it was a measure of the standard deviation of the exchange rate (and not of its growth rate). This measure has been used, among others, by Kenen and Rodrick (1986), Chowdhury (1993), Arizeet. al (2000), and Gerardo and Felipe (2002).



floating exchange rate regimes, to December 2000 before making a reversal to create the first spike at the second phase of floating regime.

Afterwards, the nominal and real (starting from 1999:M3 and 2001:M1 respectively) exchange rates of naira to U.S dollar have been maintained upward trend till date, exhibiting the ineffectiveness of the monetary authority in stabilizing the forex market through the demand and supply of currency, controlling excessive importation of goods and improper management of the country's external reserve to back up the weak currency. Even though, there tends to be wide dispersion between the real and nominal bilateral exchange rate between 1986 and 2008, but it started widen up from December 1991 and this marks the onset of intense high inflationary period in Nigeria. However, the series fluctuations and spikes that the bilateral exchange rate of naira to U.S dollar witnessed all through the first and second phase of floating exchange rate regime and during the second phase of the fixed regime period prompted this study to examine the presence and degree of volatility during the review periods.



**Figure 1: Time series plot of real and nominal bilateral exchange rate for naira vis-à-vis dollar between 1986M1 and 2008M12.**

*Data Source: CBN Statistical Bulletin (2009)*

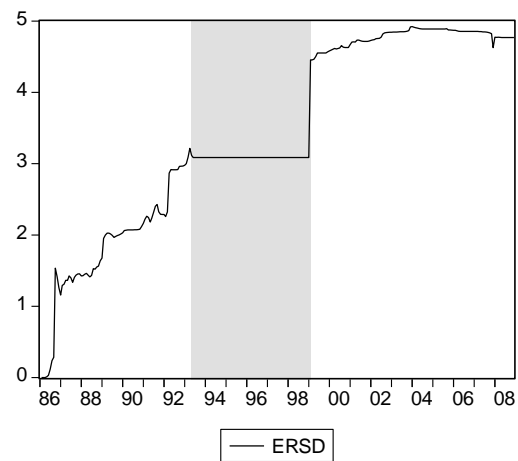
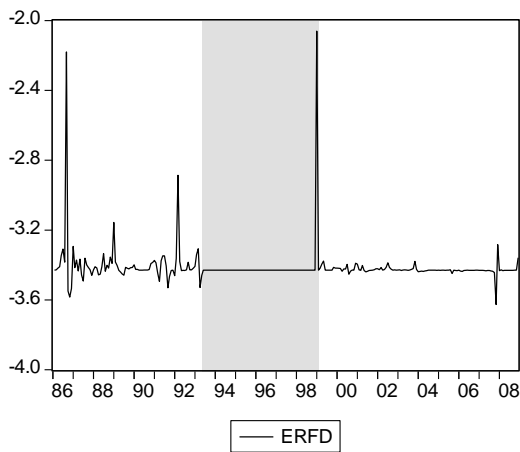
The time series of the volatility generated for the bilateral nominal and real exchange rate of naira to U.S dollar using each of the three incorporated measures defined above are plotted as follows. The chart 2 and chart 3 present the first difference, standard deviation and coefficient of variation volatility series plots for bilateral nominal and real exchange rate of naira to U.S dollar in Nigeria between February 1986 and December 2008 respectively, while the shaded area represent the periods of fixed exchange rate regime. A closer look at chart 2 and 3 revealed that the standard deviation volatility measure of bilateral nominal and real exchange rates clearly stands out in its distribution pattern and distinct from the other two alternative measures (first difference and

coefficient of variation) that exhibit clear representation of volatility clustering during the review periods based on the series of fluctuations and spikes shown. This implies that the first difference and coefficient of variation volatility series plots for bilateral nominal and real exchange rate of naira to U.S dollar in Nigeria between February 1986 and December 2008 respectively show more swings and clear volatility clustering properties based on series plots. This is similar to the volatility measure differential findings given by Gerardo and Felipe (2002).

**Figure 2**

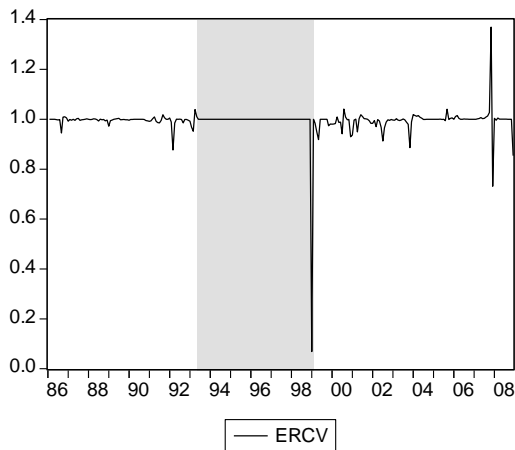
**CURRENCY VOLATILITY (N=\$):**

**Nominal Exchange Rate  
(February 1986- December 2008)**



**Figure 2(a): First Difference**

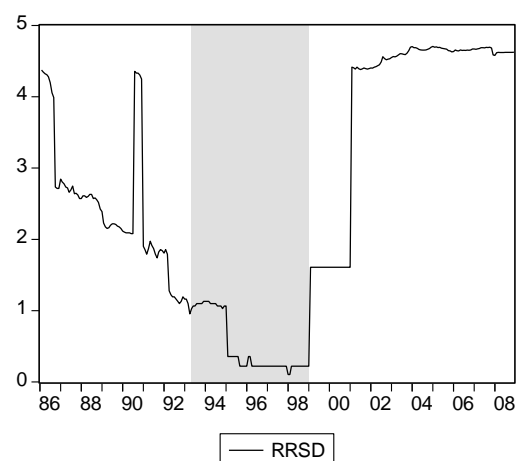
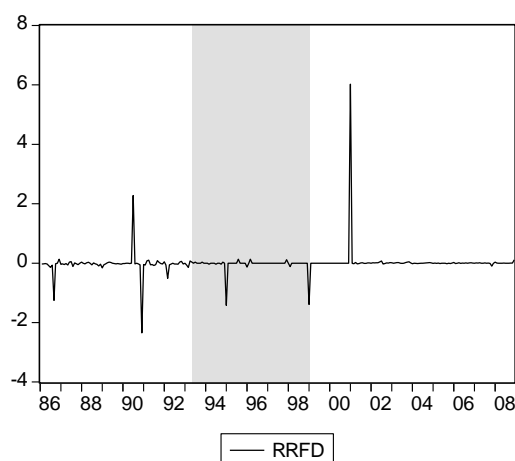
**Figure 2(b): Standard Deviation**



**Figure 2(c): Coefficient of Variation**

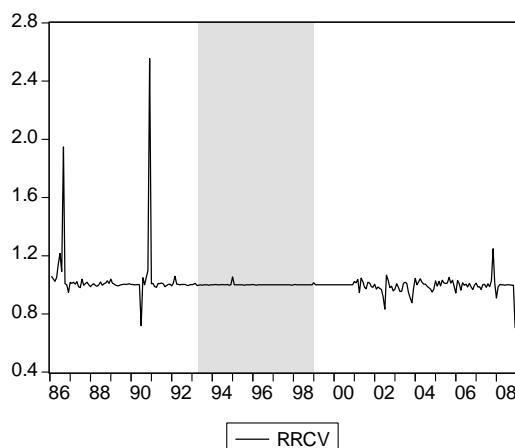
**Figure 3**

**CURRENCY VOLATILITY (₦=\$):  
Real Exchange Rate  
(February 1986 - December 2008)**



**Figure 3(a): First Difference**

**Figure 3(b): Standard Deviation**



**Figure 3(c): Coefficient of Variation**

Though, this is not sufficient to conclude that there is the presence of volatility clustering in the bilateral nominal and real exchange rate of naira to U.S dollar in Nigeria between February 1986 and December 2008 without appropriate application of econometric methodologies.

**4.0 Methodology**

**4.1 Exchange Rate Consistency Analysis**

The time series properties of the bilateral exchange rate for naira vis-à-vis U.S dollar is examined using the unit root test developed by Dickey and Fuller (1981) and Phillips and Perron (1988) on the sourced nominal and real exchange rates data set in order to verify the long-run Purchasing Power Parity hypothesis in Nigeria. This aids the validation of the long-run consistency level of the bilateral exchange rate of naira to U.S dollar based on the PPP theoretical assertion that

bilateral exchange rate tends to be stationary and non mean-reverting in the long-run. The Augmented Dickey-Fuller (ADF) unit root test specification is expressed as:

**Intercept:**

$$\Delta Z_t = \psi_0 + \psi_1 Z_{t-1} + \sum_{i=1}^{\infty} \mu_i \Delta X_{t-i} + \omega_t \tag{4}$$

**Intercept + Trend:**

$$\Delta Z_t = \psi_0 + \psi_1 Z_{t-1} + \psi_1 t + \sum_{i=1}^{\infty} \mu_i \Delta X_{t-i} + \omega_t \tag{5}$$

where:  $\omega_t$  is the residual term and  $Z_t$  is the time series variable. The lag is determined using the Akaike and Schwarz Information Criteria. The non-parametric statistical method of Phillips-Perron (PP) unit root test specification is defined as:

**Intercept:**

$$\Delta Z_t = \alpha + \delta Z_{t-1} + \varepsilon_t \tag{6}$$

**Intercept + Trend:**

$$\Delta Z_t = \alpha_0 + \alpha_1 t + \delta Z_{t-1} + \varepsilon_t \tag{7}$$

The null hypothesis of  $\delta > 0$  (no stationary) is tested against the alternative hypothesis of  $\delta < 0$  (stationary).

#### 4.2 Test of Exchange Rate Volatility: Model Specification

In literature (see Kenen and Rodrik, 1986; Bailey *et. al.*, 1986; Peree and Steinherr, 1989; Cote, 1994; McKenzie and Brooks, 1997), various measures of exchange rate volatility have been employed to examine the variability of pair-wise cross-country exchange rate based on the observation that exchange rate time series are typically heteroskedastic, leptokurtic and exhibit volatility clustering-i.e, varying variance over a specified period of time. On this basis and in line with the research objective, this study examines the degree or extent of exchange rate volatility between the end of fixed currency era, which marks the inception of the adopted IMF Structural Adjustment Programme (SAP) in 1986 and still the era of post Structural Adjustment Programme (SAP)-2008. Like other empirical studies, the Autoregressive Conditional Heteroskedasticity (ARCH) model introduced by Engle (1982) and the Generalized ARCH model by Bollerslev (1986) were used to capture the extent of exchange rate volatility in Nigeria. The choice of models are based on their empirical use in various areas of econometric modeling, especially in financial time series analysis (see for example, Engle, 1982; Bollerslev, 1986; Bollerslev *et al.*, 1992; Yinusa, 2004; Akpokodje, 2009; Olowe 2009) and their approaches in modeling financial time series with an autoregressive structure in that heteroscedasticity observed over different periods may be autocorrelated.

In developing an ARCH model, we consider two distinct specifications- one for the conditional mean and the other for conditional variance. Generalizing this, the standard GARCH (p, q) specification is expressed as:

$$y_t = \alpha + \sum_{i=1}^k \eta_i x_{t-i} + \varepsilon_t \tag{8}$$

$$\varepsilon_t \approx N(0, \sigma_t^2) \tag{9}$$

$$\sigma_t^2 = \omega + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^q \beta_i \sigma_{t-i}^2 \tag{10}$$

The mean equation given in Equation (8) is expressed as a function of a constant  $\alpha$  -(taken as mean if other exogenous variables are assumed to be zero), exogenous variable(s)  $x_{t-i}$  -(majorly in autoregressive (AR) structure of order k) and with an error term  $\varepsilon_t$ . Note that  $y_t$  is the considered measure of exchange rate volatility at time  $t$ . Since  $\sigma_t^2$  is the one-period ahead forecast variance based on past information, it is called *conditional variance*. Equation (9) expresses the normal distribution assumption (*white noise*) of the error term. The conditional variance equation specified in (10) is a function of three components: the mean  $\omega$ ; the news about volatility from the previous period, measured as the lag of the squared residual from the mean equation:  $\varepsilon_{t-i}^2$  (the ARCH term); and the last period's forecast variance:  $\sigma_{t-1}^2$  (the GARCH term).

In Equation (8), the k is the order of the AR term, while in Equation (10), the p is the order of the ARCH term and q is the order of the GARCH term. According to Gujarati (2004), a GARCH (p, q) model is equivalent to an ARCH (p+q) i.e. in our specification ARCH (k), where k=p+q. For instance, a standard GARCH (1, 1) refers to the presence of a first-order ARCH term (the first term in parentheses - p, lagged term of the squared error term) and a first order GARCH term (the second term in parentheses - q, lagged term of the conditional variance).

According to Yinusa (2004), the GARCH specification is often interpreted in financial context, where an agent or asset holder predicts this period's variance by forming a weighted average of a long term (constant), information about volatility observed in the previous period (the ARCH term), and the forecasted variance from the last period (the GARCH term). If the exchange rate changes were unexpectedly large in either the upward or the downward direction, then the agent will increase the estimate of the variance for the next period. The GARCH model is also consistent with the volatility clustering often seen in financial returns data, where large changes in returns are likely to be followed by further large changes. In the mean equation, the presence of volatility means that volatility in the current period is related to its values in the previous periods (k) plus a white noise error term.

For the purpose of this study, the presence of volatility clustering is determined by the significance of the lagged volatility series parameters-  $y_t$ . While, the extent or degree of exchange rate volatility is determined by the autoregressive root, which governs the persistence of volatility shocks, is the sum of  $\alpha + \beta$  and the indications of volatility degree are expressed as follows:-

If  $\alpha + \beta \rightarrow 1$  i.e. is close to one, it indicates that volatility is present and persistent;

If  $\alpha + \beta > 1$  i.e. is greater than 1, it indicates overshooting volatility; and

If  $\alpha + \beta < 0.5$  i.e. is less than 0.5, it indicates no volatility.

### 4.3 Data Requirements and Sources

The data required for this consistency and persistency analysis of exchange rate volatility is the quarterly series of nominal and real exchange rates of naira vis-a-vis U.S dollar from 1986 to 2008. These data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, Golden Jubilee Edition.

The precise volatility series were generated from the nominal and real exchange rates of naira to U.S Dollar using the earlier described first difference, standard deviation and co-efficient of variation measures of volatility.

## 5.0 Empirical Results and Discussion

The time series property results of incorporated bilateral nominal and real exchange rates for naira vis-à-vis U.S dollar examined using Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) unit root tests revealed that the series failed to reject the null hypothesis of no stationary at levels for both tests model with intercept and trend based on the results presented in Table 1. The table indicates the evidence that the bilateral nominal and real exchange rates for naira vis-à-vis U.S dollar follow non-stationary process. This finding seems to be valid regardless of whether nominal or real exchange rates are used, although a somewhat stronger mean-reverting behaviour is observed for the bilateral real exchange rate, offering evidence against the assumption of the long-run PPP. Therefore, we then conclude that the bilateral nominal and real exchange rates for naira vis-à-vis U.S dollar are not consistent with the hypothetical long-run PPP. This finding is consistent with previous studies, for example, Olowe (2009), Jun (2000), and Gerardo and Felipe (2002).

The non-consistency of bilateral nominal and real exchange rates for naira vis-à-vis U.S dollar with the hypothetical long-run PPP implies that the movements of Nigeria's exchange rate cannot be explained by monetary (or transitory) factors in the economy, and real (or permanent) shocks seem to be important in understanding the long-run movement. However, to some extent, the series of structural changes experienced in the country that necessitated the changes in the real sector of the economy justify the non-stationary process of the bilateral nominal and real

exchange rates for naira vis-à-vis U.S dollar which is not consistent with the hypothetical long-run PPP.

Table 2 presents the estimated GARCH model results for the nominal exchange rate for naira vis-à-vis U.S dollar in Nigeria using three variants of exchange rate volatility measures. The second column of Table 2 shows the GARCH model results using the first difference measure of exchange rate measure. The GARCH results for the first difference measure of nominal exchange rate volatility revealed persistency of volatility clustering between the current volatility and the previous two periods of volatility based on the ARCH(2) parameters, though not significant 5%. Also, from the column 2 of Table 2, the sum of the ARCH and GARCH terms which signifies degree of volatility revealed the strong presence and persistency of volatility shocks in the nominal exchange rate for naira vis-à-vis U.S dollar in Nigeria based on the first difference measure of volatility. This is similar to the results reported for the standard deviation and coefficient of variation measures of volatility. While, the volatility residuals generated from the mean equation is found to be normally distributed based on the reported residual tests for all the measures of nominal exchange rate volatility.

However, in order to conclude that there is presence of volatility in the nominal exchange rate for naira vis-à-vis U.S dollar, the ARCH LM residual and the Wald tests reported in the Table 2 for each of the measure of nominal exchange rate volatility in Nigeria. The ARCH LM residual test results presented in Table 2 for each of the measure of volatility revealed that there are no remaining ARCH effects which have not been captured by the GARCH models judging by the non-significance of the F-statistic. Thus, these results demonstrate that the GARCH models provide a good fit for the nominal exchange rate series for naira vis-à-vis U.S dollar in Nigeria using any of the measures of volatility. Also, the Wald test is conducted for coefficient restrictions, where the null hypothesis of no volatility (i.e.  $ARCH(1) + GARCH(1) = 0$  or  $\alpha + \beta = 0$ ) is tested against the alternative of the existence of volatility. The result of the Wald-test presented in Table 2 revealed that the coefficients of the ARCH(1) and GARCH(1) are statistically significant at 5% critical level. This implies that the coefficients are statistically different from zero as shown in Table 2 and based on the F-statistic result presented in Table (2), the null hypothesis of no volatility is rejected. On the basis of the evaluation test, we then conclude that there is presence and persistency of volatility shocks in the nominal exchange rate for naira vis-à-vis U.S dollar.

Unlike the Table 2, the Table 3 presents the estimated GARCH model results for the real exchange rate for naira vis-à-vis U.S dollar in Nigeria using the first difference, standard deviation, and coefficient of variation of exchange rate volatility measures. Each of the columns in the Table 3 shows the estimated GARCH model results for the real exchange rate volatility series using each of the measures of exchange rate volatility. The GARCH results for all the measures of real exchange rate volatility revealed persistency of volatility clustering between the

current volatility and the previous periods of volatility based on the ARCH parameters, but not significant at 5% for the first difference and standard deviation measures. Also, the sum of the ARCH and GARCH terms which signifies degree of volatility revealed the strong presence and persistency of volatility shocks in the real exchange rate for naira vis-à-vis U.S dollar in Nigeria based on the first difference and standard deviation measures of volatility, but the co-efficient of variation measure of volatility indicated presence of overshooting volatility in the real exchange rate for naira vis-à-vis U.S dollar. While, the volatility residuals generated from the mean equation is found to be normally distributed based on the reported residual tests for all the measures of real exchange rate volatility.

Likewise, to conclude that there is presence of volatility in the real exchange rate for naira vis-à-vis U.S dollar, the ARCH LM residual and the Wald tests reported in the Table 3 for each of the measure of real exchange rate volatility in Nigeria. The ARCH LM residual test results presented in Table 3 for each of the measure of volatility revealed that there are no remaining ARCH effects which have not been captured by the GARCH models judging by the non-significance of the F-statistics. Thus, these results demonstrate that the GARCH models provide a good fit for the real exchange rate series for Naira vis-à-vis U.S dollar in Nigeria using any of the measures of volatility. Also, the Wald test is conducted for coefficient restrictions, where the null hypothesis of no volatility (i.e.  $ARCH(1) + GARCH(1)=0$  or  $\alpha + \beta=0$ ) is tested against the alternative of the existence of volatility. The result of the Wald-test presented in Table 3 revealed that the coefficients of the ARCH(1) and GARCH(1) are statistically significant at 5% critical level. This implies that the coefficients are significantly different from zero as shown in Table 3 and based on the F-statistics result presented in Table 3, the null hypothesis of no volatility is rejected. On the basis of the evaluation test, we then conclude that there is presence and persistency of volatility shocks in the real exchange rate for naira vis-à-vis U.S dollar.

## **6.0 Conclusion**

The conventional PPP hypothesis has been tested in this study following the work of Jun (2000) in examining the long-run consistency and stability of the nominal and real exchange rates of naira vis-à-vis U.S dollar using monthly time series data from 1986 (which marks the transition period of fixed exchange rate regime to floating exchange rate regime in Nigeria) to 2008 by examining the time series property of the data series. The Augmented Dickey-Fuller and Phillip Perron unit root test methodologies revealed that the monthly data series of nominal and real exchange rates of a unit U.S Dollar to Naira do not reject the null hypothesis of non stationarity at levels, which is found similar to the result reported by Jun (2000) for most African countries, (Nigeria inclusive). On this basis, this study concludes that the bilateral nominal and real exchange rates for naira vis-à-vis U.S Dollar are not consistent with the hypothetical long-run PPP.



The presence of volatility in the nominal and real exchange rates of naira vis-à-vis U.S dollar is examined using the Autoregressive Conditional Heteroskedasticity (ARCH) model introduced by Engle (1982) and the Generalized ARCH model by Bollerslev (1986). This was based on the volatility data series generated for the two exchange rates variant using the first difference, the standard deviation and the co-efficient of variation measures and used to generate the entire volatility series for the analysis. From the findings, each of the volatility measure series for nominal and real exchange rates revealed different estimate of volatility between 0.538476 and 1.22842, indicating the presence and persistency of volatility shocks in the nominal and real exchange rates for naira vis-à-vis U.S dollar in Nigeria except the coefficient of variation measure under the real exchange rate which indicated overshooting volatility shocks in terms of degree. However, further evaluation concluded that there is presence and persistency of volatility shocks in the nominal and real exchange rates for naira vis-à-vis U.S dollar in Nigeria between 1986 and 2008. This implies that the conventional monetary management policies instituted have proved ineffective in stabilizing the exchange rate of a unit U.S dollar to naira over the years. This therefore calls for the need of other forex management measures especially in terms of meeting the high demand for foreign currency which characterized and dictate the performance and trade balance and overall economic performance in Nigeria. There is also the need for sound monetary policy to attain stability in the exchange rate.

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**Appendix**

**Table 1: Unit Root Test Results**

Level	Nominal Exchange Rate	Real Exchange Rate
ADF Tau Statistics*		
Intercept	-0.5509 [0]	-1.1441 [0]
Trend	-1.8098 [0]	-3.0490 [0]
PP Tau Statistics**		
Intercept	-0.5367 [4]	-1.0311 [16]
Trend	-1.8307 [5]	-2.9808 [18]

*Source: Authors Computation using E-Views 7.1The lag length is parenthesis.*

*\* lag length selected using the AIC and SIC;*

*\*\* lag length selected using Newey-West Bandwidth*

**Table 2: Nominal Exchange Rate Volatility Result**

Volatility	First Difference Measure		Standard Deviation Measure		Co-efficient of Variation Measure	
	Mean Equation		Mean Equation		Mean Equation	
	Co-eff.	Prob.	Co-eff.	Prob.	Co-eff.	Prob.
C	-3.543624	0.0000	0.072093	0.1164	1.025253	0.0000
NEV(-1)	-0.010555	0.8044	0.958939	0.0033	-0.037767	0.4611
NEV(-2)	-0.027669	0.6989	-0.015051	0.9668		
NEV(-3)			0.041300	0.6594		
	Variance Equation		Variance Equation		Variance Equation	
	Co-eff.	Prob.	Co-eff.	Prob.	Co-eff.	Prob.
C	0.009041	0.0000	0.009043	0.0000	0.000329	0.0000
$\alpha$ :ARCH(-1)	-0.012349	0.0000	-0.010886	0.7398	-0.006802	0.0000
$\alpha$ :ARCH(-2)			-0.001803	0.9559		
$\beta$ :GARCH(-1)	0.599795	0.0000	0.551165	0.0000	0.943221	0.0000
	Degree		Degree		Degree	
$\alpha + \beta$	0.587446		0.538476		0.936419	
	Residual Test		Residual Test		Residual Test	
JarqueBera	98995.17		87780.02		161880.2	
Prob.	0.000000		0.000000		0.000000	
	ARCH Test		ARCH Test		ARCH Test	
F-Stat	0.021940		0.104319		2.140510	
Prob.	0.882358		0.746958		0.144613	
	Wald Test		Wald Test		Wald Test	
	Test Value	Prob.	Test Value	Prob.	Test Value	Prob.
F-Stat	8762967	0.0000	1917.890	0.0000	1847212	0.0000
Chi-square	17525934	0.0000	3835.780	0.0000	3694424	0.0000

*Source: Authors Computation using E-Views 7.1*

*NEV-is the nominal exchange rate volatility. The appropriate ARCH and GARCH terms are selected based on the minimum Schwarz Information Criteria (SIC).*

**Table 3: Real Exchange Rate Volatility Result**

Volatility	First Difference Measure		Standard Deviation Measure		Co-efficient of Variation Measure	
	Mean Equation		Mean Equation		Mean Equation	
	Co-eff.	Prob.	Co-eff.	Prob.	Co-eff.	Prob.
C	0.044215	0.5132	0.037182	0.5602	-0.963604	0.0001
REV(-1)	-0.004934	0.9791	1.030751	0.0761	1.603792	0.0000
REV(-2)			-0.043626	0.9402	0.214742	0.2912
REV(-3)					0.139114	0.4882
	Variance Equation		Variance Equation		Variance Equation	
	Co-eff.	Prob.	Co-eff.	Prob.	Co-eff.	Prob.
C	0.117867	0.5118	0.018508	0.2839	0.002603	0.0211
$\alpha$ :ARCH(-1)	-0.008082	0.5677	0.022405	0.4510	0.639872	0.0208
$\alpha$ :ARCH(-2)						
$\beta$ :GARCH(-1)	0.592593	0.3434	0.763327	0.0006	0.588548	0.0000
	Degree		Degree		Degree	
$\alpha + \beta$	0.584511		0.785732		1.22842	
	Residual Test		Residual Test		Residual Test	
JarqueBera	193966.2		43865.39		10319.79	
Prob.	0.000000		0.000000		0.000000	
	ARCH Test		ARCH Test		ARCH Test	
F-Stat	0.002598		0.061438		3.670460	
Prob.	0.959390		0.804426		0.056445	
	Wald Test		Wald Test		Wald Test	
	Test Value	Prob.	Test Value	Prob.	Test Value	Prob.
F-Stat	5128.415	0.0000	15899.17	0.0000	29.02783	0.0000
Chi-square	10256.83	0.0000	31798.33	0.0000	58.05565	0.0000

*Source: Authors Computation using E-Views 7.1*

*REV-is the real exchange rate volatility. The appropriate ARCH and GARCH terms are selected based on the minimum Schwarz Information Criteria (SIC).*



# Banking Sector Credit and Economic Growth in Nigeria: An Empirical Investigation

**Aniekan O. Akpansung<sup>1</sup> and Sikiru Jimoh Babalola<sup>2</sup>**

*The paper examines the relationship between banking sector credit and economic growth in Nigeria over the period 1970-2008. The causal links between the pairs of variables of interest were established using Granger causality test while a Two-Stage Least Squares (TSLS) estimation technique was used for the regression models. The results of Granger causality test show evidence of unidirectional causal relationship from GDP to private sector credit (PSC) and from industrial production index (IND) to GDP. Estimated regression models indicate that private sector credit impacts positively on economic growth over the period of coverage in this study. However, lending (interest) rate impedes economic growth. Over and above, the paper recommends the need for more financial market development that favours more credit to the private sector with minimal interest rate to stimulate economic growth.*

**Key words:** Bank credit, Economic Growth, Two-Stage Least Squares (TSLS)

**JEL Classification Code:** C01, C32, O16, G17, G21, G28

## 1.0 Introduction

For the past few decades, theoretical discussions about the importance of financial development and the role that financial intermediation play in economic growth have remained controversial and thus occupied a key position in the literature of development finance. Studies by Gurley and Shaw (1967), Goldsmith (1969), McKinnon (1973), Jayaratne and Strahan (1996), Kashyap and Stein (2000), Beck *et al.* (2000), Beck *et al.* (2003), Driscoll (2004), etc, suggest that financial development can foster economic growth by raising saving, improving allocative efficiency of loanable funds, and promoting capital accumulation. They argued that well-developed financial markets are necessary for the overall economic advancement of less developed and the emerging economies. However, in spite of recent findings that financial development and economic growth are clearly related, this relationship has occupied the minds of economists over time; although the channels and even the direction of causality have remained unresolved in both theory and empirics (Fitzgerald, 2006).

Financial intermediation can be a causal factor for economic growth, and vice versa. The positive view of the finance-led growth hypothesis normally focuses on the role played by financial development in mobilizing domestic savings and investment through a more open and more liberalized financial system, and in promoting productivity via creating an efficient financial market. A low rate of expansion of the credit volume is not only a symptom of weak economic growth, but can also be one of its causes (Bundesbank, 2005). Furthermore, a study by Bayoumi & Melander (2008) on the United States macro-financial linkages revealed that, a 2½% reduction in overall credit caused a reduction in the level of GDP by around 1½%. Similarly, King &

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Levine (1993a) established that the banking sector's development in Europe was not only correlated with economic growth but was also a cause of long-term growth.

Prior and after the structural adjustment era, the Central Bank of Nigeria has been seen to be playing a leading and catalytic role by using direct controls not only to control overall credit expansion but also to determine the proportion of bank loans and advances going to "high priority sectors" and "others". This sectoral distribution of bank credit is often meant to stimulate the productive sectors (agriculture, industry and manufacturing) and consequently lead to increased economic growth in the country. Unfortunately, the Financial System Stability Assessment (FSSA) conducted by IMF in 2002 concluded that the Nigerian financial system was vulnerable to a number of risks, such as fiscal indiscipline/dominance, the economy's high dependence on volatile oil prices, and financial abuse. The report further noted that there were serious concerns about the soundness and stability of the Nigerian banking system (IMF, 2002). The Central Bank of Nigeria (2009) also recently noted that the flow of credit to the priority sectors did not meet the prescribed targets and failed to impact positively on investment, output and domestic price level. Certainly, these comments have evoked certain questions bothering the strength, effectiveness, and productivity of bank credit in the Nigerian economy.

Our attempt in this paper is to contribute to the existing empirical literature on financial intermediation, by testing the causality between banking sector credit and economic growth in Nigeria, using the recent data. It is particularly envisaged that the findings of this study will not only help us assess whether the intermediation role of banks stimulates the growth of the Nigerian economy but will also indicate the direction of causality. This is even more pertinent as the recent financial crisis in the world economy has highlighted the vulnerability of financial intermediaries, and more specifically of the banking system's pressure to contract their balance sheets and, ultimately reduce their credits.

The paper is divided into five sections as follows: Section 1 introduces and sets the background of the study. Section 2 reviews related literature; Section 3 highlights empirical methodology and estimating techniques. Section 4 presents empirical results based on a two-stage least squares regression model for GDP growth and Granger causality tests, while Section 5 concludes the study.

## **2.0 Literature Review**

Empirical evidence on the impact of finance on economic growth has been mixed and remained a debated subject. A theoretical literature exploring the nature of the correlation between the banking sector and economic growth suggests that the financial system could impact positively on real economic performance by affecting the composition of savings (Bencivenga & Smith, 1991), providing information (Greenwood & Jovanovic, 1990), and affecting the scope for credit rationing (Boyd & Smith, 1997). In a study involving data from 13 countries, Demetriades & Hussein (1996) concluded that the issue of causality is country-specific rather than general. Levine (1997) proposed that financial development promotes economic growth through two



‘channels’ of capital accumulation and technological innovation, while King and Levine (1993b) identified innovation as the main channel of transmission between finance and growth.

Dey & Flaherty (2005) used a two-stage regression model to examine the impact of bank credit and stock market liquidity on GDP growth. They found that bank credit and stock market liquidity are not consistent determinants of GDP growth. Banking development is a significant determinant of GDP growth, while turnover is not. Cappiello *et al* (2010) in their study of European Area found that in contrast to recent findings for the US, the supply of credit, both in terms of volumes and in terms of credit standards applied on loans to enterprises, have significant effects on real economic activity. In other words, a change in loan growth has a positive and statistically significant effect on GDP.

In a study carried out Muhsin and Eric (2000) on Turkish economy, it was found that when bank deposit, private sector credit or domestic credit ratios are alternatively used as proxies for financial development; causality runs from economic growth to financial development. Their conclusion was that growth seems to lead financial sector development.

Koivu (2002) analysed the finance-growth nexus using a fixed-effects panel model and unbalanced panel data from 25 transition countries during the period 1993-2000. His results showed that: (1) the interest rate margin was significantly and negatively related to economic growth, (2) a rise in the amount of credit did not seem to accelerate economic growth. Based on the findings, he concluded that the growth in credit has not always been sustainable and in some cases it may have led to a decline in growth rates.

Chang *et al* (2008) used branch panel data to examine bank fund reallocation and economic growth in China and found a positive association between bank deposits and growth. Vazakidis & Adamopoulos (2009) employed a Vector Error Correction Model (VECM) to investigate the relationship between credit market development and economic growth for Italy for the period 1965-2007 taking into account the effect of inflation rate on credit market development. The empirical results indicated that economic growth had a positive effect on credit market development, while inflation rate had a negative effect.

Using a Vector Autoregression (VAR) approach, Shan & Jianhong (2006) examined the impact of financial development on economic growth in China. They found that financial development comes as the second force (after the contribution from labor input) in leading economic growth in China. Their study supports the view in the literature that financial development and economic growth exhibit a two-way causality and hence is against the so-called “finance-led growth” hypothesis.

By employing a panel dataset covering 29 Chinese provinces over the period of 1990-2001, Liang (2007) employed the Generalized Method of Moment (GMM) technique to empirically examine the relationship between banking sector development and economic growth for the case

of China. Empirical results showed that, without an effective and well-developed legal system, banking sector development only partially contributed to China's economic growth.

Mishra *et al* (2009) examined the direction of causality that runs between credit market development and the economic growth in India for the period 1980 to 2008. In the VAR framework the application of Granger Causality Test provided the evidence in support of the fact that credit market development spurs economic growth. The empirical investigation indicated a positive effect of economic growth on credit market development of the country.

Mukhopadhyay and Pradhan (2010) recently examined the causal relationship between financial development and economic growth of 7 Asian developing countries (Thailand, Indonesia, Malaysia, the Philippines, China, India and Singapore) during the last 30 years, using multivariate VAR model. The study concluded that no general consensus can be made about the finance-growth relationship in the context of developing countries.

A number of empirical studies were also carried out to assess the impact of financial sector development and economic development in Nigeria by a number of authors. Odedokun (1989), for instance, tested the causality between financial variables and economic development. Among other findings, he found a rather weak unidirectional causation from the GDP to the broader money when Sim's procedures were used and contrary estimates for Granger causality. Moreover, Olomola (1995) applied cointegration and Granger causality to Nigerian quarterly-series data for 1962-1992 in order to test if the relationship between financial deepening-growth is either "demand following" or "supply leading". Among other results, his study showed that the Nigerian economy exhibits a mixture of 'supply-leading' and demand-following patterns whereby causation runs from the financial sector of the economy to the real sector and *vice-versa*. His study also supports the case of unidirectional causality from the real sector to the financial sector as in Odedokun (1989). His conclusion among others was that money is causally prior to income, in the sense of Granger, for Nigeria, and that the reverse causation holds.

Generally, the above review of related studies supposes that the causal relation between credit market development and economic growth is still debatable in the literature. Apart from being scanty, the empirical literature is weakened by not covering the period of recent global financial crisis in the Nigerian economy. This paper is an attempt to fill such gaps in the finance-growth nexus literature.

### **3.0 Research Method**

#### **3.1 Model Specification**

In Nigeria, the aggregate bank credit is always allocated to both the public sector and private sector of the economy. But studies (e.g. Beck *et al.*, 2005; Levine, 2002; Odedokun, 1998; King & Levine, 1993; Boyreau-Debray, 2003; Liang, 2007; Crowley, 2008) have shown that credit to the private sector has more significant effect on economic activities than credit to public sector. In this study, therefore, the change in the growth rate of bank credit to the private sector is taken as an appropriate means of credit to the private sector.

We propose a simultaneous equation model for this study, since bank credit and economic growth are jointly determined. The neglect of reverse causality in either a cross-sectional or time-series modeling framework might introduce simultaneity bias (Koutsoyiannis, 1977; Gujarati & Sangeetha, 2007; Wooldridge, 2006).

(a) **Economic growth equation:**

$$GDP_t = \beta_0 + \beta_1 PSC_{t-i} + \beta_2 LR_{t-i} + \beta_3 IND_{t-i} + \varepsilon_{1t} \tag{1}$$

(b) **Bank credit equation:**

$$PSC_t = \alpha_0 + \alpha_1 GDP_{t-i} + \alpha_2 LR_{t-i} + \alpha_3 PSC_{t-i} + \varepsilon_{2t} \tag{2}$$

where *GDP* is the gross domestic product at current basic prices, *PSC* is the annual domestic bank credits to private sector as a ratio of the GDP, *LR* is the lending rate of commercial banks, *IND* is the industrial production index,  $\beta_0$  and  $\alpha_0$  are constant or intercept terms,  $\varepsilon_{1t}$ ,  $\varepsilon_{2t}$  are the disturbance terms and  $\beta_1, \beta_2, \beta_3, \alpha_1, \alpha_2, \alpha_3$  are the estimated coefficients, *t* is the time period, *i* is the number of lags and *t-i* are the time lags. The optimal lag length (i) was chosen based on Akaike Information Criterion (AIC).

In equation (1), the dependent variable is economic growth rate, while the main explanatory variable is change in the growth rate of private sector credit (PSC), measured as the amount of bank credit allocated to the private sector as a share of GDP. This is used to capture the extent of financial intermediation in the economy. Koivu (2002) maintains that this ratio appears a superior option to the pure ratio of broad money to GDP used in some studies, because it excludes credits by development banks and loans to the government and public enterprises. The lagged variables are introduced into the models as control variables to recognize the dynamic nature of economic growth and banking sector credits. They also capture the fixed effects of all the unobservable historical influences. The inclusion of the consumer price index (a proxy for inflationary rate) is to enable us examine the effect of inflation rate on credit market development. A number of studies (e.g., De Melo *et al*, 1996; Havrylyshyn *et al*, 1998; Berg *et al*, 1999) have found significant effects of inflation on economic growth in transition countries. Generally, these additional exogenous variables are meant to strengthen the robustness of our findings.

**3.2 Causality Test**

Causality test was conducted to explore the transmission mechanism between bank credit and economic growth. Thus, within our bank credit - economic growth context, the Engle and Granger (1987) two step procedure was investigated using the following equations:

$$GDP_t = PSC_t + \varkappa \sum PSC_{t-1} + \gamma \sum PSC_{t-2} + \delta \sum PSC_{t-3} + \mu_{1t} \tag{3}$$

$$PSC_t = GDP_t + \tau \sum GDP_{t-1} + \varphi \sum GDP_{t-2} + \omega \sum GDP_{t-3} + \mu_{2t} \tag{4}$$

where,  $\alpha, \gamma, \delta, \tau, \varphi, \omega$  are parametric coefficients;  $\mu_1$  and  $\mu_2$  are assumed to be ‘white noise’ or error terms with zero mean and constant variance.

### 3.3. Data and Estimation Technique

Annual time series data covering 1970 to 2008 were used to estimate the models. The data for this study are GDP at current basic prices, and industrial production index (a proxy for industrial development), bank credit to the private sector, and lending rate of banks. The data were obtained from Central Bank of Nigeria’s Statistical Bulletin (various issues), Annual Reports and Statement of Accounts (various issues) as well as National Bureau of Statistics (NBS). Table 1 below reports the summary of the descriptive statistics of the variables.

A two-stage least square estimating technique was used to estimate our simultaneous equation model. The models were estimated using the log values of the variables, with the exception of lending rate. The log transformation made the estimated coefficients to serve as elasticities. The resulting estimated models were assessed based on both economic and statistical/econometric inferences.

**Table 1: Summary of Descriptive Statistics**

	GDP	IND	LR	PSC
Mean	3356424.	113.9564	16.42487	5.696014
Median	216997.5	120.8000	13.00000	0.232621
Maximum	23892171	158.8000	36.09000	33.50000
Minimum	5281.100	41.30000	6.000000	0.056856
Std. Dev.	6170407.	28.46949	7.350806	7.939521
Skewness	2.114675	-0.770492	0.747344	1.648273
Kurtosis	6.419245	2.806960	2.792740	5.678021
Jarque-Bera	48.06528	3.919333	3.700202	29.31339
Probability	0.000000	0.140905	0.157221	0.000000
Sum	1.31E+08	4444.300	640.5700	222.1445
Sum Sq. Dev.	1.45E+15	30799.46	2053.305	2395.368
Observations	39	39	39	39

**Source:** Authors’ computation.

### 4.0 Results and Discussion

Table 2 contains the results of Granger Causality tests. The results show evidence of unidirectional causal relationship from GDP to private sector credit (PSC). The results further provide evidence of uni-directional causality running from IND to GDP at 10% level of significance. However, there is no evidence to support the existence of causality between the remaining pairs of variables. Our finding on causal relationship from GDP to private sector credit (PSC) conforms to other studies by Mushin & Eric (2000), Vazakidis & Adamopoulous (2009), Adamopoulous (2010), and Mishra *et al* (2009).

**Table 2: Granger Causality Results**

Lags: 2			
Null Hypothesis:	Obs.	F-Statistic	Probability
IND does not Granger Cause GDP	37	2.78666	0.07662***
GDP does not Granger Cause IND		0.56958	0.57140
LR does not Granger Cause GDP	37	0.98012	0.38625
GDP does not Granger Cause LR		0.61244	0.54826
PSC does not Granger Cause GDP	37	2.23733	0.12318
GDP does not Granger Cause PSC		9.29142	0.00066*
LR does not Granger Cause IND	37	1.13520	0.33396
IND does not Granger Cause LR		1.03881	0.36550
PSC does not Granger Cause IND	37	0.31127	0.73471
IND does not Granger Cause PSC		0.35303	0.70526
PSC does not Granger Cause LR	37	0.93287	0.40386
LR does not Granger Cause PSC		0.64498	0.53136

(\*)(\*\*\*) indicates statistical significance at 0.01 and 0.1.

Table 3 reports the multivariate regression using Two-Stage Least Squares (TSLS) technique. The coefficient of main variable of interest (i.e., Private Sector Credit (PSC)) is found to be positive and statistically significant at 1% with t-statistic of 8.8510 and its corresponding probability value of 0.0000. By this, 1% increase in private sector credit raises the level of GDP by 86%. This, therefore, indicates that private sector credit plays pivotal role in the growth performance of Nigerian economy. The coefficient of lending rate is also correctly signed (i.e., negative) but no sufficient evidence for its significance as indicated by the t-statistic of -0.6442 with corresponding probability value of 0.5238. This result signals the need for moderate lending rate to boost productivity and hence economic growth.

However, the coefficient of industrial production index (LIND) has the correct sign, but not statistically significant. The  $R^2$  of 0.9264 indicates that about 93% of total variation in the dependent variable (LOGGDP) is accounted for by the explanatory variables (i.e., LPSC, LR and LIND). This result remains robust even after adjusting for the degrees of freedom (df) as indicated by the value of adjusted  $R^2$ , which is 0.9199 (i.e.  $\approx 92\%$ ). Thus, the regression has a good fit.

The F-statistic, which is a test of explanatory power of the model is 142.61 with the corresponding probability value of 0.0000, is statistically significant at 1%. Therefore, this implies that the three explanatory variables (LPSC, LR and LIND) have joint significant effect on the economic growth of Nigeria using GDP as a proxy. The Durbin-Watson statistic of 0.8897 indicates we cannot completely rule out autocorrelation. In summary, these results are in agreement with similar studies on Nigeria by Odedekun (1987), and Olomola (1995).

**Table 3: Regression Results for Model (1)**

Method: Two-Stage Least Squares

Dependent Variable: LGDP

Observations: 38 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.191475	2.473138	0.077422	0.9387
LPSC(-1)	0.863023	0.097506	8.850973	0.0000*
LR(-1)	-0.018484	0.028694	-0.644183	0.5238
LIND(-1)	2.726074	0.540270	5.045764	0.0000*

(\*) indicates statistical significance at 0.01.

$$R^2 = 0.9264$$

$$\bar{R}^2 = 0.9199$$

$$F\text{-statistic} = 142.61$$

$$\text{Prob (F-statistic)} = 0.0000$$

$$DW = 0.8897$$

Similarly, table 4 reports the regression estimates of bank credit equation. Two of the coefficients of the explanatory variables (i.e.,  $LGDP_{t-1}$  and  $LPSC_{t-1}$ ) have the right sign (i.e., positive) and found to be statistically significant at 1% level with probability values 0.0095 and 0.0006, respectively. These results indicate that past values of the Gross Domestic Product (LGDP) and Private Sector Credit (LPSC) have significant effects on credit to the private sector in Nigeria. The coefficient of multiple determination ( $R^2 = 0.9260$ ) is significantly high and remained robust at 0.9195 after adjusting for degrees of freedom (df). This implies that at least 92% of the total variation in LPSC is accounted for by the lagged values of LGDP, LR and LPSC.

Moreover, the explanatory variables are jointly significant at 1% level as captured by F-statistic (141.91) with a corresponding probability value of 0.0000. Overall, the results are in consonance with similar studies by Vazakidis & Adamopoulos (2009); Adamopoulos (2010). The policy implication of our findings is that the government should, through the Central Bank, grant more private sector credit with minimal interest rates since these will impact positively on economic growth.

Over and above, the paper recommends the need for more financial market development that favours more credit to the private sector to stimulate economic growth.

**Table 4: Regression Results for Model (2)**

Method: Two-Stage Least Squares

Dependent Variable: LPSC

Observations: 38 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.443774	1.508014	-2.946772	0.0058*
LGDP(-1)	0.319828	0.116255	2.751094	0.0095*
LR(-1)	0.031469	0.025009	1.258314	0.2169
LPSC(-1)	0.544217	0.144482	3.766662	0.0006*

(\*) indicates statistical significance at 0.01.

 $R^2 = 0.9260$  $\bar{R}^2 = 0.9195$ 

F-statistic = 141.91

Prob(F-statistic) = 0.0000

DW = 1.9496

## 5.0 Conclusion

The paper investigates the relationship between banking sector credit and economic growth in Nigeria over the period 1970-2008. The causal links between the pairs of variables of interest were established using Granger causality test while a Two-Stage Least Squares (TSLS) estimation technique was used for the regression. The results of the analysis indicate that private sector credit impacts positively on economic growth over the period of coverage in this study. However, lending rate impedes growth.

Over and above, the paper recommends the need for more financial market development that favours more credit to the private sector in order to stimulate economic growth.

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## **Determinants of Foreign Reserves in Nigeria: An Autoregressive Distributed Lag Approach**

**David Irefin<sup>1</sup> and Baba N. Yaaba<sup>2</sup>**

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*On global scale, central banks' holdings of foreign reserves have escalated sharply in recent years. World international reserves holdings have risen significantly from US\$1.2 trillion in 1995 to nearly US\$10.0 trillion in June 2011. Dominant among these reserves are concentrated in the hands of few countries. Ten major holders of foreign reserves are mostly from Asia. Oil exporting countries in Africa and the Middle East are not left out in this trend. Nigeria's foreign reserves rose from US\$5.5 billion in 1999 to US\$62.40 billion in July 2008, making Nigeria the twenty-fourth largest reserves holder in the world. This pace of reserves accumulation is occurring without regard to its diminishing marginal benefits and rising marginal costs. This study used an Autoregressive Distributed Lag (ARDL) approach to run a slightly modified econometrics 'Buffer Stock Model' of Frenkel and Jovanovic (1981) to estimate the determinants of foreign reserves in Nigeria with focus on income, monetary policy rate, imports and exchange rate. The results debunked the existence of buffer stock model for reserves accumulation and provide strong evidence in support of income as the major determinant of reserves holdings in Nigeria.*

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**Key Words:** Foreign reserves, central bank, financial crisis, Nigeria.

**JEL Classification:** C22, F30, F31

### **1.0 Introduction**

The holdings of foreign reserves by central banks have increased sharply in recent years. World international reserves holdings rose from US\$1.2 trillion in 1995 to nearly US\$10.0 trillion in June 2011. These reserves are concentrated in the hands of few countries mostly from Asia. About seven Asian central banks had over US\$5.89 trillion in foreign reserves as at June, 2011. The top two, China and Japan accounted for more than 80.0% of total world reserves. China, which is first on the list, had about US\$3.597 trillion in foreign reserves as at June 2011. Hong Kong the last on the list had about US\$122billion. Singapore has the highest percentage of reserves to GDP (104.4%), followed by Taiwan (78.2%), Hong Kong (75.1%) and Malaysia (55.5%).

Oil exporting countries in Africa and the Middle East are not left out in this trend. In Africa, foreign reserves increased from US\$39.0 billion in 1995 to US\$147.0 billion in 2005, representing about 276.9% increase. . The largest reserves holder in Africa is Algeria. Other important holders are Libya, Nigeria, Morocco, Egypt and South Africa (ECB, 2006a). Nigeria's foreign reserves rose from US\$5.5 billion in 1999 to US\$62.40 billion in July 2008, making Nigeria the twenty-fourth largest reserves holder in the world. However, the reserves fell to US\$34.8 billion in September 2011 ([www.cenbank.org](http://www.cenbank.org)).

This pace of reserves accumulation is occurring without regard to its diminishing marginal benefits and rising marginal costs. This led to the debate on the determinant factors. Thus, this study is an attempt to measure the determinants of reserves holdings in Nigeria. To achieve this, the study is organized into five sections. After this introduction, the next section reviews

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relevant literature on foreign reserves management. Section three explains the methodology, while section four presents the empirical results and section five concludes the study.

## **2.0 Review of Some Related Literature**

According to IMF (2009), Foreign exchange reserves are foreign currency deposits of central banks or other monetary authorities. They are assets of central banks held in different reserves currencies such as the dollar, pound sterling, euro, yen etc. These reserves currencies are used to back central bank's liabilities, such as the local currency issued, the reserves deposits of various deposit money banks (DMBs), government or other financial institutions.

Foreign reserves are used to support monetary and foreign exchange policies, in order to meet the objectives of safeguarding currency stability and the normal functions of domestic and external payment systems. From the onset, foreign reserves were held in gold, but with the advent of the Bretton Wood system, the US dollar was pegged to gold and the gold standard was abandoned. Hence, the dollar, appearing as good as gold, became the fiat and most significant reserves currency.

In today's world, large foreign reserves partly symbolizes the country's strength, as it indicates the strong backing the currency of the country has. Hence, it attracts confidence of the international community in the country, while low a foreign reserve signals the opposite.

The central bank has the statutory responsibility of managing a country's foreign reserves. This responsibility is either enshrined in the country's constitution or an act of law (ECB, 2006a). In Nigeria for example, the CBN Act of 2007 constituted the legal framework within which the CBN carries out its mandate of, among others, the responsibility to manage the country's foreign reserves.

Approaches to the management of reserves vary from country to country depending on the objectives at hand. In the context of fixed or managed exchange rate regimes, the traditional objectives have mostly been formulated with respect to monetary policy and exchange rate management (Carlos et al, 2004). In this case, foreign reserves acts as a buffer against capital outflows in excess of the trade balance. This makes foreign reserves management secondary to macroeconomic objectives, as liquidity is always the target. This also enables the monetary authority intervene in the foreign exchange market at any given time. Holding foreign reserves under both fixed and floating exchange rate regimes also acts as a "shock absorber" in terms of fluctuations in international transactions, such as variations in imports resulting from trade shocks, or in the capital account due to financial shocks. According to ECB (2006b), the holding of foreign reserves as self-insurance against currency crisis is especially important if a currency is overvalued. Mexico, Korea and Russia, for example, all share relatively recent experiences with destabilizing runs on their currency during a financial crisis. The study, however, argued that this is less relevant to undervalued currencies such as those in most Asian countries.

To corroborate the argument of ECB (2006a), Lawrence (2006), noted that the prominent reason that have been put forward for the on-going rapid accumulation of external reserves, particularly

in the Emerging Market Economies (EMEs) of Asia, is to insure against currency crisis by allowing relevant authorities to support their own currency. This is in order to avoid the re-occurrence of the currency crisis of the late 1990s. According to him, other reasons for holding foreign reserves do not necessarily require large amounts. He further argued that, foreign reserves may serve an immediate purpose of either fighting inflation or deflation, but large foreign reserves accumulation serves little purpose other than precautionary and that even the precautionary motives of foreign reserves holding is not significant in advanced economies due to flexible exchange rate and strong macroeconomic policies. He, therefore, posited that foreign reserves accumulation is not necessary as it is practiced. Others, however, argued that stockpiling of foreign reserves is critical in this era of open capital markets as a means of safeguarding against capital account crisis. In this regard, Fischer (2001) noted that: "Reserves matter because they are the key determinant of a country's ability to avoid economic and financial crisis. This is true of all countries, but especially the emerging markets that are open to volatile international capital flows. The availability of capital flow to offset current account shocks reduce the amount of reserves a country needs. But access to private capital is often uncertain, and inflows are subject to rapid reversals, as we have seen in recent years. We have also seen in the financial crisis of the late 1990s and the recent global financial crisis that, countries with robust foreign reserves, by and large, did better in withstanding the contagion than those with smaller foreign reserves" (Fischer, 2001).

Traditionally speaking, as observed earlier, most countries hold foreign reserves in support of the exchange rate policy. This is to ensure foreign exchange stability. In most cases reserves are used to intervene in the foreign exchange market to influence the exchange rate. Since exchange rate regime is bi-polar in nature. A country either practices floating exchange rate, with its inherent exchange rate volatility or fixed exchange rate with its attendant difficulties in absorbing changes in equilibrium real exchange rate. Although, between these two extremes are variety of mixed regimes, but whichever method a country adopts, of course, has its inherent consequences (Michael et al 2006). Therefore, there is need for intervention to smooth exchange rate fluctuations.

International Relations Committee, Task Force (IRC, 2006) identified other uses of foreign reserves that necessitate its accumulation and management by the central banks as: payment for the importation of goods and services, service the nation's external debt and finance domestic fiscal expenditure.

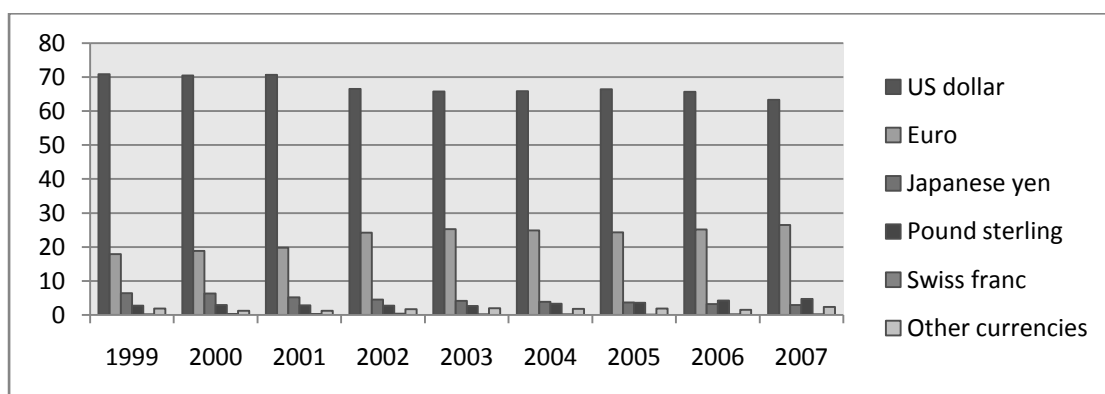
However, in recent times, an active approach to foreign reserves management tends to lay more emphasis on generation of further wealth (profit). This occurs when monetary policy, exchange rate and debt management issues are of less concern to central banks; when vulnerabilities in the financial and corporate sectors are negligible; when government vigorously pursues a flexible exchange rate policy; when it has a credible fiscal policy and institutional framework as well as highly developed domestic financial markets. Here, the foreign reserves portfolio is divided into active and passive parts. While the passive portfolio deals with macroeconomic objectives

focusing mainly on liquidity, the active portfolio is used for profit making, taking cognizance of liability management objectives (Carlos et al 2004).

In agreement with the profit making approach to reserves management, Peter and Machiel (2004) states that, over a decade now, management of foreign currency reserves has changed its focus from the objectives of maintaining liquidity and principal preservation, to that of maximizing total profit. They identified long term government bonds, global government bonds, investment-grade credits, high yield bonds and equities as among investments with high return, though with their associated risks.

To support the submission of Michael et al (2004a), ECB (2006a) noted two developments that have been witnessed in recent times with regards to foreign reserves management to include: management of foreign reserves by way of venturing into a more diversified range of instruments with longer maturity period, as well as the channeling of sizeable component of foreign assets into areas that has no link with foreign reserves holding. They cited the creation of oil funds by countries such as Norway, Russia, Venezuela, Kuwait and Oman, which are established either to stabilize the country's oil revenue (stabilization funds) or save for future generations (saving funds) or for early settlement of external debt. Another example is the creation of heritage fund, such as in Singapore, or in case of China where more than US\$60.0 billion was injected into three state-owned commercial banks, so as to increase their capital base to facilitate privatization. There is also the case of Taiwan where US\$15.0 billion was allocated for banks in the province to use in the major investment projects.

On currency diversification, there is relative stability in the shares of foreign reserves currencies in the global foreign exchange assets in recent year, with US dollar still maintaining the lead with about 63.3 % in December 2007, while the euro increased its weight from 18.0 % in 1999 to 26.5 % in 2007 (Figure 1).



**Figure 1: Official Foreign Reserves: Currency Shares (as % of total identified holdings)**

*Source: CIA Fact Book, 2007*

The US dollar is still the most common foreign reserves currency. The reason for the dominance of the dollar over other currencies according to ECB (2006) is not far from the fact that: (1) US fixed income markets and financial markets are broader, deeper and more liquid comparatively

to those of the euro area and Japan. (2) There is strong evidence in support of the fact that, the largest foreign reserves accumulators will continue to use dollar as intervention currency, at least in the main time.

In conformity with ECB (2006), Rodrick (2006) argued that foreign reserves are also managed to earn reasonable rates of return without exposing the reserves to excessive risk. However, central banks in carrying out this policy task exposed foreign reserves to a variety of financial and non- financial risks. Exposure to risks also occurs due to the fact that central bank's main activity of ensuring price stability requires adequate financial backing.

In this regards IMF (2001) identified two categories of risks; namely: external market-based risks and operational risk. According to the report, external market-based risk consists of liquidity risks, credit risks, currency risks and interest rate risks, while the operational risks consists of control system failure risks, financial error risks, financial misstatement risks and loss of potential income.

ECB (2006) however, identified risks of foreign reserves accumulation to include inflationary pressure, over investment, assets bubbles, complications in the management of monetary policy, potentially sizeable capital losses on monetary authorities' balance sheets, sterilization costs, segmentation of the public debt market and misallocation of domestic bank's lending (table 1).

To support the position of ECB (2006), on foreign reserves accumulation and inflation, Calvo (2002), noted that, the accumulation of foreign exchange reserves leads to monetary expansion and hence inflation. This is, however, in contrast with the submission of Victor and Vladimir (2006). According to them, most countries that accumulate foreign reserves faster usually finance such accumulation with government budget surplus and thus managed to escape high inflationary pressure. They observed data of about one hundred countries from the World Bank and discovered that there was no link between the accumulation of foreign reserves and inflation.

Bird and Rajan (2003), observed that reserves hoarding involves significant costs as the country is swapping high yielding domestic assets for a relatively lower yielding foreign one. They, however, argued that the cost might be reduced with a greater degree of regional monetary cooperation. Rodrik (2006), in his study, estimated the cost of holding reserves for all developing countries to be about 1.0 % of GDP.

On interest rate and reserves, Bird and Rajan (2003), observed that, while the level of foreign reserves can be influenced by some economic fundamentals, interest rates can in-turn influence the level of foreign reserves. For instance, if interest rates are lower than the foreign rates, the holders of foreign exchange are likely to divert their holdings into a relatively higher return ventures, hence keep their money where they are earned i.e. abroad. Conversely, if interest rates are higher relative to foreign rates, the foreign exchange earners will prefer to keep their fund at home, hence whatever they earned abroad is immediately repatriated back home. To this end

therefore, there is the need to keep interest rate at a competitive level so as to discourage capital outflows.

On cost structures and the foreign reserves level, they noted that the profitability of business and the growth of exports can be indirectly affected by the country's cost structure, through influencing the competitiveness of the products. Hence, it will be difficult for countries with high cost structure to build foreign reserves through exports. A good example is the United States, which is being affected negatively due to the high cost of items such as vehicles and electronic goods. Therefore, the competitiveness of a country is a primary determinant for the sustainability of foreign reserves accumulation.

On institutional arrangements in relation to foreign reserves management, Medhora (1992) and Siregar & Ramkishen (2003) explained that the management of foreign reserves includes the legal foundation and internal governance. The management of foreign reserves is mostly governed by an act or law and this serves as the legal framework for asset management and investment operations. Since all the decisions regarding management of foreign reserves are of strategic nature, the management, particularly at the top, define and set the overall parameters for foreign reserves management operations, as well as the framework for the control of risk. The investment activities and performance are often monitored by the board. The decisions regarding implementation of investment strategies are usually undertaken by the investment committee (IMF, 2001).

## **2.1 Empirical Literature**

There is no doubt as to the usefulness of foreign reserves as a tool to avoid crises as argued by Fischer (2001), but there is a limit to the amount of foreign reserves needed to prevent the financial crisis, going by the fact that holding large foreign reserves can imply costs. If foreign reserves accumulation is driven, for instance, by precautionary motives, it should stop at the stage where the optimal level has been reached. This, however, does not happen in the present circumstance. This thus raises the question about what constitutes an adequate foreign reserve. Frenkel and Jovanovic (1981) states that most of the rules for a country's demand for foreign exchange reserves consider real variables, such as imports, exports, foreign debt, severity of possible trade shocks and monetary policy considerations. Similarly, Shcherbakov (2002) states that, there are some common indicators that are used to determine the adequate level of foreign reserves for an economy. According to him, some of these indicators determine the extent of external vulnerability of a country and the capability of foreign reserves to minimize this vulnerability. These indicators includes: import adequacy, debt adequacy and monetary adequacy.

The traditional and most prominent factor considered in determining foreign reserves adequacy is the ratio of foreign reserves to imports (import adequacy). This represents the number of months of imports for which a country could support its current level of imports, if all other inflow and outflow stops. As a rule of thumb, countries are to hold reserves in order to cover their import for three to four months. According to the International Monetary Fund (IMF,



2000), the guideline of three months of imports has been in force for a few years now. However, with the Asian crisis of the late 1990s this measure has been questioned by experts. Currently some are of the view that twelve months of imports is adequate, while others argue that the number of months of coverage is of limited importance, since the focus is on the external current account. This group argued that foreign reserves adequacy should focus on the vulnerabilities of capital accounts. Countries that are vulnerable to capital account crisis should hold foreign reserves sufficient enough to cover all debt obligations falling due within the succeeding year. This is known as the Calvo, Guidotti and Greenspan's rule (reserves equal to short term external debt). See Greenspan (1999).

According to Rodrik and Velasco (1999), and Garcia and Soto (2004), a country is considered prudent, if it holds foreign reserves in the amount of its total external debt maturing within one year. The reserves to short-term debt measure have been proved empirically relevant to currency crisis prevention. The feedback on the outreach activities conducted by the IMF and the World Bank lend its support to this approach (Marion, 2005). The last measure is reserves equal to 5-20 % of  $M_2$ . This benchmark is very useful for economies with high risk of capital flight and those that want to shore up confidence in the value of local currency. It is also useful for the economies that have weak banking sectors (Summers, 2006; IMF, 2000). However, Comelliet al (2006) argued that, empirical analysis of all the three methods explained above, confirmed that the international reserves of most countries are in excess particularly that of the Asian economies (Table 3). However, it should be noted that, determining the optimal level of foreign reserves has no straight forward measurement factors. It sometimes depends also on institutional factors such as the degree of capital mobility or financial liberalization.

Various models have been developed to measure the determinants of foreign reserves. The most widely used of these models in the literature is the "buffer stock model". The model implies that the authorities demand reserves as a buffer to curb fluctuations in external payment imbalances. This is to avoid macroeconomic adjustment cost arising from imbalances in the external payments. The advantage of the model over others is its adaptability to both fixed and floating exchange regimes. The model is as relevant in a modern floating exchange regime as it was during the Bretton Woods regime.

Heller (1966) estimates the optimal stock of reserves by equating the marginal cost and marginal benefit of holding reserves following rational optimizing decision. He compares actual reserves with his results for each country to check for the adequacy of reserves. Frenkel and Jovanovic (1981) in their effort to determine the optimal stock of reserves modified Heller's model based on the principles of inventory management. Using pooled time series for the period 1971-1975 for twenty two countries, they concluded that the estimated elasticities were close to their theoretical predictions.

In their study, Flood and Marion (2002) confirmed the applicability of the buffer stock model in the modern regime of floating exchange rate as it was during the Bretton Woods era. They submitted that with greater exchange rate flexibility and financial openness, the model will

perform better if these variables were well represented. Disyatat and Mathieson (2001) adopted Frenkel and Jovanovic model for fifteen countries in Asia and Latin America and submitted that the volatility of the exchange rate is an important determinant of reserves accumulation and that the financial crisis of the late 1990s produced no structural breaks.

IMF (2003) standardized the buffer stock model and applied it on the emerging markets economies of Asia. The study concluded that reserves accumulations were driven by increases in current account and capital flow. Aizenman and Marion (2003) used the buffer stock model on sixty four countries over the period 1980 to 1996 and found that the standard variables in the model explain about 70.0 percent of the movement in the observed reserves holding without country fixed effects and 86.0 percent with country fixed effects.

Ramachandran (2005) applied the buffer stock model for India covering the period April 1993 – December 2003, which was characterized by flexible exchange rate, and high level of capital flows. He finds that the standard measure of volatility defined as the fifteen years rolling standard deviation of change in trend adjusted reserves used by Frenkel and Jovanovic (1981) produces biased estimates but when he adopted the GARCH approach result of the estimated coefficient were closer to the theoretical predictions.

The buffer stock model of Frenkel and Jovanovic (1981) is given as:

$$dR(t) = \mu dt + \sigma dW(t) \quad (1)$$

Where:  $R_t$  = reserves held in time  $t$

$W_t$  = standard Weiner process with zero mean and variance  $t$

$\mu$  = deterministic part of the instantaneous change in reserves

$\sigma$  = standard deviation of the Weiner increment in reserves

At each point in time the distribution of reserves holdings  $R(t)$  is characterized by

$$R(t) = R^* - \mu t + \sigma dW(t) \quad (2)$$

where:  $R^*$  is the optimal stock of reserves, which is obtained by minimizing two types of costs viz: i) the cost of adjustment, which is incurred once reserves reach an undesirable lower bound; and ii) foregone earnings on reserve holdings. The optimal stock of reserves is obtained by minimizing these two costs and it yields an expression:

$$R^* = \sqrt{[2c\sigma^2 / (2r\sigma^2)0.5]} \quad (3)$$

where:

$c$  = fixed cost of adjustment

$r$  = opportunity cost of holding reserves

$\sigma$  = standard deviation of change in reserves.

The estimating equation can be re-written as:

$$\text{Log } R_t = \beta_0 + \beta_1 \log \sigma_t + \beta_2 \log r_t + \mu_t \quad (4)$$

where  $\mu_t$  is white noise.

Equation 4 is considered as the benchmark for reserves determinant equation in most empirical studies. The theoretical prediction suggest  $\beta_1 = 0.5$  and  $\beta_2 = -0.25$ .

Past studies, however, arrived at different results for the elasticities (Flood and Marion 2002, and Ramachandran 2004). The difference in the result were attributed largely to the sensitivity of the model to different proxies for the opportunity cost of holding reserves, estimation methods and modification of the original model by adding new variables.

For a developing economy like Nigeria, there is need to extend the model to incorporate other variables that are peculiar in the determination of reserves holdings. Hence, variables such as Gross Domestic Product (GDP), imports, monetary policy rate which is an anchor of monetary policy and exchange rate are included in the estimation equation. Thus, the equation becomes:

$$\text{Log } R_t = \beta_0 + \beta_1 \log Y_t + \beta_2 \log IM_t + \beta_3 \log MPR_t + \beta_4 \log EXR_t + \mu_t \quad (5)$$

where R= foreign reserves, Y = Gross Domestic Product, IM = Import, MPR = Monetary Policy Rate and EXR = Exchange Rate.

The justification for including additional variables for Nigeria is that, for instance, reserves holdings are positively related with the level of international transactions hence the importance of variables such as imports and exchange rate.

### 3.0 Model Specification, Data Sources and Description

#### 3.1 Model Specification

The Autoregressive Distributed Lag (ARDL) model developed by Pesaran et al (2001) is deployed to estimate Frenkel and Jovanovic's "buffer stock" econometric model, but with a slight modification. The choice of ARDL is based on several considerations. First, the model yields consistent estimates of the long run normal coefficients irrespective of whether the underlying regressors are stationary at I(1) or I(0) or a mixture of both. In other words, it ignores the order of integration of the variables (Pesaran et al, 2001). Secondly, it provides unbiased estimates of the long run model as well as valid t-statistics even when some of the regressors are endogenous (Harris & Sollis, 2003). Thirdly, it has good small sample properties. In other words it yields high quality results even if the sample size is small.

The ARDL (p, q<sub>1</sub>, q<sub>2</sub> ... q<sub>k</sub>) model following Pesaran et al (2001)<sup>3</sup> can be written as follows:

$$\Omega(L, P)y_t = \alpha_0 + \sum_{i=1}^k \beta_i(L, q_i) x_{i,t} + \delta' w_t + \mu_t \quad (6)$$

<sup>3</sup> See Pesaran et al, 1997, 1998 and/or 2001 for more detail

Where:

$$\Omega(L, P) = 1 - \Omega_1 \delta_1 L^1 - \Omega_2 \delta_2 L^2 - \dots - \Omega_p L^p \quad (7)$$

$$\beta_1(L, P_1) = \beta_{i0} + \beta_{i1} L^1 + \beta_{i2} L^2 + \dots + \beta_{iq_i} L^{q_i}, \quad i = 1, 2, \dots, k, \quad (8)$$

$y_t$  is the dependent variable;  $\alpha_0$  is a constant;  $L$  is a lag operator; and  $w_t$  is a  $s \times 1$  vector of deterministic variables such as seasonal dummies, time trends or exogenous variables with fixed lags.

The  $x_{i,t}$  in equation (6) is the  $i$  independent variable where  $i = 1, 2 \dots k$ . In the long-run, we have  $y_t = y_{t-1} = \dots = y_{t-p}$ ;  $x_{i,t} = x_{i,t-1} = \dots = x_{i,tq}$  where  $x_{i,tq}$  denotes the  $q^{th}$  lag of the  $i^{th}$  variable.

The long-run equation with respect to the constant term can be written as:

$$y = \alpha_0 + \sum_{i=1}^k \beta_i x_i + \delta' w_t + v_t \quad (9)$$

The long-run coefficient for a response of  $y_t$  to a unit change in  $x_{i,t}$  is estimated by:

$$\beta_i = \frac{\hat{\beta}_i(L, \hat{q}_i)}{\Omega(L, \hat{p})} = \frac{\hat{\beta}_{i0} + \hat{\beta}_{i1} + \dots + \hat{\beta}_{i\hat{q}_i}}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \dots - \hat{\alpha}_{\hat{p}}}, \quad i = 1, 2, \dots, k \quad (10)$$

where  $\hat{p}$  and  $\hat{q}_i$  are the selected (estimated) values of  $p$  and  $q_i$  and  $i = 1, 2, \dots, k$

Similarly, the long-run coefficients associated with the deterministic/exogenous variables with fixed lags are estimated using the following equation

$$\delta' = \frac{\hat{\delta}(\hat{p}, \hat{q}_1, \hat{q}_2, \dots, \hat{q}_k)}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \dots - \hat{\alpha}_{\hat{p}}}, \quad (11)$$

where, the numerator (*i.e.*  $\hat{p}, \hat{q}_1, \hat{q}_2, \dots, \hat{q}_k$ ) denotes the ordinary least square estimate of  $\delta$  in equation (6) – the selected ARDL model.

The error correction representation of the ARDL is obtained by transforming equation (6) in terms of lagged levels and differences of  $y_t, x_{1t}, x_{2t}, \dots, x_{kt}$  and  $w_t$ , hence we have:

$$\Delta y_t = \Delta \alpha_0 - \sum_{j=1}^{\hat{p}-1} \Omega_j \Delta y_{t-j} + \sum_{i=1}^k \beta_{i0} \Delta x_{it} - \sum_{i=1}^k \sum_{j=1}^{\hat{q}_i-1} \beta_{ij} \Delta x_{i,t-j} + \delta' \Delta w_t - \Omega(1, \hat{P}) ECM_{t-1} + \mu_t \quad (12)$$

ECM is defined as  $ECM_t = y_t - \hat{\alpha} - \sum_{i=1}^k \hat{\beta}_i x_{it} - \delta' w_t$  where  $\Delta$  is the first difference operator and  $\Omega_j, \beta_{ij}$  and  $\delta'$  are the coefficients of the short run dynamics of the model's convergence to equilibrium while  $\Omega(1, \hat{p})$  measures the speed of adjustment.

Following equations (6) and (8), the ARDL format of equation 5 becomes:

$$\begin{aligned} \Delta \log R_t = & \beta_0 + \sum_{i=1}^m \beta_1 \Delta \log R_{t-i} + \sum_{i=1}^n \beta_2 \Delta \log Y_{t-i} + \sum_{i=1}^o \beta_3 \Delta \log MPR_{t-i} + \sum_{i=1}^p \beta_4 \Delta \log IM_{t-i} + \\ & \sum_{i=0}^q \beta_5 \Delta \log EXR_{t-i} + \gamma_1 \log R_{t-1} + \gamma_2 \log Y_{t-1} + \gamma_3 \log MPR_{t-1} + \\ & \gamma_4 \log IM_{t-1} + \gamma_5 \log EXR_{t-1} + \mu_t \end{aligned} \quad (13)$$

where  $\Delta$  = first difference of the variables,  $t$  = time,  $t-1$  = lag one (previous quarter),  $\log$  = Natural logarithm,  $\beta_0$  = Constant,  $\sum$  = summation,  $\beta_1$  to  $\beta_5$  and  $\gamma_1$  to  $\gamma_5$  are the coefficients of their respective variables. Other variables are as defined earlier.

The apriori expectations of the variables in a buffer stock model are that; income (Y) and imports (IM) are expected to be positively related to reserves while monetary policy rate (MPR) is expected to have an inverse relationship with the dependent variable (R). Exchange rate (EXR) is ambiguous.

A general error correction representation of equation (13) is formulated as follows:

$$\Delta \log R_t = \beta_0 + \sum_{i=1}^n \beta_1 \Delta \log R_{t-i} + \sum_{i=1}^n \beta_2 \Delta \log Y_{t-i} + \sum_{i=1}^n \beta_3 \Delta \log MPR_{t-i} + \sum_{i=1}^n \beta_4 \Delta \log M_{t-i} + \sum_{i=0}^n \beta_5 \Delta \log EXR_{t-i} + \gamma EC_{t-i} \quad (14)$$

where EC = error correction representation

According to Pesaran et al (2001), there are two procedures involve in estimating equation (13). First, the null hypothesis of the non-existence of the long run relationship among the variables is defined by  $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = 0$ .  $H_0$  is tested against the alternative. Rejecting the null hypothesis implies that there exists a long run relationship among the identified variables irrespective of the integration properties of the variables. This is done by computing F-test (or Wald statistics) with an asymptotic non-standard distribution. Then, two sets of critical values are tabulated with one set assuming all variables are I(1) and the other I(0). This provides a band covering all possible classifications of the variables into I(1) and I(0)<sup>4</sup>. Now, if the calculated F-statistics lies below the lower level of the band, the null cannot be rejected, indicating lack of co-integration, if it lies above the upper level of the band, the null hypothesis is rejected implying that there is co-integration but if the F-statistics falls within the band, the result is inconclusive. It is important to state here that the ARDL approach, unlike other techniques (such as Engle and Granger (1987) and Johansen and Juselius(1990)), does not necessarily require the pre-testing of the variables included in the model (Pesaran et al, 2001).

### 3.2 Data Sources and Description

The study used secondary data obtained from the publications of Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS). The data span from the first quarter of 1999 to second quarter of 2011.

The major variables for which data is collected are defined below:

**Foreign reserves (R)** is the total assets of central bank held in different reserves currencies abroad. The reserves currencies includes; US dollar, Pound Sterling, Euro, Japanese Yen etc. The common scale variables used in the model are GDP and imports.

**Gross Domestic Product** is the total value of goods and services produced in the country within a given period. Imports are the total monetary value of goods and services imported into the country on quarterly basis. Monetary Policy Rate is an anchor rate. In other words, it is the rate at which the central bank lends money to the deposit money banks (DMBs).

**The opportunity cost** plays an important role in the determination of reserves. Although, most empirical studies did not find significant opportunity cost effect in reserve accumulation.

<sup>4</sup> The critical values are available in Pesaran et al, 2001

Different scholars have used different financial variables (i.e. interest rate and lending rate) as proxy for the opportunity cost. Ben-Bassat and Gottlieb (1992) used the difference between the real rate of capital and yield on reserves. Collana (2004) used short term interest rate as proxy for opportunity cost of reserves holdings. Suvojit (2007) used monthly yield on cut off price of 91 days treasury bills. The opportunity cost of holding reserve is proxied by monetary policy rate (MPR) in our case, since the CBN, which manages reserves has the duty of lender of last resort. The ways and means, which can serve as a viable alternative has since been curtailed by one of the WAMZ convergence criteria, which provide that CBN should not lend to the central government an amount more than five percent of her previous year revenue.

**MPR** is the rate at which the CBN lends to the DMBs.

**Exchange rate** is the price at which the domestic currency (naira) exchanges for US dollar are used.

#### 4.0 Empirical Results

Although, ARDL does not require pretesting of the data but we decided to determine the order of integration of all the data before running the ARDL. Figure 2(appendix) shows the trend of the data, while Table 3 shows the results of the Augmented Dickey-Fuller(ADF) and Phillips Perron (PP) unit root tests for the order of integration of the variables under investigation.

**Table 3: Unit-Root Test (Augmented Dickey-Fuller and Phillips-Perron)**

Variable	ADF test statistics based on SBC		P-P test statistics	
	Level	First Difference	Level	First Difference
R	-1.39939**	-0.253086	-1.038022	-6.230879*
Y	1.786341	-10.28576*	1.484007	-8.223247*
MPR	-1.027445	-6.577622*	-1.027445	-6.577622*
IM	0.67614	-6.84504*	0.770733	-6.866988*
EXR	-1.651867	-5.559932*	-1.678823	-5.559932*

Notes: \* and \*\* significant at 1% and 5%, respectively.

The table shows that while reserves based on ADF test is integrated of I(0), income, monetary policy rate, imports and exchange rates are of order I(1), thereby lending support to the use of ARDL.

**Table 4: Estimated Long-Run Coefficients ARDL (1,1,1,1,0)**

Dependent Variable: LR			
Variables	Coefficient	t-Statistic	Prob-Values
C	-0.173	-0.196	0.846
LR(-1)	0.866	14.494	0.000
LY(-1)	0.240	2.366	0.023
LMPR(-1)	-0.007	-0.085	0.933
LIM(-1)	-0.072	-2.146	0.038
LEXR	-0.087	-0.422	0.675

$R^2 = 0.99$                       F - Statistics = (4, 39) = 3.918 [0.009]  
 Adjusted -  $R^2 = 0.98$               Durbin Watson = 1.942

The relevant critical values for unrestricted intercept and no trend under 5 variables for 0.05 are 2.62 - 3.79. They are obtained from Pesaran et al. (2001) CI (iii) Case III.

We now estimate the second part of equation (13). Table 4 displays the calculated F-statistics (F-statistic = 3.918), showing that the null of no cointegration can be rejected at 1.0 percent level, because it is higher than the upper bound critical value of 3.79 as tabulated in Pesaran et al (2001). This implies that there exists a long-run relationship or cointegration between reserves and its determinants. Having established the cointegration relationship, the next step is to estimate the long-run coefficients by estimating an ARDL of order m, n, p, q, r (1, 1, 1, 1, 0) in the first part of equation (13).

The result indicates that the long run overall model is well fitted as the independent variable explained over 98 % ( $\bar{R}^2$ ) movement in the dependent variable. The long-run coefficients show that income exhibits a positive significant relationship with reserves so does the lag of reserves itself. Lag of MPR, exchange rate (EXR) and lag of imports are inversely related to reserves. The significant inverse relationship between reserves and imports debunked the existence of 'buffer stock model' in the management of foreign reserves in Nigeria. In other words, reserves accumulation is negatively related to the level of imports. Thus, any 1.0 % increase in one period lag of imports induces 7.0 % fall in reserves and vice versa. Put differently, Nigeria's external reserve is depleted in favour of importation.

Similarly, the lag of MPR is negatively related to reserves, although not significant. This is consistent with most empirical studies on the determinants of reserves, although, a negative relationship provides evidence in support of opportunity cost of reserves holding in Nigeria. A decline in MPR in the preceding period will induce the deposit money banks to borrow more from the CBN, hence restrain CBN from building more reserves. The MPR elasticity, which is the measure of opportunity cost, is found to be -0.007. However, some scholars such as Ben-Bassat and Gottlieb (1992) have argued that it could take positive sign. Exchange rate (EXR), which a priori is ambiguous takes a negative sign showing an inverse relationship with reserves holdings, although statistically insignificant. The insignificance of exchange rate may be that, although exchange rate in Nigeria is said to be market determined but in the real sense of it, it was somewhat managed by the CBN for some period.

Overall, the result suggests that the most significant factor in determining the level of reserves in Nigeria is lag of income. A 1.0% increase in income induces a 24% increase in current period reserves.

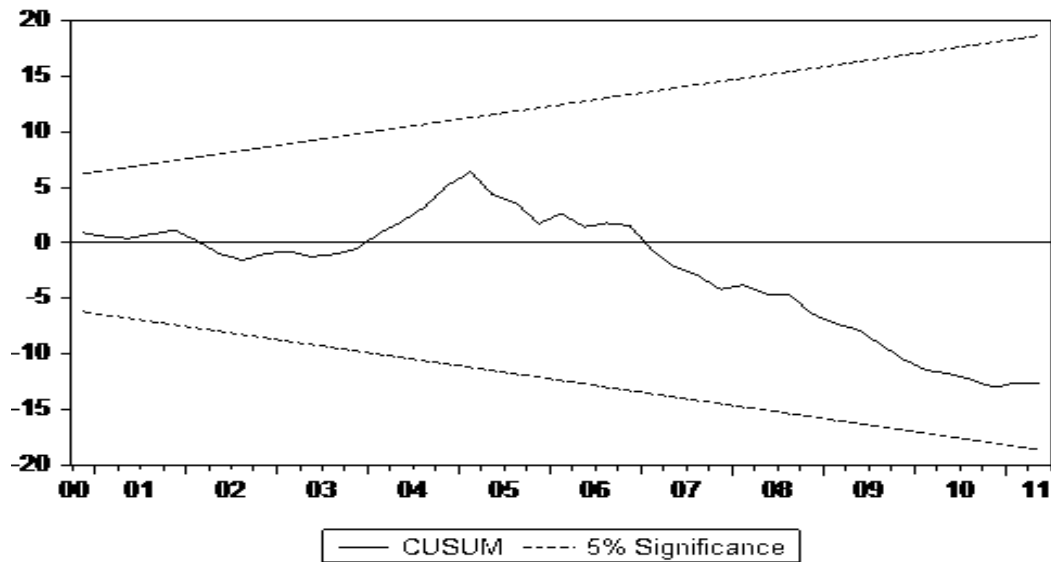
According to the Granger representation theorem, when variables are cointegrated, there must also be an error correction model (ECM) that describes the short-run dynamics or adjustment of the cointegrated variables towards their equilibrium values. The result of the ECM is presented in Table 5. The lagged error term is negative and highly significant. The coefficient of -0.14062 indicates an evidence of fast adjustment towards long-run equilibrium (i.e. about 14.1 % disequilibrium is corrected on quarterly basis by changes in reserves). This implies that, in case of distortion in equilibrium, it takes less than two years (i.e. seven quarters and one month) for equilibriums to be re-established. Similarly, following equation 14, both the short run and long run results yielded the same sign for these selected variables except exchange rate, which takes positive sign in the short run. However, while the coefficient of LR is the same in the short run as in the long run, those of income and monetary policy rate are stronger in the short run. This underscores the fact that reserve build-up in Nigeria is mainly a function of income arising from improvement in oil revenue. Other variables gain prominence only in the long-run. This also explains why the F-statistics lies below the lower bound of the critical value as tabulated in Pesaran et al (2001).



**Table 5: Error Correction Estimates of the ARDL Model**

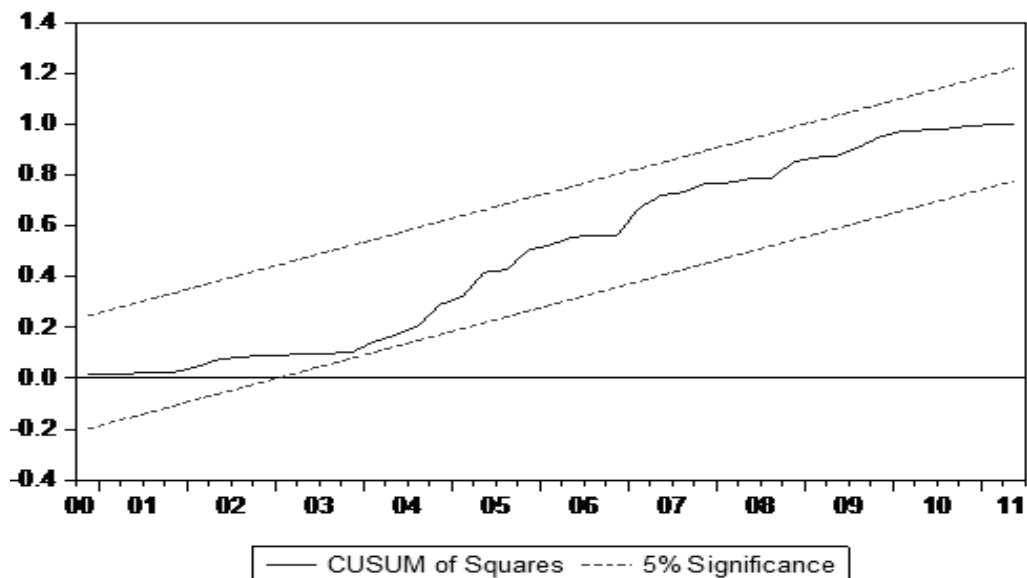
Dependent variable: $\Delta \ln R$			
<i>Regressors</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-Statistics</i>
C	-0.077762	-0.04067	-1.9118
ECM <sub>t-1</sub>	-0.14062	-0.06653	-2.11364
D(DLR(-1))	0.259519	-0.1754	1.47962
D(DLR(-2))	0.280253	-0.18514	1.51377
D(DLR(-3))	-0.000356	-0.18963	-0.00188
D(DLR(-4))	0.322149	-0.19728	1.63299
D(DLY(-1))	-0.009935	-0.20601	-0.04822
D(DLY(-2))	0.145156	-0.189	0.76801
D(DLY(-3))	0.270128	-0.18008	1.50002
D(DLY(-4))	0.412412	-0.19107	2.15838
D(DLMPR(-1))	0.097355	-0.17191	0.5663
D(DLMPR(-2))	0.097052	-0.16187	0.59958
D(DLMPR(-3))	-0.190784	-0.16138	-1.1822
D(DLMPR(-4))	-0.162654	-0.1629	-0.99848
D(DLIM(-1))	-0.059179	-0.04754	-1.24493
D(DLIM(-2))	-0.019898	-0.04639	-0.4289
D(DLIM(-3))	0.04438	-0.04557	0.97383
D(DLIM(-4))	0.008091	-0.04367	0.18526
D(DLEXR(-1))	0.603001	-0.55589	1.08475
D(DLEXR(-2))	0.595922	-0.61601	0.9674
D(DLEXR(-3))	0.881633	-0.71738	1.22896
D(DLEXR(-4))	1.218052	-0.60577	2.01074
$R^2 = 0.596$		$F\text{-Statistics} = 1.544$	

To test the stability of the equation and of the estimated parameters, the most often used techniques of CUSUM and CUSUMSQ tests were adopted.



**Figure 2:** Cumulative Sum of Recursive Residuals Test and

The CUSUM test is based on the cumulative sum of the equation errors in the regression. The software represents graphically the cumulative sum of errors together with the critical lines at 5%. On the other hand, CUSUMSQ instead used recursive double errors. The equation parameters are considered unstable if the whole sum of recursive errors gets outside the two critical lines. By and large, both graphs of CUSUM and CUSUMSQ show that the parameters of the analysed equation are stable given that the recursive errors lie within the two critical lines of both tests.



**Figure 3:** Cumulative Sum of Square of Recursive Residuals Test

### 5.0 Conclusion

The accumulations of foreign reserves have risen sharply in recent years. It rose from US\$1.2 trillion in 1995 to nearly US\$10.0 trillion in June 2011. Major holders of foreign reserves are mostly from Asia. However, oil exporting countries in Africa and the Middle East are not left out in this trend. Nigeria’s foreign reserves rose from US\$5.5 billion in 1999 to US\$62.40

billion in July 2008, making Nigeria the twenty-fourth largest reserves holder in the world and fall to US\$34.8 billion in September 2011. This pace of reserves accumulation is occurring without regard to its possible diminishing marginal benefits and rising marginal costs.

The study used an Autoregressive Distributed Lag (ARDL) approach (also known as bound testing approach) developed by Perasan et al (2001) to run a slightly modified econometrics 'Buffer Stock Model' of Frenkel and Jonanovic (1981) to estimate the determinants of foreign reserves in Nigeria with focus on income, monetary policy rate, imports and exchange rate. The result provided a strong evidence for the long run relationship among the determinants of reserves in Nigeria. It debunked the existence of buffer stock model for reserves accumulation and provides strong evidence in support of income as a major determinant of reserves management in Nigeria.

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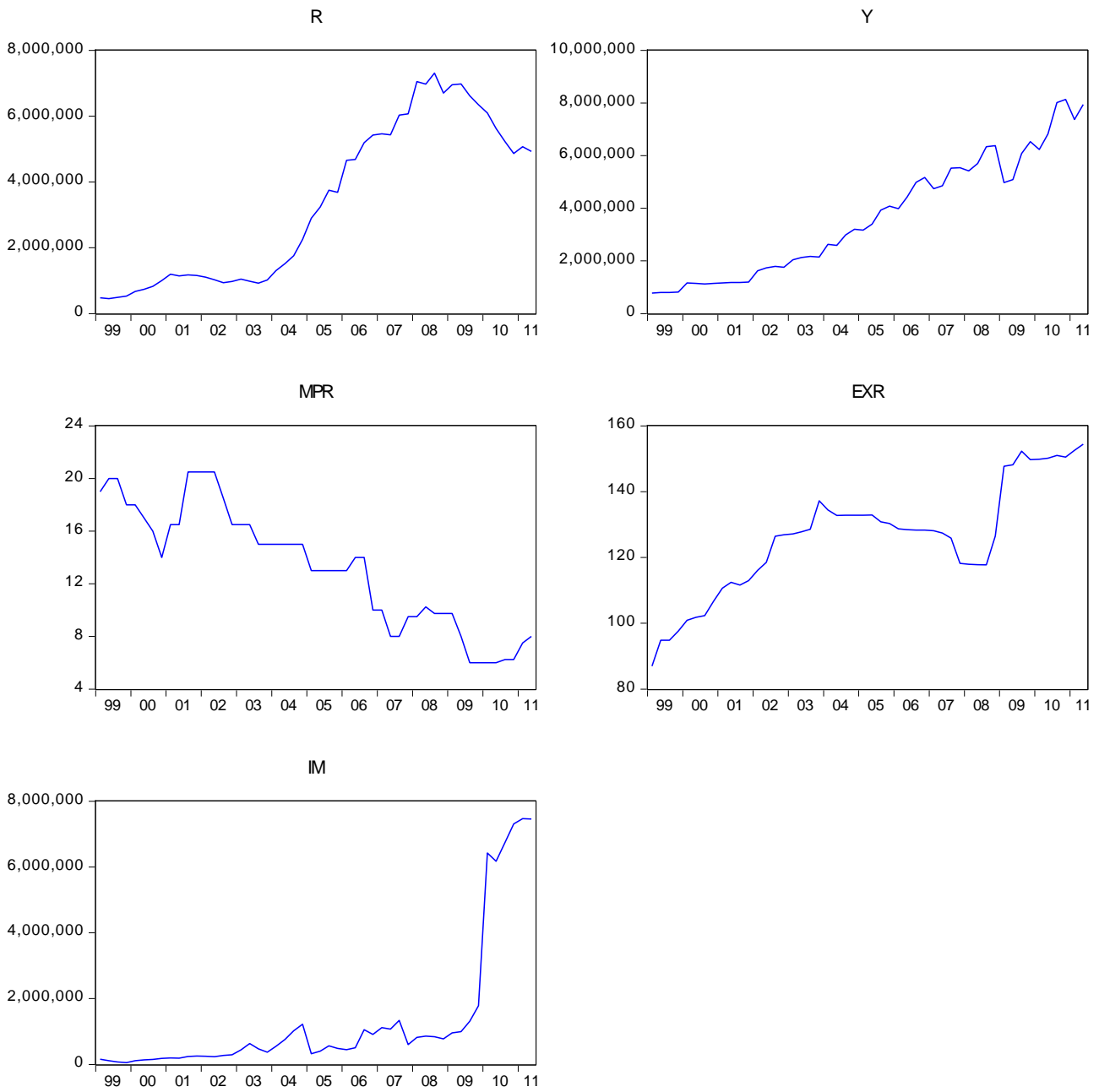
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**Appendix**



**Figure 2: Graphical representation of the variables in the model**

## Contributions of Financial Sector Reforms and Credit Supply to Nigerian Agricultural Sector (1978-2009)

**Anthony O. Onoja<sup>1</sup>, M. E. Onu<sup>2</sup> and S. Ajodo-Ohiemi<sup>3</sup>**

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*This study analyzed the trends and pattern of institutional credit supply to agriculture during pre- and post-financial reforms along with their determinants. It then compared the effects of reform policies on access to institutional credits in Nigerian agricultural sector before and after the reforms (1978 - 1985; and 1986 -2009). Relying mainly on time series data from CBN and NBS, it used ordinary least squares method (linear, semi-log and double log) to model the determinants of banking sector lending to the agricultural sector during the review period. The models were subjected to several econometric tests before accepting one. Chow test was used to verify the presence of structural change in the selected equation before and after the reforms. Results indicated an exponentially increasing trend of agricultural credit supply in the economy after the reform began. Econometric analysis shows that stock market capitalization, interest rate and immediate past volume of credit guaranteed by ACGSF significantly influenced the quantity of institutional credit supplied to the agricultural sector over the period in review. There was a significant difference between the credit supply function during the pre-reform and post reform periods. It was recommended that government must consider interest rate regulation as a veritable tool for making credit accessible to farmers at affordable levels; increase fund allocation to ACGSF; boost monitoring capacity of CBN on banks generally and strengthen the microfinance banks to be more responsive to agricultural credit needs.*

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**Keywords:** Financial Reforms, credit supply, agricultural credit, agricultural credit policy, monetary policy, Nigeria.

**JEL Classification:** E22, E23

### 1.0 Introduction

The relationship between financial development and economic growth has been the subject of a growing literature in both developed and developing countries recently (World Bank, 2008). Agricultural sector, one of the sources of economic growth, is looked unto to pave way for economic development since it has the potentials of generating employment opportunities, alleviating food insecurity, encouraging agro-industrialization and improving entrepreneurship through capacity building. The realization of this fact led Nigerian government to embark on several agricultural development programmes, many of which, unfortunately, failed (Manyong et al, 2005; and Ogunbible, 2008). Of particular interest among these agricultural programmes was the establishment of the Nigerian Agricultural Credit Guarantee Scheme Fund (ACGSF) in 1977. The scheme was established to mobilize funds from the banking sector for rural development by guaranteeing loans by the commercial banks for investment in agriculture to minimize risk involved in financing the sector. However, the vicissitudes of the financial sector appeared to be inseparable from the performance of the ACGSF in meeting up with its goals of mobilizing adequate credit for the agricultural sector. The Nigerian financial system is one of the largest and most diversified in Sub-Saharan Africa (Afangideh , 2010). The system became liberalized when structural adjustment programme was introduced in the 1980s. In recent years, the system had

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undergone significant changes in terms of the policy environment, number of institutions, ownership structure, depth and breadth of markets, as well as in the regulatory framework. According to Finance Maps of World (2012) the Central Bank of Nigeria (CBN) provided some incentives for the banks so that they could achieve the minimum capital base within 2005. These include allowing the banks to deal through foreign exchange by CBN, permitting the banks to take deposits from the public sector while the fiscal authorities were made responsible for the collection of revenue from the public sector. In addition to these some tax incentives were provided for the banks in the area of stamp duty and capital allowance; transaction costs were minimized and the government formed an expert panel to provide technical support to the banks.

Other steps in the reform process included merging the banking institutions and introduction of a regulatory framework based on some rules; establishment of a web portal for all the citizens so that they could share any confidential information with the Central bank regarding the banking systems; development of an automated process to report the bank returns; revision and updating of the banking laws to make the banking system more easy and effective. Several banks were able to increase their capital base through this reform. By merging some banks the government established an efficient and disciplined banking system. Many local banks were merged; therefore the Nigerian government had no need to depend on the foreign banks fully. In one word, it can be said that, through banking sector reform the government of Nigeria was able to move their economy forward.

However, in spite of the far-reaching reforms of the past two decades, the Nigerian financial system is not yet in a position to fulfill its potential as a propeller of economic growth and development. Although these reforms have been acclaimed to be necessary, it is however debatable if they yielded the anticipated results especially on agricultural lending growth in Nigeria. When one notes that the paucity of research outputs to portray the magnitude of the financial reforms' effects on agricultural sector can be a very big constraint towards appropriate policy derivation and implementation in agricultural finance policy of Nigeria, the need for this study becomes more evident. Such studies' need becomes more urgent when one reflects on the findings of Manyong *et al* (2005) who indicated that the rate of growth of number of credits guaranteed by ACGSF to agriculture showed high nominal growth rates but a negative real growth rate. It would therefore be appropriate to bridge this knowledge gap by finding out the present status of agricultural credit growth and its determinants so that one may see whether new policies can revert this negative trend or not. The first objective of this paper therefore, is 1) to chart and discuss the trend of agricultural credit supply in Nigeria before and after financial system reforms; 2) ascertain the influence of financial reform policy instruments/monetary policies on volume of credit accessed by the agricultural sector of Nigerian economy before and after the financial reforms; and 3) verify the differences (if any) on the agricultural credit supply functions in Nigeria before and after the financial sector reforms.



## 2.0 Justification of the Study

There is a need periodically to study the behavioural reactions of the developing countries to macroeconomic policy prescriptions in order to assess how “well” they respond to such policies and determine the necessary modifications that need be made to them so as to ensure that their implementation is successful. It may even be possible that the results of such empirical studies may lead to the reformulation of received theories to explain adequately the economic phenomena in these nations. Given the pervasive influence of the current reforms on the economy of Nigeria, and particularly the influence of the financial sector (e.g. exchange rate and interest rate) which drives the engine of growth of the agricultural and other sectors of the economy, there is an urgent need to study the response of the financial system *ex post* to the policies of regulation and deregulation of the banking sector. Such a study is hoped to be able to reveal the relevant determinants of successful implementation of financial sector reform policies and more efficient agricultural policy derivation in Nigeria.

## 3.0 Literature Review

According to Manyong et al (2005), the policies that were of relevance to agriculture are 1) direct credit to the agricultural sector on concessionary terms; 2) the launching of a Rural Banking Scheme in 1977 under which designated commercial banks were required to open a specified numbers of rural branches in different parts of the country and with at least 40% of the total deposit in these rural banks lent to borrowers within those rural areas; 3) ACGSF launched in 1977 to reduce the risk borne by commercial banks in extending credit to farmers. Under this scheme, the Central Bank of Nigeria guaranteed up to about 75%. 4) As a matter of policy, the Naira was allowed to appreciate in this period. In the period, three exchange rate systems were adopted; 5) the fixed rate system was adopted from 1960 to 1972, the managed floating system was adopted from 1973 to 1978, while the pegged system (i.e., pegged to a currency basket) was adopted from 1979 to 1985 (Iwayemi 1995a, b in Manyong et al, 2005). Relatively high crude oil prices have ensured improved government revenues and the new government has committed to a very optimistic target of making Nigeria one of the 20 largest economies by the year 2020 (this goal has been influenced in large measure by some forecasting work done by Goldman Sachs on possible levels for the world economy by that year). One of the broad policy frameworks for achieving this goal is the Financial System Strategy 2020 (FSS 2020), launched by the Central Bank of Nigeria in 2007. The FSS 2020 seeks to enhance Nigeria's economic growth through robust policy reforms in the financial sector including: consolidation of banking sector reforms; recapitalization and consolidation in the insurance sector and capital markets; creation of microfinance banks and the conversion of community banks; establishment of the African Finance Corporation; pension reforms to generate long term investible funds and solve the pension crisis; monetary policy reforms; and restructuring of the Nigeria Security Printing and Minting Company (CBN, 2005 & CBN, 2010).

The Central Bank of Nigeria (CBN) also issued new guidelines on bank mergers and acquisitions that are primarily directed towards regulating mergers and acquisitions and forestalling hostile bids that the CBN considers as damaging to the banking industry. However, they do not govern mergers or acquisitions between foreign and Nigerian banks. Consequently, the CBN stated that

foreign banks may establish banking business in Nigeria if they meet the current minimum capital requirement of N25 billion (\$216 million) and other regulatory requirements for obtaining a banking licence. In addition, interested foreign banks may acquire or merge with local banks existing in Nigeria. A prerequisite for such participation would be the continued operation of such foreign bank in Nigeria for a minimum of five years and its establishment of branches in at least two-thirds of the states in the country, excluding the federal capital. It is also required that the shareholding of the foreign bank or investors, following the merger or acquisition, shall not exceed 40% of the total capital of the resultant entity. The Central Bank of Nigeria recently withdrew the licenses of 124 microfinance banks owing to sharp practices by their managers and financial insolvency (CBN, 2010).

Theoretical models infer that the development of the financial sector is essential for economic growth, but there is no consensus yet over the direction of causality. This is because economists sharply disagree about the role of the financial sector in economic growth (Afangideh, 2010). Schumpeter (1912), Mckinnon (1973), Fry (1988), Pagano (1993) and Levine (2004) among others, on the one hand, and Lucas (1988), Greenwood and Jovanovic (1990) and Arestis and Demetriades (1991), on the other hand corroborate this assertion. Financial institutions help mobilize savings and provide payments services that facilitate the exchange of goods and services. In addition, they produce and process information about investors and investment projects to enable efficient allocation of funds; to monitor investments and exert corporate governance after those funds are allocated; and to help diversify, transform, and manage risk (World Bank, 2008). When they work well, financial institutions and markets provide opportunities for all market participants to take advantage of the best investments by channeling funds to their most productive uses, hence boosting growth, improving income distribution, and reducing poverty. A well-functioning system needs broad access, as well as depth access to finance: lack of finance is often the critical element underlying persistent income inequality, as well as slower growth (especially in the agricultural sector) (World Bank, 2008). Though still far from conclusive, the bulk of evidence suggests that developing the financial sector and improving access to finance are likely not only to accelerate economic growth, but also to reduce income inequality and poverty.

#### **4.0 Theoretical Framework**

This study benefits from the credit channel theory and other theoretical literature which suggest that policy may have an effect on credit supply and demand in an economy. Dobrinsky and Markov (2003) noted that the recently advanced “credit channel view” implies that monetary policy shocks affect real economic performance through the supply of credit by financial intermediaries due to shifts in the supply schedule of the latter. In turn, they noted, the literature makes a distinction between a “bank lending channel” which pertains to banks only and is related to their dual nature of holders of deposits and generators of loans to firms and a “broad credit channel” which treats the supply of external funds to firms by all financial intermediaries (Oliner and Rudebusch, 1996 & Hu, 1999 as cited in Dobrinsky and Markov, 2003). The credit channel view is also consistent with the assumption of the existence of market imperfections, in

particular, information asymmetries between borrowers and lenders which give rise to the above mentioned monitoring cost premium (Gertler, 1988; & Hubbard, 1995). One implication of the existence of a credit channel in the monetary transmission mechanism is that it induces a heterogeneous response both of the credit market and of the firms due to which the increase in the cost premium for external finance will not be uniformly distributed across firms. The reason for this heterogeneity is the fact that the existing credit market imperfections are likely to impact in a different manner on various categories of firms in the event of a monetary shock. In particular, the credit channel view is consistent with the empirical finding that the effect of a monetary shock should be more severe for small firms (that are more likely to face information costs) than for large firms (Oliner and Rudebusch (1996)) or that the negative effect of a monetary contraction on investment is greater for highly leveraged firms (which are more likely to suffer a reduction in their collateralizable net worth due to the monetary shock) than for less leveraged firms (Rondi *et al.*, 1998 & Hu, 1999)). It is worth noting that Nigerian agricultural sector is largely dominated by small-scale farms (or firms) and going by the foregoing empirical findings it would not be out of place to expect monetary policies having some effects on their collateralizable networths and hence their credit requirements which banks tend to respond to when they supply credit to the agricultural sector.

The indicators of financial development which can influence credit supply used in empirical studies can be classified roughly into three broad categories: monetary aggregates, stock market indicators, and structural and institutional indicators. The disaggregated variables for financial variables used in the empirical model for this paper represent the monetary aggregates and stock market indicators. These were applied by Afangideh (2010)'s study which indicated that bank lending to agriculture equation was significantly influenced by *domestic credit to the private sector, stock market capitalization, real income and previous period bank lending to agriculture*. All had direct and positive effects on bank lending to agriculture except value traded ratio which had a direct but negative effect. According to Barran *et al* (1995), in a standard IS-LM model, the effects of monetary policy on real activity are felt through the demand for money and the (unique) *interest rate*. In reality, shocks in monetary policy will affect the relative structure of interest rates given imperfect substitution among financial instruments. Soyibo and Adekanye (1992) stressed the special influence of financial reforms on the financial sector and he exemplified the influence by the proxy of exchange rate and interest rate which were acknowledged as the drivers of growth of real sectors of the economy including agriculture. From the foregoing analyses we arrive at the choice of some variables as proxies for agricultural lending and it's banking sector and monetary policy variables determinants.

Three models that can be used to capture the relationship suggested by the foregoing credit supply theories are linear multiple regression function, growth model (semi-log model) and Cobb Douglas (double log) function (See Gujarati and Sangeetha, 2007 & Greene, 2008). These are various production functions. Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable (or set of variables as in multiple linear regression) is considered to be an explanatory variable, and the other is considered

to be a dependent variable. For example, a modeler might want to relate the weights of individuals to their heights using a linear regression model.

Before attempting to fit a linear model to observed data, a modeler should first determine whether or not there is a relationship between the variables of interest. This does not necessarily imply that one variable *causes* the other (for example, higher SAT scores do not *cause* higher college grades), but that there is some significant association between the two variables. A scatter plot can be a helpful tool in determining the strength of the relationship between two variables. If there appears to be no association between the proposed explanatory and dependent variables (i.e., the scatter plot does not indicate any increasing or decreasing trends), then fitting a linear regression model to the data probably will not provide a useful model. A valuable numerical measure of association between two variables is the correlation coefficient, which is a value between -1 and 1 indicating the strength of the association of the observed data for the two variables.

A linear regression line has an equation of the form

$$Y = a + bX \tag{1}$$

where  $X$  is the explanatory variable and  $Y$  is the dependent variable. The slope of the line is  $b$ , and  $a$  is the intercept (the value of  $y$  when  $x = 0$ ).

The most common method for fitting a regression line is the method of least-squares. This method calculates the best-fitting line for the observed data by minimizing the sum of the squares of the vertical deviations from each data point to the line (if a point lies on the fitted line exactly, then its vertical deviation is 0). Because the deviations are first squared, then summed, there are no cancellations between positive and negative values.

The process of economic growth depends on the shape of the production function. The production function represents a mathematical equation that shows the combinations of production factors (e.g. capital and labor) necessary to produce a certain amount of output. One of the most common used production functions by economists is Cobb-Douglas production function. It represents a simple production function that gives a responsible description of actual economies (Josheski *et al* 2011). Cobb-Douglas production function can be written as:

$$Y(t) = F[K(t), L(t), A(t)] = AK^\alpha L^{1-\alpha} \tag{2}$$

where,  $0 > A$ , and it shows the level of technology and,  $\alpha$ , is a number between 0 and 1.

Often it is assumed that the exponent  $\alpha$  is  $3/1$ , that means  $K$  in creation of  $Y$  participate with 3. Cobb-Douglas production function provides an opportunity to establish the participation of certain factors of productions (labor and capital) in creating the total output (income) in the economy. In a market economy, factors of production, labor and capital, are paid according to their marginal product. Thus, the marginal product of capital is equal to its cost districts  $R$ , and

the marginal product of labor equals the wage, as rental income from renting labour. The model, in its simplest form, according to Pragneshu (2008), when there is only one explanatory variable (U) and one response variable (Y), is given by Equation (3):

$$Y = a + bU \tag{3}$$

where, a is scale parameter and b is a measure of curvature. To estimate the parameters, the usual procedure is to assume a multiplicative error  $\exp(\varepsilon)$  in Equation (3) so that the model may be linearized by means of logarithmic transformation, giving Equation 4

$$\ln(Y) = \ln(a) + b \ln(U) + \varepsilon \tag{4}$$

This equation is then fitted to data using “method of least squares” and goodness of fit is assessed by computing coefficient of determination  $R^2$ . Main drawback in this procedure is that a proper justification of assumption of multiplicative error is hardly ever provided and this assumption is usually made only for mathematical convenience. As pointed out by Ratkowsky (1990), the assumption tends to be valid only when variability of response variable Y increases with increasing values of explanatory variable U, which happens very rarely. Further, one frequent mistake occurs when goodness of fit of even the original nonlinear model given by Equation (3) is assessed by reporting the same value of  $R^2$  as has been obtained for the linearized model given by Equation (4).

The semilog model is another model that was proposed for the relationship between macroeconomic explanatory variables and the credit supply to agricultural sector in this paper. The semilog equation is an econometric model given as:

$$Y = e^{a+bX+e} \tag{5}$$

or equivalently

$$\ln Y = a + bX + e \tag{6}$$

It is a model commonly used to describe exponential growth curves (Gujarati and Sangeetha (2007) The semi-log model also known as log lin (log-linear) model is a mathematical model that takes the form of a function whose logarithm is a first-degree polynomial function of the parameters of the model, which makes it possible to apply (possibly multivariate) linear regression. That is, it has the general form

$$\exp(c + \sum_i w_i f_i(X)) \tag{7}$$

in which the  $f_i(X)$  are quantities that are functions of the variables X, in general a vector of values, while c and the  $w_i$  stand for the model parameters. The term may specifically be used for a log-linear plot or graph, which is a type of semi-log plot. In science and engineering, a semi-log graph or semi-log plot is a way of visualizing data that are changing with an exponential relationship. One axis is plotted on a logarithmic scale. This kind of plot is useful when one of

the variables being plotted covers a large range of values and the other has only a restricted range – the advantage being that it can bring out features in the data that would not easily be seen if both variables had been plotted linearly.

All functions of the form  $y = \lambda a^{\gamma x}$  form straight lines, since taking logs of both sides is equal to

$$\log_a y = \gamma x + \log_a \lambda. \quad (8)$$

This can easily be seen as a line in slope-intercept form with  $\gamma$  as slope,  $\log_a \lambda$  as the y-intercept. To facilitate use with logarithmic tables, one usually takes logs to base 10 or e:

$$\log(y) = (\gamma \log(a))x + \log(\lambda) \quad (9)$$

The term log-lin is used to describe a semi-log plot with a logarithmic scale on the y-axis, and a linear scale on the x-axis. Likewise, a lin-log graph uses a logarithmic scale on the x-axis, and a linear scale on the y-axis. A log-log graph uses the logarithmic scale for both axes, and hence is not a semi-log graph. On a semi-log graph the spacing of the scale on the y-axis is proportional to the logarithm of the number, not the number itself. It is equivalent to converting the Y values to their log, and plotting the data on lin-lin scales (Greene, 2008 and Wikipedia, 2012).

The Chow breakpoint test compares the sum of squared residuals obtained by fitting a single equation to the entire sample with the sum of squared residuals obtained when separate equations are fit to each subsample of the data. E Views (2002) reports two test statistics for the

$$F^* = \frac{[\sum e_p^2 - (\sum e_1^2 + \sum e_2^2)]/K}{(\sum e_1^2 + \sum e_2^2)/(n_1 + n_2 - 2K)} \quad (10)$$

Chow breakpoint test. The F-statistic is based on the comparison of the restricted and unrestricted sum of squared residuals and in the simplest case involving a single breakpoint, is computed as Where, n = number of observation (sample size);  $(\sum e_1^2 + \sum e_2^2)$  = total unexplained variation,  $\sum e_p^2$  = pooled residual variance of the regression based on the two samples  $(n_1 + n_2)$  (i.e.  $\tilde{Y} = b_0 + b_1 X$ ) =  $\sum Y_p^2 - \sum \tilde{Y}_p^2$ , with  $(n_1 + n_2 - K)$  degrees of freedom. (p stands for ‘pooled’ and K = total number of coefficients including  $b_0$ ). The null hypothesis is  $b_i = \beta_i$ , that is, there is no difference in the coefficients obtained from the two samples. This formula can be generalized naturally to more than one breakpoint (EViews 2002, Gujarati and Sangeetha, 2007). The F-statistic has an exact finite sample F-distribution if the errors are independent and identically distributed normal random variables.

The log likelihood ratio statistic is based on the comparison of the restricted and unrestricted maximum of the (Gaussian) log likelihood function. The LR test statistic has an asymptotic distribution with degrees of freedom equal to under the null hypothesis of no structural change, where is the number of subsamples. Onoja *et al* (2009) applied this model in econometric

analysis of credit and farm resource technical efficiencies’ determinants’ differentials in cassava farms in Kogi State, Nigeria.

### 5.0. Method of Data Analysis

The dependent variable in this study is proxied by amount of loans guaranteed by the Agricultural Credit Guarantee Scheme Fund in the economy; while we selected exchange rate, interest rate, consumer price index of agricultural products, share of agriculture in real GDP, volume of domestic credit to the private sector by banks, stock market capitalization, and previous period financial sector lending to agriculture proxied by previous amount guaranteed by the ACGSF.

$$ACGSFCR = \beta_0 + \beta_{1t}AGRIPRICDF + \beta_{t2}Intrt + \beta_{3t}Stcmcp + \beta_{4t}Forex + \beta_{5t}Agrigdp + \beta_{6t}Privscrd + \beta_{7t}ACGSFpst + u \quad (\text{Linear form}) \quad (11)$$

$$\ln ACGSFRCR = \beta_0 + \beta_{1t}AGRIPRICDF + \beta_{t2}Intrt + \beta_{3t}Stcmcp + \beta_{4t}Forex + \beta_{5t}Agrigdp + \beta_{6t}Privscrd + \beta_{7t}ACGSFpst + u \quad (\text{Semi-log form}) \quad (12)$$

$$\ln ACGSFRCR = \beta_0 + \beta_{1t} \ln AGRIPRICDF + \beta_{t2} \ln Intrt + \beta_{3t} \ln Stcmcp + \beta_{4t} \ln Forex + \beta_{5t} \ln Agrigdp + \beta_{6t} \ln Privscrd + \beta_{7t} \ln ACGSFpst + u \quad (\text{Double LogForm}) \quad (13)$$

Where,

ACGSFCR = Volume of loans guaranteed by ACGSF (in Millions of Naira)

AGRIPRICDF = Price Deflator for Agricultural commodities (index)

Intrt = Interest rate (minimum lending rate in %)

Stcmkcp = Stock market capitalization (Millions of Naira)

Forex = Nominal exchange rate of naira to dollar (Naira)

Agrgdp = value of agricultural output as share of total real GDP (Millions of Naira)

Privscrd = volume of credit advanced to core private sector (in Millions of Naira)

ACGSFpstcr = value of immediate past loans guaranteed by ACGSF (Millions of Naira).

$\beta_1 - \beta_7$  = coefficients of the respective variables.

t = period (year)

$\beta_0$  = intercept of the model

u = stochastic error term.

ln = log to base e.

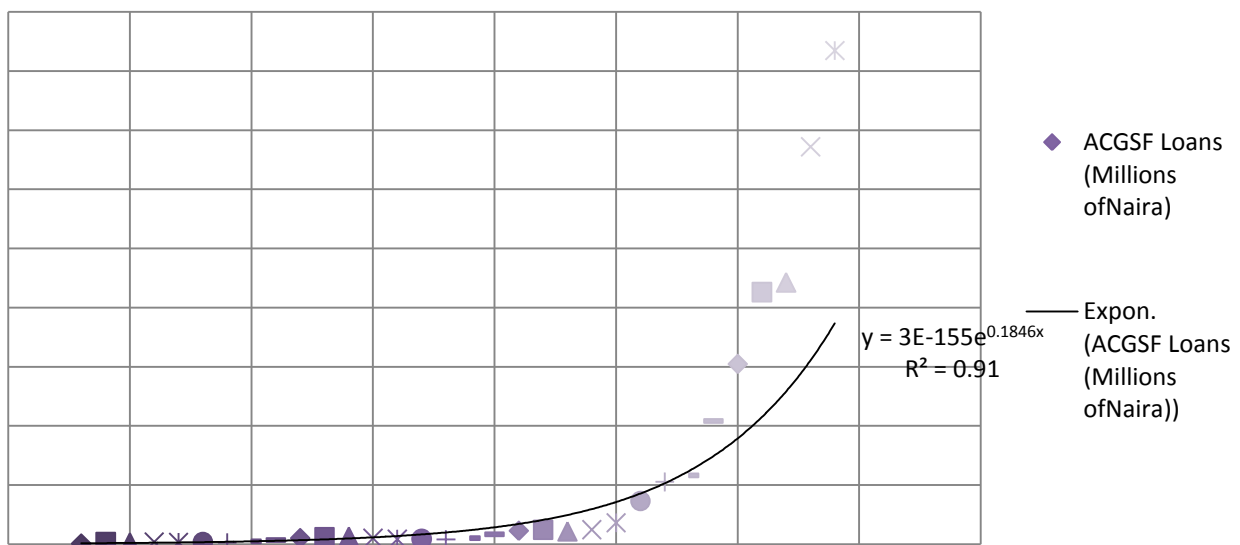
We did diagnostics on the selected model using the model selection criteria which included use of Akaike Information Crtieria (AIC), Log likelihood criteria and Schwarz Criteria in addition to economic evaluation of number of coefficients based on theoretical expectations. We also tested for autocorrelation using Q-statistics from the Correlogram of residuals since Durbin Watson statistics may not give us a more robust result as this. Test for normality of residuals and overall fitness of the model for forecasting and policy making was done using Jacque Bera test and Theil’s test. Heteroscedasticity’s presence was also done using White Heteroskedasticity test and White Heteroskedasticity-Consistent Standard Errors & Covariance approach to correct (where it is present) to avoid spurious regression results. Following Gujarati (2006) and Greene (2008) we

applied Chow test on the pooled Cobb-Douglas function (estimated by least squares using double log production function). To test for differences in the slopes of the Cobb-Douglas regression in the two sub-groups of farmers by implicitly dividing the sample into two (at 1986 when bank Reforms formally started in Nigeria) representing cut off for the two groups. We used E Views computer programme to conduct this test and other analyses in this work.

**6.0. Results and Discussion**

The trend of banking system credit supply to the agricultural sector is shown in the graph in Figure 1. The result shows a relatively sluggish and almost stagnant growth during the pre-reform era. After 2000, when the reform process had fully taken off we see the trend of institutional credit supply to the agricultural sector increasing at an exponential rate. This shows that the agricultural credit supply (proxied by volume of loans guaranteed by ACGSF) was responding to the doses of banking reform policy instruments during the post reform era to date.

**Model Selection Criteria:** The economic analysis of our findings was preceded by the econometric tests whose results presented in Table 1, which are discussed below. In terms of econometric criteria, we find the AIC recorded for the Cobb-Douglas model being lower than the other models. Its log likelihood ratio (LR ratio) was also higher relative to the other functional forms of the regression model. Thus it is evident that the model would be more suitable for our analyses having displayed better fittings. Besides the R<sup>2</sup> was very high, implying that the explanatory variables included in the selected model accounted for 97 percent variation in the volume of loan accessed by Nigerian farmers during the period in review.



**Figure 1:** Trend Analysis of institutional loans supplied to the agricultural sector in Nigeria over the two periods of study.

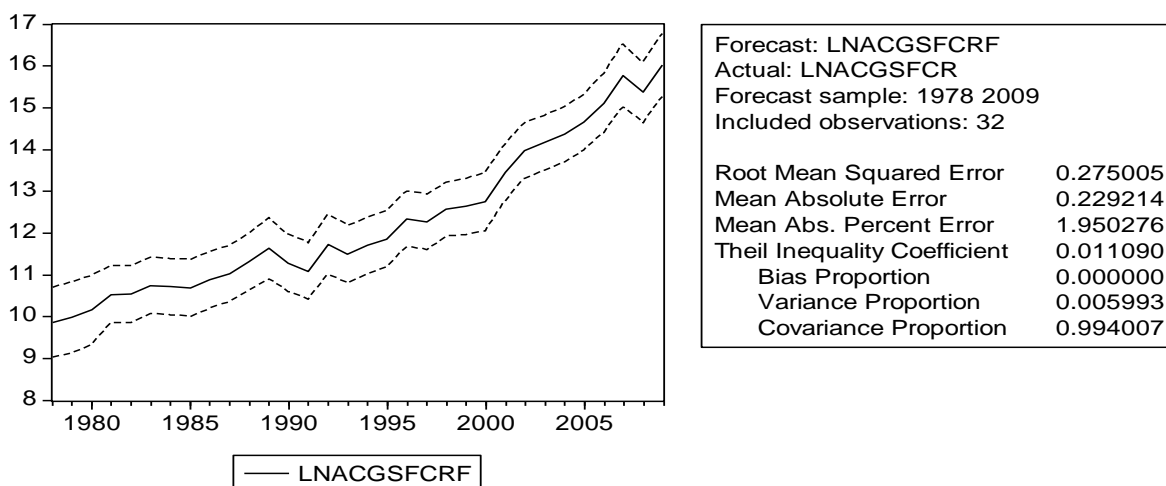
**Data Source:** CBN and NBS (2010).



**Table 1: Model Selection Criteria Showing Indices of Model Fitness**

Model Type	$R^2$	Adjusted $R^2$	LR-Ratio	AIC	Remarks
Linear	0.992	0.99	-431.9	27.49	Reject
Semi-Log	0.964	0.953	-10.87	1.179	Reject
Cobb-Douglas	0.9763	0.969	-4.095	0.7559	Accept

**Diagnostics:** The estimated Jacque Bera (JB) Statistic is 0.908 with a p value 0.634, significantly different from zero, suggesting that the sample came from normal distributions. Test for autocorrelation was done using Breusch-Godfrey serial correlation LM test. The results had an F-statistic (0.25) and Observed  $R^2$  change (0.72) with probabilities ( $p < 0.78$  and  $p < 0.70$  respectively). We therefore accept the null hypothesis of no residual serial correlation in our model. In addition to this the estimated Q-statistics (another index of autocorrelation in residuals) recorded for all the years in review did not exhibit any probability significantly close to zero. We therefore have no reason to suspect the presence of serial autocorrelation in our model. In a similar vein, our test for the presence of heteroscedasticity using White Heteroskedasticity Test, gave F-statistics and Log Likelihood estimates which were not significantly close to zero giving us the confidence to reject the hypothesis of presence of heteroscedasticity in our model. Using Theil’s criteria for appraising the overall fitness of our selected model, we find the model also suitable for forecasting and policy analysis since, in econometric analysis, a model is generally considered a good predictor of historical series when it returns low values for both bias and variance proportions and high values for covariance proportion.



**Figure 2: Residuals’ Trend and Indices used to Test for Forecasting Power of the Cobb-Douglas Model Applied in this research**

In addition, it must also have low roots mea square error (RMSE) and high correlation coefficients. These indices as shown have all shown that our model is good for forecasting and

policy formulation. The forecast as could be seen from the graph in Figure 2 indicates an upward trend in the volume of loans being advanced to the agricultural sector and guaranteed by the Agricultural Credit Guarantee Scheme Fund (proxied by  $\ln\text{ACGSFcrf}$  in the graph). This is a promising development as Nigerian farmers definitely need more access to financial services especially credit to be able to meet with their needs for investment on farm land, stocks, farm inputs and assets to be able to produce more efficiently.

**Elasticities and Results of Chow Test:** Our analyses indicate that three policy instruments significantly determined the level of loan supplied to the agricultural sector by the financial services sector of Nigerian economy before and after the financial system reforms. These include log of interest rate (lending rate), stock market capitalization and volume of loans guaranteed by the ACGSF. Their respective elasticities (shown in Table 2.0) were significant at less than 5 percent significance level. The three variables returned positive signs of their coefficients which are consistent with theoretical expectations. Our test for presence of structural break in the pooled Cobb-Douglas function used for the study indicated F-statistics and Log likelihood ratios whose p values were very close to zero. These imply that the hypothesis of no structural break in the model's slope coefficients stands rejected. See Table 3.

**Table 2: Results of Parameter Estimates Applying Cobb-Douglas Model**

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
Intercept	5.737014	0.898119	6.387810	0.0000
$\ln\text{FOREX}$	0.061340	0.042093	1.457230	0.1580
$\ln\text{PRIVSCR}$	0.043171	0.389019	0.110973	0.9126
$\ln\text{AGRIGDP}$	0.262108	0.387976	0.675578	0.5058
$\text{INTRT}$	0.040062	0.016933	2.365852	0.0264
$\ln\text{ACGSFPST}$	2.76E-07	9.41E-08	2.926613	0.0074
$\ln\text{STCKMCP}$	0.325275	0.101586	3.201985	0.0038
$\ln\text{AGRIPRICDF}$	-0.179291	0.120022	-1.493814	0.1483
R-squared	0.976314	Mean dependent var		12.27120
Adjusted R-squared	0.969405	S.D. dependent var		1.815457
S.E. of regression	0.317549	Akaike info criterion		0.755947
Sum squared resid	2.420092	Schwarz criterion		1.122381
Log likelihood	-4.095145	F-statistic		141.3202
Durbin-Watson stat	1.640491	Prob(F-statistic)		0.000000

**Table 3: Chow Breakpoint Test Output:** (Break point : 1986)

F-statistic	3.492126	Probability	0.015923
Log likelihood ratio	32.32539	Probability	0.000081

The policy implication of these findings is that there is significant difference in the levels of loans granted by the sector of the economy before and after the financial sector reforms. The findings agree with the theories advocated by pro-financial sector reforms and World Bank (2008) adopted by Nigerian monetary authorities since 1986 to date.

**7.0 Conclusion/Recommendations**

This study has been able to chart the trend of agricultural credit supply in Nigeria from 1978 to 2009. It also compared the effects of reform policies on access to institutional credits in Nigerian agricultural sector before and after the reforms (1978 - 1985; and 1986 -2009). The OLS models used for the study were subjected to several econometric tests before accepting one. Chow test was used to verify the presence of structural change in the selected equation before and after the reforms. Results showed that an exponentially increasing trend of agricultural credit supply in the economy after the reform began. It was also found that stock market capitalization, interest rate and immediate past volume of credit guaranteed by ACGSF significantly influenced the quantity of institutional credit supplied to the agricultural sector over the period in review.

The trend of agricultural lending in Nigeria during the post financial sector reform era appears to be looking upwards, relative to the sluggish and almost stagnant trend in the pre-reform era thus suggesting that the financial sector reforms seem to be paying off after all through its multiplying effects filtering to the agricultural sector. For this increase in credit supply to have sustainable growth impact or positive real growth pattern, there is a need to improve on the policy variables which determined the growth rate of this sub-sector of the economy.

First, government must consider interest rate regulation as a veritable tool for making credit accessible to farmers at affordable levels where transaction costs will not be too high as to discourage farmers willing to invest or expand their investment to withdraw from doing so. Indeed governments need to ensure competition in financial markets in order to drive innovation and efficiency thus minimizing the risk of monopolistic practices. As liberalization of financial markets progresses competition increases. By encouraging innovation, the effects of strengthening the borrowing capacity of farmers or agricultural investors will ultimately be felt.

Secondly, we also find that immediate past (previous year’s) credit volume guaranteed by ACGSF (ACGSFpst) exerted significant influence on the supply of current credit to the agricultural sector. This demonstrates the relevance of the ACGSF in improving agricultural finance level in Nigerian economy.

More funds need to be allocated to the ACGSF by the Central Bank of Nigeria to enable it expand its services to other farmers/agricultural investors denied access to fund because of fear of agricultural loan risks nursed by commercial and development banks. The relevance of stock

market capitalization as a stimulant to sectoral growth of developing and developed economies was reaffirmed by its significance in determining even the growth level of agricultural credit supply in Nigerian economy. Given the importance of the stock market, government must maintain a conducive environment for quoted companies on the stock market and the real sectors of the economy to thrive unperturbed. These include providing basic infrastructure such as adequate power supply, motorable roads, fiscal incentives like tax holidays for some priority sectors of the economy, security and lots more.

Governments must monitor, review and evaluate policies on an ongoing basis. In addition the Central Bank of Nigeria needs to increase its monitoring capacity on banks generally and strengthening of the microfinance banks with a view of encouraging them to advance more loans to the agricultural sector. Our econometric tests confirmed that the ongoing financial system reform is a right step in the right direction since its era favoured agricultural sector more than the status quo in terms of credit supply to the sector. If the reform policies are well implemented Nigeria should be on its way to realizing the goals set in Vision 2020.

Further research is recommended to probe into the supply and demand interactions that determine the credit supply to the agricultural sector in Nigerian economy using advanced dynamic econometric models.

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# DOCUMENTS





# Neither the Washington nor Beijing Consensus: Developmental Models to fit African Realities and Cultures<sup>1</sup>

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## 1.0 Introduction

The need for radical re-thinking on development strategy is imperative for African countries to be relevant in the global economy. This is further reinforced by the stark reality of extreme poverty in Africa. Over the years, the share of Africa in global trade remained insignificant despite the implementation of the policies that were recommended by international financial and development institutions, such as the International Monetary Fund (IMF) and the World Bank.

The dismal performance of African economies calls to question, the effectiveness of the economic ideologies being prescribed by international institutions, and points to the need for a paradigm shift in order to achieve sustainable development. Over the last quarter of a century, Africa has been at the receiving end of liberal orthodoxy from these institutions that have persistently advocated, amongst others things, privatization of state-owned enterprises, free trade, intellectual property rights protection and deregulation of foreign direct investment (FDI) as requirements for developing countries to grow and develop. This policy prescription was what John Williamson coined the “Washington Consensus”. This neo-liberal ideology is reflected in the policies of the Bretton Woods Institutions: the IMF, the World Bank and the World Trade Organization (WTO).

Specifically, both the IMF and the World Bank condition their offer of assistance to developing countries on the strict adherence to the Washington Consensus policies. The Consensus had continued to be under severe criticism because the performances of countries that adopted its doctrine, especially in Sub-Saharan Africa, Latin America and the former Soviet bloc showed that it had failed to deliver sustained growth as promised by its promoters.

The remarkable economic growth of China in the past 30 years, with the country having declined to adopt the original and extended framework of the Washington Consensus, has raised further doubt on the unassailability of its capabilities. The significant economic miracle of China which has been described as the “Beijing Consensus” by Joshua Cooper Ramo, represents a symbol of China’s success and a challenge to the Washington consensus normative power. The Beijing consensus is enshrined in three principles of innovation, Chaos management promotion and theory of self-determination. These tenets are embedded in the policies of China that features incremental reform, innovation and experimentation, export-led growth, state capitalism and authoritarianism. Though the Beijing consensus had recorded remarkable success, it has, however, been argued, that it might not be sustainable in the long-run because it maintains large state-owned sectors and authoritarianism, which runs contrary to people’s aspirations, as the series of revolutions in the North African countries have shown (Williamson, 2012).

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In addition, a historical review of how the advanced countries developed shows that they did not adopt policies that they are recommending for the developing countries. As pointed out by Ha-Joon Chang (2003), some of the policies that the Bretton Wood institutions kick against today, were the very policies they adopted for their development. For example, the WTO currently opposes the use of export subsidy and protection of infant industry, whereas the United Kingdom and the United States embraced these policies in their early stages of development. There is therefore, the need for pragmatic policies and institutions that best suit the developmental stages and realities of developing countries in order to achieve sustainable and fast growth, and for the benefits of developed countries in the long-run (Ha-Joon, 2003).

Against the apparent failure of the Washington Consensus as applied in developing countries, and the possibility of the un-sustainability of the Beijing consensus in the long-run, there must be a paradigm shift in Africa's development strategy for sustainable economic development. The new approach should identify development paths that focus on a pragmatic commitment to progressive change as a possible alternative to the current development strategy. The question remains whether Africa can leverage on its potentials of huge natural resources, regional market size and human resources to formulate a radical development strategy that fit its realities and cultures without adopting the tenets of the Washington and the Beijing consensus.

The objective of this paper is to present my views on this contentious issue. Following this introduction, section 2 explains the Washington and the Beijing Consensus' developmental ideologies and some related trade theories. Section 3 reviews the consensus' and development in African economies; Section 4 discusses the lessons from the growth strategies by China and India. Section 5 highlights a new development strategy for Africa while section 6 reviews Nigeria's recent developmental approach. Section 7 addresses some likely challenges to the new paradigm and section 8 concludes the paper.

## **2.0 The Washington and Beijing Consensus': Developmental Ideologies**

### **□ *The Washington Consensus:***

The phrase Washington Consensus was first coined by John Williamson in 1989 in his work where he showed the inadequacy of Latin American reforms and identified areas that needed further improvement. It simply expressed the widely held view in Washington and by international development institutions that there is a path that developing countries' economic reforms should follow to absorb aid efficiently. The Washington consensus contains ten rules namely, fiscal discipline, tax reform, re-ordering public expenditure priorities, competitive exchange rate, privatization, trade liberalization, liberalizing interest rates, deregulation, liberalizing of inward FDI and property rights. These rules mirrored the tenets of liberal market-oriented capitalism and policies of the then Ronald Reagan and Margaret Thatcher governments, which were strong promoters of capitalism and neo-liberal ideology. Neo-liberal ideology derived its tenets from the work of 18th century Economist, Adam Smith, who advocated free trade among nations as a way of promoting global growth. The policy prescriptions of conditioning aid and compelling developing countries to open their capital accounts and promote

unhindered movement of portfolio investment across international borders by the IMF and World Bank have close similarities to the tenets of the Washington consensus.

### □ *Beijing Consensus*

The Beijing consensus emanated from the published work of Joshua Cooper Ramo in 2004, where he described the social and economic transformation of China as the new physics of power and development. Transformation under the consensus was embedded in three principles namely Innovation, promoting works through Chaos management and self-determination (Kennedy, 2008). By the first component, China's economic success was rooted in constant innovations that improved its total factor productivity, while the second represents China's quest for economic development which was not limited to growth but equitable distribution of wealth. The third component symbolizes the ability of China to chart and maintain her developmental policies as a model for other countries to follow and emulate (Kennedy, 2008). Therefore, the term Beijing consensus was the sum of the five pillars of the economic policies of China over the years which included incremental reform, innovation and experimentation, export-led growth, state capitalism and authoritarianism (Williamson, 2010). The next sub-section briefly examines some related theories of trade from which neo-liberal ideology derived its tenets.

## **2.1 Trade Theories**

Free trade originated from the traditional theory of comparative advantage which asserts that nations tend to gain from trade if they specialize in the export of commodities they can produce at the cheapest cost. The benefits from trade arise among unequal trading countries because of differences in comparative advantage. An extension of the theory of free trade is the neo-classical factor endowment trade theory, propounded by Eli Hecksher and Bertil Ohlin- Swedish economists. The theory postulates that, under the assumptions of equal factor prices and equal technological possibilities, a country with relatively cheap labour enjoys relative cost and price advantages over nations with relatively high labour cost in producing labour-intensive goods, the converse holds for a country that enjoys relatively cheap capital. Therefore, developing countries should specialise in the production of labour-intensive products, and export the surplus in return for import of capital-intensive products from developed countries. The basic conclusions from these theories were that, countries stand to gain from free trade and that output increases in a free trade environment, Furthermore, identical technology in a free market equalises factor prices across participating nations and free trade increases the share of national income accruing to labour. Finally, free capital flow and human resources benefit nations (Todaro and Smith, 2009). The Washington consensus derived its tenets from these neo-classical ideologies. However, some of these neo-classical ideologies have been challenged by the new development thinking in the light of the reality in the contemporary world, especially in developing countries.

## **3.0 The Consensus' and Development in African Countries**

### **3.1 Implications of the Consensus' for Development in Africa**

Although, most African Countries have continued to apply the principles of both consensuses in their economic policies, the road to development remains bleak with very little consideration for

their growth potentials. According to Manuel (2003), one of the most important drawbacks of the Washington Consensus was that, while it provided a good mixture of reforms to stabilize an economy and encouraged private sector activities, *it did very little to help resolve structural and institutional constraints on growth*. He noted that part of Africa's growth problems were the incentives and disincentives embedded in the global environment, which had reduced the continent to mere exporter of primary commodities.

The continent's economic growth has been grossly inhibited by a global trade system inimical to the full exploitation of its comparative advantage. Furthermore, limited market access for low-cost textiles, cotton, and agricultural products and competition from heavily subsidized exports from industrialized economies has effectively prevented growth (Manual, 2003). Thus, unable to produce capital intensive goods, African countries have been reduced to net importers of finished products. Hence, for African economies to achieve their growth potentials, they should be able to utilize their export earnings to broaden their production base and productivity.

The primary commodities that are sources of export earnings have become highly susceptible to price volatility and adverse shifts in the terms of trade. Price volatility has not only resulted from adverse weather conditions and other supply shocks, but also from the secular decline in real prices caused by structural oversupply in commodity markets from output in the advanced economies (Kahl, 2004). Furthermore, the lack of support for price stabilization through commodity agreements by the international community hinders favourable pricing.

While the World Bank and IMF are constantly discouraging the use of subsidies in African countries in line with one of the tenets of the Washington Consensus, the developed countries have continued to use subsidies to stabilize their economy, particularly in critical sectors such as the agricultural sector. For instance, the 2002 cotton subsidies to the US and EU producers distorted world prices with the adverse loss in revenue to Africa being more than the total Highly Indebted Poor Countries (HIPC) debt relief initiative during the period. Such occurrences have the potential of further building-up external debt stock due to the fiscal insolvency that could arise from limited export revenue and declining terms of trade.

Manuel (2003) argued that the reliance on a single commodity export partly reflects inadequate external incentives to diversify production. Consequently, the Washington Consensus tenet of broadening the tax base and lowering marginal tax rates would continue to be extremely difficult to achieve in Africa due to the massive dependence on a single source of tax revenue.

Trade liberalization as required by the Washington Consensus further compounded Africa's problems as African countries have been unable to develop efficient and low cost industries that could compete favourably in the global market. Thus, while many countries outside Africa have been able to liberalize foreign trade to increase their share of global trade, Africa had witnessed declining terms of trade with adverse effects on export revenue and real exchange rate.

Although, the Washington Consensus could be said to have improved macroeconomic stability in Sub-Sahara Africa (SSA), it had not facilitated the solution to development in Africa and developing countries in general. This observation was supported by Woo (2004), who elucidated that although Indonesia, Korea and Thailand implemented the Washington Consensus type of policies to counter the Asian financial crisis, they suffered deeper output losses for a longer period than Malaysia, which adopted capital controls instead.

The ability of the Beijing Consensus to ensure sustainable economic development in Africa is also in doubt. Williamson (2012) argues that the Beijing Consensus could best be described as protecting China's "self-interest" rather than a genuine concern for Africa's developmental needs. For instance, Chinese loans and grants to Africa were closely linked with trade and investments in Chinese commodities. In 2004, the Chinese government granted Angola long-term non-concessional loan of US\$2 billion on the condition that 70 per cent of the total loan contracts would be awarded to Chinese companies. The loan was also conditioned on the fact that China would import 10,000 barrels of crude per day from Angola throughout the loan tenure. The terms of the loan clearly showed that it was not designed to have meaningful impact on the citizens and poverty alleviation through domestic job creation. To support the notion that Beijing consensus is more of "self-interest", Lammers (2007) noted that, the Chinese development assistance and soft loans to Africa had given China the opportunity to explore Africa's oil-fields as experienced in Angola and Sudan. So also were access to fishing waters in Sierra-Leone and Gabon, and agricultural land in Zambia and Zimbabwe.

### **3.2 The Performance of African Economies under the Consensuses**

Available statistics revealed that Africa had largely under-performed when compared to other developing regions. Economic growth in Sub-Saharan Africa (SSA) had been low; with an average real gross domestic product (GDP) growth rate of 2.6 per cent in the 1980's compared to 6.7 per cent in developing Asia over the same period. The global oil price shocks that occurred in the early 1980s worsened the economic performance in most African economies and led to the adoption of economic measures in the spirit of the Washington consensus. Noteworthy, is the Structural Adjustment Program (SAP) with key policy measures designed to achieve economic stabilization and enhance efficiency in resource allocation mainly through economic restructuring and macroeconomic balance. During this period, the growth rate of SSA declined precipitously from 2.3 per cent in 1985 to 0.8 per cent in 1986, whereas Developing Asia recorded a growth rate of 6.1 per cent in 1986.

In the 1990's, the economic performance of SSA declined further to an average of 2.4 per cent, while that of Developing Asia improved to 7.4 per cent. Although, the performance of SSA strengthened in the 2000's, Developing Asia continued to outperform SSA. Thus, in 2011, Developing Asia growth rate stood at 8.2 per cent, while that of SSA was 5.2 per cent.

#### **□ Inflation Rate**

The consumer price inflation of SSA had been within tolerable limits and relatively stable compared to the episodes of unprecedented high inflation rates in three-digit experienced in Latin America and the Caribbean region, between 1983 and 1994. This arose from severe debt crisis,

excessive import dependency, increased international commodity prices and structural bottlenecks. For SSA, the highest inflation rate recorded was 46.1 per cent in 1994, induced by agricultural supply shocks and inflation inertia. The inflationary pressure had since reversed as the consumer price inflation declined from an average of 24.4 per cent in the 1990's to 10.3 per cent in 2000-2009. However, SSA inflation rates had consistently remained above world inflation rate since 1991.

#### □ *Investment Flows*

The foreign direct investment boom that began in the early 1990's was mainly channeled to emerging economies, Developing Asia and Latin America/Caribbean economies. In the 1990's, FDI (net) in developing Asia and Latin America/Caribbean economies stood at US\$40.4 billion and US\$33.3 billion, respectively. It was however a modest US\$2.5 billion in SSA. The share of SSA in global FDI flows fell from an average of 4.0 per cent from 1980-1989 to 1.5 per cent in 1990-99 and thereafter rose to 3.4 per cent in 2000-2009. In contrast, the share of developing Asia in global FDI flow increased steadily, reaching a peak of 28.3 per cent in the period 1990-1999. The dismal performance of SSA in attracting FDI had been attributed to political and economic instability, corruption and the high cost of doing business. Furthermore, the endorsement of Bilateral Investment Treaties (BITs), Double Taxation Treaties (DTTs) and the adoption of multilateral agreements under the Multilateral Investment Guarantee Agency (MIGA), have yielded minimal improvement in inflow.

The performance of the region had however, improved modestly in recent years, owing largely to the economic reform initiatives to improve the investment climate. These included the privatization of state-owned enterprises, establishment of export processing zones, improvements in infrastructure and review of FDI regulatory frameworks. FDI net flows of US\$16.9 billion were thus recorded in the period 2000 -2009, this was however, lower than the amount recorded in Asia, Latin America and the Caribbean economies. On annualized basis, SSA's share increased slightly from 3.1 per cent in 2010 to 4.0 per cent in 2011.

#### **4.0 Lessons from the Growth Strategies by China and India**

A review of the strategies adopted by China and India in achieving their impressive growth revealed that both countries insulated their economies from international trade through import tariffs, export subsidies, and quantitative restrictions, in addition to the provision of subsidies to the manufacturing sector. Extensive regulation of economic activities was enforced until 1991. State control of the financial sector and financial flows was adopted to manage the economy and guide resources to priority sectors.

In China, gradual economic reforms were adopted in which government promoted synergy between social division of labour and growing national market. Through this mechanism, it was easy to harness the expanding skilled manpower from massive push for education; the country also adopted large social division of labour and favoured foreign capitalists to promote national development. China's promotion of Township and Village Enterprises (TVEs) also aided the

country's rapid development. This programme was introduced between 1978-1983 under Household Responsibility System reform where the control over agricultural surpluses was handed over to households and communities. The reform was further complemented by fiscal decentralization and the use of fiscal residual for bonuses. Fiscal decentralization enabled local governments to have autonomy and contribute to national economy directly, while fiscal residual bonus rewarded communities according to their contribution to the national economy. Through these reforms, TVEs became the central strategy to explore entrepreneurship energies in order to achieve national developmental objectives. China's developmental path moved from agriculture into manufacturing, before transiting to the services sector. In summary, China's policies were embedded in incremental reforms, innovations and experimentation, export-led growth, state capitalism and authoritarianism.

The Indian model leaned towards a shift to services sector and ICT, as its growth was induced by rapid growth in technological advancement in the services sector through the mechanism of free market, education and innovation. The country's developmental path directly transformed into the services sector from the agricultural sector, with the manufacturing sector remaining light.

Commonly, China and India based their industrialization on short-term autarky policies involving state control on investments and import quotas with rapid swing from agriculture. They ensured that industrial development in the private sector were kept within the national plan to prevent the diversion of foreign exchange and other investment funds to non-socially desirable sectors. Large-scale infrastructural developments were also undertaken. Both nations have evidently surpassed the performance of most countries that adopted the Washington and Beijing consensus" policies.

This posts the need for a paradigm shift in Africa's developmental efforts that have not achieved set objectives. Most African countries, including Nigeria share certain similarities with the two countries in terms of their large population, massive supply of relatively educated and cheap labour, and existence of huge domestic markets essential for the attraction of foreign investment. For Africa to emerge from the present economic problem there is need for development strategies that fit into the unique nature of the continent. This requires a clear break from the past and a change in vision. In adopting alternative strategies, planners must take cognizance of differences in its social-economic and political structures. A wholesome adoption of both the Chinese and Indian models is not advisable given that the world economy has changed significantly from what it was when these two countries adopted their respective models, but beneficial strategies within the two models could be adopted. A valuable alternative model for Africa therefore must be unique to the nature of its economies.

## **5.0 A New Developmental Strategy for Africa**

Based on the experiences of China and India, and taking cognizance of the realities of the African economic setting, there is need to fashion a new developmental strategy for Africa. The thrust of such developmental strategy must be focused towards harnessing the continent's rich natural resources, and managing them in such a way as to become a major player in the global economy

without sacrificing the need for an inclusive development. This can be done through government intervention and later adoption of free market to promote economic growth. To this end, some of the strategies that can kick start Africa's economic transformation are suggested below:

#### □ ***Regional Integration***

Regional integration is indeed the continent's biggest challenge, even though several countries in Africa belong to one regional grouping or the other. Although there has been some achievements across some of these groupings such as the free movement of persons and customs union in the Economic Community of West African States (ECOWAS), and common currency in the West African Economic and Monetary Union (UEMOA), Southern African Development Community (SADC), Southern African Customs Union (SACU) and East African Community (EAC). These achievements have to be strengthened and replicated across Africa to further promote the inter-complementarity of goods, trade facilitation and free movements of the factor of production, amongst others. The process of integration would also assist in regional infrastructure development in critical areas like energy, transport, communication/ICT systems, roads and rail transportation. This would reduce production costs and increase economic activities across the continent. In addition, it would also strengthen Africa's political voice, improve collective negotiations to achieve more favourable outcomes on the external front. Other benefits would include enhanced access to international markets and fair price for resource exploitation as well as attracting investment flows to the continent.

#### □ ***Investment in Human Capital***

Africa has a young population compared to the ageing societies across the world. Skill acquisition is critical to turn this resource into wealth. For example, for the manufacturing sector to take off the new development strategy must avoid the current fragmented approach to education which is not adapted to the developmental needs of the African economies, hence, emphasis should be placed on tailoring education to growth sectors. Education and training in cutting edge technologies would enable countries to adjust more swiftly to the challenges of globalization as enterprises become more flexible and better able to absorb new technologies. As such an integrated approach to education would enhance human resources development and create sufficient skilled manpower desired for the enhancement of industrial production. In particular, acquisition of requisite skills is also crucial for the development of Africa's informal sector, which account for the lion share of employment. In the short-term, technical and vocational skills are critical for building agro-allied industries using basic technology.

#### □ ***Utilization of Natural Resources for Development***

Aside human resources, the continent should leverage on the vast endowment of natural resources like land, water resources, solid minerals, oil and gas and renewal energy to launch itself into the next development phase. Unproductive practices such as land tenure system must be discarded, while property rights and rule of law must be enforced. Agreements on mining rights must ensure fair pricing and sustainability of these natural resources.



### □ ***Institution of Good Governance and Zero Tolerance for Corruption***

Institutional development and good governance anchored on the rule of law are paramount for sustainable development. Strong political commitment on the part of the relevant authorities is also quintessential. Enhancing the operation of public enterprises is essential to address corruption and improve efficiency. Like China, African countries should encourage the adoption of a zero tolerance policy against corruption by instituting severe punishment to penalize and control/eliminate corruption.

## **7.0 Some Likely Challenges to the New Paradigm**

In order for Africa to succeed under the proposed new economic development paradigm, the continent must cultivate a sense of urgency in overcoming some of the likely challenges currently confronting it. These challenges include:

### □ ***Corruption***

The high incidence of corruption constitutes a major challenge to the successful implementation of any new development strategies in Africa. The effects of corruption are multi-dimensional. Corruption promotes the diversion, depletion and misallocation of scarce resources, as well as increase in the costs of production of goods and services. It results in inefficient state ownership, excessive private accumulation and widening inequalities. The lack of transparency and accountability associated with corruption prevents public participation in the decision-making process thus, limiting positive developmental outcomes. The multiplicity of functions and the wanton duplication of agencies in some African countries equally promote wastages and inefficiencies in the management of resources. Corruption also distorts fiscal discipline and impedes institution of good corporate governance practices.

### □ ***Market Access***

Low level of inter-complementarity of African goods limits the ability of the continent to support a high level of intra-African trade. This results from the production of the same category of goods -primary goods, in addition to the fact that they service the same international market. There is a strong need therefore for diversification of the production base in Africa. Market access is also greatly reduced by the existence of sanitary phytosanitary measures conditions under the WTO, which promotes conditions that African countries cannot meet. There is need for the revaluation of the international trade rules that have limited the bargaining power of the continent. Due to the weaknesses of the domestic production base, African countries are unable to reciprocate the most favourable nation status in countries with which they sign bilateral trade agreements, and also fully participate in preferential trade agreements such as the African Growth and Opportunity Act (AGO) and Economic Partnership Agreement (EPA).

### □ ***Technological Constraints***

The low technology base in Africa is a major constraint to development. Old technologies are often deployed with over-reliance on traditional methods of production which results in low productivity and competitiveness due to the lack of economies of scale. African countries have

also been unable to develop cutting edge technologies owing to weak research and development. This results from poor funding of research institutes and science education. There is need therefore for better funding of research initiatives in order to stimulate technological advancements.

#### □ ***Structural/Institutional Constraints***

The lack of critical infrastructure such as transport and communication networks does not support the growth of economic activities in Africa. The inadequate supply of electricity, for example, leads to increase in production costs thereby rendering products expensive. Most of the existing legal infrastructure that is vital for the enforcement of competition laws, bankruptcy and other commercial laws are weak and inadequate. Rule of law, property rights, among others must therefore be firmly rooted to provide the enabling legal environment for Africa's development.

#### □ ***Information/Data Constraints***

Many development projects are poorly implemented due to lack of data, which often lead to insufficient knowledge on the magnitude developmental challenge. The poor data base is largely due to lack of adequate infrastructure and skills for data mapping and analysis. There is need to focus on addressing these challenges to aid effective policy formulation and implementation.

#### □ ***Access to Credit***

Entrepreneurs and investors are exposed to limited credit channels which constrains competitive business expansion and productivity growth. Increases in foreign capital inflows and developmental aids have reversed following the global financial crisis. FDI inflows are relatively low making long-term investment difficult. There is need to re-engineer the credit market in Africa so that the needs of entrepreneurs can be adequately met.

#### □ ***Climate Change/Natural Disasters***

The impact of climate change and global warming that mostly emanates from the industrialized countries makes Africa vulnerable to counter-productive forces. Rising incidence of natural disasters including droughts, floods, tropical storms, soil erosion and landslides are major threats to human life and property imposing huge social and economic losses. The lack of capabilities to accurately predict, monitor and mitigate the above sources of environmental degradation has severely constrained development efforts in Africa.

#### □ ***Trade Retaliation***

Africa's attempt to protect infant industries may provoke retaliations from trading partners that could further shrink the market for Africa's exports. Subsidies and fiscal incentives for domestic producers may induce tariff changes that could limit trade with other countries. Trade retaliation is no doubt a major threat to the new development strategy for Africa.

### □ *Violent Conflicts*

The prevalence of conflicts and social instabilities are among the major problems turning African countries into fragile states. The continent has the high concentration of the world's poorest people with little or no social safety nets. Civil unrests, inter-religious and ethnic conflicts are prevalent in most of the countries. There are numerous cases of domestic and imported security problems as exemplified by the recent war in Libya and the political crisis; as well as the terrorist attacks across the continent. The inability to resolve conflicts erodes the desired sense of equity, fairness, motivation, consensus building, ownership and participation in the development process. Poverty and inequality may also pose challenges to the new development strategies that require painful sacrifices.

### □ *Environmental Issues*

Inadequate access to modern and safe energy sources and the excessive use of firewood in rural Africa distorts ecological balance and stifle growth. Ecological hazards like soil erosion, floods, desertification, ocean/desert encroachment and deforestation are among the major development constraints in Africa. Poor sanitary conditions, gas flaring/carbon emissions, lack of access to safe drinking water, poor quality healthcare and poor nutrition all need to be addressed for development to take off.

### □ *Physical/Human Capital*

Knowledge gaps are prevalent in Africa and are generally known to constrain investment growth by diminishing returns to capital. Knowledge is a vital input into the production process and can be shared without necessarily increasing costs or diminishing the facilitator's intellect. Investments in human capital are needed for management expertise, product and process innovations and overseas marketing channels. Increased knowledge can boost productivity with limited amount of resources. Knowledge is also essential for capacity building and product development and is thus a key catalyst to development.

## **8.0 Conclusion**

Africa with its huge natural resources, regional market size and human resources ought not to be a marginal player in the global economy. Neither the Washington Consensus nor the Beijing Consensus can bring about the desired change. The implications of the structure of African economies need to be critically appraised in order to identify an appropriate African Consensus - for its development model. In this regard, a developmental strategy for the continent would include a framework that embrace competitive regional and international trade, development of critical infrastructural, harnessing of the potential of the huge natural resource endowment, including abundant labour force and large domestic market.

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# Banking Reform and its Impact on the Nigerian Economy<sup>1</sup>

Sanusi L. Sanusi<sup>2</sup>

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## 1.0 Protocol

It is a great honor to be invited to address the Warwick Economic Summit, which has become one of the largest academic conferences in Europe. I wish to commend the entire students and staff of the University of Warwick for inviting me to share my experiences at the Central Bank of Nigeria (CBN). I am highly delighted to be part of this summit where top policymakers, professionals and technocrats around the world meet to debate and exchange views on contemporary economic issues. The outcomes of the Summit had continued to inspire policymakers in designing proactive micro and macroeconomic management policies for solving emerging economic problems in both developed and developing countries. It is against this backdrop that I urge you to sustain the Annual Summit. My address today will focus on “*Banking Reforms in Nigeria and Its Impact on the Economy*”. As you may all be aware, the banking sector in Nigeria has recently witnessed significant reforms and hard choices have had to be made to tackle the lingering effects of the global financial crisis, which culminated in the contraction of some banks’ balance sheets with the attendant economic losses. I am pleased to note that these problems have been surmounted through series of reforms undertaken by the Central Bank of Nigeria.

## 2.0 Introduction

Generally, the financial system is more than just institutions that facilitate payments and extend credit. It encompasses all functions that direct real resources to their ultimate user. It is the central nervous system of a market economy and contains a number of separate, yet co-dependent, components all of which are essential to its effective and efficient functioning. These components include financial intermediaries such as banks and insurance companies which act as principal agents for assuming liabilities and acquiring claims. The second component is the markets in which financial assets are exchanged, while the third is the infrastructural component, which is necessary for the effective interaction of intermediaries and markets.

The three components are inextricably intertwined. Banks need payments system infrastructure to exchange claims securely and markets in which to hedge the risks arising from their intermediation activities. The banking system therefore functions more efficiently and effectively when there is a robust and efficient payments systems infrastructure. Moreover the concern to ensure a sound banking system by the Central Bank is underscored by the critical role of banks in national economic development. Banks for instance, mobilizes savings for investment purposes which further generates growth and employment. The real sector, which is the productive sector of the economy, relies heavily on the banking sector for credit. Government also raises funds through the banking system to finance its developmental programmes and strategic objectives. It

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<sup>1</sup>Being a Lecture delivered at the University of Warwick’s Economic Summit, UK 17th February, 2012.

<sup>2</sup>Sanusi L. Sanusi is the Governor, Central Bank of Nigeria.

is in view of these strategic roles of the banking system to national economic development that the issue of a sound banking system, through proactive reforms becomes imperative.

### **3.0 Rationale for Banking Reforms in Nigeria**

Conceptually, economic reforms are undertaken to ensure that every part of the economy functions efficiently in order to ensure the achievement of macroeconomic goals of price stability, full employment, high economic growth and internal and external balances. Thus, banking reform in Nigeria is an integral part of the country-wide reform program undertaken to reposition the Nigerian economy to achieve the objective of becoming one of the 20 largest economies by the year 2020. As part of the vision, the banking sector is expected to effectively play its actual role in intermediation and for the banks to be among global players in the international financial markets.

As I will explore later, the various reforms we undertook in Nigeria were targeted at making the system more effective and strengthening its growth potentials. In view of the fact that banks take deposits from the public, there is a need for periodic reforms in order to foster financial stability and confidence in the system.

The recent experience from the global financial crisis has further underscored the imperatives of countries to embark on banking reforms on a regular basis. As you are all aware, the world economy was hit by an unprecedented financial and economic crisis in 2007-2009 that resulted in a global recession. This crisis led to the collapse of many world-renowned financial institutions and even caused an entire nation to be rendered bankrupt.

In Nigeria, the economy faltered and was hit by the second round effect of the crisis as the stock market collapsed by 70 per cent in 2008-2009 and many Nigerian banks sustained huge losses, particularly as a result of their exposure to the capital market and downstream oil and gas sector. Therefore, the CBN had to rescue 8 of the banks through capital and liquidity injections, as well as removal of their top executives and consequent prosecution of those who committed some infractions. These actions became necessary to restore confidence and sanity in the banking system.

A holistic investigation into what went wrong in Nigeria leading up to the banking crisis in 2008 found eight interrelated factors responsible. These were macroeconomic instability caused by large and sudden capital inflows, major failures in corporate governance at banks, lack of investor and consumer sophistication, inadequate disclosure and transparency about the financial position of banks, critical gaps in the regulatory framework and regulations, uneven supervision and enforcement, unstructured governance & management processes at the CBN/ and weaknesses in the business environment. Each of these factors is serious in its own right. Acted together they brought the entire Nigerian financial system to the brink of collapse.

We all know that a well-functioning financial system matters to everyone and to the economy at large. The Nigerian economy has huge potential for growth. To realize this potential, it is imperative that we learn lessons from the crisis and take steps to not only fix the problems, but to



also introduce measures to establish financial stability, a healthy evolution of the financial sector and ensure the banking sector contributes to the development of the real economy.

As a result, the Nigerian banking system has steadily evolved, following wide and far-reaching reforms embarked upon by the regulatory authorities. Following the banking crisis of 2008, the Central Bank of Nigeria articulated a blue print known as *“The Project Alpha Initiative”* for reforming the Nigerian financial system in general and the banking sector in particular. The reforms aimed at removing the inherent weaknesses and fragmentation of the financial system, integrating the various ad-hoc and piecemeal reforms and unleashing of the huge potential of the economy.

#### **4.0 Critical Elements of Banking Reform in Nigeria**

The current reforms which began in 2004 with the consolidation programme were necessitated by the need to strengthen the banks. The policy thrust at inception, was to grow the banks and position them to play pivotal roles in driving development across the sectors of the economy. As a result, banks were consolidated through mergers and acquisitions, raising the capital base from N2 billion to a minimum of N25 billion, which reduced the number of banks from 89 to 25 in 2005, and later to 24.

Beyond the need to recapitalize the banks, the regulatory reforms also focused on the following:

- Risk-focused and rule-based regulatory framework;
- Zero tolerance in regulatory framework in data/information rendition/reporting and infractions;
- Strict enforcement of corporate governance principles in banking;
- Expeditious process for rendition of returns by banks and other financial institutions through e-FASS;
- Revision and updating of relevant laws for effective corporate governance and ensuring greater transparency and accountability in the implementation of banking laws and regulations, as well as;
- The introduction of a flexible interest rate based framework that made the monetary policy rate the operating target. The new framework has enabled the bank to be proactive in countering inflationary pressures. The corridor regime has helped to check wide fluctuations in the interbank rates and also engendered orderly development of the money market segment and payments system reforms, among others.

The Bank has over the years identified key priority sectors and developed tailored interventions to support and promote their growth. Some of the key interventions in the real sector include:

- N200 Billion Refinancing/Restructuring of SME/Manufacturing Fund
- N300 billion for long term funding of Power and Aviation
- Commercial Agricultural Credit Scheme (CACS)
- The Small and Medium Enterprises (SME) Credit Guarantee Scheme (SMECGS)
- In addition the Nigerian Incentive-Based Risk Sharing System for Agricultural

Lending (NIRSAL) was established. The programme is a demand-driven credit facility that would build the capacity of banks to engage and deliver loans to agriculture by providing technical assistance and reducing counterparty risks facing banks. It also seeks to pool the current resources under the CBN agricultural financing schemes into different components of the programme.

Furthermore, the Bank has been collaborating with the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE), to reduce the cost of transactions, particularly bond issues, so as to diversify funding sources away from banks as well as attract more foreign portfolio investors into the sector.

In 2010, the Asset Management Corporation of Nigeria (AMCON) was established following the promulgation of its enabling Act by the National Assembly. It is a special purpose vehicle aimed at addressing the problem of non-performing loans in the Nigerian

banking industry, among others. In line with its mandate, AMCON recently acquired the non-performing risk assets of some banks worth over N1.7 trillion, which is expected to boost their liquidity as well as enhance their safety and soundness. With the intervention of AMCON, the banking industry ratio of non-performing loans to total credit has significantly reduced from 34.4 per cent in November 2010 to 4.95 per cent as at December 2011.

In order to ensure that AMCON achieves its mandate, the CBN and all the deposit money banks have signed an MOU on the financing of AMCON. The CBN shall contribute N50 billion annually to AMCON, while each of the participating banks shall contribute an amount equivalent to 0.3 per cent of its total assets annually into a sinking fund as at the date of their audited financial statement for the immediate preceding financial year. Therefore, the cost of the resolution to the Nigerian taxpayer is significantly minimized.

To further engender public confidence in the banking system and enhance customer protection, the CBN established the Consumer and Financial Protection Division to provide a platform through which consumers can seek redress. In the first three months of its operation, the Division received over 600 consumer complaints, which was a manifestation of the absence of an effective consumer complaints resolution mechanism in the banks. The CBN has also issued a directive to banks to establish Customer Help Desks at their head offices and branches.

In addition, the CBN has commenced a comprehensive review of the Guide to Bank Charges with a view to making the charges realistic and consumer friendly. The CBN has taken steps to integrate the banking system into global best practice in financial reporting and disclosure through the adoption of the International Financial Reporting Standards (IFRS) in the Nigerian banking sector by end-2010. This should help to enhance market discipline, and reduce uncertainties, which limit the risk of unwarranted contagion.

The Universal Banking (UB) model adopted in 2001, allowed banks to diversify into non-bank financial businesses. Following the consolidation programme, banks became awash with capital. Some operators abused the laudable objectives of the UB Model with banks operating as private

equity and venture capital funds to the detriment of core banking practices. To address the observed challenges, the CBN reviewed the UB Model with a view to directing banks to focus on their core banking business only. Under the new model, licensed banks will be authorized to carry the following types of business:

- Commercial banking (with either regional, national and international authorization);
- Merchant (investment) banking;
- Specialized banking (microfinance, mortgage, non-interest banking (regional and national); and
- Development finance institutions.

The introduction of the non-interest banking in Nigeria is expected to herald the entry of new markets and institutional players thus deepening the nation's financial markets and further the quest for financial inclusion. In fact, the first fully licensed non-interest bank in the country (Jaiz Bank Plc.) started business on Friday, January 6, 2012.

Similarly, the importance of Microfinance in a growing economy cannot be over-emphasized, given its potential in addressing the challenges of excluding a large population from full participation in economic activities. As at December 2011 there were 24 deposit money banks with 5,789 branches and 816 microfinance banks bringing the total bank branches to 6,605. The ratio of bank branch to total population is 24,224 persons, indicating a high level of financial exclusion. This is further substantiated by the 2010 Enhancing Financial Innovation and Access (EFInA) survey, which observed that 46.3 per cent of Nigeria's population is still financially excluded compared to South Africa, Kenya, Botswana with 26.0 per cent, 32.7 per cent and 33.0 per cent, respectively. Thus, in 2012 the Bank is looking to establish a Microfinance Development Fund (MDF) aimed at improving access to affordable and sustainable sources of finance by Microfinance Institutions (MFIs) and Microfinance Banks (MFBs). It would have both commercial and social components. This would enhance their operations and outreach and support the capacity building activities of the MFBs/MFIs.

The Bankers' Committee has declared 2012 the year of "Women Empowerment" in the banking industry. A sub-committee on Women Empowerment has been formed, with the CEO of Standard Chartered Bank Nigeria as Chairperson. The CBN is working on establishing a special fund by the end of the year that would provide credit facilities to women at a single digit interest rate. The CBN is also working with banks to ensure that a certain percentage of senior management and board seats are reserved for women.

The Bank recently introduced a new policy "Cash less Policy" as part of ongoing reforms to address currency management challenges in Nigeria, as well as enhance the national payments system. As may be aware the Nigerian economy is heavily cash-oriented in the transaction of goods and services. This huge cash transaction increases the operational costs of the banking sector, which is passed on to the customers in the form of higher service charges and high lending rates. These operational costs are significant due to the high cost incurred in cash management, currency sorting, cash movements and frequent printing of currency notes.

The direct cost of cash management to the banking industry is estimated to be about N192 billion by 2012. Research has shown that about 90 per cent of withdrawals by bank customers' are typically below N150,000 whereas, only 10 per cent of bank customers who withdraw over N150,000 were responsible for the rise in cost of cash management being incurred by the generality of bank customers. There are also risks involved in keeping or moving large amounts of cash, namely the high incidence of robberies, encouraging corrupt practices and the public's propensity to abuse and mishandle currency notes.

The CBN, in collaboration with the Bankers' Committee, aims to achieve an environment where a higher and increasing proportion of transactions are carried out through cheques and electronic payments in line with global trends. The enforcement of the T+2 cheque clearing cycle is being stepped up and efforts are on-going to reduce the cycle to T+1. Anybody can now make payments of up to N10 million through the clearing system with a cheque.

The CBN recognizes the need to balance the objectives of meeting genuine currency transaction demand and combating speculative market behavior that may negatively affect economic growth and stabilization measures. The new cash withdrawal policy will ensure that a larger proportion of currency in circulation is captured within the banking system, thereby enhancing the efficacy of monetary policy operations and economic stabilization measures.

The policy does NOT in any way stop account holders from withdrawing any amount of money they desire from their accounts. The policy simply recognizes that banking is a business and, as with any business, there are costs that are sometimes shared between the business and the customers. The policy stipulates that to withdraw more than N150,000 (for individual account holders) and more than N1,000,000 (for corporate account holders), there will be a transaction cost.

The various measures notwithstanding, there was need for some intervened banks to merge in order to strengthen their capital base and to remain competitive in the market. Accordingly, five Transactions Implementation Agreements (TIAs) were signed among the banks, and the CBN issued a letter of no objection to the banks being acquired to proceed with the merger of the entities. The signing of legally binding TIAs for the five (5) banks and the full capitalization of the 3 new banks by AMCON had resolved the issue of the combined negative asset value of the eight CBN intervened banks. Similarly, the recapitalization of all the five banks that signed TIAs was completed in 2011.

## **5.0 Impact of the Reforms**

The current banking reforms have yielded the following results among others:

- i. The reforms have brought about a new mindset to the industry as banks are putting in place best practices in the areas of corporate governance and risk management. Transparency and public disclosure of transactions have remarkably improved.
- ii. A number of banks have returned to the profit-making path and improved their balance sheets, as the recent results of their financial statements have shown.

- iii. Banks are gradually resuming lending to the private sector with the additional liquidity of more than N1.7 trillion injected into the banking system through the issuance of AMCON bonds, and significant progress in re-directing credit to the power sector and SMEs at single digit interest rates. These initiatives have saved and helped create thousands of jobs in the economy.
- iv. A new code of corporate governance has been issued by the Bank. The CEO of banks shall serve a maximum tenure of 10 years. Furthermore, all CEOs who would have served for 10 years by July 31, 2010 ceased to function in that capacity and have handed over to their successors.
- v. Nigerian Banks are now key players in the global financial market with many of them falling within the Top 20 banks in Africa and among Top 1000 banks in the world.
- vi. The reform has culminated in moderating the spread between the lending and deposit rates to 9.7 per cent as at end-December 2011, from 12.2 per cent in 2010. This has contributed to the existing macroeconomic stability in the economy with inflation moderating to 10.3 per cent as at end-December 2011.
- vii. The hitherto volatility in the exchange rate witnessed in the foreign exchange market has been brought under control. The premium is within the international standard of 5.0 per cent.
- viii. There is greater cooperation between the monetary authority and the banks through regular meetings and collaboration on policy issues.
- ix. The reforms have brought about greater confidence in the banking system with the removal of distress banks and the adoption of a strict code of corporate governance.
- x. Increased widespread use of e-payment services among Nigerians.

**Table 1: Selected Banking and Macroeconomic Sector Indicators**

<b>Indicators</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>Prime lending rate (end period) (%)</b>	17.8	17.3	16.4	15.3	19.6	15.7	16.8
<b>Deposit rate (12-Months Fixed) (%)</b>	8.8	7.5	8.0	12.4	12.2	3.5	7.1
<b>Inflation rate (%)</b>	11.6	8.5	6.6	15.1	13.9	11.8	10.3
<b>GDP growth rate (%)</b>	6.5	6.0	6.5	6.0	7.0	7.9	7.7
<b>Bank Branches (No)</b>	3,535	4,579	4,579	5,134	5,565	5,799	5,810
<b>Number of Banks</b>	25	24	24	24	24	24	24
<b>Average Exchange rate (\$/N)</b>	132.2	128.6	125.8	118.5	148.9	150.3	153.7

Source: CBN Annual Report.

## **6.0 Challenges to the Banking Reforms**

The Nigerian banking reform, despite its laudable achievements is confronted with certain challenges. First and foremost is the wrong perception of the intent of the reform. The introduction of the new banking model, especially specialized banking (non-interest banking), is intended to broaden the scope of financial services offered by banks in Nigeria. However, this has been given a religious connotation. The wrong perception and stiff resistance to the policy could potentially deter prospective investors in the banking industry.

Second, the reluctance of Nigerians to accept positive changes in global dynamics is another challenge. There is incontrovertible evidence that the excessive liquidity in the system measured by broad money (M2), narrow money (M1) and currency in circulation is partly attributable to the high cash transactions for economic activities, which has continued to undermine the efforts to achieve price stability. Yet the cashless policy has faced significant resistance, despite its prospect for economic growth and development and the global trend in the intensity of usage of e-payments.

Third, the cost of doing business in Nigeria is still high when compared with developed economies or some emerging and developing countries owing to the poor state of infrastructure.

Another challenge is that the high growth rates recorded in the last five years have not been inclusive, implying that this has not transcended into sustainable development. This situation is responsible for the high unemployment and poverty levels, which inevitably affect the low banking habit in the country.

Another key challenge is the quality of manpower: real strategic change can only take place with competent and committed workforce that is constantly exposed to training and development. The competitive financial sector environment requires a highly skilled workforce that would effectively contribute to value creation within financial institutions. Hitherto, employee recruitment was merely to comply with regulatory requirements, while training was viewed as a non-revenue function that was costly and unnecessary.

## **7.0 Conclusion**

The banking sector occupies a vital position in the economy and must be subject to continuous reforms for it to function efficiently. The modest achievements recorded so far have been largely due to greater collaboration and commitment of purpose among key stakeholders. Thus, the CBN in its efforts to develop a sound and vibrant banking system will strive to ensure that democratization of policy is sustained. It will also continue to ensure that the banks abide strictly with the code of corporate governance for efficient functioning of the banking industry.

## **Instructions to Contributors**

The Statistics Department of Central Bank of Nigeria (CBN) welcomes submissions of research articles to be published in its Journal of Applied Statistics (CBN-JAS). The journal is a refereed publication and publishes original articles with the potential to affect statistical practice in the central banking field of application. Such articles should achieve one of the followings:

- (i) present statistically innovative, scientifically and practically relevant statistical analyses of monetary, banking, financial and general economic datasets;
- (ii) substantially contribute to the applied statistics field through the use of sound statistical methods;
- (iii) evaluate the quality of important data sources, even if there are no methodological innovations.

Articles presented for publication should be original articles not yet published elsewhere. Statistical applications should be dominant and that the contributions of the statistical results to policy questions should be thoroughly discussed.

However, apart from articles section, the journal has a reviews/invited papers section that would publish all review/invited paper type articles and reviews of recently published books relevant to monetary, banking, financial and general economic statistics. There is also a section where key note addresses or special remarks by distinguished personalities on money, banking, financial and general economic statistics would be published.

### **SUBMISSION GUIDELINES**

**Structure of Manuscripts:** Articles should include Abstract, Key words, Introduction, Methodology, Results, Discussion and Reference sections.

However, the formatting of all articles selected for publication must conform to the following guidelines:

- i. The article must be based on original research and be unpublished and must not be submitted in whole or in part elsewhere, and should demonstrate the author's own analysis. All articles will undergo the peer review process and will handle all submissions according to generally accepted Standard.
- ii. The final copy of the manuscripts should be submitted in MS Word, neatly typed in 1.2 line spacing on A4 size paper having margins 1.5" on left and 1.0" on right. Font name: Times New Roman, and font size: 12.
- iii. The length of the article should be between 2000-2500 words. Each article should include abstract not exceeding 150 words on a separate sheet of paper. At least 4 Keywords of the paper should be specified below the abstract.

- iv. **Title Page:** The title of paper must be brief and contain words useful for indexing, the full name and affiliation of all authors. The address for correspondence (along with e-mail address) should be given.
- v. Bibliographical Referencing (in an alphabetic ascending order) should be made on separate sheet(s) and at the end of the paper where all publications cited in the text are presented. In case of
- a. **Periodicals:** The citation should be as follows: Author's last name, first name, and middle initial, year of publication, "Title of the article", Name of the Journal (to be underlined/italicized), ISSN/ISBN, Volume number (month): and Page number (pp). For example:
- Alade, S.O. (2003). "Fiscal Adjustment in Nigeria: Issues in Capital Expenditure". *Bullion* 27(2).April/June. 108
- Doguwa S.I. and Upton, G.J.G. (1989). "Edge-corrected estimators for the reduced second moment measure of point processes" *Biom. Journal*, 31:563-575.
- b. **Online Periodicals:** The citation should be as follows:  
Author, A. A., Author, B. B., & Author, C. C. (2000), "Title of article", Title of Periodical, Retrieved month day, year, from source (Http ://.....) For example:  
Federal Reserve Board (2006)."Monetary Policy", January 3, 2006 (<http://www.federalreserve.gov/policy.htm>).
- c. **Symposia and book of proceedings etc:** The citation should be as follows:  
Alade, S.O., Ajayi, M., Enendu, C.I. and Idowu, A.E. (2003)."The Supply and Demand for Loanable Funds in Contemporary Economic Policy Issues". Ed. O.J. Nnana et al CBN.
- Demirguckunt, A and Detragiache, E. (1998)."Financial Liberalization and Financial Fragility", in proceeding of the Annual Bank Conference in Development Economics, Washington D.C., World Bank.
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Author's last name, first name, and middle initial, year of publication, "Title of the book", ISSN/ISBN, Name of the Publisher, Year, Page number (pp) and Or Chapter No. For example:
- Bamanga, M.A. and Abdulkarim, M.I. (2007)."A First Course in University Statistics", Ahmadu Bello University Press, Zaria, Nigeria.
- e. **Citation of published papers/books in the Journal,** refer to the author's name and year of publication. Example: "Since Doguwa (1989) has shown that ....." If the authors are



more than two, the name of the first author should be used followed by “et al”. In the list of references however, names of first author and coauthors should be mentioned.

- vi. **Tables and Figures:** Tables should be printed on separate sheets and should appear after references. The table should be numbered in Arabic numeral. Figures should be provided only if they improve the article. Sharp computer generated drawings would be acceptable. Figures should be numbered in Roman numeral.
- vii. **Proof:** A marked copy of the proof may be sent to the corresponding author who must return the corrected proof to the Editor-in-Chief with minimum delay.

**General Instructions:**

- i. Manuscripts must be sent in duplicate (hard copy and softcopy), to the Editor-in-Chief, CBN Journal of Applied Statistics, Statistics Department, Central Bank of Nigeria, PMB 0187, Abuja, Nigeria (e-mail: [cbn-jas@cbn.gov.ng](mailto:cbn-jas@cbn.gov.ng)).
- ii. The copyright of the paper will be reserved by the Statistics Department of the Central Bank of Nigeria once it is accepted for publication in the journal.
- iii. All papers will be peer-reviewed by at least 2 reviewers and each accepted article will attract a grant/remuneration of fifty thousand naira.
- iv. The CBN Journal of Applied Statistics is a biannual journal of the Central Bank of Nigeria which will be considered as one of the best journals of applied statistics in Nigeria



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