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Inflation and Economic Growth in Nigeria: Empirical Evidence?

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Abstract
The main purpose of this study is to examine the relationship between Inflation and economic growth in Nigeria. The scope of the study spanned from 1970 to 2012. The methodology employed in this study is the Augmented Dickey-Fuller techniques to examine the unit root property of the series after which cointegration test was conducted through the application of Johansen cointegration technique to examine the long-run relationship between the two phenomenon also Granger causality test was conducted to determine causation between economic growth and inflation. The result of the test showed that there is a nonlinear relationship between economic growth and inflation and coefficient of inflation is negatively signed and statistically insignificant both in the current period and lag three and this result seems to suggest that inflation is averse to growth. Further effort was made to check the causality relationship that exists between the two variables by employing Granger causality test and the result show that there is no causation between economic growth and inflation. Various studies as reviewed in the literature came out with the result that high inflation is not favourable to economic growth. Ability to manage the growth of inflation to single digit as proposed in the literature may be an important factor to accelerate economic growth.
Key words: Economic Growth, Inflation, Nigeria.

1. Introduction

Economic Growth in neoclassical theory is brought about by increases in the quantity of productive resources (that show up in an increase in the gross domestic product) GDP, and in the efficiency of their allocation and utilization. Every country's monetary policy is geared towards maintaining a stable price of its goods and services to sure up GDP to maintain sustainable development (Ajide and Lawanson, 2012). In reality growth process does not follow a definite pattern. Taxation, surpluses of public enterprises and borrowing are non-inflationary methods of resources mobilization and are ideal methods for achieving economic growth with stability (Dewett and Navalur, 2010). However, most developing countries because of political pressure to develop fast; adopt ambitious plans of economic growth that often leads to inflationary resource mobilization. The danger is that these developing countries like Nigeria are also more susceptible to supply shocks volatility causing high variability in inflation and disturbing the consumption, investment and production behavior (Inyiama, 2013;).

It may be argued that so much work has been done in this area of study but it is equally true that most of what is found in the literature is studies carried out in foreign -Latin American and Asian Countries. We have cited in this study the research done by Omoke (1970-2005) and Umaru and Zubairu (1970-2010) and few others are not enough because they are not as inclusive as the period under consideration. Besides, our methodology in this study is slightly different as we employ Johansen error correction model and causality test. In essence, the issue of inflation and economic growth cannot be said to have been settled empirically, at least in Nigeria, and this is why this paper is relevant and will add value to the literature on inflation economic growth nexus.

2. Conceptual Framework

Inflation can mean either an increase in the money supply or an increase in price levels. Generally, when we hear about inflation, we are talking about a rise in prices compared to some benchmark. If the money supply has been increased, this will usually manifest itself in higher price levels - it is simply a matter of time.

Inflation by whatever name it goes means the general increase in price level whether, (demand pull) which occurs when aggregate demand is in excess of available supply or (supply push or cost-push inflation) that occurs in the event of a sudden decrease in aggregate supply, owing to an increase in the price/cost of the commodity/production where there are no suitable alternatives (Thomas, 2006). The debate on inflation-growth nexus has remained perennial and has attracted substantial theoretical and empirical efforts. For instance, while

the structuralists argue that inflation is crucial for economic growth, the monetarists posit that inflation is harmful to economic growth (Doguwa, 2013).

The literature that found positive relationship between inflation and economic growth posit that there is a forced saving mechanism of inflation. Rising prices due to inflation lower real wages and tend to increase the profits when wages lag behind. It acts as a disguised taxation as income is transferred from those who propensity to save is lower to those who propensity to save is higher (Mankiw, 2010). People are forced to save and government is able to raise resources for development easily. Secondly, it is argued that growth process is hampered by rigidities and immobility's in developing nations. Rise in prices compel workers to move from the traditional subsistence sector to the expanding industrial sector and by so doing resources tend to optimally allocated and fully utilized for economic growth (Dewett, 2010). Advocates of inflationary finance contend that a moderate degree of inflation is logical for efficient economic mobilization.

Conversely, a number of economists also believe that inflation creates distortions in economic decisions concerning saving and investment when the tax system is not fully indexed to inflation. High level of inflation disrupts the smooth functioning of a market economy (Ahmed and Mortaza 2005). Again, as noted in Omoke 2010, at the individual level, inflation exerts a heavy toll on those with fixed income; inflation relatively favours debtors at the expense of creditors at the firm level; the effect of inflation is called the 'menu cost' Yap (1996), because it affects output when firms have to incur costs as they adjust to the new price level.

The third strand of the literature found a negative correlation between inflation and economic growth (Bawa and Abdullahi, 2012; Omotosho and Doguwa, 2013). In the study by Ayyoub, Chaudhry and Farooq(2011), she found a negative and significant inflation growth relationship is found to exist in the economy of Pakistan. The results of the study show that prevailing inflation is harmful to the GDP growth of the economy after a certain threshold level. Salian and Gopakumar (2010) that there is a long-run negative relationship between inflation and GDP growth rate in India. Among these studies are Bhatia, Johansen (1967) Malla (1997); Faria and Carneiro (2001). Commenting on the inconclusive nature of the relationship between inflation and economic growth, Friedman (1973) noted that some countries have experienced inflation with and without development and vice versa.

A series of studies found no conclusive empirical evidence for either a positive or a negative association between inflation and economic growth, notable among these studies are Wai (1959) argues that there is no relationship between inflation and economic growth noting that growth has been possible without inflation in some countries while in others; there have been inflation without growth. Similarly, Johanson (1967) posits that there is no convincing evidence of any clear association, positive or negative, between the rate of inflation and the rate of economic growth. "The relationship between inflation and economic output (GDP) therefore plays out like a very delicate dance". It is clear that the relationship between inflation and economic growth is far from being settled empirically.

The main thrust of this paper is to empirically examine the relationship between inflation and economic growth in Nigeria, 1970-2012. The long run relationship of the variables is evaluated using Johansen Co- integration analysis. We also applied the granger causalty test to examine the causality between economic growth and inflation.

Theoretical Framework.

Several theories have been put forward by economists from time to time to explain the phenomenon called inflation. Inflation theorist can be grouped under into three or more broad labels, but we want to identify in this article the monetarists view and the Keynesian view.

The Monetarists View

The monetarist, following from the Quantity Theory of Money (QTM), believes that all things being equal, changes in general price level are to be explained with reference to changes in the quantity of money in circulation so that an increase in the quantity of money leads to a rise in the price level, while a contraction will lead to a fall in the general price level (Dewett, K.K and Navalur, M.H, 2010). At an extreme case version of the theory, a change in the quantity of money produces an exactly direct and proportionate change in the price level. The QTM was formulated by Irving Fisher,s famous equation of exchange : MV=PQ, where M stands for the stock of money; V for the velocity of circulation of money; Q is the volume of transaction which take place within a given period; while P stands for the general price level in the economy.

Modern quantity theories led by Friedman hold that "inflation is always and everywhere a monetary phenomenon that arises from more rapid expansion in the quantity of money than total output." He argues that

changes in the quantity of money will work through to cause changes in nominal income. Inflation everywhere is based on an increased demand for goods and services as people try to spend their cash balances (Jhingan, 2007). The monetarist emphasize that any change in the quantity of money affects only he price level or the monetary side of the economy, with the real sector of the economy totally insulated.

The Keynesian View

The Keynesian theory is based on a short run analysis in which prices are assumed to be fixed. In fact, prices are determined by non-monetary forces. On the other hand, output is assumed to be more variable which is determined largely by changes in investment spending. The Keynesian opposed the monetarists' view of direct and proportional relationship between the quantity of money and prices. Keynes was able to integrate monetary theory and the theory of output and employment through the rate of interest. In other words, the Keynesian saw a link between the real and the monetary sectors of the economy and economic phenomenon that describes the equilibrium in the goods and money market (IS-LM). The Keynesian chain of causation between changes in nominal money income and in prices is an indirect one through the rate of interest rate. When the quantity of money increases, it leads to a fall in the interest rate that would, in turn, increase investment and this will raise aggregate demand and increase in output (Dornbusch, R et al (1996); Mankiw, (2010).

Structured Theories of Inflation

These groups try to explain inflations in terms of structural maladjustment and rigidities as the principal cause of inflation in developing countries, example Argentina, Brazil and Chile. Several explanations are put forward by these economists such as Mark-up Theory, the Bottleneck Theory and the Demand composition Theory. Of these three we intend to high light the demand-composition theory.

This theory argues that it is neither cost-push nor demand-pull theories can adequately explain inflation. It is of the view that prices and wages does not react to decrease in demand but quickly responds to increase in demand. Schultze, the main proponent of the theory, thinks that it is a rapid shift in the composition of demand which lead to general price rise, even if there were no increase in the overall aggregate demand or general increase in the level of wages. Therefore, it concludes that it is a change in the composition of the demand that is responsible for inflation and not either increase in aggregate demand or cost-push in wages.

Empirical Framework.

In the theoretical literature, Brazil has been cited as one of the developing countries whose development process supports the structuralist view of inflation. However, in analyzing the case of Brazil, Faria and Carneiro(2001) investigates the relationship between inflation and output in the context of an economy facing persistent high inflation. They found that inflation does not impact real output in the long run, but that in the short run there exists a negative effect from inflation on output. Their results support Sidrauski's (1967) super neutrality of money in the long run, but cast doubt on the short run implications of the model for separable utility functions in consumption and real money balances, as exposed by Fisher (1979).

A study by Omoke, (2010) employed cointegration and Granger causality test to examine the relationship between inflation and economic growth, using Consumer price index (CPI) as a proxy for Inflation and the GDP as a perfect proxy for economic growth. The scope of the study spanned from 1970 to 2005. The result of the test showed that for the periods, 1970-2005, there was no co-integrating relationship between Inflation and economic growth for Nigeria. Thus, he could not find any long-run relationship between Inflation and economic growth for Nigeria.

Also, Ahmed and Mortaza (2005) empirically explored 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 models. The empirical evidence demonstrates that there exists a statistically significant long-run negative relationship between inflation and economic growth for the country as indicated by a statistically significant long-run negative relationship between CPI and real GDP.

Contrarily, Mallik and Chowdhury (2001) examined the short-run and long-run dynamics of the relationship between inflation and economic growth for four South Asian economies: Bangladesh, India, Pakistan, and Sri Lanka. Applying co-integration and error correction models to the annual data retrieved from the International Monetary Fund (IMF) International Financial Statistics (IFS), they found two motivating results. First, the relationship between inflation and economic growth is positive and statistically significant for all four countries. Second, the sensitivity of growth to changes in inflation rates is smaller than that of inflation to changes in growth rates. These results have important policy implications, that is, although moderate inflation promotes economic growth, faster economic growth absorbs into inflation by overheating the economy. Therefore, these four countries are on the turning point of inflation-economic growth relationship.

In support of Mallik and Chowdhury, Umaru and Zubairu (2012) examined the impact of inflation on economic growth and development in Nigeria during the period 1970-2010, and found that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity and output level. He went further to posit that a good performance of an economy in terms of per capita growth may be attributed to the rate of inflation in the country.
Finally, Faria and Carneiro (2001) investigated the relationship between inflation and economic growth in the context of Brazil which has been experiencing persistent high inflation until recently. Analyzing a bivariate time series model (i.e., vector autoregression) with annual data for the period between 1980 and 1995, they found that although there was existence a negative relationship between inflation and economic growth in the short-run, inflation does not affect economic growth in the long-run. Their empirical results also support the superneutrality concept of money in the long run. This in turn provides empirical evidence against the view that inflation affects economic growth in the long run.

3. Methodology

Following the lead of Ahmed and Mortaza (2005) and Alfred (2007), the study employs two econometric models to achieve the empirical results. The first econometric model examines the short-run and long-run relationship between GDP and Inflation by applying the Johansen (1988) co-integration test and the associated Error Correction Model (ECM) and the second is the application of the Granger causality test to determine the direction of causality between the two variables.

3.1 Model Specification

Model 1

Following Romer (1990), inflation is considered as independent factor of production. The primary model showing the relationship between economic growth and Inflation, are specified in cobb-Douglas production function with constant returns to scale as:

$RGDP = \alpha INF^{B1} \varepsilon$ ---------- (1)

Where RGDP is defined as real gross domestic product (output), α is the total factor productivity, INF is the rate of inflation in Nigeria, B_1 is the constant elasticity coefficient of inflation. The logarithmic conversion of the equation above yields the structural form of the equation as:

$\log RGDP_t = \log\alpha + B_1 \log INF_t + \log\varepsilon$ ……..(2)

where logRGDP= log of Real Gross Domestic Product
$\log\alpha + B_0$ the intercept
logINF=log of Inflation
$\log\varepsilon$ = log of white noise error term
ε = white noise error term.
t = 't' is the time trend
Apriori Expectation: $B_0>0$, $B_1<0$

Model 2

The model of causality test is thus specified as follows:

$RGDP_t = a_0 + \Sigma a_{1t} RGDP_{t-1} + \Sigma a_2 INFt\text{-}1 + \varepsilon_{1t}$ .....(3)

$INF_t = \beta_0 + \Sigma \beta_{1t} RGDP_{t-1} + \Sigma \beta_{2t} INF_{t-1} + \varepsilon_{1t}$ …….(4)

Rejecting (accepting) H0; α21 = α22 = ---------- = α2m in equation (3 and 4) suggests that Growth do (do not) Granger cause Inflation. On the other hand, rejecting (accepting) H0; α11 = α12 = ---------- = β1m suggest that Inflation do (do not) Granger Cause (have an effect) on Growth. These tests enable us to reveal the relationship of no causality, unidirectional causality of feedback causality between Economic growth and Inflation.

4. Empirical Findings and Analysis.

The model was estimated using the co-integration and error correction method (ECM). The data for all the variables of the model were obtained from various issues of Central Bank of Nigeria (CBN) annual report and statistical Bulletin, 1970-2012. In order to test for the stationarity of the variables, augmented Dickey-Fuller (ADF) test was used to investigate if the variables had a unit root or not.
The ADF results in table 1, show that the variables are non-stationary in their levels. However, with first difference, the variables became stationary and there values became greater than 5% critical values. With these results, all the variables are expressed at their stationary level.

We tested for the presence or otherwise of cointegration between the series of the same order of integration through forming a cointegration equation. The basic idea behind cointegration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant. This is often referred as a long-run equilibrium relationship, as the difference between them is stationary. A lack of cointegration suggests that such variables have no long-run relationship: in principal they can wander arbitrarily far away from each other (Johansen and Juselius 1990).

Table 1.1: Unit root test result at ordinary and 1st difference.

Variables	ADF statistics	5% critical value	ADF statistics	5% critical value
LN(RGDP)	-3.393310	-2.9339	-5.858317	-2.9358
LN(INF)	-4.437474	-2.9339	-7.261402	-2.9358

Table 1.2: Johanson Cointegration Result.

Series: D(LOG(RGDP),2) D(LOG(INF),2)
Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.753759	102.3858	15.41	20.04	None **
0.705899	47.72941	3.76	6.65	At most 1 **

*(**) denotes rejection of the hypothesis at 5% (1%) significance level LR test indicates 2 cointegrating equations at 5% significance level.

Table 1.3: Parsimonious result

Dependent Variable: D(LOG(RGDP))
Method: Least Squares
Date: 12/19/14 Time: 17:09
Sample(adjusted): 1974 2012
Included observations: 39 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.032848	0.105914	-0.310137	0.7584
D(LOG(RGDP(-1)))	0.075432	0.199464	0.378174	0.7077
D(LOG(RGDP(-2)))	0.150754	0.169909	0.887260	0.3814
D(LOG(INF))	-0.019789	0.164881	-0.120019	0.9052
D(LOG(INF(-3)))	-0.401861	0.141572	-2.838569	0.0077
ECM(-1)	-0.626101	0.201047	-3.114206	0.0038

R-squared	0.448245	Mean dependent var	-0.000885
Adjusted R-squared	0.364646	S.D. dependent var	0.825554
S.E. of regression	0.658041	Akaike info criterion	2.141540
Sum squared resid	14.28960	Schwarz criterion	2.397472
Log likelihood	-35.76002	F-statistic	5.361841
Durbin-Watson stat	1.753489	Prob(F-statistic)	0.001026

Table 1.4: Pairwise Granger Causality Tests

Pairwise Granger Causality Tests
Date: 12/20/14 Time: 17:13
Sample: 1970 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
LOG(INF) does not Granger Cause LOG(RGDP)	41	0.53230	0.59181
LOG(RGDP) does not Granger Cause LOG(INF)		1.66327	0.20375

Pairwise Granger Causality Tests
Date: 12/20/14 Time: 17:14
Sample: 1970 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
LOG(RGDP) does not Granger Cause LOG(INF)	41	1.66327	0.20375
LOG(INF) does not Granger Cause LOG(RGDP)		0.53230	0.59181

From the result the in table 1.3, the coefficient of inflation is negatively signed both in the current period and in lag three, though statistically significant in lag three. This is in line with our apriori expectation. What this result seems to suggest is that inflation is averse to growth. However, that we find in the lag three that the probability column is 0.007 suggests that inflation at a certain level could be positive. In other words, there exists a non-linear relationship. The Error correction model is rightly signed- negative and statistically significant as the probability is lower than the critical level of significant (0.003< 0.05), and so adjustment of deviation of the explanatory variable back to normality is very high. The coefficient of determination and its adjusted coefficient are 44% and 36% respectively; this means that about 56% and 64% of variation in the real gross domestic product are accounted for by variables not contained here. The value of Durbin Watson is 1.8 for the model. This falls within the acceptable region indicating positive first order serial autocorrelation among the explanatory variables in the model. The F-statistics of 5.361841 is statistically significant at 5 per cent level, indicating that the explanatory variables are jointly significant. The Prob(F-statistic) of 0.001 < 0.05 at 5% level is significant which suggests that the model has a very good fit. The lagged error correction term ECM (t-1) included in the model to capture the long run dynamics between the co-integrating series are correctly signed (negative) and statistically significant at .003 < 0.05. The coefficient indicated adjustment of 62% for the model. These adjustments imply that errors are corrected within one year. The error correction model also reveals a long run relationship between explanatory and dependent variables in the model.

Granger Causality Test Analysis

The results of Granger causality are contained in table 1.4. The results revealed that there is no causation between economic growth and inflation in Nigeria. The F-statistics values are all less than 2 which indicate acceptance of the two hypotheses of no causation between the variables. The probability values also confirmed that, given their high values.

These findings have important policy implications. Even if we do not find any direction in Granger causality, the weak exogenous test indicates that high levels of inflation were harmful to economic growth in the period considered. Hence, our evidence corresponds to the monetarist position, and caution is needed since periods of higher inflation may produce negative inflation elasticities. So, the estimated results in the ECM imply that inflation affects economic growth negatively. This result is in line with the predictions Mubarik (2005) who finds negative association between inflation and economic growth. It is also contrary to Umaru and Zubairu (2012), and Chaudhry, S., Qamber, Y. and Farooq, F.(2012). Our empirical findings also demonstrate that there is significant relationship between the two variables in the long-run.

5. Conclusion

The objective of this study is to find out the existence of (if there is) a relationship between Inflation and economic growth in Nigeria. The methodology employed in this study is the Johansen-Juselius cointegration technique and Granger causality test. Our variables are the rate of Inflation and the GDP as a perfect proxy for economic growth to examine the relationship. The scope of the study spanned from 1970 to 2012. The test showed that for the periods, 1970-2012, there was a co-integrating relationship between Inflation and economic growth for Nigeria data.

Thus, we could find a long-run relationship between Inflation and economic growth for Nigeria. The relationship between inflation and growth is non-linear. The hypothesis of non-linearity actually suggests that the adverse effect of inflation on economic growth may not be universal; it appears only when inflation exceeds some turning-point or threshold level below which inflation has a positive or non-significant impact on economic growth. However, the threshold effect is not the subject of this paper.

Notwithstanding, the result equally show that inflation does not promote economic growth because as the coefficient of inflation is negative, it implies that any percentage increase in inflation will bring equal or more percentage decrease in economic growth. This result is related to the Granger causality test. What this result indicates is inflation has a negative impact on growth.

Recommendation

Policy makers throughout the world during the last decade or so have recognized that lowering inflation is conducive to improved growth performance. So, the goal that the government of Nigeria has to achieve is of keeping inflation to single digit, or close to single digit as it is highly impossible to have a zero inflation economy.

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