

# Inflation And Economic Growth Nexus In Nigeria

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**Abstract**—This study was conducted on the “Inflation and Economic Growth Nexus in Nigeria” using annual time series data from 1961 to 2014. The aim of the study was to determine the relationship between inflation and economic growth in Nigeria for a longer period of 54 years. This study was organized into five different sections. Section I was on introduction, section II was on literature review and empirical literature, section III dealt with the methodology of the study, section IV was on the results and discussions while section V was on conclusion and recommendations. Preliminary tests of stationarity were conducted and the series under investigation were found to be  $I(0)$  variables. The study employed the use of Ordinary Least Squares method, Johansen Cointegration method, Error Correction mechanism and Granger Causality method to ascertain both the impact of inflation on economic growth as well as the relationship between the two variables. The result of the OLS regression analysis revealed a negative impact of inflation on economic growth in Nigeria, although the coefficient is statistically insignificant which implied that inflation does not influence economic growth in the country over the sample period. The cointegration test result indicated the existence of a long-run equilibrium relationship between inflation and economic growth in Nigeria. The error correction term was correctly signed and statistically significant which confirmed that the two variables under study converge towards a long run equilibrium relationship but the speed of adjustment appeared to be slow as only 17% of the error was being corrected each year. The Granger causality test result showed that there was no either unidirectional or bidirectional causality between inflation and economic growth in Nigeria from 1961 to 2014. Based on the findings of this study, it was recommended that both fiscal and monetary policy measures be taken to reduce inflation rate in Nigeria.

**Keywords**—*Inflation and Economic Growth Nexus*

## I. INTRODUCTION

The major objective of macroeconomic policies for every nation is to attain sustainable economic growth together with price stability. The importance given to price stability when conducting monetary policy amongst other things is to stimulate sustainable economic growth as well as strengthening the purchasing power of the local currency. The question of whether or not inflation is detrimental to economic growth has recently been a subject of strong argument to policy makers and macroeconomists. The bone of contention is that whether inflation is necessary for economic growth or it is harmful to economic growth. The effects of inflation on economic growth are more or less certainly biased towards that view that inflation is detrimental to the growth of an economy.

Datta and Kumar [5] contend that the rate of economic growth primarily depends on the rate of capital formation and

the rate of capital formation depends on the rate of savings and investment. The relationship between inflation and economic growth has been argued in various economic literatures and the arguments appeared to have shown differences in relation with the condition of world economy order. Policies which promote increase in aggregate demand could cause increase in production and inflation too as a consequence. In such situations and periods, inflation cannot be considered a serious problem as it can be regarded as having a positive impact on economic growth.

The maintaining of price stability is one of the macroeconomic issues faced by every economy including the Nigerian economy. Moreover, sustainable economic growth along with price stability is the ultimate goal of every economy. Price instability which is being considered as either being Inflation or deflation poses a serious concern to all economic agents. Jhingan [12] defined inflation as a persistent and appreciable rise in the general level of prices. However, a rise in the general price level can only be considered as inflation when it is persistent, continuing and sustained. Demberg and McDougall are much more explicit in referring to inflation as a continuing rise in prices as measured by an index such as the Consumer Price Index (CPI) or by the implicit price deflator for Gross National Product [15]. In an inflationary economy, it is difficult for the national currency to act as medium of exchange and a store of value without having an adverse effect on income distribution, output and employment (CBN, 1984). Inflation is characterized by a fall in the value of the country's currency and a rise in her exchange rate with other nation's currencies. This is quite obvious in the case of the value of the Naira (N), which was N1 to \$1 (one US Dollar) in 1981, average of N100 to \$1 in year 2000 (Okeke, 2000) and over N128 to \$1 in 2003. This decline in the value of the Naira coincides with the period of inflationary growth in Nigeria, and is an unwholesome development that has led to a drastic decline in the living standard of the average Nigerian

The main thrust of this paper is to empirically examine the long run relationship between inflation and economic growth in Nigeria using the Johansen Co- integration approach and to examine the causality among the variables using the Granger Causality method. The study is organized into five sections. Section I deals with the introduction, section II deals with the literature reviews and empirical studies, section III is concerned with the methodology of the study, section IV is on empirical results and discussion, and section V deals with conclusion and policy recommendations.

The need for this study was born out of the desire to know if actually there is a relationship between inflation and economic growth in Nigeria from 1961 to 2014 making about 54 observations which covers a longer period of time and with

enough observations, there is high chance of obtaining a more robust estimates. Some studies found a negative relationship between inflation and economic growth while others found it to be positive. However, some results did not find any relationship between inflation and economic.

## II. LITERATURE REVIEW AND EMPIRICAL STUDIES

In the view of Ahmed and Mortaza [1] as cited by Inyama [11], it is widely assumed that modest and stable inflation rates stimulate the development process of a country vis-a-vis economic growth as it complements return to savers, improves investment, and therefore, hastens economic growth of the country. This view is in line with the result of the study conducted by Umar and Zubairu [19] where they investigated the impact of inflation on economic growth and development in Nigeria from 1970 to 2010 using Granger causality test to test the causal relationship between inflation and economic growth. In their results, it was found that GDP causes inflation but inflation does not cause GDP. The result also showed that inflation has a positive impact on economic growth through encouraging productivity and output level and on evaluation of total factor productivity.

The relationship between inflation and economic growth has usually been perceived to be a negative one. Many studies including that of Naz et al [16], Mallik and Chowdhury [14], Wai [20] revealed divergent ideas about the relationship between inflation and economic growth. For example, Naz et al [16] was of the view that high inflation is devastating for an economy due to the adverse effects it has on economic well-being of a country while very low or zero inflation is similarly detrimental to the economy. They suggest that a small level of inflation is desirable for a meaningful economic growth to ensue. Mallik and Chowdhury [14] on the other hand discovered that there are lots of controversial issues concerning the relationship between inflation and economic growth. While some see inflation as being essential for a tangible economic growth, others believe that it hinders economic performance and growth. The belief that inflation hinders economic growth by having a negative impact is associated with scholars such as Fisher [8], Bruno and Easterly [3] as well as Barro [2]. Their beliefs might have been related to the fact that “in 1970s, nations with high inflation particularly the Latin American countries begun to experience a decrease in growth rates and thus caused the emergence of the views stating that inflation has negative effects on the economic growth instead of the positive effects”, Kasidi and Mwakanemela [13]. Wai [20] observe no significant relationship between inflation and economic growth and this was discovered in a causality study between inflation and economic growth. Kearney and Chowdhury [14], moreover, in a study containing seventy countries including both developed and low income countries, established absence of causality between inflation and economic growth in 28 countries. However, there was bi-directional causality running from inflation to economic growth and vice versa among 14 countries and a unidirectional causality in the remaining 28 countries under investigation. More remarkably, the study revealed a positive relationship in some countries, but negative in other countries.

Nell [17] studied whether “inflation was injurious to economic growth or not” employed Vector Auto Regressive (VAR) technique. Using data for the period 1960 to 1999 discovered that single-digit inflation may be beneficial to

economic growth while double digit inflation tends to hinder economic growth. Osuala et al [18] studied the impact of inflation on economic growth in Nigeria employing the usual Johansen technique and error correction model as well as granger causality test. Their study revealed a significantly positive relationship between inflation and economic growth over the period 1970 to 2011 in Nigeria. Although much was not being reported regarding the existence of the long run relationship as well as the directions of the causality, the results of the study is in line with many empirical findings. Similar result was obtained by Umaru and Zubairu, [19] where the results of causality test revealed that GDP caused inflation and not the other way round. The results similarly revealed that inflation has a positive impact on economic growth through boosting productivity and output level. In a similar study on the impact of inflation on economic growth in Tanzania by Kasidi and Mwakanemela [13], a negative impact of inflation on economic growth was discovered during the period 1990 to 2011. This result is consistent with the views of Fischer [7], Bruno and Easterly [3] and Barro [2] who maintained that inflation has a negative impact on economic growth. Furthermore, the study further revealed that there was no long run relationship between inflation and economic growth in this country. A study by Gylfason and Herbertsson [8] revealed that increase in inflation rate from 5% to 50% decreases economic growth where a non-linear effect of the inflation on economic growth was found. They equally discovered a positive correlation between single-digit inflation and economic growth whereas a negative correlation was found between double-digit inflation and economic growth. In a similar study, Hasanov [9], examined the possibility of threshold effect of inflation on economic growth over the period of 2000-2009. Estimated threshold model indicate that there is a non-linear relationship between economic growth and inflation in the Azerbaijani economy and threshold level of inflation for GDP growth is 13 percent. Below threshold level inflation has statistically significant positive effect on GDP growth, but this positive relationship becomes negative one when inflation exceeds 13 percent. Muritala [15] empirically examined the impact of investment and inflation on economic growth in Nigeria using OLS technique of analysis from 1981 to 2006 and found a significantly negative impact of inflation on economic growth while investment has positive impact of the economic growth.

## III. METHODOLOGY

Basically, this study employs time series data in analysing the relationship between inflation and economic growth in Nigeria from 1961 to 2014. The data used in this study was obtained from the World Bank World Development Indicators. The two main techniques adopted for exploring the relationship between inflation and economic growth in Nigeria are the Granger Causality method and Johansen Cointegration approach. In every econometric analysis, it is essential to perform some preliminary statistical tests especially when using time series so that the order of integration of each time series can be ascertained. Stationarity test is therefore paramount in order to determine whether or not the time series under consideration are actually stationary. A time series is said to be stationary if its probability distribution does not change over time, otherwise, it is said to be non-stationary. If the series is not stationary, then valid inferences cannot be made due to the fact that results derived from such regression models are spurious results. Thus, the first thing to do is to

check for the existence of stationarity in the series of the variables. In this case, growth rate and inflation rate which are the two main variables used for establishing their relationship are being subjected to stationarity test using the Augmented Dickey-Fuller (ADF) test and Philip Perron (PP) test.

**A. Model Specification**

In determining the relationship between economic growth and inflation rate in Nigeria, Granger causality approach is being employed to know the causal relationships as well as the direction of causality between the two variables. The relationship is specified as follows.

a) *Granger Causality:*

$$GDPGRT_t = \sum \alpha GDPGRT_{t-1} + \sum \beta INF_{t-1} \tag{1}$$

$$INF_t = \sum \theta GDPGRT_{t-1} + \sum \delta INF_{t-1} \tag{2}$$

The causal relationship given in the above equations 1 and 2 explain the direction of causality between inflation and economic growth in Nigeria. If  $\beta$  and  $\theta$  are statistically significant, then there is a bidirectional causality running from both inflation to economic growth and economic growth to inflation. A unidirectional causality running from inflation to economic growth occurs when only  $\beta$  is statistically significant. When only economic growth Granger Causes inflation, only  $\theta$  will be statistically significant. The expectation is that economic growth Granger causes inflation which implies that  $\theta$  is expected to be statistically significant.

The impact of inflation rate on economic growth will also be estimated and the model is being specified as follows.

$$GDPGRT_t = \beta_0 + \beta_1 INF_t + u_t \tag{3}$$

Where:

$GDPGRT_t$  is the GDP growth rate in time period t.

$INF_t$  is the inflation rate in time period t.

$\beta_0$  and  $\beta_1$  are the parameters to be estimated.

$u$  is the disturbance term.

A priori expectations:  $\beta_1 < 0$

We expect inflation rate to have a negative impact on economic growth .thus, the researcher follows the views that inflation impedes economic growth by negatively impacting on the economy.

**B. Stationarity Test**

The time series data used for determining the relationship between inflation and economic growth in Nigeria have been subjected to stationarity tests using two different approaches in order to establish the order of integration of the variables. The approaches adopted are the Augmented Dickey-Fuller (ADF) test and the Phillips Perron (PP) test.

1) *The Augmented Dickey-Fuller (ADF):* The Augmented Dickey-Fuller which is an extended version of the Dickey-

Fuller test, suggests the inclusion of extra lagged terms of the dependent variable in order to get rid of autocorrelation. To determine the lag length, selection criteria such as the Akaike Information Criteria (AIC), Schwartz Bayesian Criteria (SBC) can be employed or by checking the residual of the ADF regression using the LM test. Thus ADF test takes the following form

$$\Delta y_t = \delta + \varphi y_{t-1} + \sum_{i=1}^p \omega_i \Delta y_{t-i} + u_t \tag{4}$$

Where:

y= time series

$\delta$  = the intercept

p = lag length

u = white noise error term

The distribution theory supporting the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests is based on the assumption that the error terms are statistically independent and have a constant variance. In this regard, one has to be certain that the error terms are uncorrelated and have a constant variance when using the ADF method.

2) *The Phillips-Perron (PP) test:* Philips and Perron (1988) developed a generalization of the ADF test procedure that allows for fairly mild assumptions regarding the distribution of the error terms. The test regression for the PP test is the AR (1) process given as.

$$\Delta y_{t-1} = \vartheta + \theta y_{t-1} + u_t \tag{5}$$

While the ADF test corrects for higher-order autocorrelation by adding lagged differenced terms on the right-hand side, the PP test makes a correction to the t-statistic of the coefficient  $\theta$  from the AR(1) regression to account for the autocorrelation in  $u_t$ .

**IV. RESULTS AND DISCUSSION**

This section of the study presents and discusses the results of the various tests conducted in order to analyse and determine the relationship between inflation and economic growth as well as the impact of inflation on economic growth in Nigeria.

**A. Stationarity Test Results**

It was established that the variables inflation rate and GDP growth rate are level stationary. The combined graph showing level – stationarity of the two variables are given in graph 1 below. The graph is an informal presentation of the stationarity condition of the series which depicts that the series moments are constant.

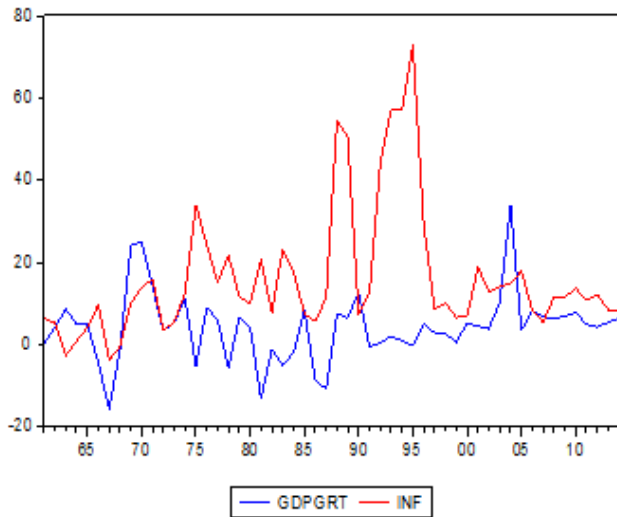


Fig. 1. A Graph Depictim Stationarity of GDP Growth Rate and Iflation in Nigeria (1961-2014).

The formal test of stationarity was performed and the results presented as.

TABLE I. UNIT ROOT TEST RESULTS

VARIABLE	ADF	PPT
	H <sub>0</sub> : The series has a unit root	H <sub>0</sub> : The series has a unit root
	CONSTANT	CONSTANT
GDPGRT	-5.241 (0.000)	-5.213 (0.000)
INF	-3.386 (0.016)	-3.214 (0.025)
$\Delta$ GDPGRT	-7.969 (0.000)	-30.989 (0.000)
$\Delta$ INF	-7.483 (0.00)	-13.713 (0.000)

<sup>a</sup> The probability values are given in parenthesis. Only constant was included since the variables appeared not have trend. All the null hypotheses of a unit root are being rejected at all levels.

From the table 1, it can be seen that given the ADF statistic of -5.241, PP statistic of -5.213 with the p-values of 0.000 and 0.000 respectively, it can be concluded that the GDP growth rate is stationary at level indicating that it is an I(0) variable. Similarly, for stationarity test on inflation rate, the ADF and PPT statistics are -3.386 and -3.214 with p-values of 0.016 and 0.025 respectively indicating that inflation rate is also stationary at level since the null hypothesis of a unit root is being rejected at the 5% level of significance. Both the ADF and PP tests imply rejection of the null hypothesis of a unit root. The null hypothesis being that the series has a unit root against the alternative that the series is stationary. For inflation rate and GDP growth rate, the variables are both I(0). It is not disputable the fact that most macroeconomic variables are I(1) because series such as GDP and prices appear to be trended. However, the rate of growth and rate of inflation was used which were taking as a percentage thereby making the variables stationary at levels.

**B. Ordinary Least Squares (OLS) Result**

In an attempt to explore the impact of inflation on economic growth in Nigeria from 1961 to 2014, ordinary least squares method was adopted where the variable inflation rate was regressed on the variable GDP growth rate which is a proxy for economic growth. The result of the regression analysis is presented below.

$$GDPGRT_t = 4.657 - 0.029INF_t$$

(2.829)      (-0.407)

$$R^2 = 0.003 \quad DW = 1.392$$

This result shows a negative impact of inflation on the rate of economic growth in Nigeria. It means that if inflation increases by 1 percentage point, the rate of economic growth decreases by 2.9%. However, this value is not statistically significant at the 5% significance level. The result therefore reveals that inflation does not influence the rate of economic growth in Nigeria from 1961 to 2014 which is clear from the extremely low coefficient of determination of 0.003 explaining the fact that only 0.3% of the variation in economic growth is explained by the variation in inflation. This shows that 99.7% of the variation in economic growth is explained by numerous other factors outside this model. The Durbin-Watson statistic of 1.392 indicates that there is presence of first – order autocorrelation. This result is consistent with the findings of Faria and Carneiro [6] from the study of the relationship between economic growth and inflation in Brazil where a negative relationship was found between economic growth and inflation. It is equally consistent with the findings of Ahmed and Mortaza [1] who studied the relationship between inflation and economic growth in Bangladesh using annual series from 1980 to 2005 and found a long term negative relationship inflation and economic growth.

**C. Johansen Cointegration Result**

In order to ascertain the long run relationship between inflation and economic growth in Nigeria from 1961 to 2014, Johansen Cointegration test was applied and the result of the test has been presented in table 2 below.

TABLE II. COINTEGRATION TEST RESULT

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.384542	36.65618	15.49471	0.0000
At most 1 *	0.197110	11.41594	3.841466	0.0007
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.384542	25.24024	14.26460	0.0006
At most 1 *	0.197110	11.41594	3.841466	0.0007

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

The cointegration test results show both the trace test and the maximum Eigen value indicate 2 cointegrating equations. This means that there is a long run equilibrium relationship between inflation rate and the GDP growth rate in Nigeria. This implies that even if inflation rate appears to have insignificant impact on GDP growth rate, they still move together towards a long run equilibrium. Given that the variables are cointegrated, we proceed with the Error Correction Mechanism to determine the short run dynamics between inflation rate and GDP growth rate in Nigeria. This result is inconsistent with the result from a study by Kasidi and Mwanemela [13] in the study of the impact of inflation on economic growth in Tanzania where the series were not cointegrated thereby indicating no long run equilibrium relationship. It is also not in agreement with the result of Chimobi [4] who studied the relationship between inflation and economic growth in Nigeria from 1970 to 2005 and discovered that there was no cointegration relationship between the variables.

**D. Error Correction Mechanism**

The variables have been subjected to error correction test in an attempt to explain the short-run dynamics between them. The coefficient of the error correction term, ECT (-1) measures the speed of adjustment of the short-run to the long-run equilibrium. Therefore, the coefficient of the speed of adjustment has to be negative and statistically significant and its magnitude should not be greater than unity. The result of the estimated error correction mechanism is presented in the equation form as.

$$\Delta GDPGRT_t = 0.028 + 0.186\Delta INF_{t-1} + 0.066\Delta GDPGRT_{t-1} - 0.170ECT_{t-1}$$

(0.001)                      (2.122)                      (0.459)                      (-3.912)

As can be seen from the equation above, the result of the error correction indicates that the coefficient of the speed of adjustment (ECT) is -0.170 with t-statistic of -3.912. This coefficient implies that 17% of the error is being corrected every year. The coefficient is found to have the correct sign and statistically significant explaining the fact that GDP growth rate and inflation rate are converging in the long run. However, the coefficient of the error correction term is low thereby indicating low speed of adjustment towards equilibrium.

**E. Granger Causality Test**

Granger Causality test was conducted in order to determine the direction of causality between the GDP growth rate and inflation rate in Nigeria from 1961 to 2014.

TABLE III. PAIRWISE GRANGER CAUSALITY TEST

Sample: 1961 2014			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
INF does not Granger Cause GDPGRT	52	0.67367	0.5147
GDPGRT does not Granger Cause INF		1.13334	0.3306

As shown by the result in table 3, the null hypothesis that inflation rate does not Granger Cause GDP growth rate cannot be rejected at the 10% level of significance. Also, the null hypothesis that GDP growth rate does not Granger Cause inflation rate cannot be rejected at the 10% level of significance. This result is a clear indication that there is no either unidirectional or bidirectional causality between GDP growth rate and inflation rate in Nigeria from 1961 to 2014. This result is consistent with the result obtained by Umaru and Zubairu [19] in their investigation of the effect inflation on economic growth in Nigeria from 1970 to 2010. Their result did not find either unidirectional or bidirectional causality between inflation and GDP. However, this result is inconsistent with that of Chimobi [4] where a unidirectional causality was found running from inflation to economic growth indicating the fact that inflation leads to economic growth in Nigeria within the period of his study, 1970 – 2005.

**CONCLUSION AND RECOMMENDATIONS**

The relationship between economic growth and inflation rate has for long attracted the attention of teaming researchers. Some scholars have the views that inflation has a negative impact on economic growth, others view inflation as having a positive impact on economic growth while others believe that there is no relationship at all between these two macroeconomic variables. As cited in many places in this work, all these views have been backed by empirical investigations in different countries for different sample periods. The result of this empirical study is consistent with the views that inflation has a negative impact on economic growth even though the magnitude of the impact is actually infinitesimal since for a 1 percentage increase in inflation rate, economic growth decreases by only 0.029%. The result also revealed a long run relationship between inflation and economic growth and that the coefficient of the error correction term appeared to be have a correct sign and statistically significant. There is also no either unidirectional or bidirectional causality between inflation and economic growth in Nigeria from 1961 to 2014.

The researcher recommends that the government takes both fiscal and monetary policies aimed at controlling inflation in Nigeria since inflation has a negative impact on economic growth and they are negatively correlated. Hence, if left uncontrolled, inflation in Nigeria will bring about a devastating effect on the economic growth of the country. Though the variables move together in the long run, the speed of adjustment towards the long run equilibrium is very slow as only 17% of the errors are corrected each year.

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