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Impact of Inflation on Economic Growth in Nigeria: 1981-2016

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Abstract

The study examines the impact of inflation on economic growth in Nigeria, using annual time series data from 1981-2016. A review of literature shows that inflation can either have positive or negative effects on economic growth in Nigeria. The Augmented Dickey Fuller (ADF) and Phillip Peron (PP) technique were employed to run the unit root test and the results shows some variables are stationary at level while others at their first difference. The Auto regressive distributive lag (ARDL) bound test is adapted to test for co integration and error correction model. From the results generated from ordinary least square (OLS) shows that there exist a negative and insignificant relationship between inflation and economic growth. Exchange rate has a positive and significant effect on real GDP at 1% level of significant. Interest rate also has positive and significant effects on real GDP at 1% level of significant. This study, recommend that, the government of Nigeria should design sound and productive macro-economic policies to address factors that drive inflation high and to encourages local producers with the necessary facilities to boost production and supply of goods. This will help in reducing demand pull inflation and accelerate economic growth in Nigeria.

Keywords: Economic Growth, Inflation Rate; Exchange Rate; Interest Rate.
JEL Codes: E52

1. Introduction

One of the key macroeconomic challenges threatening output growth in Nigeria is the inflation rate. The rate of inflation over the last three decades has significantly increased thereby affecting the macroeconomic growth and international competitive drive of the growing economy. After numerous attempts by successive administrations to regulate this economic problem using both monetary and fiscal policies, efforts seem to be abysmal (Idris & Bakar, 2017).

One of the most fundamental objectives of macroeconomic policies is to sustain high economic growth together with low inflation. Specifically, the question whether inflation is necessary for economic growth or it is harmful, generates a significant debate both theoretically and empirically. Some consensus exists, suggesting that macroeconomic stability specifically defined as low inflation, is positively related to economic growth (Hossin, 2013).

Rate of Inflation is one of the basic macroeconomics objectives which has been a cankerworm eaten deeply in the growth fabric of most economy of the world, most especially the developing countries-such as Nigeria. Moderate inflation rate is an official monetary policy target in many countries because of the positive effects it generate on economic growth (Victoria, Hoogennveen, Simon & Kulpers, 2000).

The beginning of inflation in Nigeria can be said to be a direct results of the policies of the government, to stimulate a fast rate of

economic growth and development since 1951 when ministerial government was introduced. Inflationary trend since independence shows two distinctive periods in terms of digital analysis. Until 1969 the growth rate of inflation was in a unit with the highest being about 9% in 1966 and even negative growth rate was recorded in 1963, 1967 and 1968. Since 1969, inflationary growth has become two digits, except in 1972, 1973, and 1982. Information shows that 1975 recorded 33.7% indicating the effects of the 1974 increase in money supply via Udoji salary awards in the face of inadequate supply of commodities. It was 11.4% in 1980, 21% in 1981, 7.7 % in 1982, 23.2 % in 1983, 40% in 1984 and 40.9% in 1989 (Anyanwu, 1993).

The relationship between inflation and economic growth is wide both theoretically and empirically. In 1970's there was a debate on the relationship between inflation and economic growth. The argument then was, there is no relation or there is a positive relationship between the variables. The monetarist also believe that inflation is detrimental to economic growth (Behera, 2014).

Inflation can have either positive or negative impact on the economic performance of an economy. Positively, inflation can lead to a higher sustained growth due to the effect it has on capital accumulation. The Phillips curve for example, shows that high inflation is consistent with low rates of unemployment, implying that it has an impact on economic growth. It is widely believed that moderate and stable inflation rates promote economic growth as it supplements return to savers, enhances investment, and therefore accelerates economic growth of the country (Ahmed & Mortaza, 2005).

On the contrary, inflation imposes negative externalities on the economy. It creates more burdens on the cost of living and makes the life of common man more miserable. It is also known that inflation leads to uncertainty about the future profitability of investment projects especially, which have long gestation period. The increased price variability may lead to an increased in cost of production and less profitability. Besides this, inflation may lead to uncertainty about the future profitability of different investment projects, It may also reduce the country's international competitiveness. Inflation undermines the confidence of domestic and foreign investors. Inflation also affects the accumulation of other determinants of growth like investments, research, growth and development (Veni & Choudhury, 2007).

It is against this background that this paper is devoted to providing better understanding on how inflation rate affects the desired level of economic growth in Nigeria this is because at the time of conduct of this study empirical literature has shown there is no conclusive result on the relationship between inflation and economic growth. In fact, the relationship between inflation and economic growth is more complicated. The results obtained in various studies varies across time, country experiences and methodology used. The main objective of this paper is to examine the impact of inflation on economic growth in Nigeria, using annual time series data from 1981 to 2016.

2. Literature Review and Theoretical Framework

Concept of Inflation

According to Peter and Sean (2011), the word inflation is use to describe a situation in which the general level of price in the economy is rising. This situation doesn't mean that every price of every good is going up-a few prices may even be falling-but the overall trend is upward. Typically, the trend is for price to go up only a small percentage each year, but people dislike even mild inflation because no one likes paying higher prices.

As observed by Parkin (2005) inflation is a process of rising prices. Inflation is a rate at which there is the percentage change in the average price level. A common measure of

the price level is the consumer price index (CPI).

Concept of Economic Growth

Ahuja (2014) opined that, economic growth has been defined in two ways. In the first place, economic growth is defined as sustained annual increases in an economy's real national income over a long period of time. In the other words, economic growth means rising trend of net national product or constant prices.

Furthermore, Dwivedi (2004) define economic growth as the sustained increase in per capital natural output over a long period of time. Economic growth is measure as a percentage change in the Gross domestic product.

Theoretical Framework

Researchers adopted Keynesian theory of inflation as the basis of the research. This is because the theory is relevant and add value to the work. In addition, in Keynesian framework, the positive relationship between inflation and growth exhibited in the short-run dynamics is unsustainable in longer term and turns negative with higher inflation rate.

Review of Empirical Literature

Empirical studies reviewed have revealed that there are mixed results on the relationship between inflation and economic growth. Studies by Veni and Choudhury (2007), Omoke (2010), Shuaib, Augustine and Frank (2015) and Anochiwa and Maduka (2015) concluded that the change in inflation rate has no relationship with economic growth. However, there is also considerable evidence by some studies that inflation has an identifiable negative effects on economic growth such include Saaed and Afaf (2007), Kasidi and Mwakanemele (2011), Sultan and Shah (2013), Hossin (2015), Enu, Attah-Obeng and Hagan (2013), Tihanh (2015), Eze (2015), Bawa and Abdullahi (2016), Michael and Mbam (2017) and Idris and Bakar (2017). Finally, a number of other studies have also found that inflation has positive effects on economic growth which includes Umaru and Zubairu (2012), Osuala, Osuala and Onyeika (2013), Jaganath (2014), Echekoke, Kanayo and Amokor (2015), Chude, Daniel, Chude and Nkiru (2015), Olu and Idah (2015), Yelwa, David and Omuniyi (2015), Ihugba, Ebomuche and Ezeonye (2015), Saidu and Mohammed (2015), Olalere (2016), Madurapperuma (2016), Enejoh and Tsauni (2017) and Ndri (2017) among others.

3. Methodology

Method of Data Collection

This study makes use of time series data over a period of 35 years (1981-2016). Data is obtained from secondary sources. The data used for this study is drawn from the Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS), World Bank and International Monetary Fund (IMF) reports on measure of inflation and economic growth in Nigeria

Model Specification

This research adopts the model of Chude and Chude (2015) with little modifications. In the model , Real Gross Domestic Product (RGDP) is used as dependent variable while the independent variable is inflation rate and control variables include exchange rate and interest rate. The model is therefore specified as follows:

$$RGDP_t = \beta o + \beta_1 INF_t + \beta_2 EXR_t + \beta_3 INTR_t + e_t \quad \ldots\ldots 1$$

Where:

RGDP= Real Gross Domestic Product a proxy for Economic Growth.
INF= Inflation Rate
EXR= Exchange Rate
INTR=Interest Rate
e =Error Term
t = Time Series
βo = Constant
$\beta 1, \beta 2, \beta 3$ are parameters of the variables to be estimated in the model

4. Results and Discussions

Statistical Properties of Data Series

In line with the methodology of this study, all variables are subject to stationarity test, the two types of technique employed are

Augmented Dickey –Fuller (ADF) and the Phillip Peron (PP) tests. The results are presented below:

Table 4.1: Result of ADF and PP unit root test

S/N	VARIABLES	ADFT-STAT	P-VALUE	I(d)	PP T-STAT	P-VALUE	I(d)
1	Real GDP	-3.163951	0.0312**	1(1)	-2.981512	0.0468**	1(1)
2	Inflation rate	-3.252798	0.0252**	1(0)	-3.153543	0.0316**	1(0)
3	Exchange rate	-5.015670	0.0002***	1(1)	-5.015670	0.0002***	1(1)
4	Interest rate	-2.817597	0.0661*	1(0)	-2.735226	0.0783*	1(0)

Source: Researchers Computation Using E-Views-9 Software (CBN 2015,; World Bank 2016)
*(Note: ***, ** and * means significant 1 %, 5% and 10% levels respectively)*

From Table 4.1, with a sample of 35 observations, the null hypothesis states that there is non stationarity. The ADF and PP tests are run against the null hypothesis that there is unit root and non- stationarity of series. The results of these test shows some variables are stationary at level while others at their 1^{st} differences. The inflation and interest rate are stationary at level form 1(0) and Real GDP and exchange rate are stationary at 1^{st} difference 1(1). This implies that all the variables in the model are stationary at both 1% and 5% respectively. The mixture of 1(0) and 1(1) order of integration met the condition of Auto Regressive Distribution Lag (ARDL) bound test. The best model in this case is the Autoregressive distributive lag developed by Pesaran et al (1999), which is used to test for co integration and vector error correction model (VECM) to find the short run and long run relationship among the variables.

Test for Cointegration

Since the unit root test shows that Real GDP and exchange rate are stationary at level form 1(0). While others at 1^{st} differences 1(1). It is therefore necessary to test for co integration among these variables.

Table 4.2: Result of Cointegration using ARDL Bound Test

F-statistic	52.223	3
Level of significance	Critical value I(0) Bound	Critical value I(1) Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: Researchers Computation Using E-Views -9 Software (CBN 2015,; World Bank 2016)

From Table 4.2 the value of F-Statistic is 52.223, which is more than the lower and upper bound values of Pesaran table at 1 % level of significant. There is evidence of long run relationship between the variables.

Short run Error Correction Model

Having found the evidence of cointegration among the variables, the study proceeded to estimate the short run and long run relationships among the variables and the results are presented below.

Table 4.3: Result of Short run Error Correction Model

Short run error correction model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINF)	-0.031260	0.006025	-5.188531	0.0000
D(LINF(-1))	0.064209	0.006031	10.646859	0.0000
D(LINF(-2))	0.023191	0.006342	3.656717	0.0015
D(LINF(-3))	0.014898	0.005387	2.765477	0.0116
D(LEXR)	-0.071636	0.012392	-5.780684	0.0000
D(LEXR(-1))	-0.063024	0.012568	-5.014552	0.0001
D(LINTR)	0.022357	0.013944	1.603314	0.1238
CointEq(-1)	-0.075514	0.004275	-17.664186	0.0000
Cointeq=LRGDP-(-0.9697*LINF+0.1115*LEXR+0.1988*LINTR+19.8286)				

Source: Researchers Computation Using E-Views 9 Software (CBN 2015; World Bank 2016)

Table 4.3 shows that in the Short run, inflation has a negative and significant impact on economic growth in the current year at 1% level of significant, but the impact was positive and significant at lag -1, lag -2 and lag -3. This implies that an increase in inflation rate by 1% will lead to a decrease in real GDP by 31% at current year. Exchange rate has a negative and significant impact on economic growth. Indicating an increase in exchange rate by 1% will reduce real GDP by 72%. Interest rate also has positive and insignificant effect on economic growth. The error correction term measures the speed of adjustment towards the equilibrium after the initial deviations are corrected. The error correction model ECM (-1) coefficient is -0.075 and significant at 1%. This implies that the speed of adjustment for correcting disequilibrium from the previous year to current year is 7.5%.

Long run coefficient

Table 4.4: Long run Coefficient

Long run coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINF	-0.969724	0.216908	-4.470660	0.0002
LEXR	0.111458	0.047677	2.337773	0.0294
LINTR	0.198837	0.255454	0.778366	0.4450
C	19.828599	0.690082	28.733683	0.0000

Source: Researchers Computation Using E-Views 9 Software (CBN 2015, ; World Bank 2016)

From Table 4.4, in the long run, inflation has a negative and significant impact on economic growth at 1% level of significant. Therefore, if inflation increases by 1%, it will reduce real GDP by 97%. The result further shows that exchange rate has a positive and significant impact on economic growth at 5% level of significant. Indicating that an increase in exchange rate by 1% will increase real GDP by 11% and interest rate also has a positive and insignificant impact on economic growth in Nigeria during the study period.

Test for Auto correlation

Table 4.5: Results of the test for Autocorrelation

F-statistic	0.128644	Prob. F(2,13)	0.8804
Obs*R-squared	0.621031	Prob.Chi-Square(2)	0.7331

Source: Researchers Computation Using E-Views 9 Software (CBN 2015,; World Bank 2016)

From Table 4.5, the test for autocorrelation was conducted because the Durbin Watson (DW) statistics result (0.637) obtained in the Ordinary Least Square is very low and not close to the conventional point 2, indicating the presence of auto correlation problem; therefore, after conducting the unit root test and test for autocorrelation the Durbin Watson (DW) statistics (2.46) is very high and are up to the conventional point 2. The variables are also not significant at 5%, we conclude that the model is free from auto correlation problem.

Test for Heteroskedasticity

Table 4.6: Results of the test for Heteroskedasticity

F-statistic	1.238184	Prob. F(16,15)	0.3419
Obs*R-squared	18.21123	Prob. Chi-Square(16)	0.3117

Source: Researcher Computation Using E-Views 9 Software (CBN 2015,; World Bank 2016)

The test for heteroskedasciticity was conducted to find out if there is heteroskedasciticity problem so as to know the best alternative model to apply. Therefore, based on the results in table.4.6, it shows that the variables are not significant at 5%, meaning that the model is free from heteroskedascity problem.

Normality Test

Table 4.7: Normality test

Statistic	Value
Skewness	-0.464056
Kurtosis	2.724323
Jarque-Bera	1.406086
Probability	0.495076

Source: Researcher Computation Using E-Views 9 Software (CBN 2015,; World Bank 2016)

From the above table, normality test was also conducted to find out if the variables are normally distributed. The conditions for normality are all met. Therefore, based on the results in table 4.7, the skewness is negative and less than one, Kurtosis must be close to 3, while Jarque-bera probability is not significant. Therefore, the data is normally distributed.

Ordinary Least Square Results

The ordinary least square regression results obtained are presented as;

Table 4.8: Regression Result

Independent Variable	Coefficient	Std. Error	t-Stat	Prob.
LINF	-0.083227	0.052860	-1.574495	0.1252
LEXR	0.271388	0.021804	12.44682	0.0000
LINTR	-0.566961	0.131198	-4.321430	0.0001
C	17.94132	0.333131	53.85661	0.0000
R-squared	0.847522	Mean DV	17.12688	
Adjusted R-squared	0.833227	S.D. dependent variance	0.535872	
S.E. of regression	0.218839	Akaike info criterion	-0.096526	
Sum squared resid	1.532489	Schwarz criterion	0.079420	
Log likelihood	5.737472	Hannan-Quinn criterion	-0.035116	
F-statistic	59.28883	Durbin-Watson statistic	0.637436	

Source: Composed By Researchers From Data Set Using Eview-9(CBN 2015,;World Bank 2016)

The ordinary least square (OLS) result is presented in table 8, shows that the inflation coefficient value is negative and not significant, indicating that there exist a negative and insignificant relationship between inflation and economic growth. Exchange rate has positive and significant effects on real GDP at 1% level of significant. This implies an increase in exchange rate by 1% will lead to increase in real GDP by 27%. Interest rate also has negative but significant effects on real GDP at 1% level of significant. An increase in interest rate by 1% will lead to decrease in real GDP by 57%.

The R square value of 0.847, implies that, 84% changes in dependent variable (Real GDP) is cause by independent variables such as inflation rate, exchange rate and interest rate. Thus, only 16% is cause by other factors. Again, the F-Statistic is significant at 1%, which indicates that the model is adequate and fit.

Granger Causality Test

The results of granger causality test between inflation and real GDP, exchange rate and real GDP and interest rate and real GDP. The first null hypothesis is that the inflation rate does not granger cause Real GDP. Thus, the null hypothesis is accepted because inflation does not have any significant impact on Real GDP. On the other hand, there is evidence of unidirectional causality running from economic growth to inflation and no evidence of causation on the other side.

The second null hypothesis is that exchange rate does not granger cause Real GDP. However, the results show that exchange rate does cause real GDP. The third null hypothesis is that interest rate does not granger causes Real GDP. The hypothesis is accepted as the p-value is not significant at all levels. This implies that interest rate does not cause economic growth in Nigeria.

CUSUM Test

The results of CUSUM plot for stability of the model shows that CUSUM test is within 5% level of significant. The results further shows that all the variables passed the CUSUM test. There are no chances of having spurious regression because the blue line is in-between the two red lines. Implies that all the variables used are stationary and the model is stable.

5. Discussion of Results

This study examines the impact of inflation rate on economic growth in Nigeria. Other macroeconomic variables used are exchange rates, interest rate were incorporated into the

model. This section analysis the extent to which findings of this study conforms to or deviates from those of other researches of similar interest. This study found an evidence of a negative and non-significant relationship between inflation and economic growth. This is not surprising considering the fact that the Nigerian government has taken measure to increase productive capacity and supply of goods and service. That is why the negative impact of inflation is not significantly affecting economic growth in Nigeria during the study period. Another finding of this study has to do with direction of causality between inflation and real GDP.This study finds evidence of unidirectional causality running from economic growth to inflation and no evidence of causation on the other side during the study period.

In addition, the study also found an evidence of positive relationship between exchange rate and economic growth in Nigeria; though the relationship is significant irrespective of the degree of volatility of the exchange rate, as such exchange rate influence economic growth. This study also finds evidence of unidirectional causality running from exchange rate to economic growth.

The interest rate also has negative but significant effects on real GDP. The implication of the finding from the study implies that the negative relationship existing between the two macro-economic variables will continuously shrink the Nigerian economy. This is because an increase in interest rate by 1% will reduce economic growth by 56%. The increase in interest rate would result in increase in cost of production that led to decrease investment and supply of goods and services, which affects economic growth.

To make a decision on the result, the null hypothesis states that there is no significant relationship between inflation and economic growth in Nigeria while the alternative hypothesis says there is a significant relationship between inflation and economic growth in Nigeria. Therefore, we accept the null hypothesis (H_0) that there is a negative and no significant relationship between inflation and economic growth and reject the alternative hypothesis (H_1) that states there is a significant relationship between inflation and economic growth in Nigeria during the study period.

However, the negative impact of inflation on economic growth is in line with Keynesian theory of inflation, which states that there exists a positive relationship between inflation and output in the short run. However, the positive relationship between inflation and growth exhibited in the short-run dynamics is unsustainable in longer term and turns negative with higher inflation.

Furthermore, the negative impact of inflation on economic growth in Nigeria is in line with the findings of Kasidi and Mwakanemele (2011), Enu, Attah-Obeng and Hagan (2013), Tihanh (2015), Bawa and Abdullahi (2016) and Michael and Mbam (2017) among others.

6. Summary of Major Findings

This study investigates the impact of inflation on economic growth in Nigeria. The research covers a period of 35years from 1981 to 2016. It used time series data in analyzing the data on real GDP, inflation rate, exchange rate and interest rate. The study made use of the Augmented Dickey Fuller (ADF) Phillips Peron (PP) test to administer the unit root tests, Auto Distributive Lag (ARDL) and Error Correction Model. The findings of the study are therefore summaries as follows:

The results generated from Ordinary least square shows that there exist a negative and insignificant relationship between inflation and economic growth. Exchange rate has positive and significant effects on real GDP at 1% level of significant. Interest rate also has negative but significant effects on real GDP at 1% level of significant. However, the R squared value is highest at 0.847. The R square value 0.847. That is, 84% of variation in Real GDP can be explained by inflation rate, exchange rate and interest rate. Thus,

only 16% is due for other factors. This shows that the model is significant and adequate. The Durbin Watson (DW) statistics is very low and not close to the conventional point 2, indicating the presence of auto correlation problem; therefore, the unit root test was conducted to make the variables stationary. Again, the F-Statistic is significant at 1% which indicates that the model has a good fit.

Surprisingly, the ADF and PP tests run on the data shows that the inflation rate and interest rate were stationary at level form 1(0) and Real GDP and exchange rate are stationary at 1^{st} difference 1(1). This implies that all the variables of the model are found to be stationary at both 1% and 5% respectively.

The co integration test conducted reveal that the value of F-Statistic is 52.223 is more than the lower and upper bound values of Pesaran table at 1 % level of significant. This indicates that there is evidence of long run relationship between the Real Gross Domestic Product and Inflation rate, Exchange rate and Interest rate. More so, the Short run error correction model shows that inflation has a negative and significant impact on economic growth in the current year at 1% level of significant, but the impact was positive and significant at lag -1, lag -2 and lag -3. Interest rate also has positive and insignificant effect on economic growth. The error correction model ECM (-1) coefficient is -0.075 and significant at 1%. This implies that the speed of adjustment for correcting disequilibrium from the previous year to current year is 7.5%.

The long run ARDL results shows, inflation has a negative and significant impact on economic growth at 1% level of significant. Therefore, if inflation increases by 1%, it will reduce real GDP by 97%. The result further shows that exchange rate has a positive and significant impact on economic growth at 5% level of significant. Interest rate also has a positive and insignificant impact on economic growth in Nigeria during the study period.

The test for autocorrelation conducted shows the Durbin Watson (DW) statistics is very high and is up to the conventional point 2. The test for heteroskedasticity was also conducted to find out if there is heteroskedasticity problem the results further shows that the variables are not significant at 5%, meaning that the model is free from heteroskedasticity problem.Normality test conducted shows that all the conditions for normality test are all met.

Finally, the results of CUSUM plot for stability of the model shows the CUSUM test is within 5% level of significant. The results further shows that all the variables passed the CUSUM test. There are no chances of having spurious regression because the blue line is in-between the two red lines. Implies that all the variables used are stationary and the model is stable.

7. Conclusions

On the basis of the findings of this study, the following conclusions were drawn:

Inflation is one of the major macroeconomic problems in Nigeria economy. There is evidence of co integration between the variables. Inflation has a negative and insignificant impact on economic growth; as such inflation does not influence economic growth.

In addition, exchange rate has a positive and significant impact on economic growth. An increase in exchange rate will increase economic growth. However, exchange rate exerts an influence on economic growth.

Finally, interest rate has a negative and significant impact on economic growth. The study therefore concludes that the inflation rate during the study period has a negative effect on the realisation of macroeconomic objective of sustainable economic growth.

This study suggests an optimal and sound macroeconomic policy which will control the excessive increase in inflation rate and stimulate economic growth.

8. Recommendations

Based on the findings of the study, the following are suggestions that would

improve the standard of the economy.

- To reduce the adverse effects of inflation, the monetary authorities should keep the inflation rate between 3 to 5% through effective monetary policy. This is because moderate inflation facilitates investment, productivity and economic growth.
- Regulatory authorities should ensure compliances with the monetary policy objectives by strengthen the supervisory role of price control board in ensuring inflation rate does not grow to the level it affects economic growth negatively.
- Government should address all key factors which cause persistent increase in prices such as shocks in price of crude oil, exchanges rates volatility, increase in money supply, electricity inadequacy and ensure a routine on this indication are check with appropriate policies since they have link with inflation in Nigeria.
- The government should take timely measures to design suitable framework that will encourage the local producers to engage in the agricultural productivity, investment and economic activities in order to boost production and supply of goods. This will reduce demand pull inflation and help to fight against inflation.

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