
James T. Ihum1, Nafiu Bashir Abdussalam2 and Fabian Stephen3
1Former Postgraduate Student, Department of Economics, LUBS, University of Leeds, UK
2Department of Economics, Faculty of Social and Management Sciences, Bayero University Kano, Nigeria
3Center for Energy, Petroleum and Mineral Law and Policy, School of Social Sciences, University of Dundee, UK

Abstract: - The study was conducted to evaluate the impact of inflation on economic growth in the context of an emerging market using empirical evidence from Nigeria. Using time series data spanning thirty years (1986-2016) which was obtained from the Central Bank of Nigeria (CBN) official website, the nature of the relationship existing between the focus variables- economic growth (proxied by real Gross Domestic Product, GDP) and inflation rate was explored. The Augmented Dickey Fuller (ADF) was used to test for the stationarity of the variables while the granger causality test was employed to ascertain the direction of influence between inflation and economic growth in Nigeria. The results showed no evidence of causal relationship between inflation and economic growth in Nigeria. Again, there is no leading variable in the relation between inflation and economic growth in Nigeria. The study therefore concludes that inflation does not stimulate economic growth and vice versa. It is thus recommended that since it may be difficult to control inflation, effectively manage real exchange rate and ensure stable growth at the same time, the CBN should set nominal interest rate such that the real interest rate will follow the pattern of growth in the economy. CBN should only worry if the rate of inflation is significant given the uncertainty of existence of causality between inflation rate and real GDP growth in this study. The CBN should also get involved and collaborate in foreign exchange in order to maintain a stable real exchange rate.

Keywords: Inflation, economic growth, money supply, exchange rate, granger causality.

I. INTRODUCTION

Inflation has remained a chronic problem for Nigeria economy for some time. Inflation is not a new word in the world economy and not out rightly bad, but the case of Nigeria is severe and it will destabilize the entire economic framework if it is not properly checked. This problem has brought about reduction of purchasing power, discouragement of real investment, balance of payment disequilibrium and unemployment. The Nigerian economy seemed to have experience moderate inflation prior to the advent of the Structural Adjustment Programme (SAP) in 1986. Inflation on its own is not bad as studies have shown that there exist a relationship between inflation and growth. But the problem lies on a country continuously having high inflation rates. It has been revealed that a close relationship exists between inflation and diminishing growth rate across a variety of inflation ranges. IMF (1995) reports a World Bank study which shows that rising inflation and diminishing growth are closely related. In the study of 127 countries covering 1960-1992, “average growth rate falls slightly as inflation rate across as inflation rates moves towards 20-25 percent. The growth rate declines more steeply as inflation rates approaches 25-30 percent and growth rates became increasingly negative at a higher rate of inflation (IMF, 1995).

Increased national output and low inflation are the most common objective of the macroeconomic policy makers in both developed and developing economics. In Nigeria, the formulation and implementation of monetary policy by the Central Bank of Nigeria (CBN) is aimed at maintaining price stability which is consistent with the achievement of sustainable economic growth. The monetary authority strives to achieve the government overall inflation objectives through effective monetary management, which entails selling intermediates and operating target in tandem with the assumed targets for GDP growth, inflation rate and balance of payments.

In Nigeria, various macro-economic policies notably, fiscal, monetary and exchange rate had from time to time been adopted to address this problem of inflation. Unfortunately, these measures have met with little or no success and this has hindered the achievement of other macro-economic objectives such as economic growth, increase in employment, satisfactory balance of payment and equitable income distribution. It is in this light that this study is devoted to examine the effect of inflation on economic growth in Nigeria and to suggest, on the basis of the findings, policy recommendation for effective control of inflation in Nigeria.

II. EMPIRICAL LITERATURE ON INFLATION-GROWTH NEXUS

The growth theory literature on inflation growth relationship in the 1950s emphasized the positive impact of inflation on the rate of economic growth (popularly known as the Tobin effect) while the costs of inflation detailed in Fischer and Modigliani (1978) suggested a negative association through
the new growth theory mechanisms. Other strands of related literature have also argued that the negative relationship between inflation and growth is not universal (i.e. it appears after certain inflation thresholds) and hence nonlinear. Paul et al. (1997) used annual data spanning the period 1960-1989 on 48 developing countries and relationship. They found mixed evidences as the relationship was negative in some countries and positive in others. Barro (1995) used data for 100 countries from 1990 to investigate the effects of inflation on economic performance by using instrumental variable estimation method. He found that a 10 percent point increase in average inflation per year yielded a reduction in growth rate of real per capital GDP of between 0.2 and 0.3 percent points. He further noted that the inclusion of high inflation expenses in the growth regressions yielded more statistically significant results and stated that the direction of causation runs from higher inflation to reduced growth. Malla (1997) used a small sample of eleven OECD countries in a pooled time series and cross-section fashion to examine the relationship between inflation and growth. He concluded that the negative effects of inflation on economic growth outweigh its positive effects.

Doguwa, (2013) studied inflation and economic growth in Nigeria using three approaches that provide the procedures for estimating the threshold level and inference. The result showed that the threshold level of inflation above which inflation hampers growth is between 10.5% and 12 % for Nigeria. His study also could not confirm the neutrality of money hypothesis. He thus concludes that inflation has a threshold above which money is not super neutral. Osuala, et al (2013) in a similar study applied Granger causality and found a statistical significance relationship between inflation and economic growth. However, they could not determine any leading variable in the relationship attributing the conclusion that the effect of inflation-growth nexus is contemporaneous.

Chude and Chude (2015) on the same study used time series covering 2000-2009 and applied OLS. They found an existence of relationship between inflation and economic growth in Nigeria. They also found a strong positive relationship between exchange rate and GDP while a negative relationship was found to exist between interest rate and GDP.

Umuru and Zubairu (2012) examined the impact of inflation on economic growth and development in Nigeria covering 1970-2010 and found that inflation posses a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity. Bruno and Easterly (1998) investigated possible relationship between inflation and economic growth using cross country data. They found that inflation has a negative effect on medium to long-term economic growth and showed that the relationship is influenced by counties with extreme values (either very high or very low inflation). They argued that inflation rates in excess of a critical value of 40 percent are inimical to growth and went ahead to investigating only cases of discrete high-inflation (40 percent and above) crises. This yielded very robust empirical result that growth falls sharply during high inflation episodes and recovers rapidly as inflation falls to moderate levels. Also Malik and Chowdhury (2001) empirically examined the relationship between inflation and GDP growth for four South Asian Countries (Bangladesh, India, Pakistan and Sri Lanka) using co-integration and error correction models. They found evidence of long run positive relationship between inflation and economic growth and concluded that the sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates. This study however puts the countries on a knife edge as they struggle to achieve non-inflationary growth. The challenge for them therefore, is to find a growth rate that is consistent with a stable inflation rate, rather than beat inflation first to take them to a path of faster economic growth. Motivated by the global inflation episode of 2007 and concern that high level of information could undermine growth, Espinoza et al (2010) employed the Smooth transition model to examine the rate at which inflation levels in excess of threshold impede economic growth. They used a panel of 165 countries and found an inflation threshold of 10 percent based on data for the period 1960-2007 and suggesting the need for a prompt policy response to inflation at or above the threshold.

Erbaikal and Okunya (2008) examine the relationship between the inflation and the economic in Turkey has been in the framework of data covering 1987: 1-2006:2 periods. The existence of the long term relationship between these two variables was examined using bound test development by Pesaron et al (2001), and the existence of a co-integration relationship between the two series was detected following the test result. Whereas no statistically significant long-term relationship was fund with the formed ERDL models, a negative and statistically significant short terms relationship has been found. No causality relationship was found from economic growth to inflation. However, the effect of inflation on economic growth in Nigeria remains in-exhaustive and non-critically examined, so if forms the gap to be filled in future researchers.

Clearly, available empirical findings are inconclusive and not unanimous as regards the relationship between inflation and GDP growth. While some economists/scholars have found that, no relationship exists between inflation and economic growth. Others have found either a positive or negative causality. However, the evidences are not convincing to show a clear association, positive or negative between the rate of inflation and the rate of economic growth.

III. METHODOLOGY

The study adopts the vector auto regression (VAR) model which is an econometric model used to capture the linear interdependencies among multiple time series. VAR models generalize the univariate auto regressive model (AR Model) by allowing more than one evolving variable. All variables in a VAR are treated symmetrically in a structural sense (although the estimated quantitative response coefficient will...
not in general be the same), each variable has an equation explaining its evolution based on its own lags and the lags of the other model variables. VAR modeling does not require as much knowledge about the forces influencing a variable as do structural models with simultaneous equations: The only prior knowledge required is a list of variables which can be hypothesized to affect each other inter-temporally.

The model is been specified as,

\[ Y_t = c + B_1 Y_{t-1} + B_2 Y \cdot t - 2 + \ldots \ldots + B_p Y_{t-p} + et \]

Applicably,

\[ GDP_t = C + B_1 \text{REALEXRt-1} + B_2 \text{INFRt-2} + B_3 \text{M2s} + et \]

Where,

GDP means Gross Domestic Product  
INF means Inflation rate  
CPI means Consumer Price Inflation

The method of maximum likelihood as, the name implies consist in estimating the unknown parameters is such a manner that the probability of observing the given Y’s is as high (or maximum) as possible. Therefore, we have to find the maximum of the function. This is a straightforward exercise in differential calculus.

This can be expressed in log terms as

\[
\ln LF = -n \ln \sigma - n \ln (2\pi) - \frac{1}{2} \sum (Y_i - \beta_1 x - \beta_2)^2
\]

IV. EMPIRICAL ANALYSIS AND DISCUSSION OF RESULTS

4.1 Test for Unit Root Using Augmented Dickey-Fuller Test

The data analyzed in this study consist of quarterly data of Nigeria’s real GDP, money supply, inflation rate and real exchange rate, ranging from 1986 quarter 3 to 2016 quarter 2 respectively. The study applied the ADF test setting the null hypothesis that series are non-stationary and have unit root. The alternative hypothesis is set that series are stationary. The ADF test results at levels shows that all time series variables used in the study are non-stationary. This is shown by the p-values which are all greater than 5% (see table 4.1 below).

In order to solve this problem, all series were first-differenced and the ADF applied. The results then revealed as shown in table 4.1 below that series were all stationary at first difference. The p-values were all 0.00 less than 0.05 hence the null hypotheses of unit root series is rejected.

### Table 4.1: Augmented Dick-Fuller Test for Unit Root

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF at Levels</th>
<th>ADF at 1st Diff</th>
<th>Order of integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lag order</td>
<td>p-value</td>
<td>p-value</td>
<td></td>
</tr>
<tr>
<td>Real growth rate</td>
<td>1</td>
<td>0.4528</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Source: Authors’ computation using stata

4.2 VAR and Granger Causality Wald Test

Accordingly, the study applied VAR at first differenced series since all series were non-stationary at levels. This is necessary so that spurious or nonsense regression will be avoided. After fitting a VAR, the study tested to confirm whether one variable “Granger-causes” another. A variable, say inflation, is said to Granger-cause another variable say real GDP growth, if given the past values of real GDP growth, past value of inflation are useful for predicting real GDP growth (see Granger, 1968).

Table 4.2 Granger causality test

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>chi2</th>
<th>df Prob &gt; chi2</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_rgdpt</td>
<td>d_infl</td>
<td>0.8491</td>
<td>2 0.442</td>
</tr>
<tr>
<td>d_rgdpt</td>
<td>d_exr</td>
<td>0.9105</td>
<td>2 0.956</td>
</tr>
<tr>
<td>d_rgdpt</td>
<td>d_m2</td>
<td>1.1092</td>
<td>2 0.574</td>
</tr>
<tr>
<td>d_rgdpt</td>
<td>ALL</td>
<td>1.8066</td>
<td>6 0.358</td>
</tr>
<tr>
<td>d_infl</td>
<td>d_rgdpt</td>
<td>0.21958</td>
<td>2 0.696</td>
</tr>
<tr>
<td>d_infl</td>
<td>d_exr</td>
<td>0.94157</td>
<td>2 0.979</td>
</tr>
<tr>
<td>d_infl</td>
<td>d_m2</td>
<td>0.9120</td>
<td>2 0.640</td>
</tr>
<tr>
<td>d_infl</td>
<td>ALL</td>
<td>2.0528</td>
<td>6 0.910</td>
</tr>
<tr>
<td>d_exr</td>
<td>d_rgdpt</td>
<td>5.2003</td>
<td>2 0.074</td>
</tr>
<tr>
<td>d_exr</td>
<td>d_infl</td>
<td>3.8903</td>
<td>2 0.143</td>
</tr>
<tr>
<td>d_exr</td>
<td>d_m2</td>
<td>0.2251</td>
<td>2 0.654</td>
</tr>
<tr>
<td>d_exr</td>
<td>ALL</td>
<td>11.650</td>
<td>6 0.068</td>
</tr>
<tr>
<td>d_m2</td>
<td>d_rgdpt</td>
<td>0.5457</td>
<td>2 0.761</td>
</tr>
<tr>
<td>d_m2</td>
<td>d_infl</td>
<td>1.3064</td>
<td>2 0.500</td>
</tr>
<tr>
<td>d_m2</td>
<td>d_exr</td>
<td>0.9065</td>
<td>2 0.552</td>
</tr>
<tr>
<td>d_m2</td>
<td>ALL</td>
<td>1.5422</td>
<td>6 0.907</td>
</tr>
</tbody>
</table>

Source: Authors’ computation from stata 14

Ho: No Causal Relationship Exist  
H1: Causal Relationship Exist

Looking at table 4.2 above, it shows that there no evidence of causality moving either from inflation to real GDP or from real GDP to inflation. In order words, inflation does not Granger causes real GDP and also real GDP does not Granger cause inflation. Again, the result shows no evidence that money supply granger-cause real GDP and vice versa. The same as is said of real exchange rate and real GDP. Both real exchange rate and money supply does not granger cause real GDP and vice versa. Based on the sample evidence and the
results shown in table 4.2 above, the null hypothesis of no causality moving from inflation to real GDP is failed to be rejected (we cannot reject the null hypothesis). The conclusion is that inflation does not cause or induce real GDP growth. Moving from real GDP to inflation, the conclusion is also the similar as no evidence of causality exists. The same conclusion is made regarding causality relationship between money supply and real GDP and between real exchange rate and real GDP. The null hypothesis is failed to be rejected in each of the remaining equations.

Figure 4.1 Impulse response when inflation is the response variable

Figure 4.2 Impulse Response when real GDP is the response variable

Figure 4.3: Impulse response when real exchange rate is the response variable

Source: Authors’ computation using stata

Analyzing figure 4.2 shows that an orthogonalized shock in exchange rate will trigger a response in real GDP that fluctuates from positive to negative in the short run. The response becomes transitory in the medium and long runs. The response of real GDP to an orthogonal shock in inflation rate is also positively and negatively fluctuating in the short run. Meanwhile a shock in money supply will produce negative response from real GDP in the short run. However, the negative response dies out towards the medium and long runs.
Analysis of figure 4.3 above reveals that an orthogonal shock in inflation will initially generate a negative response from real exchange rate. This negative response quickly dies out to zero in the medium and long run. The response of real exchange rate to an orthogonal shock in money supply is also negative in the short run and transitory in both the medium and long run. Lastly, a unit shock in real GDP will produce a steep negative response from real exchange rate that moves towards zero and falls back slightly in the second period. The movement of the response dies out to zero in the long run.

From figure 4.4, an orthogonal shock in real GDP will cause money supply to fall sharply in the short run. In the medium and long run, any shock in real GDP will produce no response from money supply. Meanwhile, a unit shock in real exchange rate seems to generate a response from money supply that fluctuates between negative and positive in the short run. This response dies out in the medium and long run. A unit shock in inflation cases money supply to slightly rise initially but quickly falls continuously and stabilizes at zero.

V. CONCLUSION AND POLICY IMPLICATION OF THE RESULT

The study in general is more concerned about the impact of inflation in the economy at large. As it is contained macroeconomic theory, the main macro economic variables that should be kept at optimal level are price level and money supply (credit level) adjusted by interest rate in the sense any little change in them might escalate the whole economy affecting all other sectors of the economy. The study however, provides an important policy implication to Nigeria macro-economic policy makers and the country’s Central bank. Though inflation targeting is the current fashion among monetary policy makers, a developing country like Nigeria should not only aim to combat inflation but also target real exchange rate for a stable and accelerated growth. The economy should be diversified to cut down the current over dependence on crude oil export and heavy import of food and finished products. It may be difficult to control inflation, effectively manage real exchange rate and ensure stable growth at the same time. In this regard, the CBN should set nominal interest rate such that the real interest rate will follow the pattern of growth in the economy. They also should get involved and collaborate in foreign exchange in order to maintain a stable real exchange rate. Meanwhile CBN should only worry if the rate of inflation significant given the uncertainty of existence of causality between inflation rate and real GDP growth in this study.

REFERENCES


