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DOES INFLATION WEAKEN ECONOMIC GROWTH? EVIDENCE FROM NIGERIA

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ABSTRACT: *The study aims at evaluating the link between inflationary rate and economic growth in Nigeria. It also examines the nature and form of association between inflationary rate and exchange rate as well as interest rates from 1979 t0 2010.Ordinary least squares approach in the form of multiple regression was adopted in examining the relationship among the variables while the causalities were evaluated using Granger Causality model. It is pertinent to check whether the short run relationships would be sustained in the long run. To achieve this, Johansen and Juselius cointegration technique was adopted while the variables were adjusted for stationarity using the Augmented Dickey- Fuller (ADF) tests for unit root. It was found that inflationary rate is negatively related with real gross domestic product while exchange rates and interest rates are positively related with inflationary rate though not to a very significant extent. This is sustainable even in the long run and the implication is that when inflationary rate is rising, it affects the economy negatively as growth is dampened. On causality, at both lag 2 and lag 4, the study reveals that there is no causality between inflationary rate and real gross domestic product. However, at lag 2, there is a unidirectional causality running from inflationary rate to interest rate and also a unidirectional causality running from interest rate to real gross domestic product. At lag 4, there is a unidirectional causality running from interest rate to inflationary rate and from interest rate to exchange rate and also a unidirectional causality running from exchange rate to real gross domestic product. Consequently, efforts should be geared towards keeping inflationary rate at a single digit level to enhance the growth and development of Nigeria economy and to ensure that macroeconomic activities are kept alive.*

KEYWORDS: Inflation Rate, Exchange Rate, Interest Rate, GDP, Granger, Cointegration.

INTRODUCTION

The growth of Nigerian economy revolves around her ability and capacity to increase its level of production of quality services and tangible goods. Economic growth however reflects the increase in the Gross Domestic Product (GDP) of a country. The objective of every monetary policy and their setters all over the globe is to evolve strategies for stabilizing the price of goods and services. The reason is to entrench sustainable development and growth which is gradually being eroded by the weak purchasing power of the domestic naira. Ojo (2000) as cited in Umaru and Zubairu(2012) opine that the term inflation describes a general and persistent increase in the prices of goods and services in an economy

Developing countries like Nigeria, are more susceptible to supply shocks causing high variability in inflation and disturbing the consumption, investment and production behaviour (Jayathileke and Rathnayake, 2013) and as government intervene in financial and goods markets, macroeconomic reactions cause economic instability and market failure. However, Aurangzeb and Haq (2012) opine that mild inflation is a healthy and natural phenomenon of

any developing economy, no matter how strong and stable it may be. This is why economists argue that small steady inflation is "greasing the wheels of commerce." The risk attached to this is that stable prices and zero inflation rate might trigger deflation, economic depression, general recession, technical insolvency and even bankruptcy.

The structuralists argue that inflation is crucial for economic growth while the monetarists posit that inflation is harmful to economic growth(Doguwa, 2012). To date as opine by Ahmed and Mortaza(2005), several empirical studies confirm the existence of either a positive or negative relationship between these two major macroeconomic variables even as Mubarik (2005) argue that low and stable inflation promotes economic growth and vice versa. Omoke(2010) lends his support by emphasizing that despite these plethora of studies both for developing and developed countries, the literature on inflation and economic growth in Nigeria is still very scanty.

The main thrust of this paper is to empirically examine the relationship between inflation and economic growth in Nigeria using the ordinary least square method and to examine the causality amongst the variables using the Granger Causality Approach. The long run relationship of the variables is evaluated using Johansen Co- integration analysis. The rest of the study is organized as follows. Section 2 presents the review of related literature Section 3 discloses the methodology for data analysis. Section 4 presents the annual data for analysis. Section 5 discusses the results while Section 6 concludes.

LITERATURE REVIEW

Theoretical Framework

Cost-push and demand-pull theories for decades have been the key theories underpinning the concept and study of inflation as propounded by John Maynard Keynes in the 1930s. The theory centred on government spending and reduction in tax rates so that this will in turn change the dwindling fortune of the depressed global economy. This is achievable through proactive government policies and economic reforms.

The arbitrary increase in labour cost relative to increase in productivity is a major cause of inflation for the cost-push theorists while inflation is attributed to demand exceeding supply in the market of goods and services by the demand pull theory. According to Jhingan (2002), demand-pull theory is sub-divided into the monetarists and Keynesian views.This study used the Keynesian views which supports the view that as long as an economy has not reached the level of full employment, any increase in money supply or the price would exhaust itself in raising the level of employment and output and not the general price level in the economy (Bakare, 2000) as cited in Bayo(2005).

It is widely believed that moderate and stable inflation rates promote the development process of a country, and hence economic growth as it supplements return to savers, enhances investment, and therefore, accelerates economic growth of the country (Ahmed and Mortaza, 2005). Generally, monetary policy, whether expressed in terms of interest rates or growth of monetary aggregates has been increasingly geared toward the achievement of low and stable inflation (Barro, R. J, 1996).

Analysing the case of Brazil using Blanchard and Quah(1989) decomposition Faria and Carneiro(2001) investigates the relationship between inflation and output in the context of an

economy facing persistent high inflation. They found that inflation does not impact real output in the long run, but that in the short run there exists a negative effect from inflation on output. Their results support Sidrauski's (1967) superneutrality of money in the long run, but cast doubt on the short run implications of the model for separable utility functions in consumption and real money balances, as exposed by Fisher (1979).

Seleteng (2006) in his study seeks to estimate the optimal level of inflation, which is conducive for economic growth in Lesotho, using quarterly time-series dataset for the period 1981 to 2004. The estimated model suggests a 10 per cent optimal level of inflation above which, inflation is detrimental for economic growth.

In a related study in Bangladesh, Ahmed and Mortaza (2005) found that there exists a statistically significant long-run negative relationship between inflation and economic growth. In addition, the estimated threshold model suggests 6% as the threshold level (i.e., structural break point) of inflation above which inflation adversely affects economic growth.

A study to ascertain the existence (or not) of a relationship between Inflation and economic growth in Nigeria was carried out by Omoke(2010). The study employed the cointegration and Granger causality test while Consumer price index (CPI) was used as a proxy for Inflation and the GDP as a perfect proxy for economic growth to examine the relationship. The result of the test showed that for the periods, 1970-2005, there was no co-integrating relationship between Inflation and economic growth for Nigeria data. The results showed the same at different lags. Unidirectional causality was seen running from Inflation to economic growth showing that Inflation indeed has an impact on growth.

Mallik and Chowdhury (2001) examines the relationship between inflation and GDP growth for four South Asian countries (Bangladesh, India, Pakistan and
Sri Lanka). It was found that a long-run positive relationship between GDP growth rate and inflation for all four countries exist. There are also significant feedbacks between inflation and economic growth as moderate inflation was found to be helpful to growth.

In another study by Ayyoub, Chaudhry and Farooq(2011) a negative and significant inflation growth relationship is found to exist in the economy of Pakistan. The results of the study show that prevailing inflation is harmful to the GDP growth of the economy after a certain threshold level. Salian and Gopakumar (2010) that there is a long-run negative relationship between inflation and GDP growth rate in India.

Chaudhry, Qamber and Farooq(2012) investigates the long and short run relationships of monetary policy, inflation and economic growth in Pakistan during 1972 to 2010. The results indicate that credit to private sector, real exchange rate and budget deficit are found elastic and significant variables to influence the real GDP in Pakistan. Real GDP and real exchange rate are causing to each other. The real GDP also do cause financial depth (M2GD), domestic credit (CREDIT) and budget deficit (BDEF). The real exchange rate is also causing the financial depth and budget deficit variables.

The foregoing review reveals that empirical studies on the relationship between inflation and other macroeconomic variables such as interest rate, real GDP, money supply and exchange rate are still very shallow in Nigeria and other developing economies. Policy makers in

Nigeria need to be armed with causality and direction of the relationship to aid their policy making efforts. This is the target of this study.

DATA AND METHODOLOGY

Data

The study made use of annual data for all the variables from 1979 to 2010 taken from various issues of Central Bank of Nigeria (CBN) statistical bulletin especially the 50 years special anniversary edition.

Table 1: Description of Variables under Study

INFRATE	Inflationary Rate(All items, Year on Change)
INTRATE	Interest Rate
EXCHRATE	Exchange Rate
RGDP	Real Gross Domestic Product

Methodology

The study examines the causal relationship between inflation and key macroeconomic variables in Nigeria with special emphasis on Real Gross Domestic Product, the proxy for economic growth, in a bivariate causality framework. The econometric model employed in data analysis is consistent with the studies done by Omoke (2010), Chaudhry, Qamber and Farooq(2012), Salian and Gopakumar (2010), Ayyoub, Chaudhry and Farooq(2011), Mortaza (2005) and Mallik and Chowdhury (2001). The Johansen (1988) co-integration test examines the short-run and long-run relationship between inflation and real GDP while Granger causality test was employed to determine the causality between each pair of the variables. Augmented Dickey Fuller (ADF) test is applied to test the stationarity of the time series data. Augmented Dickey-Fuller test rejects a null hypothesis of unit root if the series are non-stationary and accepts the alternate hypothesis of stationarity.

The primary model showing the relationship between Inflation and real GDP is specified below:

RGDP = f (Infrate)

$RGDP = \alpha_o + \alpha_1 Infrate_t + \varepsilon_t$

To examine the relationship between Inflation Rate and Real GDP on the one hand and among other explanatory variables under consideration, the multiple regression equation is estimated in the form:

$INFRATE_t = K + \beta_1 RGDP_t + \beta_2 INTRATE_t + \beta_4 EXCHRATE_t$

Where

$INFRATE_t$ = Inflation Rate in time t (All items, Year on Change)

$RGDP_t$ = Real Gross domestic product in time, t.

$INTRATE_t$ = Interest rate in time t

$EXCHRATE_t$ = Exchange rate in time t.

α_o is a constant term, 't' is the time and 'ε' is the random error term.

Test of Stationarity (Unit Root)

The time series data used for the study was tested for stationarity to ascertain the order of integration using the Augmented Dickey-Fuller (ADF) test. The ADF test is generally estimated in the form:

$$\Delta\gamma_t = \alpha^o + \alpha^1\gamma^{t-1} + \sum_{i-1}^{n} \alpha\Delta\gamma i + \ e^t$$

$$\Delta\gamma_t = \alpha^o + \alpha^1\gamma^{t-1} + \sum_{i-1}^{n} \alpha\Delta\gamma i + \delta t + \ e^t$$

Where

γ - a time series
t - linear time trend,
Δ - the first difference operator,
α^o - a constant,
n - the optimum number of lags in the dependent variable and
e - random error term

The second equation has a linear time trend constituent attached to the drift.

$$\Delta\gamma t = \ \alpha_o \ + \ \alpha\gamma_{t-1} + e_t c$$

Test for Cointegration

The basic idea behind cointegration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant and could be seen as defining a long-run equilibrium relationship, as the difference between them is stationary (Hall and Henry, 1989), as cited in Omoke(2010).
When there is absence of cointegration amongst the variables under consideration, it means that the variables may not share their short run relationship characteristics in the long run because the variables meander randomly away from each series.

In this study, the number of co-integration vectors is ascertained by the use of trace test(λ trace) established by Johansen and Juselius (1990). The main emphasis of the trace test is to test the null hypothesis that the number of clearly different cointegrating vectors is ≤ q instead of q =r in the form stated below.

$$\lambda \text{ trace } (r) = \ -T \sum_{i=r+1} \ In \ \ ^{[1-\Lambda_t]}$$

Where

T = number of possible and usable observations,
Λ_t = the estimated eigenvalue .

Granger Causality Technique

The study seeks to establish whether the short run relationship between the variables is sustainable in the long run. An Error Correction Representation/Term is included in the equation to capture the speed of adjustment to equilibrium in case of shock to any of the independent variables under consideration.

$$RGDP_t = \alpha_o + \sum_{i=1}^{n} \alpha_{it}\ RGDP_{t-1} + \sum_{i=1}^{n} \alpha_{2t}\ Infrate_{t-1} + \delta_1 ECT_{t-1} + \varepsilon_{it}$$

$$\text{Infrate}_t = \beta_o + \sum_{i=1}^{n} \beta_{it}\ \text{RGDP}_{t-1} + \sum_{i=1}^{n} \beta_{2t}\ \text{Infrate}_{t-1} + \delta_1 \text{ECT}_{t-1} + \varepsilon_{it}$$

Where:
RGDPt is Real Gross Domestic Product
Infrate is the Inflationary Rate (All items, Year on Change);
The term ECTt-1 is the error correction term.
δ is the speed of adjustment to equilibrium. When cointegration test reveals that a relationship does not exist between RGDP and Inflation rate, the error correction term is detached and the equation of bivariate autoregression is reconstructed thus:

$$RGDP_t = \alpha_o + \sum_{i=1}^{n} \alpha_{it}\ RGDP_{t-1} + \sum_{i=1}^{n} \alpha_{2t}\ Infrate_{t-1} + \varepsilon_{it}$$

$$Infrate_t = \beta_o + \sum_{i=1}^{n} \beta_{it}\ RGDP_{t-1} + \sum_{i=1}^{n} \beta_{2t}\ Infrate_{t-1} + \varepsilon_{it}$$

Given the estimated OLS coefficients for the above equations four different hypotheses about the causal relationship between inflation rate and macroeconomic indices can be formulated:
1. Unidirectional Granger-causality from inflation rate to real GDP (or other macroeconomic indices studied).
2. Unidirectional Granger-causality from real GDP (or other macroeconomic indices studied) to inflation rate.
3. Bidirectional causality among the macroeconomic variables under study.
4. State of independence (no Granger-causality) between inflation rate and other macroeconomic indices.

DISCUSSION OF FINDINGS

The original time series data were checked for stationarity. Fig 4.1 reveals non stationarity as shown below:

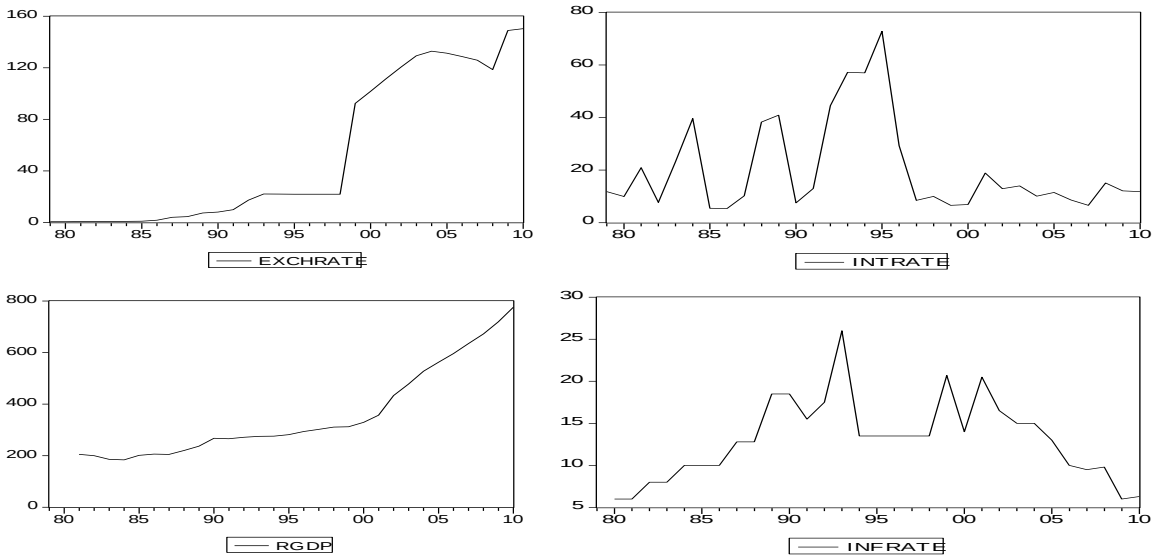

Fig 4.1
Source; Authors' Eview Output.

Augmented Dicker- Fuller (ADF) tests on the series reveals the number of times the non-stationary time series are to be differenced to achieve stationarity. The results are presented in Table 4.1:

Table 4.1: ADF Unit ROOT Test Result.

	Test Critical values				
Variable	**1%**	**5%**	**10%**	**ADF**	**Status**
Exchange rate	-2.6453	-.1.9530	-1.6218	-2.880163	1(1)
Inflation rate	-3.6852	-2.9705	-2.6242	-4.976846	1(1)
Interest rate	-3.6752	-2.9665	-2.6220	-5.240623	1(1)
Real GDP	-3.7076	-2.9798	-2.6290	-3.860900	1(2)

Source: Author's Eview output

In the above unit root test the null hypothesis of a unit root is H0: $a = 0$ versus the alternative: H1: $a < 0$. The ADF unit root test result presented above confirms that stationarity was achieved for real GDP at the second difference while exchange rate, inflation rate and interest rate achieved stationarity at first difference. The null hypothesis of unit root was not rejected rather the variables, exchange rate, inflation rate and interest rate were differentiated at first difference while the variable, real GDP was differentiated at second difference.

The graphs for the differenced time series to confirm their new state of stationarity are as presented in fig 4.2 below:

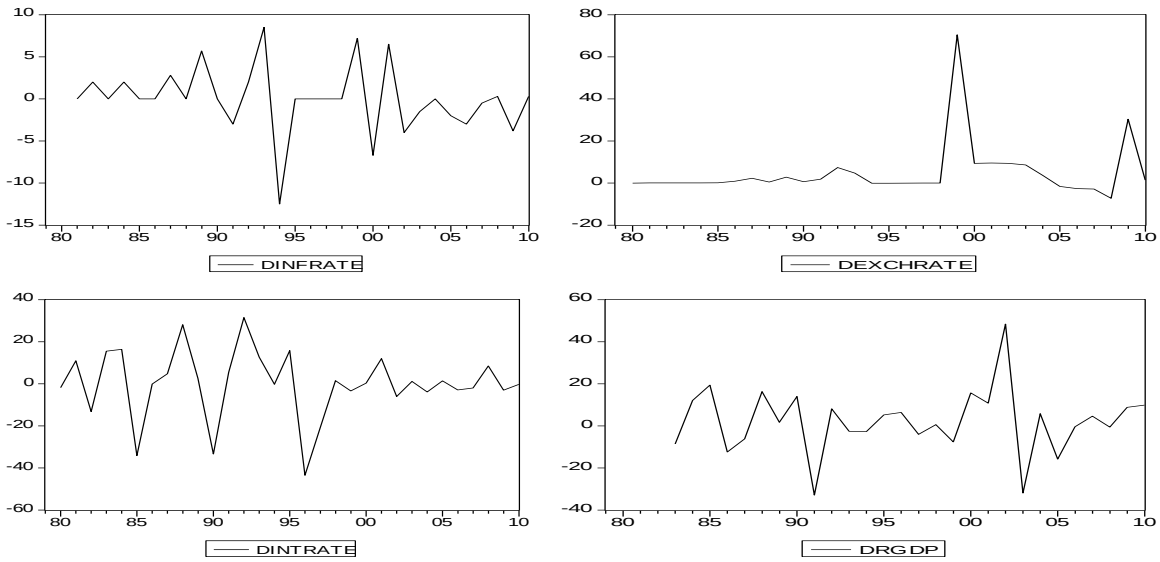

Fig. 4.2
Source; Authors' Eview Output.

The research reported in this paper employs Granger causality test (Granger, 1969) and the result presented thus:

Table 4.2: Pairwise Granger Causality Tests

Sample: 1979 2010
LAGS: 2

Null Hypothesis:	Obs	F-Statistic	Probability
DEXCHRATE does not Granger Cause DINFRATE	28	0.58718	0.56401
DINFRATE does not Granger Cause DEXCHRATE		0.02660	0.97378
DINTRATE does not Granger Cause DINFRATE	28	2.01257	0.15651
DINFRATE does not Granger Cause DINTRATE		5.28203	0.01295
DRGDP does not Granger Cause DINFRATE	26	0.81533	0.45602
DINFRATE does not Granger Cause DRGDP		1.73982	0.19992
DINTRATE does not Granger Cause DEXCHRATE	29	0.93197	0.40757
DEXCHRATE does not Granger Cause DINTRATE		0.39142	0.68034
DRGDP does not Granger Cause DEXCHRATE	26	0.00050	0.99950
DEXCHRATE does not Granger Cause DRGDP		0.72850	0.49443
DRGDP does not Granger Cause DINTRATE	26	0.62547	0.54469
DINTRATE does not Granger Cause DRGDP		2.87410	0.07883

Lags: 4

Null Hypothesis:	Obs	F-Statistic	Probability
DEXCHRATE does not Granger Cause DINFRATE	26	0.82948	0.52467
DINFRATE does not Granger Cause DEXCHRATE		0.01734	0.99935
DINTRATE does not Granger Cause DINFRATE	26	2.43280	0.08737
DINFRATE does not Granger Cause DINTRATE		2.35930	0.09457
DRGDP does not Granger Cause DINFRATE	24	0.37769	0.82103
DINFRATE does not Granger Cause DRGDP		1.67126	0.20873
DINTRATE does not Granger Cause DEXCHRATE	27	2.39852	0.08830
DEXCHRATE does not Granger Cause DINTRATE		0.12487	0.97160
DRGDP does not Granger Cause DEXCHRATE	24	0.08418	0.98603
DEXCHRATE does not Granger Cause DRGDP		6.09959	0.00404
DRGDP does not Granger Cause DINTRATE	24	0.66637	0.62511
DINTRATE does not Granger Cause DRGDP		1.07403	0.40378

Source; Authors' Eview Output.

The result of the Granger Causality test at Lag 2 above, reveals that inflation rate Granger cause interest rate and not real GDP. However, interest rate Granger Cause real GDP and not vice versa. The result however shows that inflation rate does not Granger Cause real GDP at Lag 2. Hence, the null hypothesis that inflation rate does not Granger Cause real GDP is accepted.

At Lag 4, the null hypothesis that inflation does not Granger Cause real GDP is also accepted. However, there is a bidirectional causality running from interest rate to inflation rate and from inflation rate to interest rate. There is also a uni-directional causality that runs from interest rate to exchange rate and from exchange rate to real GDP.

The impact of inflation on the selected macroeconomic indices with emphasis on real GDP, was examined using the least squares method. The findings are as presented in table 4.3 below.

Table 4.3 Regression Coefficient

Dependent Variable: DINFRATE
Method: Least Squares

Sample(adjusted): 1983 2010
Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEXCHRATE	0.077491	0.056154	1.379983	0.1803
DINTRATE	0.040405	0.048438	0.834162	0.4124
DRGDP	-0.005958	0.052138	-0.114269	0.9100
C	-0.467525	0.858103	-0.544836	0.5909
R-squared	0.099369	Mean dependent var		-0.060714
Adjusted R-squared	-0.013210	S.D. dependent var		4.175887
S.E. of regression	4.203377	Akaike info criterion		5.841217
Sum squared resid	424.0411	Schwarz criterion		6.031532
Log likelihood	-77.77704	F-statistic		0.882663
Durbin-Watson stat	2.759623	Prob(F-statistic)		0.464045

Source; Authors' Eview Output.

The result indicates that real GDP has negative coefficient but not statistically significant. This implies that an inverse relationship exists between real GDP and inflationary rate in Nigeria. The findings of this study accords widely with the result of the studies carried out by Salian and Gopakumar (2010), Ayyoub, Chaudhry and Farooq(2011), Ahmed and Mortaza (2005), Omoke(2010) and Jayathileke and Rathnayake (2013). This result is in accord with the a priori expectation. However, exchange rate and interest rate have positive and insignificant relationship with inflation rate. The above results portray a short run relationship. Consequently a test for co-integration was performed using the Johansen trace test estimation approach as presented in the table below.

Table 4.4 Test for Cointegration

Series: DINFRATE DEXCHRATE DINTRATE DRGDP
Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.659313	70.68138	47.21	54.46	None **
0.524927	42.68485	29.68	35.65	At most 1 **
0.470049	23.33341	15.41	20.04	At most 2 **
0.230849	6.824183	3.76	6.65	At most 3 **

Source; Authors' Eview.

Table 4.4, above for the trace test indicates that there are three cointegrating equations at the 1 per cent significance level among the variables. Consequently, it could be concluded that a long run relationship exist between inflation rate and real GDP.

CONCLUSION

Regulatory agencies in Nigeria such as Financial Reporting Council(FRC), Central Bank of Nigeria(CBN), Securities and Exchange Commission(SEC), Nigeria Stock Exchange(NSE), The Budget Office, Ministries of Finance and Planning, Bankers Committee and the Nigeria Deposit Insurance Corporation(NDIC) need the inter relationship and interactions of the variables of this study to redefine the growth and development equation of the Nigerian economy. It is widely believed that these variables contribute a great deal in determining the general output of the economy. The variables are also key factors in economic planning, budgeting and predictions.

The causal relationships among the variables indicate no causal relationship. Findings of this study reveal that the short run relationships can also be sustained at the very long run. Hence, monetary and fiscal policy setters should take a clue from this to fashion out strategies for the efficient regulation of these macroeconomic indices in order to grow the economy more rapidly.

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