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The Impacts of Inflation on Economic Growth: Empirical Evidence from Nigeria

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Abstract The study examined the impact of inflation on Economic growth in Nigeria between 1980 and 2009. Error Correction Model was employed to test for the impacts of inflation on Economic growth in Nigeria. The data for the variables were sourced from CBN statistical Bulletin. The result of the test established a significant long run positive relationship between inflation and economic growth in Nigeria. Based on the above result, the paper now make following recommendations. The monetary authority should encourage moderate level of inflation in other to stimulate economic growth in Nigeria.

Keywords Inflation, Economic Growth, Error Correction Model

1. Introduction

One of the objectives of monetary authority is to ensure stable price in an economy in other to attain sustainable economic growth. To achieve this objective, the Central bank Act of 1958 gave Central Bank of Nigeria as the monetary authority, the responsibility to formulate and implement monetary policy to enhance economic growth and price stability. To achieve these objectives, the monetary authority is working towards strengthening the purchasing power of our currency in order boost the economic activities by ensuring the cost of production is relatively stable, as any increase in rate of inflation will lead to persistence increase in general price level. For this objective to be achieved, monetary authority has to put in place policies that will stimulate the growth of output in the economy of lower inflation.

According to Friedman (1968), the function of monetary authority which is to regulate the volume as well as the direction of money supply was recommended in order to contain the negative effects of too much money in circulation on general price level. In line with this, monetary authority in Nigeria has been implementing various policies such as tight and loose monetary policies which are geared towards influencing economic growth and ensure price stability.

Over the years, monetary authority in Nigeria has been working very hard recorded sustainable economic growth using monetary instrument to achieve this. However, the attended economic growth in Nigeria still leaves much to be desired. Also in the literature, there are divergent views on the impact of inflation on the economic growth in Nigeria. Some researchers [1-5] had the opinion that output is affected negatively by the rate of inflation. However, some other researchers [6-8] submitted that, inflation has a positive link with economic growth.

Based on this contradiction in the opinions of researchers on the nature of an impact on economic growth, this posed an empirical question that does inflation promote or retard economic growth? Consequently, this paper attempts to answer the above question by empirically analyzing the impact of inflation on the economic growth in Nigeria. This creates more avenues to critically appraise of the impact of inflation on economic growth by the inclusion of interest rate variable which is usually omitted in all previous studies carried out.

2. Literature Review

In Nigeria, Adesoye (2012) [9] examined the nexus between price, money and output in Nigeria using con-integration – causality test between the periods of 1970 and 2009, using inflationary gap model. The results revealed that inflation is caused by the amount of money supply in Nigeria. In their own part it was considered the effectiveness of monetary-fiscal policies interaction on price and output growth in Nigeria between 1970 and 2010, using impulse response and variable decomposition for their analysis. The result suggested that the policy

variable such as money supply and government revenue have more positive impact on price and economic growth, specifically on the long-run in Nigeria [6].

It was investigated that the nexus between money supply and output from 1960 t0 1995. The results indicated that unexpected growth in money supply brought about positive effect on output. In the vein, Omoke and Ugwuanyi (2012) examined the causal relationship between money, price and output in Nigeria from 1970 to 2005, using cointegration and granger causality test analysis. The results revealed that increase in money supply leads to an increase in both output and inflation and vice versa in Nigeria [3].

Awe and Olalere (2012) investigated the relationship between budget deficit and inflation in Nigeria between 1980 and 2009, using vector error correction model. The study shown that budget deficit fuels inflation through increase in amount of money in circulation, thereby impacted negatively on real output in Nigeria. Suleman et al (2009), examined money supply, government expenditure, output and price in Pakistan. Their result indicated that government expenditure and inflation are indirectly related to economic growth in the long-run but directly to economic growth in the short run [4].

Rogers and Wang (1995) study the relationship between output, inflation, exchange rate, government expenditure and money supply in Mexico, applying VAR model. The results shown that, most changes that occur in Mexican's output was accounted for by shocks from output [10]. Olubusoye and Oyaromade (2008) [7] analyzing the source of fluctuations in the Nigeria economy using error correction mechanism. Their results indicated that the lagged value of Consumer Price Index (CPI) among other variables brought about changes in the inflationary process in the Nigeria economy.

Demand pull inflation or excess demand is the traditional and most common types of inflation. It occurs when aggregate demand is rising while the available supply of goods is becoming less. As a result of this, price begin to rise in response to a situation often described as too much money chasing too few goods.

The monetarist emphasizes the role of money supply as the principal cause of demand-pull inflation. They contend that inflation is always a monetarist phenomenon. The explanation to this is found in the quantity theory of money. The monetarists use the formula identity of Fisher's equation of exchange.

$MV = PQ$ . . . . . (1)

Where M is the money supply, V is the velocity of money, P is the price level and Q is the level of real output.

Assuming V and Q are constant, the price level (P) varies proportionally with the supply of money. With flexible wage, the economy was believed to operate at full employment level. Naturally, when the money supply increases, it creates more demand for goods but supply of goods cannot be increased due to the full utilization of resources. This leads to a rise in price level.

$MV = PQ$ . . . . . (2)

$MV = P * GDP$ . . . . . (3)

Where GDP is Gross domestic product

$$\partial M/_M + \partial V/_V = \partial P/_P + \partial GDP/_{GDP} \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (4)$$

Where $\partial M/_M$ change in money supply is, $\partial V/_V$ is change in the velocity of money, $\partial P/_P$ is change in price level and $\partial GDP/_{GDP}$ is a change in output.

Since $\partial V/_V$ is zero,

$$\partial M/_M = \partial P/_P + \partial GDP/_{GDP} \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (5)$$

$$\partial GDP/_{GDP} = f\left[\partial P/_P, \partial M/_M\right] \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (6)$$

Equation 6 states that growth in output is a function of growth in money supply and general price level.

3. Methodology

Most researchers have adopted single equation model to analyze the impact of inflation on economic growth. This paper mirrors the work of Emmanuel et al (2008) [11] with little modification. The model specification considers the Gross Domestic Product Growth Rate (GDPGR) as dependent variable, while rate of inflation (INF), Exchange Rate (EXR), Money Supply Growth Rate (GRMS) and Interest Rate (INT) as independent variables.

The ARDL model is specified thus;

GRGDP = f (INF, EXR, GRMS, INT) . . . . . (7)

Explicitly,

$$\Delta GRGDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta GRGDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta INF_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta EXR_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta GRMS_{t-i} + i=0 na5 \Delta INTt-i + \beta 1 GRGDPt-i + \beta 2 INFt-i + \beta 3 EXRt-i + \beta 4 GRMSt-i + \beta 5 INTt-i + \varepsilon t$$

Where α_0 and β_0 are the constant value represent the intercept for both short and long run while, α_1-α_5 and β_1 – β_5 are parameter coefficients of INF, EXR, GRMS and INT. μ_i is the error term.

The ECM aims at determining the short run dynamics relationship that exists between the variables before long run relationship is established. The specification of the model in a general form of ECM is stated below;

$\Delta GRGDP_L = \alpha_0 + \alpha_1 \Delta INF_{t-1} + \alpha_2 \Delta EXR_{t-1} + \alpha_3 \Delta GRMS_{t-1} + \alpha_4 \Delta INT_{t-1} + ECM_{t-1} + \varepsilon_t$ ..... (8)

Where L is the lag operator

ECM_{t-1} is the Error correction term lagged by one period.

The study collected annual data on Gross Domestic Product growth rate, Rate of Inflation (INF), Money supply growth rate (GRMS), Exchange rate (EXR) as well as Interest rate (INT) from Statistical Bulletin and Annual Report and statement of account published by Central Bank of Nigeria (CBN) from 1980 to 2013.

In analyzing the impact of inflation on economic growth in Nigeria, a Multi-stage VAR Model, involving unit root test, co-integration as well as Wald Bound test to test for the presence of co-integration in ARDL is employed in this study, to determine the impact of inflation on economic growth in Nigeria.

4. Presentation and Analysis of Result

Table 4.1: ADF Unit Root Test

	At levels			1ST Difference			Level of
Variable	**ADF-Test**	**1% C. V.**	**5% C. V.**	**ADF-Test**	**1% C. V.**	**5% C. V.**	**Integration**
GRGDP	-4.55366	-3.64634	-2.95402	-8.65375	-3.65373	-2.95711	1(0)
INF	-2.95299	-3.64634	-2.95402	-5.54034	-3.66166	-2.96041	1(1)
GRMS	-1.22066	-3.64634	-2.95402	-4.40822	-3.65373	-2.95711	1(1)
EXR	-0.0446	-3.64634	-2.95402	-5.4725	-3.65373	-2.95711	1(1)
INT	-2.62351	-3.64634	-2.95402	-6.34671	-3.66166	-2.96041	1(1)

Source: Author's Computation, 2015

The ADF unit root test shows that all variables were stationary at first difference (1) except GRGDP which shows stationarity at level. Therefore the condition for autoregressive distribution lag co-integration test is met while the condition for Johansen co-integration test is not met. To be on the safer side we employ the ARDL – Bound testing method of co-integration analysis rather than the Johansen method.

Ardl Modelling

To start with, the vector Autoregressive Estimates which shows the linear interdependencies of each of the variable with the dependent variable equation explaining its evolution based on its own lags and other variables lags. The test is sensitive to the lag length, the choice of lag was 2, this was made using the iterative method, that is gradually increasing the lag length until there is no further improvement in the decision making [12].

Results of the ARDL Lag Length Selection

The result of Table 4.2 below shows that all the lag length selection criteria suggest a maximum of one lag for the ARDL model in this study. To implement the information criteria for selecting the lag-length in a time-effect way, the lag structure was estimated. The appropriate lag length is determined by using one or more of AIC, SC and HQ. The result is presented below

Table 4.2: Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-78.0424	NA*	22.14460*	5.931600*	6.169494*	6.004327*
1	-77.64535	0.623948	23.18573	5.974668	6.26014	6.061939
2	-76.71575	1.394392	23.39787	5.979697	6.312748	6.081514
3	-76.7136	0.003075	25.26582	6.050971	6.431601	6.167334

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Author's Computation, 2015

By iteratively increasing the lag length to about three lags and beyond to where there seems to be no improvement in the choice of lag length, the result in Table 4.2 was generated. The result shows that all the criteria suggest a maximum of one lag for the ARDL model.

One key assumption of Bound Testing methodology of Peseran et al (2001) is that the errors of the equation must be serially independent. We use LM to test this hypothesis [13]. The LM test of serial correlation conducted on ARDL showed no traces of serial correlation at one lag at 1% and 5% level of significance and to

avoid multicollinearity, a maximum of one lag are selected. The ARDL (GRGDP,INF,INT,EXR,GRMS), therefore ARDL (1,1,1,1,1,0,0,0,0,0) was preferred.

Table 4.3 : Unrestricted ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GRGDP(-1))	0.218883	0.135282	1.617978	0.1206
D(INF)	-0.05734	0.059063	-0.970824	0.0342
D(GRMS)	0.228997	0.258295	0.886572	0.3854
D(EXR)	0.042604	0.058137	0.732831	0.4718
D(INT)	0.15329	0.190402	0.805084	0.4298
INF(-1)	0.081759	0.065924	1.240208	0.2286
GRMS(-1)	-0.047191	0.161154	-0.292831	0.7725
EXR(-1)	0.06083	0.015964	3.810364	0.001
INT(-1)	0.301923	0.215653	1.400043	0.1761
GRGDP(-1)	-1.256129	0.189485	-6.629176	0
C	-4.69597	7.398839	-0.63469	0.5325

R-squared	0.768963	Mean dependent var	-0.48125
Adjusted R-squared	0.658946	S.D. dependent var	7.014061
S.E. of regression	4.096202	Akaike info criterion	5.924284
Sum squared resid	352.3563	Schwarz criterion	6.428131
Log likelihood	-83.78854	Hannan-Quinn criter.	6.091295
F-statistic	6.98946	Durbin-Watson stat	1.802782

Source: Author's Computation.

The ARDL result in Table 4.3 shows both the short-run and long-run analyses of the variables. The major hypotheses of this study were stated as follows:

H_0: There is no significant relationship between inflation and economic growth in Nigeria.

H_1: There is a significant relationship between inflation and economic growth in Nigeria.

The ARDL test therefore established that, there is a significant negative short-run relationship between inflation and economic growth at 5% level; this implies that inflation tends to decrease economic growth in the short run. Other variables exhibit a positively relationship to economic growth in the short run and this implies that exchange rate, interest rate and money supply tends to increase the level of economic growth. The R^2 which is the coefficient of determination and also measure the goodness of fit records 0.768963 This means 77% (percent) of the total variation in economic growth is been explained by other variables.

Table 4.4 : Wald Bounds Test of Presence of Co-integration in ARDL

Wald Test:
Equation: Untitled

Test Statistic	Value	Df	Probability
F-statistic	10.65551	(5, 21)	0
Chi-square	53.27757	5	0

Null Hypothesis: C(6) = C(7) = C(8) = C(9) = C(10) =0		
Null Hypothesis Summary:		
Normalized Restriction (= 0)	Value	Std. Err.
C(8)	0.06083	0.015964
C(9)	0.301923	0.215653
C(10)	-1.256129	0.189485
Restrictions are linear in coefficients.		

As regard the long run, the coefficient of GRGDP (-1) is significant at 5% level. This suggests there is a long run relationship among the variables. The Bound test is conducted on the unrestricted ECM to test for the presence of co integration by conducting the F statistics of the hypothesis, $H_0 : \theta_0 = \theta_1 = \theta_2 = 0$ against the alternative. As a check we perform a "Bounds" t-test" of $H_0 = 0$, if the t-statistic for INV_{t-1} in our equation is greater than the "I (1) bounds" tabulated by Pesaran et al (2001) [13], this would support the conclusion that there is a long-run relationship between the variables.

Pesaran et al (2001), supplied bounds on the critical values for the asymptotic of the F – statistics. If the computed F-statistic falls below the lower bound we would conclude that the variables are I(0), so no co-integration is possible, by definition. If the F- statistics exceeds the upper bound, we conclude that we have co-integration. Finally if the F-statistics falls between the bounds, the test is inconclusive, we may rely on the result of Granger causality and/or the short-run analysis. The result of the Wald Test is presented in Table 4.4

Source: Author's Computation.

The value of our F-statistic is 10.6555 and the critical lower and upper bounds of the Pesaran et al (2001), is presented in Table 4.5.

Table 4.5: Critical Lower and Upper Bounds Values of Peseran F-test Statistical Table

	5%		**1%**	
	LOWER	**UPPER**	**LOWER**	**UPPER**
RESTRICTED INTERCEPT NO TREND	2.08	3.00	2.39	3.38
UNRESTICTED INTERCEPT NO TREND	2.62	3.79	2.26	3.35

Source: Peseran et al (2001)

As the value of our F statistic of our Unrestricted ECM exceeds the upper bound at the 5% significant level, which is 10.6555, we can conclude that there is evidence of a long-run relationship between GRGDP (growth rate of gross domestic product) and the set of other independent variables.

The long-run multiplier for the individual coefficient is presented in Table 4.6

Table 4.6: Long-run Multiplier Coefficient of ARDL

GRGDP(-1)	
D(INF)	-0.0456482
D(GRMS)	0.18230373
D(EXR)	0.0339169
D(INT)	0.12203364
INF(-1)	0.06508806
GRMS(-1)	-0.0375686
EXR(-1)	0.04842655
INT(-1)	0.24035987

Source: Author's Computation.

We can therefore confirm a negative long-run relationship between economic growth and growth rate of money supply. While exchange rate, inflation rate and interest rate establishes a positive long-run relationship with economic growth.

There is need to emphasize here that the result discussed above do not analyze the short-run dynamics of the respective variables on economic growth. When co-integration exists, the Engle-Granger Theorem establishes the encompassing power of the error correction mechanism over other forms of dynamic specifications. The next section reports the results of the Error Correction Mechanism.

Table 4.7: Error Correction Model

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INF)	-0.042147	0.067973	-0.620051	0.5406
D(INT)	-0.131108	0.222399	-0.589515	0.5606
D(EXR)	0.012637	0.080083	0.157794	0.8758
D(GRMS)	-0.006572	0.315298	-0.020844	0.9835
GRGDP(-1)	-0.03081	0.43205	-0.071311	0.9437
ECM(-1)	-0.994071	0.459865	-2.161658	0.04
C	0.252082	2.477251	0.101759	0.9197
R-squared	0.515956	Mean dependent var		0.075758
Adjusted R-squared	0.404254	S.D. dependent var		7.609083
S.E. of regression	5.873039	Akaike info criterion		6.564453
Sum squared resid	896.8072	Schwarz criterion		6.881894
Log likelihood	-101.3135	Hannan-Quinn criter.		6.671262
F-statistic	4.619029	Durbin-Watson stat		1.494516
Prob(F-statistic)	0.002557			

Source: Author's Computation.

The result in Table 4.7 is the error correction mechanism. It is the dynamic adjustment to the disequilibrium in the short run. The coefficient of most importance is the ECM coefficient. From the result the ECM term is well

defined, that is negative and statistically significant at 5% level. The coefficient is -0.99407 which indicates approximately 99% of the previous year's disequilibrium in gross domestic product. This also shows the speed at which the model converges to equilibrium. The magnitude of this coefficient implies that nearly 99% of any disequilibrium in GRGDP is corrected by the independent variables within one period (one year).

The interpretation of the GRGDP equation is further explained as follows. The presence of co-integration between GRGDP and explanatory variables show that there exists a long run equilibrium relationship in the model. The negative value of the ECM coefficient (-0.99407) confirms that there is disequilibrium in the short run which the set of variables in the model are trying to correct in the long run.

That is there is change in the level of investment, **Δgrgdp $\neq$ 0,** if either there was a disequilibrium last period (ECM$\neq$ **0**) in which case some changes in all the exogenous variables are necessary to restore equilibrium, or there was a change in the exogenous variables in the current period which because of the equilibrium condition (as shown in the co-integrating equation), implies that GRGDP should also change.

The rule of thumb is that if the coefficient of ECM is greater than zero it means there is a surplus of the dependent variable, which is gross domestic product, is in surplus, a reduction in the level of inflation estimate is therefore required to restore equilibrium in the long run. But if otherwise the coefficient is less than zero as it is in Table 4.7, there is deficiency in gross domestic product and increase is required through the set of exogenous variables to restore equilibrium in the long run.

5. Conclusion

This study investigated impact of inflation and economic growth in Nigeria. The result of the study indicates that, inflation has a direct impact on economic growth in Nigeria. Also, the result of this research work showed a positive effect of interest rate and exchange rate on economic growth. However, there exists a negative impact of increase in money supply on economic growth in Nigeria.

In other words, an increase in rate of inflation brings about an increase in economic growth in Nigeria. Based on these, the monetary authority should formulate polices that will ensure moderate increase in the rate inflation and also strengthen our currency to appreciate more in the international market so as to boost our economy. In the same vain, the monetary authority should regulate the amount of money in circulation in order to bring about the needed economic growth in Nigeria.

References

[1]. Ajayi, S. I. (1974), The demand for money in Nigeria Economy; comments and extensions. *Nigeria Journal of Economics and Social Studies.* Vol. 3, 16(1): 165 – 173

[2]. Iyoha, M. (2012). Budget of Economic Growth and Development. Bullion Publication of CBN. Vol. 26. No.2 .

[3]. Omoke, P. C. and Ugwuanyi, U. C. (2010). Money, price and output: A causality test for Nigeria. *American Journal of Scientific Research.*

[4]. Awe, A. A. and Olalere, S. S. (2012). The nexus between Budget deficit and Inflation in Nigeria Economy (1980 - 2009). *Research Journal of Finance and Accounting.* Vol 3. No.10 pp 78 – 92. www.iiste.org

[5]. Apere, T. O. and Karimo, T. M. (2014). Monetary policy effectiveness, output, growth and inflation in Nigeria. *International journal of Economics, Finance Management*. Vol.3, No 6.

[6]. Musa,Y; Asare, B. K. and Gulumbe, S. U. (2013). Effect of Monetary - Fiscal policies interaction on price and output growth in Nigeria. *CBN Journal of applied statistics*. 4(1). 55-74.

[7]. Olubusoye, O. E. and Oyaromade, R. (2008). Modeling the Inflation Process in Nigeria. AERC Research Paper 182. *African Economic Research Consortium*, Nairobi, 1 - 36

[8]. Edoumiekumo, S. G; Karimo, T. M and Amaegberi, M. (2013). Real Sector Responsiveness to Monetary Policy Shocks in Nigeria. *Journal of Research in National Development.* Vol. 11(2). 269 – 227.

[9]. Adesoye, A. B. (2012), Price, money and output in Nigeria: A co-integration-causality analysis. *African Journal of Scientific Research.* Vol. 8, No

[10]. Rogers, John H. and Ping Wang (1995), "Output, Inflation, and Stabilization in a Small Open Economy: Evidence from Mexico," Journal of Development Economics, 46: 271-293.

[11]. Emmanuel A.I. (2000) "Impact of Monetary Policies on Inflation in Nigeria (1980 – 1995); M.Sc Thesis submitted to the Department of Economics, ABU, Zaria.

[12]. Gujarati, D.N. and Sanjeetha, T. (2007). 'Basic Econometrics' Fifth reprint, New Delhi , Tata McGraw-Hill Publishing Company, Ltd, 801-820.

[13]. Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.