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Price Instability, Exchange Rate Volatility and the Nigerian Economy: An Empirical Analysis

Folorunso Sunday Ayadi* Olajide Anuoluwa Jeremiah
Economics Department, Faculty of Social Sciences, University of Lagos, Nigeria

Abstract

Previous studies on price and exchange rate volatility have commonly focused on its effect on FDI and some sectors of the Nigerian economy, and not much has been conducted on its effect on the economy as a whole. This research therefore empirically verified the dynamics of price and exchange rate volatility on the Nigerian economy for the period of 1970 to 2010. The study was conducted by building a model which looked at the relationship between price, exchange rate and economic growth. Exchange rate variability was estimated using the GARCH model and variables were tested for unit root (stationarity). Consequently, the Johansen cointegration test was also conducted. The analysis was concluded with the estimation of the Error Correction Model (ECM) and interpretation of the short-run and long-run (OLS) results. The study found that the exchange rate in Nigeria is volatile, as the trend shows the fluctuation in price and exchange rate which of course may bear serious implications. Their instability however did not discourage investment and consequently economic growth both in the short and long run. Based on the regression result, it was observed that 1% change in money supply led to about 83.2% change in RGDP, the implication of this is that monetary variable may be a reliable instrument of ensuring growth in the long run. In addition, trade openness significantly depresses growth in the short and long run suggesting the adoption of inward growth strategy.

Keywords: Exchange rate, Growth, Inflation, Macroeconomics, Trade openness.

1. Introduction

There has been an ongoing debate about the appropriate exchange rate policy in developing countries. The debate focuses on the degree of fluctuations in the exchange rate in the face of internal and external shocks. Exchange rate fluctuations are likely, in turn, to determine economic performance. In judging the desirability of exchange rate fluctuations, it become, therefore, necessary to evaluate their effects on output growth and inflation via the demand and supply channels. A depreciation (or devaluation) of the domestic currency may stimulate economic activity through the initial increase in the price of foreign goods relative to home goods. By increasing the international competitiveness of domestic industries, exchange rate depreciation may divert spending from foreign goods to domestic goods.

Hirschman (1949) points out that currency depreciation from an initial trade deficit reduces real national income and may lead to a fall in aggregate demand. In other words, currency depreciation gives with one hand, by lowering export prices, while taking away with the other hand, by raising import prices. If trade is in balance and terms of trade are not changed, these price changes offset each other. But if imports exceed exports, the net result is a reduction in real income within the country. Cooper (1971) also confirmed this point in his general equilibrium model. Depreciation may raise the windfall profits in export and import-competing industries. If money wages lag, the price increases and if the marginal propensity to save from profits is higher than from wages, national savings will go up and real output will decrease. Krugman and Taylor (1978) and Barbone and Rivera-Batiz (1987) have formalized the same views.

Supply-side channels further complicate the effects of currency depreciation on economic performance. Bruno (1979) and van Wijnbergen (1989) postulated that in a typical semi-industrialized country where inputs for manufacturing are largely imported and cannot be easily produced domestically, firms' input cost will increase following devaluation. As a result, the negative impact from the higher cost of imported inputs may dominate the production stimulus from lower relative prices for domestically traded goods.

Currency devaluation was bound to generate inflationary pressures as most of the imported goods had no close domestic substitute. On one hand, it has been recognized in the literature that depreciation of exchange rate tends to expand exports and reduce imports, while the appreciation of exchange rate would discourage exports and encourage imports. Thus, exchange rate depreciation leads to income transfer from importing countries to exporting countries through a shift in the terms of trade, and this affects the economic growth of both importing and exporting nations.

Currently, economists seem to agree that high rates of inflation cause "problems" not just for some individuals, but for aggregate economic performance. However, much less agreement exists about the precise relationship between inflation and economic performance, and the mechanism by which inflation affects economic activity. There exists also some evidence which strongly supports the view that the relationship between inflation and economic growth is non-linear. Further investigation suggests that developing countries and developed countries show different forms of non-linearity in the inflation-growth relationship.

Barro (1996) emphasize that the growing interest on price stability as a major goal of monetary policy has been borne out by recent developments in economic literature, which tends to show that a reduction in the inflation rate impacts measurably and positively on economic growth. Furthermore another strands of these economic thoughts as explained by Bruno and Easterly (1996) and Mishkin and Posen (1997) imply that there is no long-run trade-off between inflation and economic growth. Put differently, increases in economic activities can occur without a spell of inflationary pressure as envisaged by the Phillips curve hypothesis.

In effect recent papers by some economists have demonstrated that inflation had positive effect on growth while some other economists who are advocate of the efficient firm's hypothesis, are preaching an inverse correlation between inflation and economic growth. The problem therefore lies in determining the inflation rate consistent with development and identifying the price rise that reflects inflationary pressure on the economy.

Although, there exists numerous research on separate impact of exchange rate on growth, and inflation on growth in Nigeria (for example, Ikhide and Yinusa, 1998; Ajibefun and Daramola, 2003; Odusola and Akinlo, 2001), this approach differs in terms of methodology and focus. Thus, this study on the Nigerian economy attempts to find out how these two macroeconomic variables interact with the economic performance. The general objective of this study is to examine empirically the dynamics of inflation and exchange rate volatility on the performance of Nigerian economy. This paper is divided into six sections, section 2 review relevant literature while section 3 focuses on theoretical framework. Section 4 presents methodology and data, section 5 presents results while the sixth section recommends.

2. Literature Review

Nwankwo (1982) defines inflation, as "excess of demand over supply at current prices. Inflation is also a situation whereby too much money is chasing too few goods. From the definitions, it is clear that inflation has four essential characteristics. One is increase in demand which simultaneously results in a proportionate or higher increase in supply. If increases in demand must lead to inflation then there must also be a second factor which is limitation of supply. But a limitation of supply will not necessarily lead to inflation unless the third factor is present. This is an increase in the supply of money. It is this which will make the increase in demand effective. Even then there would still be no inflation unless there is a struggle in the community for the limited supply of goods and services. This is the fourth element. From the above four essentials of inflation, Onitiri and Awosika (1982) defined inflation as a state of disequilibrium in which the community is struggling to acquire more goods and services than are available and which lead to persistently rising prices.

Hashim and Zarma (1996) emphasized that exchange rate is an important economic variable as its appreciation or depreciation affects the performance of other macroeconomic variables in any economy. Its value can be used to assess overall performance of an economy and a very important variable in policy decision-making of an economy. Any government at any point in time seek the stability of the exchange rate because it provides economic agents the opportunity to plan ahead without fear of varying costs and prices of goods and services. On the other hand, instability of exchange rate can cause a negative distortion in any economy.

Sanusi (2004) highlighted that the country's (Nigeria's) exchange rate policy has been aimed at preserving the external value of the domestic currency and maintaining a healthy balance of payments position, which indeed is a major provision of the enabling law. The problem of foreign exchange market, which Nigeria is facing just like any other developing countries, has much to do with the gap that exists between supply of foreign exchange and its demand. The failure of the economy to supply enough foreign exchange to meet the demand forced the government to resort to rationing the available foreign exchange and this led to speculative hoarding and the development of a parallel market. All these cause the instability of the exchange rate in Nigeria.

Broadly, Nigeria had adopted two exchange rate systems, the fixed and flexible exchange rate system (Hashim and Zarma, 1996). Ogunleye (2010) noted that the real exchange rate in Nigeria has been principally influenced by external shocks resulting from the vagaries of world price of agricultural commodities and oil price, (both major sources of Nigerian export and foreign exchange earnings) contending that when the economy depended on agricultural exports, real exchange rate volatility was less pronounced given the fact that these products were

subjected to less volatility, and that there were more trading partners' currencies involved in the calculation of the country's real exchange rate. This to him minimally affected the real exchange rate fluctuations between 1970 and 1977.

Iyoha and Oriakhi (2002) observed that the important factor that determined the movement in real exchange rate during the 1970's was nominal shock resulting from fiscal deficits. Ogunleye (2008) observed further that the oil windfalls which resulted in excessive fiscal expenditure in ambitious development projects in the 1970's, forced the government to finance its expenditures through money creation when the windfall ended. This expansionary monetary policy exerted upward pressure on inflation, thus further aggravating sharp movements in real exchange rate.

Adeyeye and Fakiyesi (1980), Osakwe (1993) have sought explanations for the worrisome trend in inflation in Nigeria. Popular among the adduced reasons for the price fluctuation includes large fiscal deficits financed by accommodating monetary policies, entrenched inflationary expectations, nominal exchange rate depreciation, capital inflows and real factors, like drought, OPEC reduction of quota, ethnic violence and civil strife, etc. In explaining the effect and determinants of inflation in Nigeria, other various empirical studies have been carried out explaining this unprecedented increase in the general price level. Economists have applied more of the combination of the monetarist's theory and the structuralist views on inflation to explain the causes and effects of inflation in Nigeria (Akinnifesi, 1977; Adeyeye and Fakiyesi, 1980; 1996; Egwaikhile et. al., 1994 among others).

The connection between exchange rate variability and inflation has been explained by Hyder and Shah (2004). Exchange rate movement can influence domestic prices via their effect on aggregate supply and demand. On the supply side, exchange rate could affect prices paid by the domestic buyers of imported goods directly. In an open economy, when the currency depreciates, it will result in higher import prices and vice versa. Exchange rate fluctuations could have an indirect supply effect on domestic prices. The potentially higher cost of imported inputs associated with an exchange rate depreciation increases marginal cost and lead to higher prices of domestically produced goods. Furthermore, import-competing firms might increase prices in response to an increase in foreign competitor's price in order to improve profit margins. The extent of such price adjustment depends on a variety of factors such as market structure, nature of government, exchange rate policy, or product substitutability. While on the demand side, exchange rate depreciation (appreciation) increases (decreases) foreign demand for domestic goods and services, causing increase (decrease) in net export and hence aggregate demand (see also Rosenberg, 2003).

A relatively large number of studies have attempted to estimate the impact of price and exchange rate variation on economic performance using various methodologies. 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 on growth.

Hasanov (2011) examined the possibility of threshold effect of inflation on economic growth over the period of 2000-2009. Estimated threshold model indicated that there is a non-linear relationship between economic growth and inflation in the Azerbaijani economy and threshold level of inflation for GDP growth is 13 percent. Below threshold level, inflation has statistically significant positive effect on GDP growth, but this positive relationship becomes negative one when inflation exceeds 13 percent. Also, Grimes (1991) analyzed data of 21 countries covering 1961-1987, and found a positive relationship between inflation and economic growth for a short term, and a negative relationship between them for a long term.

Ghosh, et. al. (1997) points to inflation volatility as being, at least, as important as average inflation. The authors analyzed 140 countries over a 30-year period, and divided them into 9 groups according to their exchange rate regime. Then, they regressed inflation volatility against the Central Bank's turnover rate, degree of openness, volatilities of output growth and of money supply and interest rates, plus dummies for fixed and intermediate exchange rate regimes. However, when they split the countries into groups, results show that inflation volatility is lower under the floating and intermediate exchange rate regime for countries with low inflation.

Petreski (2009) conducted a literature review on the relationship between exchange rate regime and growth with the aim of examining the theoretical and empirical arguments for the relationship. He found that as a nominal variable, exchange rate may not impact on the long –run growth process. He further concluded that there is ambiguous theoretical evidence of the effect the exchange rate target have on economic growth. The channel through which exchange rate impacts growth is trade, investment and productivity. In addition, theoretical

considerations link exchange-rate effect on growth to the uncertainty level caused by the flexible option of the rate. However, the relationship remains controversial theoretically requiring empirical analysis. The empirical research remains divergent. On the overall, these empirical works have the following shortcomings. The growth-framework used not appropriate, problem of endogeniety (exchange rate and growth), sample selection bias among others.

Stotsky et. al. (2012) examines the relationship between foreign exchange regime and macroeconomic performance in seven East African countries with 5 of which foreign exchange regimes are liberalized using the generalized method of moment. They developed two models, one which relates growth and its determinants which include inflation, nominal exchange rate and liberalization among others. The other model relates inflation to its various determinants which include lagged inflation, exchange rate and liberalization among others. They found that investment and real exchange rate are the significant determinants of growth while the lagged inflation rate, nominal exchange rate and de facto regime are the significant determinants of inflation. The cue we take from the growth model is that if the real exchange rate influences growth, what impact the exchange rate volatility would have on growth is worth an effort.

Harms and Kreschmann (2009) conducted a study on some developing countries to investigate the relationship between exchange rate regime and growth and they found out that less flexible regimes confers some benefits in the sampled countries. However, when inflation is taken into consideration by removing high inflation periods from the sample, the benefits disappear. This implies that inflation distorts the impact of exchange rate growth.

Okhiria and Saliu (2008) employed econometric techniques to investigate the impact of currency devaluation on output growth and inflation rate and they found 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.

Cooper (1971) 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.

On this debate, the conclusion of Du and Zhu (2001) is relevant. They posited that results from many empirical studies differ from country to country even, when the same method of examination is applied. It also differs for same country at different point of time. Survey of literature showed that the debate on growth, exchange rate and inflation is still fraught with considerable controversy. In addition few researches have been done on the combined role of inflation and exchange rate variability and economic growth. So, additional research in this area is still of importance.

3. Theoretical Framework

The link between exchange rate, inflation and economic growth is better explained using the Balassa-Samuelson model (B-S model) which is presented using a single-factor aggregate production function of Obstfeld and Rogoff (1996). This model assumes that the production functions of tradable (T) and non-tradable goods (N) take the following form:

$$Y_T = A_T L_T$$

$$Y_N = A_N L_N$$

$$Y_T^* = A_T^* L_T^*$$

$$Y_N^* = A_N^* L_N^*$$

where Y is production, A is a constant describing technology, and L is labor force. Foreign economies employ the same kind of technology as the domestic economy, but may differ from it in the value of the technological parameter **A**; the subscript **T** denotes the tradable sector, and the subscript **N** is the non-tradable sector. This model also assumes that the law of one price holds for tradable commodities and that the world price of tradable commodities is equal to one without a loss of generality. In addition, perfect labor mobility is assumed between sectors within an individual economy, but zero mobility of labor is assumed between economies. The mobility of labor insures that the wage rates **w** are equal in other sectors of the same economy. We define the price index as the weighted geometric average of prices of tradable and non-tradable goods as:

$$P = (p_T)^{\gamma}(p_T)^{1-\gamma} = (p_T)^{1-\gamma} = \left(\frac{A_T}{A_N}\right)^{1-\gamma}$$

, where γ is the share of tradable goods in total outputs. If this share is the same at home as abroad, the relative price vis-a-vis the outside world is expressed as

$$\frac{P}{P^*} = \left(\frac{A_T / A_N}{A_T^* / A_N^*}\right)^{1-\gamma}$$

, and the nominal GDP per employee is expressed as $GDP_{nom} = A_T$. the relative price can then be transformed into

$$\frac{P}{P^*} = \left(\frac{GDP_{nom}}{GDP_{nom}^*}\right)^{1-\gamma}\left(\frac{A_N^*}{A_N}\right)^{1-\gamma}$$

This formula states that the relative price is determined by relative GDP and the relative technological level or productivity in non-tradable sector of the two economies. Given a level of productivity at home and abroad, a higher nominal GDP growth at home than abroad leads to an appreciation of the real exchange rate. On the other side, given an economic growth rate, higher productivity of non-tradables in the home country than the foreign country will lead to depreciation of the real exchange rate.

This simplified model can be easily extended to a more general one that includes two production factors: labor and capital. Let us consider a small economy that produces two composite goods: tradables and non-tradables. We assume that the production functions are functions of capital and labor with constant return to scale:

$$Y_T = A_T F(K_T, L_T),$$

$$Y_N = A_N F(K_N, L_N),$$

where *K* denotes capital. The other variables are the same as above. Through some manipulation, the log-differentiation of the relative price of tradable goods and non-tradable goods can be expressed as

$$\hat{P} - \hat{P}^* = (1-\gamma)\left(\frac{\mu_{LN}}{\mu_{LT}}(\hat{A}_T - \hat{A}_T^*) - (\hat{A}_N - \hat{A}_N^*)\right)$$

where $\mu_{LT} = wL_T / Y_T$ and $\mu_{LN} = wL_N / pY_N$ are respectively the labor share of the income generated in the tradable and non-tradable goods sectors.

Provided that non-tradables are relatively labor intensive, meaning

$$\frac{\mu_{LN}}{\mu_{LT}} \geq 1,$$

, the model forecasts that the domestic economy will experience real appreciation if its productivity-growth advantage in tradables exceeds its productivity growth advantage in non-tradables.

The Balassa-Samuelson model is one of the cornerstones of the traditional theory of the real equilibrium exchange rate. The key empirical observation underlying the model is that countries with higher productivity in tradables compared with non-tradables tend to have high price levels. The B-S model hypothesis states that productivity gains in the tradable sector allow real wages to increase commensurately and, since wages are

assumed to link the tradable to the non-tradable sector, wages and prices also increase in the non-tradable sector, leading to an increase in the overall price level in the economy, which in turn results in an appreciation of the real exchange rate.

4. Methodology and Data

The model employed in this study is hereunder stated:

$$GDP= f(INF,M_2,OPNS,INT, EXCVL) \quad (1)$$

$$logGDP= \beta_0+ \beta_1INF+ \beta_2 logM_2+ \beta_3OPNS+ \beta_4INT+ \beta_5EXCVL+ U_t \quad (2)$$

Where $ß_0$, $ß_1$, $ß_2$, $ß_3$, $ß_4$, and $ß_5$ are parameters of the model, exchange rate volatility (EXCVL), inflation rate (INFL), broad money supply (M_2), trade openness (OPNS) and Interest Rate (INT) respectively; U_t is the disturbance term.

Trade openness (OPNS) is calculated as (Total Trade/GDP), while exchange rate volatility (EXVL) would be measured with the use of GARCH in order to determine how volatile the exchange rate has been over the years.

4.1 Estimation Techniques

Although time series data are used in many econometric studies, they present some special problems for econometricians. Most of the empirical work based on time series data assumes that the underlying time series are stationary. In regressing a non-stationary time series variable on another, one often obtains a very high coefficient of determination (R^2) although there is no meaningful relationship between the two. This is the problem of spurious regression. This problem arises because if both the time series involved exhibit strong trends (sustained upward or downward movements), the high coefficient of determination (R^2) observed is due to the presence of the trend, and not because of a true relationship between the two variables.

Any time series can be thought of as being generated by a stochastic or random process. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance or lag between two time periods and not on the actual time at which the covariance is computed. An alternative test of stationary that has become popular is known as unit root test. This study would however utilize the Augmented Dickey Fuller (ADF) method to test for the stationarity of the variables. Most macroeconomic time series have unit roots and regressing non-stationary data against another is bound to yield spurious regression result. We conducted a unit root test and based on the order of integration conducted Johansen cointegration test which indicates the presence of cointegrating equation. Meaning that even though variables are non stationary at levels, a combination of nonstationary variables can produced a stationary result. We went further by estimating the error correction model and the static model

The data that employed in this research work are secondary in nature. They are gotten from various issues of the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics, whom which reliance is total in the case of data sourcing in Nigeria. The data ranges from 1970 through 2010.

5. Results Presentation

The exchange rate volatility in Nigeria from 1970-2010 was obtained through the estimation of Autoregressive Conditional Heteroscedasticity {ARCH} and Generalized Autoregressive Conditional Heteroscedasticity {GARCH (1,1)} model. It can be seen from the graph that the trend of exchange rate volatility grew sharply between 1971-1977, and a steady growth between1978-1999 where it experienced a minimal volatility within the range of 197.94 and 200.31, but in 2000, volatility in exchange rate dropped extremely to 6.56 before rising to 85.68 in 2001, and leveling between 2005-2008 before declining in 2009.

Table 1: Measurement of Exchange Rate Volatility

Dependent Variable: EXC				
Method: ML - ARCH (Marquardt) - Normal distribution				
Sample (adjusted): 1971 2010				
Included observations: 40 after adjustments				
Failure to improve Likelihood after 34 iterations				
Variance backcast: ON				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)				
	Coefficient	Std. Error	z-Statistic	Prob.
C	3.701957	12.50528	0.296031	0.7672
EXC(-1)	1.034266	0.116844	8.851693	0.0000
	Variance Equation			
C	82.06787	175.0194	0.468907	0.6391
ARCH(-1)	-0.044191	0.110873	-0.398576	0.6902
GARCH(-1)	0.594436	0.797021	0.745822	0.4558
R-squared	0.951117	Mean dependent var		42.24014
Adjusted R-squared	0.945530	S.D. dependent var		55.81143
S.E. of regression	13.02573	Akaike info criterion		7.990910
Sum squared resid	5938.436	Schwarz criterion		8.202020
Log likelihood	-154.8182	F-statistic		170.2475
Durbin-Watson stat	1.949483	Prob(F-statistic)		0.000000

Substituted Coefficients:
==========
EXC = 3.701957142 + 1.034266427*EXC(-1)
GARCH = 82.06787185 - 0.04419123661*ARCH + 0.5944356198*GARCH(-1)

Table 2: ARCH and GARCH Results

Variable	α (ARCH Coefficient)	β(GARCH Coefficient)	α+β= Volatility
EXC	-0.044191	0.594436	0.550245

Based on the above result, volatility in exchange rate was insignificant but persistent in Nigeria over the study period. The degree of exchange rate volatility after the summation of GARCH and ARCH Coefficient is estimated at 0.55 or 55% which is less than 1 or 100%, therefore, exchange rate in Nigeria over the study period was volatile, but on the average.

5.1 Augumented Dickey-Fuller Test (Trend & Intercept)

In the literature, the finding that many macro time variables may contain unit root spurred the development of non-stationary time series analysis; given that using non-stationary variables in a model may lead to spurious regressions.

However, Engle and Granger (1987) pointed out that if a linear combination of such non-stationary series are stationary, or I(0), then the non-stationary (with a unit root), time series are said to be cointegrated. In other words, a vector of time series is said to be cointegrated with cointegrating vector if each element is stationary only after differencing while linear combinations are themselves stationary. This stationary linear combination is called the cointegrating equation and may be interpreted as a log-run equilibrium relationship between the variables.

Table 3: Augumented Dickey-Fuller Result (With Lag 1)

Variables	Level	Critical Value	First Difference	Critical Value	Order of Integration
EXCVL	-3.838434**	1% -4.211868 5% -3.529758 10% -3.196411	-7.092589*	1% -4.219126 5% -3.533083 10%-3.198312	I(1)
INF	-3.334723***	1% -4.205004 5% -3.526609 10% -3.194611	-6.274004*	1% -4.219126 5% -3.533083 10%-3.198312	I(1)
LOGRGDP	-2.066127	1% -4.205004 5% -3.526609 10% -3.194611	-6.130764*	1% -4.211868 5% -3.529758 10% -3.196411	I(1)
INT	-2.949629	1% -4.205004 5% -3.526609 10% -3.194611	-7.087351*	1% -4.219126 5% -3.533083 10% -3.198312	I(1)
OPNS	-0.094258	1% -4.211868 5% -3.529758 10% -3.196411	-9.119490*	1% -4.211868 5% -3.529758 10% -3.196411	I(1)
$LOGM_2$	-2.621408	1% -4.211868 5% -3.529758 10% -3.196411	-4.477000*	1% -4.211868 5% -3.529758 10% -3.196411	I(1)

NB:*(**)(***) denote statistical significance at 1% ,5% and 10% level respectively.

The result of the stationarity test (with lag 1) as reported in the above table depict that EXCVL and INF are stationary at Level at 5% critical level but not at 1% critical level, while LOGRGDP, INT, OPNS and $LOGM_2$ are not stationary at level at 5% critical level. Tactically, all variables possess unit root and are integrated of order one at a critical level of 1%. Therefore, the condition for application of co-integration is met. The implication of this is that we can examine evidence for any possible cointegration (long-run relationship) between the stated variables. Therefore, Johansen cointegration test is employed to determine the cointegration rank, i.e., the number of cointegration vectors among the variables.

Table 4: Johansen Cointegration Result

Date: 07/29/12 Time: 10:22					
Sample (adjusted): 1973 2010					
Included observations: 38 after adjustments					
Trend assumption: Linear deterministic trend					
Series: LOGRGDP LOGM2 INT INF EXCVL OPNS					
Lags interval (in first differences): 1 to 1					
Unrestricted Cointegration Rank Test (Trace)					
Hypothesized		Trace	1%	5%	
No. of CE(s)	Eigen value	Statistic	Critical Value	Critical Value	Prob.**
None**	0.654592	103.9303	104.9615	95.75366	0.0121
At most 1	0.467391	63.53524	77.81884	69.81889	0.1431
At most 2	0.388146	39.59644	54.68150	47.85613	0.2373
At most 3	0.283998	20.92852	35.45817	29.79707	0.3621
At most 4	0.176909	8.233750	19.93711	15.49471	0.4407
At most 5	0.021749	0.835574	6.634897	3.841466	0.3607

*(**) denotes rejection of null hypothesis at 1% (5%) critical level
Trace test indicates no cointegration at the 1% level
Trace test indicates 1 cointegrating equation at the 5% level

From the above Johansen Cointegration result, it was observed that the trace statistic is lower than all the critical value at 1%, while at 5%, the trace statistic and the critical value suggest the presence of only one cointegrating vector, and no evidence exist for more than one. The conclusion drawn from the above result is that there exist a

unique long-run relationship between economic growth (RGDP) and its determinants (LOGRGDP, LOGM2, INT, INF, EXCVL and OPNS). In the short run, deviation from this relationship could occur due to shocks to any of the variables. Thus, the error correction model (ECM) is applied to obtain the short-run dynamics.

5.2 Error Correction Model (Short-Run Analysis)

The short – run result of the model is hereunder presented:

Table 5: Short-Run Result of the Model

Dependent Variable: D(LOGRGDP)				
Method: Least Squares				
Date: 08/02/12 Time: 11:33				
Sample (adjusted): 1973 2010				
Included observations: 38 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.138313	0.056182	2.461857**	0.0194
D(LOGRGDP(-1))	0.198839	0.150930	1.317427	0.1971
D(INF)	0.005806	0.003207	1.810738***	0.0796
D(INF(-2))	0.004918	0.003222	1.526254	0.1368
D(OPNS)	-0.063369	0.028540	-2.220348**	0.0336
ECM(-1)	-0.453165	0.126105	-3.593551*	0.0011
R-squared	0.334564	Mean dependent var		0.133310
Adjusted R-squared	0.230590	S.D. dependent var		0.348202
S.E. of regression	0.305429	Akaike info criterion		0.609740
Sum squared resid	2.985177	Schwarz criterion		0.868306
Log likelihood	-5.585052	F-statistic		3.217754
Durbin-Watson stat	2.024842	Prob(F-statistic)		0.018259

*(**) (***) indicates significant at 1, 5 and 10% level respectively.

The data for the ECM variable was obtained from the residual of the long-run equation; using the rate of change on each of the variable and lagging them by 1 and 2 years respectively yield the over-parameterized equation before elimination of highly insignificant variables with constant check on the Akaike and Schwarz criterion to determine the stage at which the parsimonious equation was attained. The result shows that the estimated specification for the LOGRGDP disequilibrium suggests that the speed of adjustment (the error-correction mechanism) to long-run equilibrium is low. Specifically, over forty-five percent (45.32%) of the disequilibrium errors, which occurred the previous year, are corrected in the current year.

The one lag value of LOGRGDP positively and insignificantly influenced the behaviour of D(LOGRGDP) in the current period. In addition, change in current inflation rate D(INF) has a significant positive effect on D(LOGRGDP), while two period lag inflation D(INF(-2)) exhibit a positive and insignificant effect on D(LOGRGDP). Also, the current value of trade openness D(OPNS) exhibit a negative and statistically significant influence on D(LOGRGDP).

5.3 Results of the Static Model

The long-run result of the model is hereunder presented:
Table 6: Long-run Result of the Model

Dependent Variable: LOGRGDP				
Method: Least Squares				
Date: 08/01/12 Time: 18:21				
Sample (adjusted): 1971 2010				
Included observations: 40 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.553955	0.716361	3.565181*	0.0011
LOGM2	0.831696	0.087652	9.488598*	0.0000
INT	-0.028264	0.018105	-1.561097	0.1278
INF	0.000724	0.004902	0.147765	0.8834
EXCVL	0.005243	0.001992	2.631660*	0.0127
OPNS	-0.135229	0.026800	-5.045901*	0.0000
R-squared	0.905907	Mean dependent var		11.94324
Adjusted R-squared	0.892070	S.D. dependent var		1.425056
S.E. of regression	0.468169	Akaike info criterion		1.457507
Sum squared resid	7.452203	Schwarz criterion		1.710839
Log likelihood	-23.15015	F-statistic		65.46914
Durbin-Watson stat	0.995930	Prob(F-statistic)		0.000000

*(**) (***) indicates significant at 1,5 and 10% level respectively.

The Coefficient of Determination value is high based on the above result indicating that about 91% variation in Real GDP is explained by variations in the explanatory variables. The results also show that an increase in money supply by 1% will increase RGDP by 83.17%. Growth of money supply shows a positive relationship and this is in conformity with the a priori expectation of a positive relationship.

Interest rate is the cost incurred in the course of securing loans from banks. If interest rate increases by 1%, RGDP will fall by 2.82% which is in line with the a-priori expectation that there exist a negative relation between interest rate and economic growth (RGDP). When interest rate is low, more loans will be in demand by economic agents which will lead to an increase in investment and output. Also, decrease in interest will lead to low savings since the opportunity cost of parting with income will be low, economic agents (individuals, firms and organizations) will prefer to hold their income in form of cash which brings about an increase in the level of currency outside bank. In the same vein, inflation which is the persistent rice in price level exhibit positive trend with output, as a 1% increase will lead to 0.07% increase in GDP which is not in conformity with the a-priori expectation of a negative relationship between inflation and economic growth. This may be explained by the fact that there is non-linearity in the effect of inflation on growth.

This result partly agrees with that of Grimes (1991) who found a positive relationship between inflation and the economic growth for a short term, and a negative relationship between them for a long term.

Exchange Rate volatility shows the level of instability of the exchange rate, and a 1% increase of it will lead to 0.52% increase in RGDP which is not in line with the a-priori expectation of a negative relationship between exchange rate volatility and economic growth; because, the more volatile the exchange rate, the riskier it is for investors to invest, therefore leading to a negative effect on the economy. This finding is in conformity with that of Azeez, Kolapo and Ajayi (2012), who concluded that exchange rate volatility has positive relationship with the macroeconomic performance, and that the volatility affords investors to utilize the opportunity of an appreciating Naira to import required capital technology.

In addition, trade openness shows the level of international movement of goods and services of a nation. 1% increase in trade openness will lead to a fall in RGDP to the tune of 13.52%, which is not in conformity with the a-priori expectation of a positive relationship between the variables concerned. The result here may not be so worrisome as higher trade openness can create a countervailing effect of fuelling capital flight and corruption via

mis-invoicing. This is in line with the findings of Samra and Muhammad (2011) who investigated the causal link between trade openness and economic growth for four (4) South Asian countries for the period 1972-1985; it was observed that there exists negative relationship between GDP and openness.

6. Conclusion

Our results have shown clearly the beneficial effect of monetary aggregates in enhancing growth both in the short run and in the long run. The lesson to be learnt here is that the Nigerian government and other developing countries should strive to create conducive environment for sound macroeconomic policy necessary for smooth flow of financial resources into productive sector of the economy.

Since trade openness significantly depresses growth, policies that ensure an increase in the domestic content and the smooth running of Industrial and Manufacturing sector should be put in place. In order words, Nigerian government should adopt strategic trade policies. It should examine the challenges, opportunities and constraints they will face in participating in any trade liberalization (see also Ayadi, 2005).

Lastly, our result points to the possibility of a non-linear effect of inflation on growth. Meaning that there might be a threshold of inflation rate consistent with growth, beyond which inflation can be distortionary. The nation's monetary authorities should therefore develop and implement measures that will ensure that both inflation and foreign exchange rates are sustained at levels that will ensure increasing level of FDI inflows and output growth.

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Dr. AYADI, Folorunso Sunday is a Senior lecturer and a Ph.D. holder in Economics (majoring in Environmental and Resource Economics) at the University of Lagos, Nigeria. He has taught Economics at the undergraduate as well as postgraduate levels for several years. Some of his postgraduate classes include Microeconomics of Environment and Macroeconomics of Environment and policy. He also has consultancy experience in management and tax auditing with a tax consultancy firm in Lagos for some years. He has received some scholarly awards as best paper presenter and best track presenter in international conferences. He has publications in various academic journals (including the World Review of Science, Technology and Sustainable Development, Oxford Journal etc.), chapters in books and conference proceedings. His current research and consultancy interests are in the area of Economics of pollution control and wastes management, natural resources Economics and Management, Urban Management, Poverty, Development Economics, Globalization and; Energy in Developing Economies.

Olajide Anuoluwa JEREMIAH earned his Bachelor's degree in Economics from one of the Nigerian's top Universities (University of Lagos, Nigeria). He is currently studying for his Master's in the same department. Olajide Anuoluwa Jeremiah has Strong and insatiable quest for analytical research and he is coined as a lecturer in the making. His undergraduate research work was seen as outstanding, and thus regarded as one of the best undergraduate research work of his time by lecturers and the undergraduate project defense panelists. His areas of interest include Microeconomic research, Macroeconomics and development economics among others.