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Impact of Exchange Rate on Economic Growth in Nigeria: A Test of Granger Causality

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Abstract
The study investigates the direction of causality between exchange rate and economic growth in Nigeria. It also examines the impact of exchange rate on growth in the country. The problem of exchange rate instability in Nigeria has motivated the study. The conceptual and theoretical foundation of the study is based on trade, the degree of openness, real inflation and real exchange rate in relation to output growth. The methodology of the study involves the use of Keynesian national income accounting framework in an open economy as well as Granger causality test and cointegration test approaches. Macro-econometric model (multiple regressions) was employed and secondary data collected from the Central Bank of Nigeria (CBN) were used in this study. It was found that real exchange rate has a significant but negative impact on economic growth in Nigeria. The results for money supply, inflation rate, and openness were also negative. The study however revealed that government expenditure has positive impact on growth in Nigeria. It showed that a unit change (increase) in government expenditure would positively cause about 13.1unit change (increase) in GDP growth in the country. The study recommends among others that fiscal, monetary and exchange rate policies need to be designed in order to ensure sustainable macroeconomic stability which will stimulate real appreciation of the naira so as to drive growth. However, policymakers should ensure that real appreciation does not exceed the equilibrium exchange rate in order to prevent massive importation of goods so as to preserve domestic industries.

Keywords: Exchange Rate, Money Supply, Inflation Rate, Government Expenditure, GDP

Background to the Study
The issue of exchange rate management and macroeconomic performance in developing countries has received considerable attention and generated much debate in recent years. The debate 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 (Dada and Oyeranti, 2012). 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 demands 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.

The liberalisation policies in many developing countries has exposed the behaviour of real exchange rate in these countries, with some experiencing persistent overvaluation and others persistent undervaluation which has resulted in worsened economic outcomes (Dollar, 1992; Akinlo, 2003; Aquirre and Calderon, 2005). 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. This invariably implies 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. A number of economies in the world today are experiencing real exchange rate instability which affects their economic performance due to inability to achieve realistic exchange rate and stable prices as expected. Nigeria is one of such countries. In Nigeria for instance, the exchange rate policy has undergone substantial transformation from the immediate post-independence period when the country maintained a fixed parity with the British 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. 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.

The direction of influence between exchange rate and economic growth has been blurred. Considering that Nigeria has experienced various exchange rate regimes, from fixed to floating exchange rate regimes, it is important to ascertain the impact of exchange rate on economic growth of the country, and to establish the true nature of causality between the two variables. The study would address these issues. The exchange rate is a major economic performance measuring tool because of its influence on the relative prices of local and foreign goods as well as demand for such products. It has been viewed as a major link by which economic growth is influenced through its volatility on investment and profits on international trade, but this linkage is tenuous reflecting a major weakness of the flexible exchange rate regime (Fumey, 2012).

Some attempts have been made to conduct econometric studies on exchange rate determination and the movements in output in Nigeria. These include the works of Egwaikhde, Louis and Gabriel (1994); Odusola and Akinola (2001); Ekpo (2003) among others. However, many of these earlier studies were concerned with the impact of exchange rate on output. This study has taken a wider approach and intends to investigate both the impact and direction of causality between exchange rate and economic growth in Nigeria using econometric method and Granger causality test respectively. An effective exchange rate management is important if policymakers understand the causality between exchange rate and economic growth. Econometric answers to which exchange rate relates and impacts on growth are crucial for implementing exchange rate policy in Nigeria as a strategy for poverty reduction in the context of export-led growth. This means that exchange rate policy can change a country's external balance, income distribution, poverty level and employment.

Objective of the Study

The study would provide answers to the following research questions:
What is the nature of causal relationship between foreign exchange rate and economic growth in Nigeria?
Does foreign exchange has any impact(s) on economic growth in Nigeria?
Is this impact observable both in the short and long-run periods?

Therefore, the objective of the study is to examine the nature of causality between foreign exchange rate and economic growth in Nigeria with particular interest on the channel of impact and stability between the two variables based on the Keynesian national income accounting framework of an open economy and macro-econometric model.

From the foregoing therefore, the study is divided into six parts. Part one is the introduction. Part two deals with literature review, conceptual framework and theoretical structure of the study. The methodology of the work is specified and explained in part three. This comprises model specification, sources of data, Granger causality test, and the method of data analysis. Empirical results are given and interpreted in part four. While part five discusses the findings of the study, part six concludes with recommendations.

Review of Relevant Literatures, Concepts and Theories

This section discusses the conceptual clarifications and the theoretical framework of the study. It also reviews various pieces of empirical studies conducted by several scholars on subject of study. This section therefore, deals with the harmonisation of various views and opinions expressed by different scholars on exchange rate and economic growth.

Conceptual Clarifications

Montiel (2003) described exchange rate as the relative price of foreign goods in terms of domestic goods. Similar definition was given by Bautista (1987) who defined the real exchange rate as the real worth of foreign exchange in terms of a given domestic currency. Hinkle and Nsengiyuwva (1999) described exchange rate (nominal) as the rate adjusted for differences in price level between economies and these are measured in a common currency. This is based on purchasing power parity (PPP) theory which compares the relative value of currencies by measuring the relative prices of foreign and domestic consumption baskets. They also defined exchange rate as the ratio of local price of tradable to non-tradable within a country. This captures the internal relative price incentives of an economy for the production or consumption of tradable goods as against non-tradable goods.

Exchange rate is defined by Edwards (1988) as the ratio of the prices of tradable to non-tradable as it determines the rate at which countries trade among themselves. This implies that exchange rate is the terms of trade as the nominal exchange rate takes into account the inflation differentials among the countries. That is, real exchange rate is calculated as: RER = e*PRERP. Where P and *P represent domestic and international prices respectively. 'e' denotes nominal exchange rate which is the rate at which a person can trade the currency of one country for the currency of another, and RER is the relative price of the goods of two countries. Nonetheless,

the real exchange rate is a function of nominal exchange rate and prices of goods in two countries measured in the local currencies. So, if the real exchange rate is high, foreign goods become relatively cheaper when compared with domestic goods. Conversely, if the real exchange rate is low, foreign goods become relatively expensive when compared with domestic goods. An increase in RER is termed appreciation and a decrease is termed depreciation.

Theoretical Framework

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 labour market mobility. However, since the links between the nominal exchange rate regime and macroeconomic performance both counterbalance and reinforce each other, the OCA theory is unable to present an unambiguous proposal for the optimal exchange rate regime. For example, 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.

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 1994; Edwards and Savastano 2000; Eichengreen, Savastano and Sharma 1999; and Frankel 2003).

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 emphasised, 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, Eduardo and Paolo 2002; Borensztein and Lee 2002; Frankel 1999; Lin 2001, McKinnon and Schnabel 2003; and Mussa et al 2000).

On the basis of economic theory, scholars such as Fumey (2012) would argue that for standard of living to be improved or for an economy to grow and develop, such economy needs to be

linked up with other economies through exchange rate regimes and trade flows. In the process, real exchange rate emerges as an important variable that requires prudent management in order to influence the standard of living of a country. One school of thought would argue that real exchange rate (RER) operates through the aggregate demand and that devaluation or depreciation of the RER enhances international price competitiveness of locally produced goods (tradable) which tends to improve the balance of payment. With the improvement in international competitiveness, net exports would increase and boost aggregate demand in the economy. But with revaluation or appreciation, it would adversely affect the performance of locally produced goods which tends to decrease net export thereby contracting the economy through low aggregate demand. Another school of thought would maintain the view that real devaluation or depreciation can cause a reduction in aggregate supply through an increase in the cost of imported raw materials which tends to reduce importation of productive raw materials thereby affecting production (Cottani, Cavallo, and Khan, 1990; Papazoglou, 1999).

Empirical Review

Evidences abound that inappropriate exchange rate policy is harmful to the overall well being of an economy. For example, Obadan (1994) observed that an undervalued exchange rate results in balance of payment deficit which could lead to a decline in standard of living, while an overvalued exchange rate leads to artificial rise in standard of living beyond a nation's productive capacity and creates a deficit in the current account balance often financed by depleting foreign exchange reserves or incurring external debt. This implies the need to adopt exchange rate policies that will avert the problem of reserve depletion. Changes in the real exchange rate depend on other policies such as fiscal and monetary policies which may strengthen or weaken the transmission mechanism and could affect the cost of the economy in terms of its exports competitiveness (Fumey, 2012). This means that real exchange rate affects the competitiveness of trade flows and the likely consequences of such competitiveness for economic growth are inevitable.

The link between foreign exchange rate and economic growth operates either through aggregate demand or aggregate supply side of the economy. For example, Akinbola and Oyetayo (2010) examined the relationship between real exchange rate and domestic output in Nigeria using the Engel-Granger cointegration approach for the period 1989 to 2004. They found that real exchange rate in Nigeria operates through the aggregate supply channel to enhance output and economic expansion, and concluded that real exchange rate needs to be used as one of the macroeconomic policy instruments while diversifying exports to boost foreign exchange. Operating through the aggregate demand, devaluation or depreciation of the real exchange rate could enhance international price competitiveness of locally produced goods (tradable) which tends to improve the balance of payments position. With the improvement in international competitiveness, net exports would increase and boast aggregate demand in the economy. However, a revaluation or appreciation of the real exchange rate would adversely affect the performance of locally produced goods in the international market which tends to decrease net export thereby contracting the economy through low aggregate demand. This position is in accord with the view echoed by Fumey (2012).

Nevertheless, dissimilar view was given by Cottanni, Cavallo and Khan (1990) and Papazoglou (1999) who argued that real devaluation can cause a reduction in aggregate supply through an increase in the cost of imported raw materials which tends to reduce importation of productive raw materials hence affects production. Foreign exchange rate is therefore an important component of the external sector, and considering the significance of real exchange rate in international trade and to economic growth, foreign exchange rate is adopted as an explanatory variable.

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 - an indication 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. Output, inflation and exchange rate in Nigeria was the focus of the work by Odusola and Akinola (2001). Employing a structural VAR model, evidence from the estimations demonstrated the existence of mixed results on the impacts of exchange rate depreciation on output. Inflation was found to generate substantial destabilizing impacts on output, suggesting that monetary authorities should play a critical role in providing enabling environment for growth. The authors concluded that prices, parallel exchange rate and lending rate were important sources of fluctuations in the official foreign exchange rate.

Nevertheless, 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, it is evident that most cases of contractionary devaluations had been focused on Latin America.

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 195561. 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 195966. 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 Schmid (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) who regressed the real GDP on measures of the nominal and real exchange rates, government spending, the terms of trade, and measures of money growth, has observed 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 (1991) 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.

Morley (1992) analysed the effect of real exchange rates on output for twenty eight devaluation experiences in developing countries 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 observed 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 VARmoney supply, domestic price level, exchange rate index, foreign price index, real output, and the rate of interestin 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 VARoutput growth, real wage growth, exchange rate depreciation, inflation, monetary growth, and the Solow residualsin an attempt to decompose the movements of Peruvian output. They observed 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 growthmost variations in the Mexican output resulted from "own" shocks. They however noted that exchange rate depreciations led to a decline in output.

Bleany and Greenaway (2001) investigated the effects of terms of trade and real exchange rate volatility on growth and investment in fourteen sub-Saharan African countries using the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) models. Based on annual data for 1980-1995, the study found that GARCH model volatility of RER has a negative impact on growth and investment. Gyimah-Brempong and Gyapong (1993) have investigated the effects of exchange rate distortion on economic growth in Ghana, based on time series data and a five-equation simultaneous model; they found that exchange rate distortion, as measured by black market premium, has a harmful effect on economic growth. This includes reduced investment and constricted international trade. They concluded that a liberalised exchange rate policy has become necessary to enhance growth.

Mcpherson and Rakovski (2000) examined the possible direct and indirect relationship between real and nominal exchange rates and GDP growth in Kenya from 1970 to 1996. The study used a single equation instrumental variable estimation model and finds no strong evidence of direct relationship between changes in the exchange rate and GDP growth. They, however, concluded that improvements in exchange rate management alone are not enough to revive economic growth in Kenya but should be part of a broader economic reform programme. Furthermore, Fumey (2012) has studied the relation between real exchange rate and economic growth in Ghana using an annualised data from 1980 to 2010. Using the model of an open economy and Johansen cointegration approach, it was revealed that an appreciation of the real exchange rate improves economic growth. It was also found that there exists a unidirectional movement from real exchange rate to GDP in Ghana. This implies that when the real exchange rate appreciates, costs of imported goods become relatively cheaper in terms of the local currency and this increases the volume of imports, reduces costs of production and increases output.

Methodology

This section specifies the model for estimation and provides a priori expectation as well as describes the sources of data. It also deals with Granger causality and cointegration tests, method of data analysis and interpretation of results.

Model Specification

The study uses the model adopted on the economy of Ghana by Fumey (2012) to investigate the impact of foreign exchange rate on economic growth in Nigeria. This implies adopting Keynesian national income model of an open economy as follows:

GDP = C + I + G + (C M) ..... (1)

Where: GDP = Gross domestic product (as a proxy for economic growth), C = Private consumption, I = Investment, G = Government consumption or expenditure, X = exports, M = imports, (X M) = net export.

Recall from macroeconomic theory that private consumption (C) is a positive function of GDP and negative function of real interest rate. Investment is a negative function of real interest rate.

Government consumption is the exogenous factor which is a stock. Net export is a negative function of real exchange rate.
In determining the real GDP, equation (1) can be manipulated in the following equation:

$GDP = +\_ \beta_1(R\ \pi^e)\ \beta_2 RER + \beta_3 G + \mu_t$ ..... (2)

Or;

$GDP = \beta_1(R\ \pi^e)\ \beta_2 RER + \beta_3 G + \mu_t$ ..... (3)

Where R = nominal interest rate, π^e = expected inflation rate, RER = real exchange rate, G = Government consumption expenditure, β_1, $\beta 2$, and β_3 = Parameters to be estimated, μ_t = error term

Now, since nominal interest rate is a function of money supply, by substituting ($R\pi^e$) in equation (3) by money supply (M), the new equation becomes:

$GDP = +\beta_1 M\ \beta_2 RER + \beta_3 G + \mu_t$ ..... (4)

Equation (4) shows that money supply would have positive impact on real GDP ceteris paribus, such that an increase in nominal money supply would make nominal interest rate to fall which could lead to an increase in investment, thereby increasing real GDP.

Therefore, based on equation (4) above, the estimation model for the study takes the following forms which is a modified version of the model used by Thapa (2002) and Akinbola and Oyetayo (2010). The model is expressed in log-linear form so that the data will be smoothened and the coefficients be interpreted as elasticities that gives the response of the dependent variable (InGDP) to a unit change in any of the explanatory variables when others are held constant.

$In\ GDP = + \beta_1 InM + \beta_2 InG + \beta_3 InRER + \beta_4 InINF + \beta_5 InOPEN + e$ ..... (5)

Where: InGDP = real GDP, InM = money supply, InG = real government consumption expenditure, InRER = real exchange rate, InINF = inflation rate, InOPEN = degree of openness in the economy measured as the sum of real export and import, e = the error term.

A priori expectation

The study expects β_1 to be positive and β_4 to be negative. β_2 is indeterminate depending on whether or not government consumption crowds out private consumption. If the government consumption crowds out private consumption β_2 will be negative, but otherwise it complements private consumption. β_3 is indeterminate depending on whether the real exchange rate operates through the aggregate demand channel or the aggregate supply channel. If it is positive, it operates through aggregate supply channel, but if negative it operates through demand channel. $\beta_5$is indeterminate depending on whether real openness is import dependent or export dependent. Nigeria being predominantly an importing economy, openness is expected to be import dependent. This implies that if openness is negative the Nigerian economy is import dependent, but if it turns out to be positive, the economy is export dependent an indication that exports boost the output growth rate.

Data Sources

Secondary data were used in this study for empirical analysis of the research variables for the period 1986 to 2012. The choice of this period is to coincide with trade liberalisation, deregulation and more openness of the Nigerian economy. Data required for the study are annual time series in nature. These data would be collected from the Central Bank of Nigeria (CBN) statistical bulletin and annual statements of accounts, the statistical abstract of the National Bureau of Statistics (NBS).

Granger Causality Test

Granger causality test is applied to provide the statistical evidence of the direction of causality between the variables of study. According to Granger (1969, 1988), two series say exchange rate and economic growth (GDP) are said to be mutually dependent (two-way causality), if GDP causes exchange rate fluctuation, and foreign exchange rate causes GDP as earlier stated. This implies a feedback between exchange rate and GDP. The causality model that emerges in this study is based on the assumptions of autoregressive behaviour in time series. Causation or relationship between exchange rate and GDP is assumed to take place with a lag. This is consistent with econometric theory. This suggests that many variables exhibit lags in their effects on others, as it is the case with most economic phenomena (Koutsoyiannis, 1977).

In view of the nature of economic behaviour, any realistic formulation of economic models should involve some lagged variables among the set of explanatory variables to determine the direction of causation between these variables. To ascertain the causal relationship between exchange rate and growth, the study therefore adopts the use of distributed lagged models as used by Granger (1969). The Granger definition exploits time series relationships to identify causality. Lagged variables are one way of taking into account the length of time in the adjustment process of economic behaviour, and perhaps the most efficient way of rendering them dynamic (Gujariti and Sangeetha, 2007). Granger proposed that for a pair of linear covariance stationary time series say; X and Y; X causes Y if the past values of X can be used to predict Y more accurately than simply using the past values of Y. The Granger causality test requires the use of F-statistic to test whether lagged information on a variable say "Y" provides any statistical information about another variable "X"; if not, then, "Y" does not Granger cause "X". In other words, the Granger causality tests will indicate whether a set of lagged variables has explanatory power on the other variables. If the null hypothesis is rejected, then it can be concluded that one variable does Granger cause the other variable.

Method of Data Analysis

Quantitative method of analysis was used in this study. This involves the use of analytical technique that employs a simple macro-econometric model (using multiple regression equation) to show the relationship between foreign exchange rate and economic growth in Nigeria. This implies the use of econometric procedure in estimating the parameters in the regression equation. Data collected would be subjected to empirical investigation to find out the significance of the variables.

The choice of econometric method (ordinary least squares) is partly because it has some attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis, and partly because we assume that time series is essentially stationary. The objective of using OLS is not only to estimate the values of the OLS estimators such as β_1, β_2 andβ_3, but also to draw inferences about the true behaviour of these parameters. For example, the OLS enables us to know how close the estimated parameters are to their counterparts in the population, or how close the dependent variable is to the explanatory variables

In the event where the assumptions of OLS are violated, the study would consider the use of a robust standard error correction technique known as Heteroscedasticity and Autocorrelation Consistency (HAC) method to correct the weakness of the OLS. This is suitable because the HAC procedure corrects the OLS standard error for the presence of autocorrelation and Heteroscedasticity (Gujarati and Porter, 2009). This implies that the HAC method effectively overcomes the limitations inherent in the structural model by producing satisfactory estimates of the parameters of structural equations.

Empirical Results of the Model

From the regression results (see appendix), the coefficient values of the estimated parameters (β_1, β_2, β_3, β_4 and β_5 are empirically captured or substituted into the regression equation (5) as follows:

GDP = 10898.7 1.04MS + 13.14G 30418.7RER 28167.81INF 2509973OPN

Std	(73880)	(0.906)	(3.05)	(13010.88)	(18459.59)	(2379116)
t	(0.0147)	(-1.158)	(4.31)	(-2.34)	(-1.526)	(-1.055)
P-value	(0.988)	(0.2598)	(0.003)	(0.0294)	(0.142)	(0.3034)

R^2 = 0.98, ? 2 = 0.98, F-stat 238.79, DW-stat 1.64, N = 27

Interpretation of the Results

The regression results have empirically shown that GDP is negatively related to money supply, real exchange rate, real inflation and openness of the Nigerian economy. A 1% increase in the level of money supply for instance, would reduce the level of GDP in Nigeria. In the same way, increases in the levels of real exchange rate, inflation and openness of the economy would cause reduction in the level of gross domestic product (GDP). This implies a slowing of economic growth in the country. While the real exchange rate shows a significant negative effect on growth, government expenditure shows a positive and significant impact on GDP. The R^2 indicates that 98% of the changes observed in GDP are caused by changes in the explanatory variables. The HAC test was a robustness check for the correction of the effects of Heteroscedasticity and autocorrelation. From the result, the Durbin-Watson value was 1.6 which is approximately 2; an indication that autocorrelation (serial correlation) is absent in the model.

The Granger causality test showed a one-way direction between real exchange rate and GDP. That is, exchange rate granger causes GDP and not the reverse. This means a unilateral relationship exists between exchange rate and GDP in Nigeria. It shows that at lag 6, the real exchange rate significantly causes GDP at 0.1level of significance (10% level of significance) because 0.1 is greater than 0.09866 probability value obtained in Granger causality test (see appendix).

From the test for unit root as presented in the appendix, the variables were individually tested for stationary; the data became stationary at different levels of differencing. Real inflation was the only variable that was stationary at its level. While real exchange rate and openness exhibited stationary at the first level difference; GDP, government expenditure and money supply were stationary at the second level difference. The variables were cointegrated as the combined unit root test showed stationary of the data used. This implies that linear combination of the variables in the model ensures a long run relationship between the dependent and explanatory variables. In stability test, the growth model is examined to know whether it has shifted over the study period. The Cumulative Sum (CUSUM) of squares was adopted to ensure the stability. The stability test conducted revealed that the relationship between GDP and the explanatory variables has not been stable over time. The CUSUM test showed that the hypothesis of parameter constancy is not rejected as the static falls within the 5% confidence bound. The stability graph shows the unstable relationship between the variables for the period under review (see appendix: Figure 1).

Discussion of findings

The results interpreted above reveals that a unit change in government expenditure will positively cause about 13.1 unit change in GDP in the long run. This is in consonance with economic theory as an increase in government expenditure which goes to compliment private consumption and investment leads to an increase in aggregate demand particularly if the consumption is made on productive goods. It implies that government consumption does not crowd out private sector consumption but compliments it. This has agreed with the a priori expectation on government consumption expenditure (G).

The negative effect of real exchange rate on growth in the long run as could be seen from the elasticity coefficient value (-30418.7) which means that a unit change in real exchange rate would lead to a unit fall in GDP by that amount in the long run. Theoretically, this implies that the real exchange rate operates through the aggregate demand channel which means that a depreciation of the naira exchange rate would lead to increase in cost of imported capital goods and raw materials thereby leading to higher cost of production which would reduce output growth in the country.

The degree of openness has a negative effect on real economic growth in Nigeria in the long run. This means that a unit increase in trade openness leads to a decrease in real growth by 250997 unit of output. The negative impact implies the predominant import dependent structure of the Nigerian economy. By this finding, openness leads to fall in output and does not promote economic growth contrary to economic theory. This has attested to the a priori expectation on the nature of trade openness in Nigeria.

Further, a unit increase in the real inflation rate (index of inflation) also leads to a 28167.8 unit fall in GDP growth in Nigeria for the period under consideration. This is in line with a priori expectation on the impact of real inflation rate on GDP. This could largely be explained by macroeconomic instability in the economy which does not auger well for investment and this will reduce output growth, as could be worsened by imported inflation.

Money supply (which is currency in circulation outside the banking system plus the deposits of commercial banks and building societies) has also but surprisingly showed a negative impact on GDP contrary to a priori expectation. This could be explained by lack of effective control of excess money supply in respect to reserve requirements, discount rate, and open market operations by the Central Bank. This could add to inflationary pressure in the economy. This implies indirect effect. This is in line with economic theory that says a unit change (increase) in money supply causes a change in prices (inflation), and an increase in inflation reduces output growth (Begg, Fischer and Dornbusch, 1994).

Conclusion / Recommendation

The study has examined the impact of real exchange rate in relation to money supply, real inflation rate, government expenditure and real openness on economic growth in Nigeria. The findings of the study revealed that the real exchange rate operates through the aggregate demand channel to impact on GDP in Nigeria. As a result, devaluation has made imported goods more expensive while domestic raw materials cheaper for foreigners. This would raise the cost of production in Nigeria thereby reducing the level of output growth. A unidirectional relationship between real exchange rate and economic growth was established. This means that real exchange rate influences or causes GDP. The results generally indicated that inflation needs to be taken seriously since it exerts negative influence on economic growth. Therefore measures to curb the inflationary pressure on the economy in order to ensure a stable macroeconomic environment that can boost economic activities have become important.

To curb the problem of inflationary pressures on the economy, government should formulate suitable and sustainable fiscal and monetary policies to ensure growth in domestic output in the economy. Some of the measures may include improved tax administration to take in more tax revenues, and a careful and regulated money supply based on CBN's own research without undue interference by government. Since any mismanagement of the real exchange rate would lead to risk and uncertainty in business and investment climate culminating into low economic growth in Nigeria, government should ensure that appropriate exchange rate policies which would exert positive impact on the economy and would not allow high rates of depreciation of the naira are pursued. This would also discourage banks and individuals from doing businesses that have detrimental impact on the real economy.

From the major findings of this study, it implies that fiscal, monetary and exchange rate policies need to be designed in order to ensure sustainable macroeconomic stability which will stimulate real appreciation of the naira so as to drive growth. However, policymakers should ensure that real appreciation does not exceed the equilibrium exchange rate in order to prevent massive importation of goods so as to preserve domestic industries. Though government expenditure has been positive in terms of impact on growth, this expenditure should be made on productive sectors or the growth enhancing real economy.

Again, the import dependency nature of the Nigerian economy leaves much to be desired, so government should create the enabling environment for local industries; to increase their production capacities and to target foreign markets so that problems of balance of payments

could be tackled. There is need to intensify campaign on domestication. This means Nigerians should be urged to patronise made in Nigeria goods so as to reduce the importation of consumer goods in the country. Exports should be diversified especially in the area of agriculture in order to improve foreign exchange earnings and develop the manufacturing sector in the country.

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APPENDIX

Table 1: Exchange Rate and Growth Variables in Nigeria

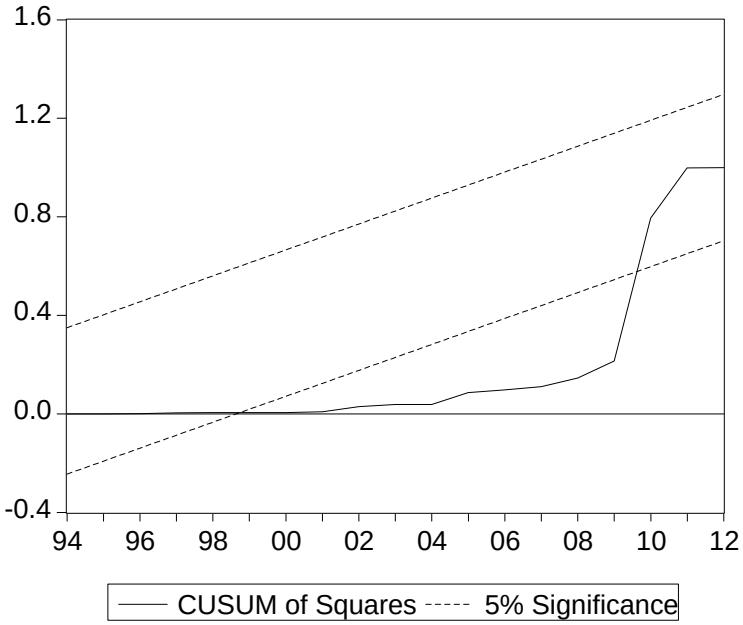
YEAR	GDP (N'Million)	MONEY SUPPLY (N'Million)	GOVT. EXP (N'Million)	REAL EXCH RATE (N to $1)	REAL INFL RATE	REAL OPENNESS
1986	69,146.99	27,389.80	16,223.70	2.0206	6.6	0.1
1987	105,222.84	33,667.40	22,018.70	4.0179	9	0.24
1988	139,085.30	45,446.90	27,749.50	4.5367	-20.7	0.19
1989	216,797.54	47,055.00	41,028.30	7.3916	-16.3	0.22
1990	267,549.99	68,662.50	60,268.20	8.0378	20.2	0.31
1991	312,139.74	87,499.80	66,584.40	9.9095	7.8	0.37
1992	532,613.83	129,085.50	92,797.40	17.2984	-13.3	0.38
1993	683,869.79	198,479.20	191,228.90	22.0511	-21.11	0.34
1994	899,863.22	266,944.90	160,893.20	21.8861	-36	0.25
1995	1,933,211.55	318,763.50	248,768.10	21.8861	-52.01	0.57
1996	2,702,719.13	370,333.50	337,417.60	21.8861	-8.44	0.45
1997	2,801,972.58	429,731.30	428,215.20	21.8861	14.82	0.49
1998	2,708,430.86	525,637.80	487,113.40	21.8861	11.34	0.39
1999	3,194,014.97	699,733.70	947,690.00	92.6934	20.59	0.43
2000	4,582,127.29	1,036,079.50	701,050.90	102.1052	14.65	0.43
2001	4,725,086.00	1,315,869.10	1,017,996.50	111.9433	2.44	0.46
2002	6,912,381.25	1,599,494.60	1,018,178.10	120.9702	17.29	0.41
2003	8,487,031.57	1,985,191.80	1,225,988.30	129.3565	8.88	0.51
2004	11,411,066.91	2,263,587.90	1,384,000.00	133.5004	5.82	0.56
2005	14,572,239.12	2,814,846.10	1,743,200.00	132.147	1.59	0.69
2006	18,564,594.73	4,027,901.70	1,842,587.70	128.6516	10.5	0.57
2007	20,657,317.67	5,809,826.50	2,348,593.00	125.8331	12.96	0.6
2008	24,296,329.29	9,166,835.30	3,078,300.00	118.5669	7.12	0.64
2009	24,794,238.66	10,767,377.80	3,284,702.60	148.9017	10.52	0.58
2010	29,205,782.96	11,034,940.93	3,839,974.80	152.9	9.99	0.53
2011	37,543,654.70	12,172,490.28	4,308,029.60	151.8266	10.69	0.47
2012	45,881,526.44	13,310,039.64	4,776,084.40	157.6788	-11	0.42

Source: CBN various issues

Table 2: Unit Root/Stationarity Test using Phillips - Perron Method

Variables	Level of stationarity		Level of significance
GROSS DOMESTIC PRODUCT	I(2)	- 2.96	-1.96
GOVERNMENT EXPENDITURE	I(2)	- 7.04	-1.96
MONEY SUPPLY	I(2)	- 4.97	-1.96
REAL EXCHANGE RATE	I(1)	- 2.75	-1.96
OPENNESSS	I(1)	- 3.77	-1.96
REAL INFLATION	I(0)	-3.05	-1.96

Figure 1: CUSUM Square Test for Parameter Stability for the Model



Date: 04/11/13 Time: 08:54
Sample: 1986 2012
Lags: 6

Null Hypothesis:	Obs	F-Statistic	Probability
REAL_EX_RATE01 does not Granger Cause GDP	21	2.68473	0.09866
GDP does not Granger Cause REAL_EX_RATE01		1.43793	0.30907

Multiple Regression Results
Dependent Variable: GDP
Method: Least Squares
Date: 04/11/13 Time: 18:14
Sample: 1986 2012
Included observations: 27
Newey-West HAC Standard Errors & Covariance (lag truncation=2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS	-1.049826	0.906502	-1.158107	0.2598
GOVT_EXP01	13.14222	3.051698	4.306528	0.0003
REAL_EX_RATE01	-30418.70	13010.88	-2.337943	0.0294
OPN	-2509973.	2379116.	-1.055002	0.3034
REAL_INFL01	-28167.81	18459.57	-1.525919	0.1420
C	10898.70	738880.8	0.014750	0.9884

R-squared	0.982715	Mean dependent var	9933334.
Adjusted R-squared	0.978599	S.D. dependent var	12745846
S.E. of regression	1864601.	Akaike info criterion	31.90812
Sum squared resid	7.30E+13	Schwarz criterion	32.19609
Log likelihood	-424.7596	F-statistic	238.7792
Durbin-Watson stat	1.640332	Prob(F-statistic)	0.000000