Responsiveness of Economic Growth to Inflation Rate in a Developing Economy Using Nigeria as Case Study 1970-2012

Femi-Oladunni Opeyemi Afolabi*

Department of Agricultural Extension and Management, Federal College of Agriculture Akure, Ondo State, Nigeria

Abstract

This study examined the responsiveness of economic growth to inflation rate in Nigeria from 1970-2012. The study used secondary data obtained from Central Bank of Nigeria (CBN) statistical bulletin 2012, the data were analyzed using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), findings shows that INF (Inflation rate), EXR (Exchange rate), INT (Interest rate) variables were stationary while GRM (Growth rate of money supply), GRGDP (Gross rate of Gross Domestic Product), FDGDP (Ratio of Fiscal deficit to Gross Domestic Product) variables were not stationary. The Johansen-Juselius co-integration technique was employed in this study in accessing the co-integrating properties of the variables. The impacts of each of the endogenous variables are investigated using the Vector Error Correction Model (VECM). The study revealed that INF (-0.1672), GRM (-0.3363) and EXR (-0.0177) have negative coefficient respectively, findings also revealed that; the coefficient of other variables FDGDP (0.0185), GRGDP (0.07657) and INT (0.068681) shows a positive relationship (respectively). The study concluded that on the long-run, interest rate is the fastest variable through which inflation and output growth react in Nigeria. It was recommended that, the monetary authority needs to target the interest rate in other to reduce inflation growth and positively impact output growth in the economy.

1. Introduction

The question on whether or not inflation is harmful to economic growth has always been a subject of intense debate to policy makers and macro economists. Several studies have estimated a negative relationship between inflation and economic growth. Specifically the bone of contention is that whether inflation is necessary for economic growth or it is detrimental to growth.

The problem of inflation surely is not a new phenomenon, It has been a major problem in the country over the years.

Inflation can be defined as a persistence rise in the general price level of broad spectrum (Lipsey, 1995) of goods and services in a country over a long period of time (Lipsey and Chrystal, 1995). According to Umaru and Zubairu, (2012) the concept of Inflation has been intrinsically linked to money, as captured by the often heard maxim "inflation is too much money chasing too few goods". Inflation is a household word in many market oriented economics. Although several people, producers, consumers, professionals, non-professionals, trade unionists, workers and the likes, talks frequently about inflation particularly if the malady has assumed a chronic character, yet after an

* Corresponding author

E-mail address: afoladunni@gmail.com, afemioladunni@gmail.com

appreciable economic performance in the early 1970s, the Nigeria economy witnessed some anxious moment in the late 1970s to mid-1980s. Severe pressures built up in the economy mainly because of the expansionary fiscal policy of the federal government during these years. This was accompanied by rapid growth in domestic money supply, exacerbated by the monetization of the earnings from oil and high monetary expansion as the huge government deficit was financed largely by the Central Bank of Nigeria. This was exacerbated by the transfer of government sector deposits to the banks and the resultant increase in their free reserves with adverse consequences on the general price level. The inflationary pressure was further aggravated by high demand for imports of both intermediate inputs and consumer goods due to over valuation of the naira which made imports relatively cheaper than locally manufactured goods. In this case, the impediments to development may be referred to as cost. Economics theory, however, postulates that for the profit to be maximized, cost should be minimized. One of the main cost is inflation, which has turned into a canker worm eating deep into the nation's path of economic progress.

There is almost a universal consensus that macroeconomic stability, specifically defined as low inflation, is positively related to economic growth. Over the years the question of the existence and nature of the link between inflation and growth has been the subject of considerable interest and debate (Erbaykal and Okuyan, 2008). While the structuralists argue that inflation is crucial for economic growth, the monetarists posit that inflation is harmful to economic growth (Doguwa, 2013). Although the debate about the precise relationship between these two variables is still open, the continuing research on this issue has uncovered some important results. In particular, it is generally accepted that inflation has a negative effect on medium and long-term growth (Bruno and Easterly, 1998. Inflation impedes efficient resource allocation by obscuring the signaling role of relative price changes, the most important guide to efficient economic decision-making (Fischer, 1993). Kumapayi, et al. (2012) reveals that over the last few decades, high inflation in Nigeria has caused yield on investment to decline while government policy objectives has been adversely affected as the real size of its budget shrinks with rising inflation which has hampered economic growth.

However, Ajide, K. B. and Lawanson, O. (2012) focused on the effect of inflation on growth in developed countries while little attention has been paid to developing countries. It is therefore imperative to conduct a research into the effect of inflation on economic growth in developing countries with special focus on Nigeria, which is the main thrust of this study.

The objective of this study is;

To examine the responsiveness of economic growth to inflation rate in a developing country.

Despite various policies that had been formulated and implemented, no meaningful progress has been made in the combat of inflation. Therefore, this study examines not only the responsiveness of economic growth to inflation rate in Nigeria, it also investigate its effect on other macroeconomic variables. The effect of inflation on economic growth shall be investigated empirically with the data spanning from 1970 to 2012. The choice of the period of reference is significant because inflation constituted a matter of serious policy consideration. The period witnessed a steady and positive growth in the money supply. This period encompasses the major landmarks in our national economy.

2. Methodology

2.1. Model Specification

This work adapts the model followed by Maku and Adelowokan (2013), it is specified below;

$$INF_t = \beta_0 + \beta_1 INF_{t-1} + \beta_2 GRM_t + \beta_3 FDGDP_t + \beta_4 GRGDP_t + \beta_5 EXR_t + \beta_6 INT_t + U_t \qquad (1)$$

Where: INF = Inflation rate, GRM = Growth rate of money supply, FDGDP = Ratio of fiscal deficit to Gross Domestic Product, GRGDP = Growth rate of Gross Domestic Product, EXR = Exchange rate, INT = Interest rate, β_0 = Intercept or constant, β_{1-6} = Parameters of explanatory variables, U = Error term.

The model is the autoregressive model that defines the responsiveness of economic growth to inflation rate in Nigeria.

2.2. Estimation Technique

To estimate the model, the first step involved testing for stationarity properties and then test for the order of integration using the Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981), and the Phillip-Perron (PP) due to Phillips and Perron (1988). It is generally known that time series data are prone to spurious result, a way out of this however is to test for the level of significance of each data used by the study. Furthermore, the Johansen co-integration test was used to test for long-run relationship. Finally, vector error correction model was used to tie the long-run relationship between the variables to deviations that may occur in short run. The VECM also helped to have better understanding of the nature of any

non-stationary property among the different component series and can also improve longer term forecasting over an unconstrained model.

The unit root test is conducted using the Augmented Dickey Fuller and Phillips-Perron, the result obtained from the test is as presented in the table below.

2.3. Unit Root Test

Table 1. Augmented Dickey Fuller for Unit Root Test.

Critical values 1%, 5% and 10% are -4.1923, -3.527 and -3.1913 respectively.

Variables	At levels	1st Difference	2nd Difference	Order of Integration
INF	-3.9362	-6.6554*	-6.4797	1(1)
EXR	-1.7350	-5.0810*	-7.1883	1(1)
GRM	-6.5723*	-7.2545	-5.9366	1(0)
GRGDP	-6.3211*	-10.9556	-6.4460	1(0)
FDGDP	-4.3293*	-6.0921	-7.1956	1(0)
INT	-2.7166	-6.9086*	-10.6262	1(1)

Source: Author's computation from E-views 7
Key: INF-Inflation rate, EXR- Exchange rate, GRM- Growth rate of money supply, GRGDP- Gross rate of gross domestic product, FDGDP- Ratio to fiscal deficit of Gross Domestic Product, INT- Interest rate.
*Significant at 1%, **Significant at 5%

From the table above, there exists the presence of unit root test in all variables with the exception of GRM, GRGDP and FDGDP.

Table 2. Philips-Perron for Unit Root Test.

Critical values 1%, 5% and 10% are -4.1923, -3.527 and -3.1913 respectively

Variables	At levels	1st Difference	2nd Difference	Order of Integration
INF	-3.7454*	-10.7732	-25.2691	1(0)
EXR	-1.9831	-5.0750*	-22.8985	1(1)
GRM	-12.7630*	-22.6730	-36.7082	1(0)
GRGDP	-6.3211*	-40.4159	-60.9261	1(0)
FDGDP	-4.1076	-14.7533*	-25.1279	1(0)
INT	-2.7254	-9.3715**	-11.8974	1(1)

Source: Author's computation from E-views 7 (2015)
Key: INF-Inflation rate, EXR- Exchange rate, GRM- Growth rate of money supply, GRGDP- Gross rate of gross domestic product, FDGDP- Ratio to fiscal deficit of Gross Domestic Product, INT- Interest rate.
*Significant at 1%, **Significant at 5%

The above results show that the result gotten from ADF is similar to that of PP with the exception of series INF. Which is a confirmation of the fact that once ADF confirms a result hardly will PP negates such result.

2.4. Co-integration Test

The essence of co-integration is to test for the existence of the long-run relationship among the variables used in a research work. The major aim of this test is to find out if a linear combination of the integrated variable becomes stationary over the long-run, if it is, then it means co-integration exists among variables. The Johansen co-integration test commenced with the test for number of co-integrating relations or rank using Johansen's maximum Eigen value and the trace test.

2.5. Johansen Co-integration Test

Table 3. Johansen Co-integration Table.

Sample (adjusted): 1973 2012				
Included observations: 40 after adjustments				
Trend assumption: Linear deterministic trend				
Series: INF GRM FDGDP GRGDP EXR INT				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.586456	94.33057	95.75366	0.0624
At most 1	0.523115	59.01094	69.81889	0.2670
At most 2	0.328423	29.39178	47.85613	0.7494
At most 3	0.194418	13.46670	29.79707	0.8691
At most 4	0.110774	4.819100	15.49471	0.8277
At most 5	0.003069	0.122936	3.841466	0.7259

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.586456	35.31963	40.07757	0.1560
At most 1	0.523115	29.61916	33.87687	0.1483
At most 2	0.328423	15.92508	27.58434	0.6722
At most 3	0.194418	8.647598	21.13162	0.8598
At most 4	0.110774	4.696164	14.26460	0.7796
At most 5	0.003069	0.122936	3.841466	0.7259

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Note: Trace test indicates no cointegration at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level. While Maximum Eigenvalue test also indicates no cointegration at the 0.05 level and denotes rejection of the hypothesis at the 0.05 level. The implication of this result stated above is that there exists a long run relationship among the variables.

2.6. Vector Error Correction Model (VECM)

Table 4. Vector error correction estimate table.

Independent Variables	Dependent variable					
Error Correction	DINF	DGRM	DFDGDP	DGRGDP	DEXR	DINT
Coint Eq 1	-0.167219	-0.336308	0.108566	0.076579	-0.017731	0.068681
	(0.08724)	(0.14427)	(0.19253)	(0.15574)	(0.00982)	(0.02004)
	[-1.91679]	[-2.33106]	[0.563891]	[0.49172]	[-1.80613]	[3.42700]
R-squared	0.632279	0.802505	0.497823	0.67100	0.967458	0.778128
S.E. equation	0.297554	0.492085	0.656677	0.531188	0.033485	0.068356

Source: Author's computations from E-views 7 (2015)
Key: INF-Inflation rate, EXR- Exchange rate, GRM- Growth rate of money supply, GRGDP- Gross rate of gross domestic product, FDGDP- Ratio to fiscal deficit of Gross Domestic Product, INT- Interest rate.

3. Results

The table above shows the results of the VECM estimates. Each column shows the equation for each endogenous variable in the model. It is shown that 16%, 33% and 1.7% of derivation of INF (inflation rate), GRM (growth rate of money supply) and EXR (exchange rate) respectively have negative coefficient. This means that 16%, 33% and 1.7% respectively can be corrected for in a year and it will take approximately 6 years for the shock to be fully dissipated.

For other variables (FDGDP, GRGDP and INT), their coefficient shows a positive relationship which means there is an absence of convergence to equilibrium path in both co-integrating equations which indicates that the adjustment process takes a longer time On the long-run, interest rate is the fastest variable through which inflation and output growth react. Furthermore, the monetary authority needs to target interest rate in other to reduce inflation growth and positively impact output growth in the economy.

R-squared show that the model explains a significant portion of the variability in the series whereby exchange rate has the highest R-square of 0.98 unit and other variables have the R-square of 0.80 (GRM), 0.78 (INT), 0.67 (GRGDP), 0.63 (INF), 0.50 (FDGDP) respectively. Altogether, the standard error equations are high.

4. Discussion

The estimated result for the multiple parameters regression specified to recapture the impact of inflation on output growth in Nigeria between 1970 and 2012 revealed that 16%, 33% and 1.7% of derivation of INF (inflation rate), GRM (growth rate of money supply) and EXR (exchange rate) respectively have negative coefficient, this means that from its implied rule and long-run path, the derivations of the variables can be corrected for within a year and it will take approximately 6 years or more depending on favourable government policy for the shock to be fully dissipated. Other variables (FDGDP, GRGDP and INT), have a positively related coefficient which means there is an absence of convergence to equilibrium path in both co-integrating equations and this indicated that the adjustment process takes a longer time.

5. Conclusion and Recommendations

Based on the findings, the study concludes that GRM (growth rate of money supply) and EXR (exchange rate) have a long-run relationship with inflation; this may imply that they can be corrected for within a year and it will take approximately 6 years or more depending on favourable government policy for the shock to fully dissipate. While fiscal deficit to gross domestic product (FDGDP), growth rate of gross domestic (GRGDP) and interest rate (INT), have a positively related coefficient which means there is an absence of convergence process takes a longer time. From the earlier stated objective, the study concludes that output growth has a short-run relationship with inflation. The study further recommended that;

The monetary authority needs to target high interest rate (i.e reduce interest rates which will impact productivity) in other to reduce inflation growth and positively impact output growth in the economy.

Policy makers should increase the level of output in Nigeria by improving productivity/supply in order to reduce the prices of goods and services so as to boost the growth of the economy.

Policy formulation and implementation adopted by the government should be consistent because inconsistence policy making have tendencies of destabilizing general price level

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