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RESEARCH ARTICLE

INVESTIGATING THE IMPACT OF INFLATION ON OUTPUT GROWTH IN THE NIGERIA ECONOMY (1970-2012)

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ABSTRACT

This study examined the trend of inflation in Nigeria and the impact of inflation on output growth and inflation trend in Nigeria from 1970-2012. Findings revealed that inflation rate, interest rate, exchange rate, gross domestic product and money supply were on the high in 1995, 1993, 2010, 2008, 2010 respectively, while it recorded a low in 1971, 1977, 1981, 1972, 1970 respectively. 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 revealed that INF (Inflation rate), EXR (Exchange rate), INT (Interest rate) variables were stationary while GRM (Growth rate of money supply), GRGDP (Growth rate of Gross Domestic Product), FDGDP (Ratio to fiscal deficits of Gross rate of 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 impact of each of the endogenous variables is 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, GRGDP and INT shows a positive relationship (0.0185, 0.07657, 0.068681 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.

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INTRODUCTION

Achieving price stability in Nigeria has remained one of the key objectives of monetary policy since the 1970s. In spite of this target by monetary authorities, a persistent increase in prices has constituted a major macroeconomic challenge. From a single digit level in 1960s, the inflation rate increased to 16% in 1971 only to jump to an all-high level of 33.9% in 1975. The 1975 high level of inflation has been attributed to oil boom of the early 1970s and the increase in salaries and wages of both government and private workers. Even though several control measures put in place to control inflation in the late 1970s yielded good results with lower inflation recorded during the period, high inflation levels were nevertheless recorded in 1984, 1988 and 1989 when inflation stood at 39.6%, 38.3% and 40.9% respectively. Inflation was curtailed effectively in the late 1990s when the country recorded single digit of 8.5% and 6.6% in 1997 and 1999 respectively. Inflation entered the two digit range between 2001 and 2004 when 18.9%, 13.2%, 14% and 15% were recorded in 2001, 2002, 2003 and 2004 respectively. It is in the light of bringing inflation back to single digit level that the present study becomes highly relevant. Inflation became more worrisome to

both monetary authorities and other policy makers in the early 1990s when it increased from 13% in 1991 to 44.5% in 1992 and to an unprecedented level to 72.8% in 1995. It suffices to also note that from 1992 to 1999, Nigeria's real gross domestic product (real GDP) grew at an average of about 2.6%, which is far short of propelling the economy into sustainable growth and development. However, during the democratic era (1999-2007), inflation rate increased from 6.6% in 1999 to a peak of 17.9% in 2005 and later declined by 53.1% to 8.4% in 2006 and further eased to its historical low (since 1986 SAP era) of 5.4% in 2007. The emergence of global financial crisis (2008-2011) further increased inflation rate by over 100% and it averaged 11.8% during the crisis era. 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 objectives of this study are;

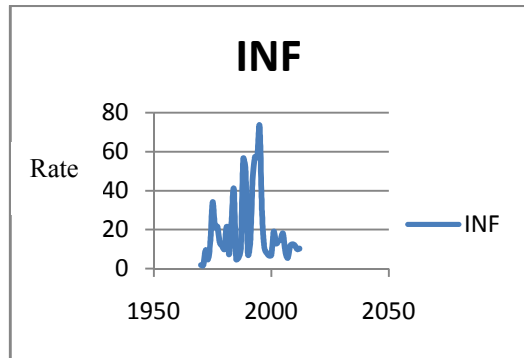
1. To examine the trend of inflation in Nigeria
2. To investigate the effect of inflation on other macroeconomic variables.

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

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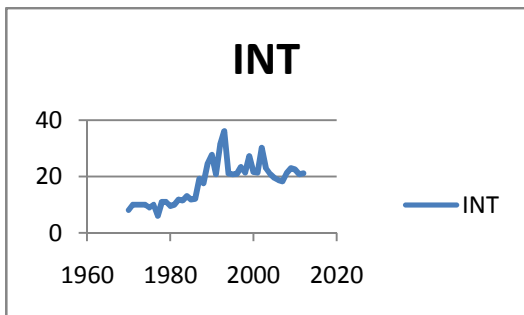
the responsiveness of economic growth to inflation rate in Nigeria, it also investigate its effect on other macroeconomic variables. The effect of inflation on economic growth shall be investigated empirically with the data spanning from 1970 to 2012. The choice of the period of reference is significant 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.



Source: CBN Statistical Bulletin(2014)

Fig. 1. Trends of Inflation Rate in Nigeria (1970-2012)

The figure above shows that Nigeria as a nation has been battling with the challenge of price stability from 1970-2012. The fluctuations of inflation rates over time has affected Nigeria growth rate. The highest inflation recorded in Nigeria so far is 1995 which was known for excessive spending not matched with increased productivity.

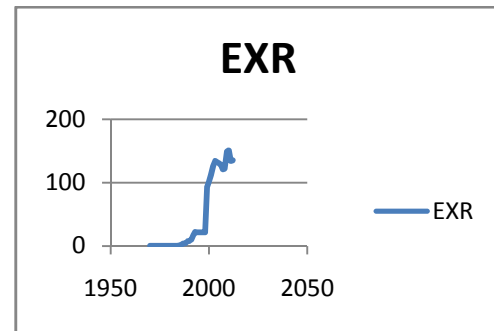


Source: CBN Statistical Bulletin (2014)

Fig. 2. Trends of Interest Rate in Nigeria (1970-2012)

The figure 1.2 shows Nigeria interest rate from 1970-2012. Interest rate in Nigeria has fluctuated over time. In the 1970's Nigeria experienced low interest rate which brought about financial repression because ceiling on interest rate was very low relative to inflation. The resulting low interest rates discouraged savings mobilization and channeling of mobilized savings through the financial system. This negative impact made the financial sector reforms begin the deregulation of interest rate in August 1987 on the quality of investment. Immediately, deposit rates were once again set at 12%-15% per annum while a ceiling of 21% per annum was fixed for lending rate. By the end of 1994, the weighted average lending and deposit rates were 21% and 13.5% respectively. The cap for interest rate was retained with minor modification to allow for flexibility. The cap was maintained until it was lifted in 1996. This made possible a flexible interest rate regime in which

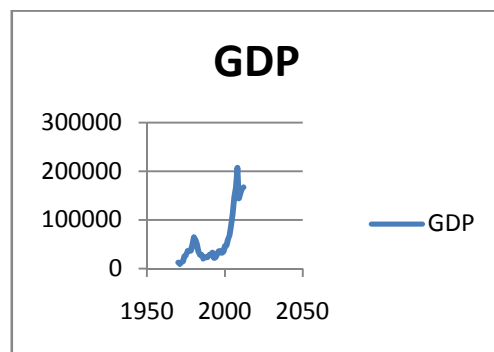
bank lending and deposits rates were largely determined by the forces of supply of funds.



Source: CBN Statistical Bulletin(2014)

Fig. 3. Trends in Exchange rate in Nigeria (1970-2012)

The figure above shows how Nigeria exchange rate increased gradually from 1970-2012. This indicates that the nation's currency value depreciates from time. Although the exchange rate showed signs of stability from 1994-1998 and rose drastically in year 2000 then later experienced a drop in 2008 which means that naira devalued and export of the country became cheaper and import became more expensive. From year 2008 the exchange rate experience gradual increase.



Source: CBN Statistical Bulletin(2014)

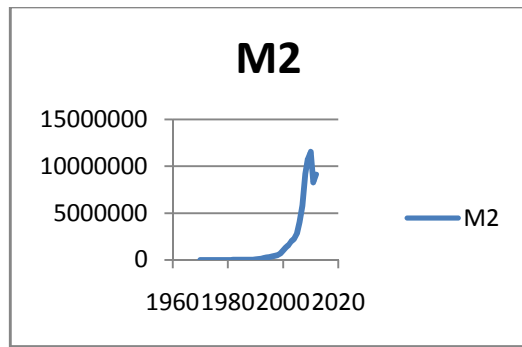
Fig. 4. Trends of GDP in Nigeria (1970-2012)

The figure above show how GDP rose gradually from 1970 to 2012 which was the result of an unexpected increase in public expenditures caused by oil revenues thereafter brought vast expansion in aggregate demand and other contributors such as banking and telecommunication. According to Bamidele and Joseph (2014), M2 is the appropriate definitions of money in Nigeria. In the UK, narrow money includes M0, M1, M2. Mo includes only notes and coins in circulation and in bank bills, M1 includes notes and coins in circulation and sight deposits with banks, M2 includes not only notes, coin and current accounts but also 7-days bank deposits and some building society deposits. In the Nigerian context, broad Money (M2) is defined as M1 plus quasi money. Quasi-money as used here is defined as the sum of savings and time deposits with commercial banks.

It is symbolically shown as;

$$M2 = C + D + T + S$$

Where; M2 = Broad Money, T = Time deposit, S = Savings deposits, C = Currency Outside banks, D = Demand Deposits



Source: CBN Statistical Bulletin(2014)

Fig. 5. Trends of money supply in Nigeria (1970-2012)

The Figure above shows how money supply in Nigeria maintained a steady movement from 1970-1990 and increased gradually from 1990-2009 before experiencing a sharp decline. This occurred due to the increase in inflationary pressure, which is as a result of the monetization of oil earnings.

MATERIALS AND METHODS

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

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

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 impact of inflation on economic growth in Nigeria.

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.

Unit Root Test: 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.

Table 1. Augmented Dickey Fuller for Unit Root Test

Variables	At levels	1 st Difference	2 nd 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)

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

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

Variables	At levels	1 st Difference	2 nd 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)

Critical values 1%, 5% and 10% are -4.1923, -3.527 and -3.1913 respectively 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 os series INF. Which is a confirmation of the fact that once ADF confirms a result hardly will PP negates such result.

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.

Johansen Co-integration Test

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

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.

Table 3. Vector error correction estimate table

Independent Variables	Dependent variable					
Error Correction	DINF	DGRM	DFDGD	DGRGDP	DEXR	DINT
CointEq1	-0.167219 (0.08724) [-1.91679]	-0.336308 (0.14427) [-2.33106]	0.108566 (0.19253) [0.563891]	0.076579 (0.15574) [0.49172]	-0.017731 (0.00982) [-1.80613]	0.068681 (0.02004) [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)

Vector Error Correction Model (VECM)

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 order 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.

RESULTS AND 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.

Conclusion

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 means 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.

Recommendations

Based on the outcome of the study, the following recommendation proffered includes:

1. The monetary authority needs to target high interest rate (i.e reduce interest rates which will impact productivity) in order to reduce inflation growth and positively impact output growth in the economy.
2. 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.
3. Policy formulation and implementation adopted by the government should be consistent because inconsistency policy making have tendencies of destabilizing general price level

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