INFLATION AND ECONOMIC GROWTH IN NIGERIA: AN APPLICATION OF THE GRANGER CAUSALITY TEST (1986-2013)

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Abstract

The study was undertaken to empirically examine the theoretical relationship between inflation and economic growth in Nigeria using Granger Causality Test complimented by other econometric tests. The results of the ADF violated the stochastic assumptions of the OLS and the Johansen cointegration test confirmed the existence of a long run relationship between inflation and economic growth. The result of the ECM shows the coefficient of one and two year lagged value of CPI to be positively related to GDP in Nigeria. The granger causality test shows case of bi-directional causality between the CPI and GDP in Nigeria. Recommendations include: Inflationary control measures in Nigeria should take note of the fact that inflation is a serious motivator of growth rate of GDP in Nigeria but the sustained growth rate of the Nigerian economy without developing is not acceptable.

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1.1 Introduction

Inflation is described as the persistent increase in the general price level of goods and services. Inflation has remained a very important economic cum political concept since it was discovered by the classical economists. According to Jhingan (2006), the classical economists regarded inflation "*as a destroying disease born out of lack of monetary control whose results undermine the rules of business, creating havoc in markets and financial ruin of even the prudent*".

The above assertion by the classical economists simply points out the negative effect of inflation on an economy. This effect is undesirable to both the public and policy makers. From the point of view of the public, inflation causes uncertainty about future prices. This affects decisions on expenditure, savings and investment, and causes misallocation of resources which sometimes affects the growth process of such economy. Inflation also allows substantial redistribution of income and wealth from savers to borrowers (Lantz and Sarte, 2001).

To the policy makers, inflation is capable of rendering uncertainties which sometimes distorts the pattern of saving and investment (Fakiyesi, 1996). The analysis of Fakiyesi (1996) is contested by other economists who see only the positive effects of inflation on growth and development process of an economy. Ahmed and Mortaza (2005) for example argues that increases in the general price level signals productive sectors to increase productivity, thereby, leading to employment of more workers, pushing the level of unemployment to a lower level. Their argument gives credence to the popular A.W. Philips curve which postulates an inverse relationship between inflation and unemployment.

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Recent indices from the Central Bank of Nigeria (CBN) indicates an increase in the price level of more than one-digit in Nigeria and over 7% growth rate of the GDP with increasingly high rate of unemployment. Considering some of the general distortions within the Nigerian economy manifesting in the form of high unemployment rate, high poverty level, poor budget implementation, poor income redistribution and internal and external debt in the midst of sustained growth rate of the GDP and high inflation rate, one wonders what causes what in Nigeria.

Despite the precise theoretical relationship between these two variables, there exist two strands of thought on it. This generates a significant debate both theoretically and empirically. A series of studies found no conclusive empirical evidence for either a positive or a negative relationship between inflation and economic growth notably among these studies are Bhatia (1960) and Johnson (1967).

The second strand of the literature found a negative correlation between inflation and economic growth. Among these studies are Fischer, (1993); De Grigorio, (1993); Barro, (1997); Bruno and Easterly, (1995); Malla, (1997); and Faria and Carnerio, (2001) while the third strand of the literature found a positive relationship between inflation and economic growth. Despite the plethora of studies on both developed and developing countries, the theoretical literature on inflation and economic growth is plenty but the empirical works on causality is less the gap that this research is set out to fill.

The broad objective of this study is to empirically examine the relationship between inflation and economic growth in Nigeria between 1986 and 2013. The specific objectives of the research are to: examine the relationship between inflation and economic growth in Nigeria and

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to examine the direction of causation between inflation and economic growth in Nigeria. The scope is between 1986 and 2013. The choice of 1986 is to enable the researchers cover the structural adjustment programme (SAP) which was essentially introduced as a developmental policy. During the period, Naira was devaluated and was seen to have worsened inflationary pressure in Nigeria soon after SAP's introduction.

2.1 The Concept of Inflation

The debate on the concept of inflation has attracted the attention of several scholars and authors. Some of the scholars see inflation as a monetary phenomenon while others see it as both monetary and non-monetary phenomenon. Thus the debate has continued unabated with no universal consensus about the concept. Friedman as cited from Jhingan (2006) says *"inflation is always and everywhere a monetary phenomenon and can be produced only by a mere rapid increase in the quantity of money than output"*. His view is supported by that of Hamilton (2001) who describes inflation as an economic situation when increase in money supply is faster than the new production of goods and services in the same economy.

However, some economists disagree with money supply alone being the cause of inflation. Hicks (1970) for example points out that "our present troubles are not of monetary character". Melberg (1992) supports the position of Hicks who defines inflation *"as a general and persistent increase in the prices of goods and services in an economy without a corresponding increase in good supply"*. Most economist therefore define inflation in terms of continued rise in prices caused by varying factors not necessarily money supply.

Inflation is a rise in the general level of prices of goods and services in an economy over a long period of time (Barro, 1997). To Tsembe (2008), inflation is the persistent increase in the

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general price level without a corresponding increase in output. Inflation is a general and continuous increase in prices of goods and services is the view expressed by Onwioduokit (1996).

The general consensus here is that inflation occurs when the general price level rises such that each unit of currency buys fewer goods and services. Consequently, inflation also reflects erosion in the purchasing power of money. Most economists generally seem to agree that in the long run, inflation has potential of hurting the growth and progress of an economy. This fear is expressed by Abah (2009) when she says that *"inflation has the potential of derailing the economy from the path of sustainable growth and development"*. It is indeed a central issue in the contemporary economy hence the need to examine its determinants.

Other economic concepts related to inflation include deflation which is a fall in the general level of price; disinflation – a decrease in the rate of inflation; stagflation – a combination of inflation, economic growth and low employment and reflation – an attempt to raise the general price level to contract deflationary pressures (Barro, 1997).

Since there are many possible measures of the price level, there are many possible measures of price inflation. Most frequently used terms refer to a rise in a broad price index representing the overall price level for goods and services in the economy. The consumer price index (CPI), the personal consumption expenditure price index (PCEPI) and the gross Domestic Product (GDP) deflator are some of the broad price indices. The CPI is used in this study due to annual data on it published by the CBN.

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2.2 The Concepts of Economic Growth and Economic Development.

Quite often, the concepts of economic growth and economic development are used interchangeably as if they mean the same thing. That is, they are used synonymously (Jhingan, 2006). However, economic growth according to Todaro (2000) refers to an increase in a country's national output of goods and services or increase in the volume of output of goods and services within a specific period.

According to Schumpeter as cited from Jhingan (2006), growth is a gradual and steady change in the long run which comes about by gradual increase in the rate of savings and population, while economic development is seen as a discontinuous and spontaneous change in the stationary state which forever alters and displaces the equilibrium state previously existing.

To Jhingan (2006), economic growth is related to quantitative sustained increase in the countries per capital output or income accompanied by expansion in its labor force, consumption capital and volume of trade, while economic development is a wider concept than economic growth. It relates to qualitative change in economic wants, goods, incentives, institutions, productivity and knowledge. It is the upward movement of the entire system. This implies that an economy can grow but cannot develop because poverty, unemployment and inequalities may continue to persist. Thus, while economic growth is the increase in the total output of an economy over a certain period of time, economic development means growth plus change. Despite these apparent differences, some economists used these terms interchangeably.

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2.3 Empirical Literature

Barro (1997) explores the inflation-economic growth relationship using a large sample covering more than 100 countries from 1960 to 1990. His empirical analysis suggests that the estimated relationship between inflation and economic growth is negative.

Shitundu and Luvanda (2000) use least trimmed squares (LTS) method which detects regression outliers and produces robust regression, to examine the impact of inflation on economic growth in Tanzania. The empirical results obtained suggest that inflation has been harmful to economic growth in Tanzania.

Faria and Carneiro (2001) investigated the relationship between inflation and economic growth in the context of Brazil which had been experiencing persistent high inflation until recently. Analyzing a bi-variate time series model (Vector Autoregressions) with annual data for the period between 1980 and 1995, they found a negative relationship between inflation and economic growth in the long-run.

Ahmed and Mortaza (2005) empirically explores the relationship between inflation and economic growth in Bangladesh using annual data set on real GDP and CPI for the period of 1980 to 2005, and the co-integration and error correction model. The empirical evidence demonstrates that there exists a statistically significant long-run negative relationship between CPI and real GDP.

Saaed (2007) studies the relationship between inflation and economic growth in the context of Kuwait, using annual data set on real GDP and CPI the period of 1985 to 2005 using econometrics regression model of the OLS. The estimated result of the relationship shows a long run and strong inverse relationship between CPI and real GDP in Kuwait.

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From the foregoing, it is evident that most of the researches conducted in this area are foreign hence we cannot assume that what is happening to other countries is also applicable to Nigeria; the gap this work is intends to fill.

3.1 Methodology

The study area is Nigeria while time series data on all the variables in the model which covered 1986-2013 is sourced directly from the CBN and NBS. The study employed an OLS regression model supported by other econometric tests like the Augmented Dicker Fuller (ADF) unit root test, Johansen Cointegration test, vector Error correction mechanism and Granger Causality test to examine both the short run and long-run relationship between inflation and economic growth in Nigeria.

3.2 Model Specification

The primary model showing the relationship between inflation and GDP is specified explicitly thus: $GDP = b_o + b_1CPI + b_2MS + b_3INTR + b_4 INVT + U$

Where: b_o = Intercept; b_1-b_4 = Coefficients to be estimated; CPI = consumer price index; MS = broad money supply; INTR = Interest rate; INVT=investment rate as % of GDP and U = Stochastic error term. All the variables were used in their log form. On a priori expectation, it is expected that the CPI, MS and INVT would be positively related to the GDP.

4.1 Data Presentation and Analysis

Table 4.1 ADF Unit Root Test

Variables	ADF values at 5%	Mackinnon value 5%	Order of integration
DGDP	-3.404958	-2.986225	1(0)

DCPI	-2.474963	-2.986225	1(0)
DMS	-1.323421	-2.986225	1(0)
DINTR	-1.7761229	-2.991878	1(1)
DINVT	-0.042755	-2.986225	1(0)

Source: Computed by the Authors, 2014 (Eviews 7.0)

The result of Table 4.1 above shows that all the variables except INTR are stationary at this level. It means that INTR variable violates the stochastic assumptions of the OLS. This forms the basis for VECM which is a superior and dynamic model as compare to a static OLS model.

Table 4.2 Johansen Cointegration Test (Trace Test)

Variable	Eigen value	Trace statistics	5% critical value	No of CE Hypotheses	Prob value
GDP	0.969369	159.3248	69.81889	None *	0.0000
CPI	0.781876	79.15235	47.85613	At most 1*	0.0000
MS	0.654128	44.13040	29.79707	At most 2 *	0.0006
INTR	0.571443	19.71162	15.49471	At most 3*	0.00109
INVT	0.009646	0.222996	3.841466	At most 4 *	0.6368

Trace test indicate 4 co integrating equations at the 5% level.
 *   *Denotes rejection of the hypothesis at the 5% level*
 **   *Mackinnon- Haug- Michelis (1999) P. values.*
Source: Computed by the Authors, 2014 (Eviews7.0)

Table 4.2 above shows that the trace statistic as compared with the critical values at 5% level of significance, the hypothesis of no cointegrating or the existence of at most one cointegrating vector is rejected. The result shows four cointegrating equations (vectors).

Table 4.3 Johansen Cointegration Test (Max-Eigen)

Variable	Eigen value	Trace statistics	5%critical value	No of CE Hypotheses	Prob value
GDP	0.969369	80.17240	33.87687	None *	0.0000
CPI	0.781876	35.02195	27.58434	At most 1*	0.0046
MS	0.654128	24.41878	21.13162	At most 2 *	0.0166
INTR	0.0571443	19.48863	14.26460	At most 3*	0.0068
INVT	0.009649	0.222996	3.841466	At most 4 *	0.6368

Trace test indicate 4 co integrating equations at the 5% level.
* *Denotes rejection of the hypothesis at the 5% level*
** *Mackinnon- Haug- Michelis (1999) P. values.*
Source: Computed by the Authors, 2014 (Eviews 7.0)

The result of table 4.3 shows that Maximum Eigen test as compared to the critical value at 5% level of significance shows that there are 4 cointegrating equations and the value is at par with the trace test.

Table 4.5 Vector Error Correction Test

Variable	Coefficient	Std. Error	t-statistic
CPI (-1)	0.110595	0.11856	0.93280
CPI (-2)	0.050928	0.09782	0.52065
MS (-1)	0.254628	0.51852	0.49107
MS (-2)	0.0531401	0.36759	0.14458
INTR (-1)	113.7283	74.7907	1.52062
INTR (-2)	52.15907	122.747	0.42493
INVT (-1)	0.153370	0.35486	0.43220
INVT (-2)	0.025496	0.41756	0.06106
ECM	-9.677670	6.32252	-1.53067
R Squared 78	Adj. R Squared 77		

The extent to which any previous disequilibrium in the model is adjusted for in the current year is captured by the coefficient of the error correction. The coefficient of the ECM in this model carries the correct sign with the speed of adjustment of 96%. This means that the model has high adjustment potentials to endogenous policy variables.

The R^2 and adjusted R^2 are very high, 78% and 77% respectively. The model is no doubt a good fit with 22% left for the stochastic elements of factors affecting the GDP but was not explicitly captured in the model. The vector error correction estimates does not indicate the

Durbin-Watson statistic but N-K and K-1 degrees of freedom (28-5) and (5-1) = 23 and 4, the Durbin-Watson shows positive autocorrelation and is within the range of 1.79. This can be rounded up to 2 implying there is no serial correlation in the model.

The result of the ECM in table 4.5 shows that the coefficient of the one and two-year lagged value of CPI is positively related to GDP in Nigeria. This shows that the CPI is currently influencing the growth rate of GDP in the country and will continue to do so in the long-run. This is consistent with a priori theoretical expectation and empirical data available about CPI and GDP growth rate in recent years.

All the other independent variables of MS, INTR and INVT are positively related to GDP in both the short and long run. The positive relationship between INTR and GDP does contradict our a priori expectation. There is no economic justification for the result but we are not expected to manipulate the result to obtain "correct" estimates.

4.6 Pairwise Granger Causality

Null hypothesis	Obs	F. statistic	Prob
CPI does not granger cause GDP	26	1.52801	0.0325
GDP does not granger cause CPI	26	2.63881	0.0270
INTR does not granger cause GDP	26	4.50962	0.0250
GDP does not granger cause INTR	26	0.67561	0.5207

Source: Computed by the Authors, 2014 (Eviews7.0)

The result of table 4.6 above shows that there is a case of bi-directional causality between the CPI and GDP in Nigeria. That is CPI causes positive changes in the growth rate of GDP and GDP as well causes changes in the CPI and the result is significant at 5% level. This result is consistent with a prior expectation of a direct or positive relationship between inflation and Gross Domestic Product growth rate. It can be concluded that the CPI has contributed to the sustained growth rate of GDP in Nigeria within this few years.

There is however a unidirectional causality running from INTR and MS to GDP in Nigeria and is significant at 10% level of significance. There is no causation running from INVT to GDP in Nigeria during the period under study.

5.1 Conclusion and Recommendations

From the empirical analysis through various econometric tests carried out by the researchers, it is concluded that inflation in Nigeria has very significant positive effect on the growth rate of GDP. Based on empirical finding of this work and reviewed literature, the following recommendations are made:

(a)   Inflationary control measures should take note of the fact that inflation is a serious motivator of growth rate of GDP in Nigeria.

(b)   The sustained growth rate of the Nigerian economy without meaningful development is not acceptable.

(c) Too low inflation in the economy will affect GDP growth rate negatively and, hence, retard economic growth.

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