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An Econometric Analysis of the Relationship between Macroeconomic Factors and Economic Growth in Nigeria

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Abstract

This paper aims to find the macroeconomic constraints of Nigeria through GDP (Gross Domestic Product) measurement. From 1991 to 2017, time series data has been collected from CBN and World Bank, on which Ordinary Least Square technique was employed to assess the impact of the macroeconomic factors on economic growth. Causal relationship has been measured through Granger Causality Test. Association between economic growth and the macroeconomic variable has been noticed. Negative and significant relationship between unemployment and economic growth has also been observed. Inflation rate has been seen to create a negative and -significant impact on economic growth. It also showed that while inflation rate has an impact on economic growth, economic growth does not cause changes in inflation rate. It also revealed that while unemployment does not cause changes in economic growth, economic growth has an impact on unemployment. The study recommended that the Nigerian government should reduce taxes to boost aggregate demand to stimulate economic growth and consequently to curb unemployment. It was also recommended that fiscal and monetary policies be adopted to reduce inflation in a bid to promote economic growth in the nation. Finally, there is also the need for the Nigerian government to stimulate exportation to enable the appreciation of the Naira currency. This will result in the growth of the Nigerian economy.

Keywords: *Macroeconomic, economic growth, unemployment*

1. Introduction

According to Jhinghan (1997), economic growth occurs when a nation's productive capacity is enhanced, leading to the production of more goods and services. Every nation hopes to achieve economic growth. Unfortunately, today not every economy is developed. This is also true of the Nigerian economy. Despite having gained independence in 1960, the level of economic growth over the years has not been encouraging. This is largely due to the fact that economic growth is not the result of magic. It is the resultant effect of various macroeconomic factors.

Economic growth is essential to attaining economic development. It reduces poverty, augments political and democratic stability, enhances health care facilities, etc. Thus, the Nigerian government has developed numerous policies geared towards achieving economic growth. Such attempts have employed the instruments of monetary and fiscal policies, import substitution strategy and export promotion strategy. Some of the programmes developed by the government include NEEDS (National Economic Empowerment and Development Strategy) and Vision 2020. These attempts were meant to achieve maintenance of balance of payment equilibrium; price stability, growth in output, more employment opportunities and sustainable development. Such goals are essential for attaining economic growth in the long run.

Economists disagree on the policies that are most effective in fostering long-run economic growth. For example, according to DeLong and Summers (1992), macroeconomic policies are not optional in stimulating long-term growth. Uniamikogbo and Enoma (2001) asserted that monetary policies are more effective than fiscal policies in achieving economic growth. Another school of thought is of the opinion that investment in human capital through education and training is a significant stimulant for long run economic growth (Barro, 1990).

The attempts of the Nigerian government to boost the economy have failed to produce steady economic growth. This is reflected in the unsteady increase in the nation's GDP (Gross Domestic Product) shown in the Bar Chart below:

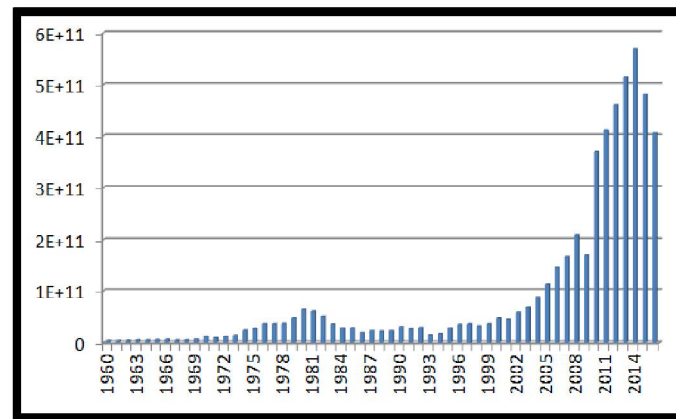


Figure 1: Nigeria's GDP from 1960 to 2016
2018 World Development Indicators

Over the years, studies have been conducted on the impact of macroeconomic factors on the economic growth of various countries. The relationships between their economic growth and macroeconomic factors such as inflation, exchange rate, money supply and unemployment have been examined. The objectives of this study are:

- To explore the association between macroeconomic variables and economic growth of the Nigerian economy with special focus on unemployment, inflation and exchange rate.
- To find out if there is a causal relationship exists between each of the macroeconomic variables and economic growth in Nigeria.

The rest of this study is structured as follows: section two is a review of related literatures. Section three examines the theoretical framework and methodology of the study. The results are presented and analysed in section four. Section five concludes the investigation with conclusion and recommendations.

2. Theoretical Background and Literature Review

Macroeconomic theories provide insight into the behavior of the macroeconomy. They explain the mechanics behind the changes in economic growth. They also recommend policy instruments to enhance the economic performance of a nation. Macroeconomic theories identify an array of factors that determine the growth of an economy. Some of these factors include inflation, interest rate, exchange rate, unemployment, government expenditure and taxes. Some of the macroeconomic theories are classical economics, neoclassical economics, and Keynesian economics.

Economic growth can be defined as an increase in the quantity of final goods and services produced in a country within a year. Economic growth can be stated in real or nominal terms. When inflation is accounted for, we have real economic growth. Nominal economic growth does not account for the impact of inflation. According to Godwin (2007), economic growth is an increase in real GDP. Dwivedi (2004) defines economic growth as a sustained increase in per capita national output over a long period of time. Macroeconomic factors are variables that determine the performance of the whole economy of a nation. They influence the performance of the sectors or players in an economy. Macroeconomic variables include inflation rate, currency exchange rate, money supply, unemployment rate, tax rate, government expenditure, periods of high economic growth and periods of economic contraction such as recessions and depressions. Macroeconomic factors are usually adjusted with the use of macroeconomic policies. Macroeconomic policies are employed to achieve the macroeconomic goals of economic growth, full employment and stability. Macroeconomic policies used by the government include fiscal and monetary policies. Fiscal policy involves the government adjusting government spending or tax with the aim of promoting economic growth. Monetary policy includes effecting changes in money supply or the factors that influence money supply.

Ismaila and Imoughele (2015) examined the macroeconomic determinants of economic growth in Nigeria. The period used for the study was 1986 to 2012. A co-integration approach was used to examine the short and long run relationships between economic growth and macroeconomic factors. The results indicated that when inflation is stable, the main determinants of Nigeria's economic growth are gross fixed capital formation, foreign direct investment and government expenditure. The study recommended that the government should provide the infrastructure required for businesses to thrive; maintain tight monetary and fiscal policies to combat inflation; and establish strict policies to minimize strike in the nation's labour sector.

Olu and Idih (2015) studied the impact of inflation rate, labour, capital and exchange rate on Nigerian's economic growth from 1980 to 2013. Multiple regression analysis was used to explore the relationship between the macroeconomic factors and economic growth. The findings showed that inflation rate has a positive yet insignificant impact on economic growth. It was recommended that the inflation rate should be stabilized to achieve sustainable economic growth.

Antwi, Mills and Zhao (2013) explored the relationship between macroeconomic constraints and the growth of the Ghanaian economy. The macroeconomic variables considered for the study include gross fixed capital formation, labour force, foreign direct investment, foreign aid, inflation rate and government expenditure. Real GDP per capita was used as the proxy for economic growth. The period of analysis was from 1980 to 2010. The study examined the long-run macroeconomic determinants of economic growth by employing the Johansen approach to co-integration. The data was analyzed with the Augmented Dickey Fuller (ADF) test. The result of the investigation showed that there is a relationship

between economic growth and the macroeconomic factors. It was recommended that the Ghanaian government should focus on generating more revenue with domestic resources rather than relying on foreign aid. How the Indian economic growth, has been affected by the inflation rate and interest rate has been studied by Bhunia (2016). The author also showed that economic growth influences interest rate. The paper suggests that the Indian government and policy makers should minimize inflation rate and maintain the interest rate essential for stimulating economic growth. Granger causality pair wise test was used to examine the causal relationship between the two variables. It was recommended that the government should resort to monetary or fiscal policy to curb inflation. It was also recommended that the government should maintain tight control of money supply because of its strong impact on inflation. The Nigerian government was also encouraged to stimulate savings by the public as savings stimulate capital accumulation.

Chughtai, Malik and Aftab (2015) revealed a positive relationship between exchange rate and economic growth. It was recommended that policy makers should employ strict policies to stifle the increase in inflation by controlling money supply, increasing exports and reducing imports and government expenditure. Another recommendation was for the Pakistani government to maintain high exchange rate to stimulate economic growth.

From 1980 to 2012, economic growth in Nigeria had been studied by Uwakaeme (2015). As a finding the author found that causality exists between economic growth and the major macroeconomic variables with the help of Johansen Co-integration and Granger Causality tests. Study revealed that economic growth is getting positively affected by the productivity index, stock market capitalization, and foreign direct investment. The directions of causality were shown to be unidirectional, bilateral and independent. Recommendation from the findings suggests price stabilization, fiscal discipline and effective institutional and economic reforms to augment production capacity.

Obadeyi, Okhiria and Afolabi (2016) explored the effect of monetary policy on the growth of the Nigerian economy. The period of research covered 1990 to 2012. The Ordinary Least Square (OLS) technique was employed to analyze the relationship among the macroeconomic factors. The research shows that the cause of the problem associated with money supply is the inability of the CBN (Central Bank of Nigeria) to maintain control over the money supply and bank credit. It was recommended that the Nigerian government implement policies that would stimulate growth in output and employment. From 1999 to 2014, macroeconomic constraints such as exchange rate, inflation and interest rate-based affect had been premeditated by Ubaka (2016). Multiple regression analysis was used in examining the relationship between the macroeconomic factors and economic growth. The investigation revealed that 41.80% of the variation in economic growth is attributed to changes in the macroeconomic factors. It also showed a positive but weak relationship between economic growth and the macroeconomic variables of interest rate and exchange rate. It also deduced a negative but weak relationship between inflation and economic growth. The analysis recommended that fiscal and monetary policies should be combined with the proper implementation of efficiently planned programs to accomplish macroeconomic objectives in the short and long run. 1980 to 2016 based economic growth in South Africa had been studied by Dingela and Khobai (2017) by considering money supply, interest rate and inflation rate using the ARDL (Autoregressive distributed lag)-bounds test. The study showed that in the short and long run, a positive and significant relationship exists between economic growth and money supply. It was recommended that the South African government stimulate a steady increase in money supply to keep pace with economic growth. It is believed that such recommendation will enable the South Africa Reserve Bank to avoid the inefficiencies resulting from discretionary policy.

Jajere (2016) evaluated the relationship between unemployment and the growth of the Nigerian economy. The study analysed the impact of unemployment, government expenditure and money supply on economic growth from 1980 to 2010. Ordinary Least Square regression technique was used for the analysis. Result showed that there is no significant relationship between unemployment and economic growth. Policy recommendations include enhancing the level of productivity to curb unemployment and inflation with the goal of stimulating economic growth. It was also recommended that the Nigerian government engage in labour intensive production rather than the capital-intensive approach to combat unemployment and inflation and boost domestic output.

Eze (2015) assessed the effect of inflation and unemployment on economic growth in Nigeria from 1980 to 2013. Multiple regression analysis of the Ordinary Least Squares technique was employed for the assessment. The Johansen Cointegration Test performed revealed an equilibrium relationship between unemployment, inflation and gross domestic growth in the long run. The results showed an inverse relationship between inflation, unemployment and economic growth. They also indicate that unemployment and inflation are independent of each other. Policy recommendations include the Central Bank of Nigeria adopting a more transparent policy regarding inflation and stimulating the energy sector to create employment.

3. Research Methodology

The study used secondary data. Data was sourced from CBN Statistical Bulletin and World Development Indicator. The period of investigation was from 1991 to 2017. The Gross Domestic Product (GDP) was used as the proxy for economic growth because it measures the level of output produced in an economy. Multiple regression analysis was used in exploring the relationship between the dependent variable (economic growth) and the independent variables (unemployment, inflation and exchange rate). The model for the regression analysis is shown below:

$$GDP = f(UE, IR, EXR) \dots\dots\dots(1)$$

Where GDP is the Gross Domestic Product

UE is Unemployment

IR is Inflation Rate

EXR is Exchange Rate

Re-writing equation (1) in a linear form, we have the equation as:

$$GDP = \alpha_0 + \alpha_1UE + \alpha_2IR + \alpha_3EXR + \beta \dots \dots \dots (2)$$

The data of the GDP parameter was converted into their natural logarithm form. This was done to minimize spurious results as a result of its large values. Therefore, the new equation is:

$$\text{Log GDP} = \alpha_0 + \alpha_1UE + \alpha_2IR + \alpha_3EXR + \beta \dots \dots \dots (3)$$

Where,

α_0 is the constant

α_1, α_2 and α_3 are the parameter estimates

β is the error term

Log is the Natural log.

The model has the following a priori assumptions

$\alpha_1 < 0, \alpha_2 < 0$ and $\alpha_3 < 0$. The data gathered for the study is adequate for testing the variables for stationarity and co-integration.

4. Empirical Results

4.1. Unit Root Test

Null Hypothesis: LOG(GDP) has a unit root				
Exogenous: Constant				
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic			-4.567418	0.0013
Test critical values:	1% level		-3.711457	
	5% level		-2.981038	
	10% level		-2.629906	
*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				0.005874
HAC corrected variance (Bartlett kernel)				0.007221
Phillips-Perron Test Equation				
Dependent Variable: D(LOG(GDP))				
Method: Least Squares				
Date: 01/28/19 Time: 15:43				
Sample (adjusted): 1992 2017				
Included observations: 26 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(GDP(-1))	-0.051496	0.010228	-5.034565	0.0000
C	1.757527	0.309352	5.681313	0.0000
R-squared	0.513647	Mean dependent var		0.202066
Adjusted R-squared	0.493382	S.D. dependent var		0.112079
S.E. of regression	0.079775	Akaike info criterion		-2.145422
Sum squared resid	0.152735	Schwarz criterion		-2.048645
Log likelihood	29.89049	Hannan-Quinn criter.		-2.117554
F-statistic	25.34685	Durbin-Watson stat		1.512729
Prob(F-statistic)	0.000038			
Null Hypothesis: ER has a unit root				
Exogenous: Constant				
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic			0.991563	0.9952
Test critical values:	1% level		-3.711457	
	5% level		-2.981038	
	10% level		-2.629906	
*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				380.8556
HAC corrected variance (Bartlett kernel)				479.7545
Phillips-Perron Test Equation				
Dependent Variable: D(ER)				
Method: Least Squares				
Date: 01/28/19 Time: 22:39				

Sample (adjusted): 1992 2017				
Included observations: 26 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER(-1)	0.081885	0.062276	1.314867	0.2010
C	2.800215	7.645103	0.366276	0.7174
R-squared	0.067196	Mean dependent var		11.38002
Adjusted R-squared	0.028329	S.D. dependent var		20.60638
S.E. of regression	20.31240	Akaike info criterion		8.934144
Sum squared resid	9902.246	Schwarz criterion		9.030920
Log likelihood	-114.1439	Hannan-Quinn criter.		8.962012
F-statistic	1.728875	Durbin-Watson stat		1.395791
Prob(F-statistic)	0.200981			

Figure 1

Null Hypothesis: D(ER) has a unit root				
Exogenous: Constant				
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic			-2.922093	0.0569
Test critical values:	1% level		-3.724070	
	5% level		-2.986225	
	10% level		-2.632604	
*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				374.1959
HAC corrected variance (Bartlett kernel)				374.1959
Phillips-Perron Test Equation				
Dependent Variable: D(ER,2)				
Method: Least Squares				
Date: 01/28/19 Time: 22:41				
Sample (adjusted): 1993 2017				
Included observations: 25 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ER(-1))	-0.625579	0.214086	-2.922093	0.0077
C	7.891564	4.540968	1.737860	0.0956
R-squared	0.270736	Mean dependent var		1.796357
Adjusted R-squared	0.239028	S.D. dependent var		23.11913
S.E. of regression	20.16767	Akaike info criterion		8.922657
Sum squared resid	9354.898	Schwarz criterion		9.020167
Log likelihood	-109.5332	Hannan-Quinn criter.		8.949702
F-statistic	8.538628	Durbin-Watson stat		1.963082
Prob(F-statistic)	0.007667			

Figure 2

Null Hypothesis: INF has a unit root				
Exogenous: Constant				
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic				
Test critical values:			-1.955566	0.3033
	1% level		-3.711457	
	5% level		-2.981038	
	10% level		-2.629906	
*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				
				136.1090
HAC corrected variance (Bartlett kernel)				
				171.2202
Phillips-Perron Test Equation				
Dependent Variable: D(INF)				
Method: Least Squares				
Date: 01/28/19 Time: 22:43				
Sample (adjusted): 1992 2017				
Included observations: 26 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
	t			
INF(-1)	-0.231657	0.130720	-1.772168	0.0891
C	4.241601	3.495036	1.213607	0.2367
R-squared	0.115715	Mean dependent var		-0.291850
Adjusted R-squared	0.078870	S.D. dependent var		12.65214
S.E. of regression	12.14296	Akaike info criterion		7.905179
Sum squared resid	3538.833	Schwarz criterion		8.001956
Log likelihood	-100.7673	Hannan-Quinn criter.		7.933047
F-statistic	3.140580	Durbin-Watson stat		1.276543
Prob(F-statistic)	0.089063			

Figure 3

Null Hypothesis: D(INF) has a unit root				
Exogenous: Constant				
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic				
Test critical values:			-4.660804	0.0011
	1% level		-3.724070	
	5% level		-2.986225	
	10% level		-2.632604	

*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				125.8807
HAC corrected variance (Bartlett kernel)				59.46137
Phillips-Perron Test Equation				
Dependent Variable: D(INF,2)				
Method: Least Squares				
Date: 01/28/19 Time: 22:44				
Sample (adjusted): 1993 2017				
Included observations: 25 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-0.809717	0.185107	-4.374321	0.0002
C	-1.303651	2.339688	-0.557190	0.5828
R-squared	0.454131	Mean dependent var		-
				1.160827
Adjusted R-squared	0.430398	S.D. dependent var		15.49886
S.E. of regression	11.69730	Akaike info criterion		7.833211
Sum squared resid	3147.016	Schwarz criterion		7.930721
Log likelihood	-95.91514	Hannan-Quinn criter.		7.860256
F-statistic	19.13469	Durbin-Watson stat		2.058206
Prob(F-statistic)	0.000221			
Null Hypothesis: UE has a unit root				
Exogenous: Constant				
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic			-1.058664	0.7162
Test critical values:	1% level		-3.711457	
	5% level		-2.981038	
	10% level		-2.629906	
*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				0.337859
HAC corrected variance (Bartlett kernel)				0.391885
Phillips-Perron Test Equation				
Dependent Variable: D(UE)				
Method: Least Squares				
Date: 01/28/19 Time: 22:45				
Sample (adjusted): 1992 2017				
Included observations: 26 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
UE(-1)	-0.143237	0.186663	-0.767360	0.4504
C	0.703269	0.836024	0.841206	0.4085
R-squared	0.023948	Mean dependent var		0.068231
Adjusted R-squared	-0.016721	S.D. dependent var		0.599995
S.E. of regression	0.604991	Akaike info criterion		1.906596
Sum squared resid	8.784326	Schwarz criterion		2.003372
Log likelihood	-22.78574	Hannan-Quinn criter.		1.934464
F-statistic	0.588841	Durbin-Watson stat		1.985844
Prob(F-statistic)	0.450351			

Figure 4

Null Hypothesis: D(UE) has a unit root				
Exogenous: Constant				
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel				
			Adj. t-Stat	Prob.*
Phillips-Perron test statistic			-5.390362	0.0002
Test critical values:	1% level		-3.724070	
	5% level		-2.986225	
	10% level		-2.632604	
*MacKinnon (1996) one-sided p-values.				
Residual variance (no correction)				0.354661
HAC corrected variance (Bartlett kernel)				0.426671
Phillips-Perron Test Equation				
Dependent Variable: D(UE,2)				
Method: Least Squares				
Date: 01/28/19 Time: 22:45				
Sample (adjusted): 1993 2017				
Included observations: 25 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UE(-1))	-1.119791	0.207051	-5.408283	0.0000
C	0.079382	0.125060	0.634749	0.5319
R-squared	0.559805	Mean dependent var		-0.000840
Adjusted R-squared	0.540666	S.D. dependent var		0.916111
S.E. of regression	0.620887	Akaike info criterion		1.961284
Sum squared resid	8.866522	Schwarz criterion		2.058794
Log likelihood	-22.51605	Hannan-Quinn criter.		1.988329
F-statistic	29.24953	Durbin-Watson stat		1.851444
Prob(F-statistic)	0.000017			

Figure 5

According to the result of the Unit Root test for logarithm of GDP at level, the absolute value of the Phillips-Perron test statistic calculated value (4.567418) is greater than the critical values at 1%, 5% and 10% levels of significance (3.711457, 2.981038 and 2.629906 respectively). The Probability value (0.0013) is also less than the test critical values (0.01, 0.05 and 0.10). Thus, the null hypothesis that the logarithm of GDP has a unit root is rejected. Therefore, GDP is stationary at level.

The result of the Unit Root test for exchange rate at level indicates that the absolute value of the Phillips-Perron test statistic calculated value (0.991563) is less than the critical values at 1%, 5% and 10% levels of significance. The Probability value (0.9952) is greater than the test critical values (0.01, 0.05 and 0.10). Thus, the null hypothesis that the exchange rate has a unit root is accepted. Therefore, exchange rate is not stationary at level. The result of the Unit Root test for exchange rate at first difference shows that the absolute value of the Phillips-Perron test statistic calculated value (2.922093) is less than the critical values at 1% and 5% levels of significance (3.724070 and 2.986225 respectively) but greater than the critical value at 10% level of significance (2.632604). The Probability value shows that exchange rate is stationary at first difference. Therefore, exchange rate is not significant at 1% and 5% levels of significance but significant at 10% levels of significance.

According to the result of the Unit Root test for inflation at level, the absolute value of the Phillips-Perron test statistic calculated value (1.955566) is less than the critical values at 1%, 5% and 10% levels of significance. The Probability value (0.3033) is greater than the test critical values (0.01, 0.05 and 0.10). Thus, the null hypothesis that the inflation rate has a unit root is accepted. Therefore, inflation rate is not stationary at level. The result of the Unit Root test for inflation rate at first difference shows that the absolute value of the Phillips-Perron test statistic calculated value (4.660804) is greater than the critical values at 1%, 5% and 10% levels of significance. The Probability value (0.0011) is less than the test critical values of 0.01, 0.05 and 0.10. Thus, the null hypothesis that inflation rate has a unit root is rejected. Therefore, inflation rate is stationary at first difference.

The result of the Unit Root test for unemployment at level shows that the absolute value of the Phillips-Perron test statistic calculated value (1.058664) is less than the critical values at 1%, 5% and 10% levels of significance. The Probability value (0.7162) is greater than the test critical values (0.01, 0.05 and 0.10). Thus, the null hypothesis that unemployment has a unit root is accepted. Therefore, unemployment is not significant at 1%, 5% and 10% levels of significance. The result of the Unit Root test for unemployment at first difference shows that the absolute value of the Phillips-Perron test statistic calculated value (5.390362) is greater than the critical values at 1%, 5% and 10% levels of significance. The Probability value (0.0002) is less than the test critical values of 0.01, 0.05 and 0.10. Thus, the null

hypothesis that unemployment has a unit root is rejected. Therefore, unemployment is significant at 1%, 5% and 10% levels of significance.

Since all of the variables were not significant at the same level, there is the need to run ARDL (Autoregressive Distributed Lag). All the variables must be of the same order to allow for co-integration.

4.2. ARDL

Dependent Variable: LOG(GDP)				
Method: ARDL				
Date: 04/03/19 Time: 17:33				
Sample (adjusted): 1995 2017				
Included observations: 23 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (4 lags, automatic): INF ER UE				
Fixed regressors: C				
Number of models evaluated: 500				
Selected Model: ARDL (4, 2, 3, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(GDP(-1))	0.056539	0.164997	0.342665	0.7419
LOG(GDP(-2))	0.037075	0.127110	0.291673	0.7790
LOG(GDP(-3))	0.074163	0.108334	0.684579	0.5156
LOG(GDP(-4))	0.749140	0.154870	4.837222	0.0019
INF	0.001588	0.001204	1.318373	0.2289
INF(-1)	0.002497	0.000896	2.785854	0.0271
INF(-2)	0.005013	0.001262	3.971980	0.0054
ER	-0.002933	0.000750	-3.908349	0.0058
ER(-1)	0.000757	0.000628	1.205253	0.2673
ER(-2)	0.001861	0.000811	2.294091	0.0555
ER(-3)	0.001989	0.000456	4.360776	0.0033
UE	-0.062337	0.023078	-2.701153	0.0306
UE(-1)	0.024900	0.030862	0.806815	0.4463
UE(-2)	0.336892	0.090092	3.739435	0.0073
UE(-3)	0.076156	0.056167	1.355886	0.2172
C	1.368200	0.998137	1.370753	0.2128
R-squared	0.999903	Mean dependent var		30.73939
Adjusted R-squared	0.999695	S.D. dependent var		1.219820
S.E. of regression	0.021311	Akaike info criterion		- 4.657461
Sum squared resid	0.003179	Schwarz criterion		- 3.867552
Log likelihood	69.56080	Hannan-Quinn criter.		- 4.458801
F-statistic	4804.747	Durbin-Watson stat		2.440258
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model selection.				

Figure 6

According to the result of the estimation of the Autoregressive Distributed Lag (ARDL) Model, the GDP in the past 4 years (from 2013 to 2016) has an impact on the current GDP. This means the time lag for GDP to have an impact on the current GDP is a minimum of 4 years. A unit increase in GDP in the past 4 years causes the current GDP to increase by 74%. Thus, the growth in GDP is cumulative. The result also indicates that the inflation in the past 2 years (from 2015 to 2016) has an impact on the current GDP. This means the time lag for inflation to have an impact on the current GDP is a minimum of 2 years. A unit increase in inflation rates in 2015 and 2016 cause the current GDP to increase by 0.2% and 0.5% respectively. This conforms to economic theory since a stable inflation encourages investors to plan for the future. The result indicates that the exchange rate in the past 3 years has an impact on the current GDP. This means the time lag for exchange rate to have an impact on the current GDP is a minimum of 3 years. A 1 Naira increase in exchange rate in the past 2 years causes current GDP to increase by 0.2%. A 1 Naira increase in exchange rate in the past 3 years also causes current GDP to increase by 0.2%. This means the exchange rate is stable, thereby encouraging investors in the export sector to plan for the future. This causes the exchange rate to have a positive impact on the current GDP. The result of the estimation of the model also shows that unemployment in the past 2 years has an impact on the current GDP. This indicates that the time lag for unemployment to have an impact on the current GDP is a minimum of 2 years. A unit

increase in unemployment in 2015 leads to an increase in the current GDP by 33%. This means the growth in GDP is a jobless growth as it is not creating any job.

The R-squared of the model is 0.999903. This indicates that approximately 100 percent of variations in economic growth are explained by all the independent variables in the model. The adjusted R-squared is 0.999695. This implies that the model has a high ability to predict changes in economic growth as a result of changes in the past values of economic growth, unemployment, inflation rate and exchange rate. The value of the F-statistic of the model is also significant, signifying that all the independent variables in the model are jointly significant.

The Durbin-Watson statistic of 2.440258 indicates the presence of negative auto-serial correlation in the data, implying that the results may not be entirely reliable.

ARDL Cointegrating And Long Run Form				
Dependent Variable: LOG(GDP)				
Selected Model: ARDL(4, 2, 3, 3)				
Date: 07/02/19 Time: 14:51				
Sample: 1991 2017				
Included observations: 23				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(GDP(-1))	-0.860378	0.166947	-5.153605	0.0013
DLOG(GDP(-2))	-0.823303	0.154600	-5.325389	0.0011
DLOG(GDP(-3))	-0.749140	0.154870	-4.837222	0.0019
D(INF)	0.001588	0.001204	1.318373	0.2289
D(INF)	-0.005013	0.001262	-3.971980	0.0054
D(ER)	-0.002933	0.000750	-3.908349	0.0058
D(ER(-1))	-0.001861	0.000811	-2.294091	0.0555
D(ER(-2))	-0.001989	0.000456	-4.360776	0.0033
D(UE)	-0.062337	0.023078	-2.701153	0.0306
D(UE(-1))	-0.336892	0.090092	-3.739435	0.0073
D(UE(-2))	-0.076156	0.056167	-1.355886	0.2172
CointEq(-1)	-0.083083	0.027066	-3.069638	0.0181
Cointeq = LOG(GDP) - (0.1095*INF + 0.0201*ER + 4.5209*UE + 16.4678)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	0.109502	0.046965	2.331568	0.0525
ER	0.020149	0.003007	6.699667	0.0003
UE	4.520889	2.255353	2.004515	0.0851
C	16.467797	6.822691	2.413681	0.0465

Figure 7

According to the result of the test for long run relationship between the dependent and independent variables, there is a long run relationship between current inflation rate and current GDP. Current GDP has been increased by 10.9% through a unit increase of present inflation. A long run association between current exchange rate and current GDP A 1 Naira increase in current exchange rate will lead to a 2% increase in current GDP. The result also indicates that a long run relationship exists between current unemployment and current GDP. A unit increase in current unemployment causes current GDP to increase by 452%.

Since, all the variables were not significant at level, there is the need for conducting co-integration test on them.

4.3. Co-integration Test

Date: 01/28/19 Time: 22:51				
Sample (adjusted): 1993 2017				
Included observations: 25 after adjustments				
Trend assumption: Linear deterministic trend				
Series: LOG(GDP) ER INF UE				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.683412	61.64629	47.85613	0.0015
At most 1 *	0.499800	32.89247	29.79707	0.0213
At most 2 *	0.323628	15.57378	15.49471	0.0487
At most 3 *	0.207006	5.798475	3.841466	0.0160

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.683412	28.75382	27.58434	0.0353
At most 1	0.499800	17.31869	21.13162	0.1575
At most 2	0.323628	9.775308	14.26460	0.2271
At most 3 *	0.207006	5.798475	3.841466	0.0160
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):				
LOG(GDP)	ER	INF	UE	
2.481151	-0.054197	-0.079364	2.121081	
-0.531045	-0.015644	-0.018306	-4.064050	
1.290481	-0.015410	0.016407	-1.873911	
2.685047	-0.053848	0.045720	2.337600	
Unrestricted Adjustment Coefficients (alpha):				
D(LOG(GDP))	-0.049800	0.016886	-0.014673	-0.000968
D(ER)	4.867525	-1.750083	-2.433331	6.799601
D(INF)	4.467293	-3.258161	-2.241026	-2.517324
D(UE)	-0.075891	-0.275497	0.084412	0.126208
1 Cointegrating Equation(s):		Log likelihood	-162.5008	
Normalized cointegrating coefficients (standard error in parentheses)				
LOG(GDP)	ER	INF	UE	
1.000000	-0.021844	-0.031987	0.854878	
	(0.00178)	(0.00593)	(0.29305)	
Adjustment coefficients (standard error in parentheses)				
D(LOG(GDP))	-0.123560			
	(0.02782)			
D(ER)	12.07707			
	(9.15621)			
D(INF)	11.08403			
	(4.98235)			
D(UE)	-0.188296			
	(0.28659)			
2 Cointegrating Equation(s):		Log likelihood	-153.8415	
Normalized cointegrating coefficients (standard error in parentheses)				
LOG(GDP)	ER	INF	UE	
1.000000	0.000000	-0.003690	3.749377	
		(0.01623)	(0.75731)	
0.000000	1.000000	1.295419	132.5097	
		(0.73692)	(34.3784)	
Adjustment coefficients (standard error in parentheses)				
D(LOG(GDP))	-0.132527	0.002435		
	(0.02670)	(0.00059)		
D(ER)	13.00644	-0.236430		
	(9.30800)	(0.20693)		
D(INF)	12.81426	-0.191146		
	(4.72905)	(0.10514)		
D(UE)	-0.041994	0.008423		
	(0.24531)	(0.00545)		
3 Cointegrating Equation(s):		Log likelihood	-148.9538	
Normalized cointegrating coefficients (standard error in parentheses)				
LOG(GDP)	ER	INF	UE	
1.000000	0.000000	0.000000	3.330367	
			(0.70912)	
0.000000	1.000000	0.000000	279.6011	
			(62.4059)	

0.000000	0.000000	1.000000	-113.5474	
			(34.0869)	
Adjustment coefficients (standard error in parentheses)				
D(LOG(GDP))	-0.151462	0.002661	0.003402	
	(0.02838)	(0.00058)	(0.00083)	
D(ER)	9.866269	-0.198932	-0.394196	
	(10.3211)	(0.21202)	(0.30124)	
D(INF)	9.922257	-0.156612	-0.331670	
	(5.09969)	(0.10476)	(0.14884)	
D(UE)	0.066938	0.007122	0.012451	
	(0.26964)	(0.00554)	(0.00787)	

Figure 8

According to the unrestricted Cointegration Rank Test (Trace), the null hypothesis that there is no long run relationship between any of the independent variables (unemployment, inflation rate, exchange rate) and GDP is rejected at 5% level of significance. Also, the null hypothesis that there is a long run relationship between at most 1, 2 and 3 independent variables and GDP is rejected at 5% level of significance. The trace statistics are greater than the critical values at 5% level of significance. The probability values are within 5% levels of significance. The unrestricted Cointegration Rank Test (Maximum Eigenvalue) indicates that the null hypothesis that there is no long run relationship between any of the independent variables (unemployment, inflation rate, exchange rate) and GDP is rejected at 5% level of significance.

4.4. Granger Causality Test

Pairwise Granger Causality Tests			
Date: 01/28/19 Time: 23:14			
Sample: 1991 2017			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
ER does not Granger Cause LOG(GDP)	25	2.82785	0.0829
LOG(GDP) does not Granger Cause ER		1.58409	0.2298

Figure 9

Pairwise Granger Causality Tests			
Date: 01/28/19 Time: 23:16			
Sample: 1991 2017			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause LOG(GDP)	25	4.64473	0.0220
LOG(GDP) does not Granger Cause INF		1.08226	0.3579

Figure 10

Pairwise Granger Causality Tests			
Date: 01/28/19 Time: 23:17			
Sample: 1991 2017			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
UE does not Granger Cause LOG(GDP)	25	0.03774	0.9630
LOG(GDP) does not Granger Cause UE		5.92467	0.0095

Figure 11

According to the result of the Granger Causality Test for LOG(GDP) and exchange rate, the Probability value (0.0829) for the null hypothesis that exchange rate does not Granger cause LOG(GDP) is within 10% level of significance. Thus, the null hypothesis is rejected and exchange rate Granger causes LOG(GDP). This is consistent with economic theory. An appreciation in exchange rate causes a slower growth of real GDP because of a reduction in net exports and a rise in the demand for imports. The Probability value (0.2298) for the null hypothesis that LOG(GDP) does not Granger cause exchange rate is not within 10% level of significance. Thus, the null hypothesis is accepted and LOG(GDP) does not Granger cause exchange rate. The result of the Granger Causality Test for LOG(GDP) and inflation rate indicates that the Probability value (0.0220) for the null hypothesis that inflation rate does not Granger cause LOG(GDP) is within 10% level of significance. According to the result of the Granger Causality Test for LOG(GDP) and unemployment, the Probability value (0.9630) for the null hypothesis that unemployment does not Granger cause LOG(GDP) is greater than 10% level of

significance. Thus, the null hypothesis is accepted and unemployment does not Granger cause LOG(GDP). This is not consistent with economic theory as an increase in unemployment leads to a reduction in production, leading to a reduction in GDP. The Probability value (0.0095) for the null hypothesis that LOG(GDP) does not Granger because unemployment is within 10% level of significance. Thus, the null hypothesis is rejected and LOG(GDP) Granger causes unemployment. This is reflected in economic theory as an increase in a nation's GDP stimulates employment, thereby reducing unemployment, according to Okun's Law.

4.5. Regression

Dependent Variable: LOG(GDP)				
Method: Least Squares				
Date: 01/17/19 Time: 16:24				
Sample: 1991 2017				
Included observations: 27				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	31.04320	0.531018	58.45981	0.0000
UE	-0.649386	0.133188	-4.875696	0.0001
INF	-0.007178	0.006312	-1.137159	0.2672
ER	0.020706	0.001639	12.63611	0.0000
R-squared	0.920724	Mean dependent var		30.28573
Adjusted R-squared	0.910384	S.D. dependent var		1.585127
S.E. of regression	0.474523	Akaike info criterion		1.482941
Sum squared resid	5.178960	Schwarz criterion		1.674917
Log likelihood	-16.01970	Hannan-Quinn criter.		1.540025
F-statistic	89.04198	Durbin-Watson stat		1.098314
Prob(F-statistic)	0.000000			

Figure 12

In the result of the regression, unemployment and exchange rate have a significant relationship with economic growth in Nigeria. Unemployment has a negative impact on economic growth. The coefficient of the series indicates that for every unit increase in unemployment, we expect a 0.65 percent decrease in GDP. Exchange rate has a positive impact on economic growth. The coefficient of the series indicates that for every unit increase in exchange rate, a 0.02 percent increase in GDP is expected. Inflation rate has a negative but non-significant relationship with economic growth in Nigeria. According to the coefficient of the series, for every unit increase in inflation rate, a 0.01 percent decrease in GDP is predicted. The R-square indicates that 92 percent of variations in economic growth are explained by all the independent variables in the model. A value of 0.910384 for adjusted R-squared shows that the model has a high ability to predict changes in economic growth as a result of changes in unemployment, inflation rate and exchange rate. All the independent variables in the model are jointly significant by checking the value of F statistics. The Durbin-Watson statistic of 1.098314 indicates the presence of positive auto-serial correlation in the data, implying that the results are entirely reliable. The positive relationship between exchange rate and economic growth does not conform to the apriori expectation. This can be attributed to the fact that an increase in exchange rate makes foreign commodities more expensive and local goods cheaper. This increases the velocity of money in the domestic economy, stimulating economic growth.

5. Conclusion and Policy Implications

This study explored the relationship between economic growth in Nigeria and macroeconomic factors such as unemployment, inflation and exchange rate from 1991 to 2017. It also determined if there is a causal relationship between each of the macroeconomic variables and economic growth. The relationship was analyzed through the Ordinary Least Square (OLS) technique. The existence of the causal relationship was examined with the Granger Causality Test. The study revealed that there is a long run relationship between economic growth and the macroeconomic variables. It also showed that unemployment exerts a negative but significant impact on economic growth. Positive and significant association has been observed between exchange rate and economic growth, whereas, inflation rate has a negative and non-significant impact on economic growth. As a finding of causal effect, exchange rate determines economic growth but that economic growth has no impact on exchange rate and inflation rate has an impact on economic growth, economic growth does not cause changes in inflation rate.

It also revealed that while unemployment does not cause changes in economic growth, economic growth has an impact on unemployment.

Based on the findings of the investigation, the following recommendations are suggested:

There is the need for the Nigerian government to curb unemployment since it inhibits economic growth. This can be achieved by creating a conducive environment for establishing small and medium enterprises. The recent policy by the government in reducing the cost of registering companies is a step in this direction.

The government should also reduce taxes to stimulate increase in aggregate demand. This will boost economic growth. This will create more jobs thereby reducing unemployment.

The government should also employ fiscal and monetary policies to reduce inflation in the Nigerian economy. This will stimulate aggregate demand, thereby fostering economic growth in the nation.

There is also the need for the Nigerian government to stimulate exportation of commodities from the economy. This can be achieved by creating a conducive environment for businesses to thrive and compete on a global level. Increase in exports will lead to appreciation of the Naira currency. Appreciation of the Naira currency will boost economic performance of the Nigerian economy.

Finally, the Nigerian government should employ policies that will foster growth and stabilization of macroeconomic factors. Such policies will boost economic growth and development.

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