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Inflation and Nigeria's Economic Growth, An Auto Regressive Distributed Lag (ARDL) Model Approach (1981-2018)

Efanga, Udeme Okon[1], Ugwuanyi, Georgina Obinne Ph.D[2],
Umoh, Emmanuel Alphonsus[3]
[1&2]Department of Banking and Finance, College of Management Sciences, Michael Okpara University of Agriculture, Umudike, Nigeria.
[3]Department of Statistics, Akwa Ibom State Polytechnic, Ikot Osurua, Nigeria.
**Corresponding Author: Efanga, Udeme Okon[1]*

ABSTRACT:-This study empirically ascertained the impact of inflation on economic growth of Nigeria employing annual time series data collected from Central Bank of Nigeria Statistical Bulletin between 1981 and 2018. The data was modeled and analyzed using Auto Regressive Distributed Lag (ARDL) Model. Other diagnostic test such as; unit root test, test of Normality, Auto correlation test, Heteroskedasticity test and Breusch-Godfrey Serial Correlation LM test were also carried out and they confirmed the validity and reliability of the model employed. Real gross domestic product was employed as the explained variable, while inflation was employed as the explanatory variable and exchange rate was employed as controlled variable. The results elicited from the study suggested that inflation rate had a negative significant impact on economic growth of Nigeria, while exchange rate recorded a negative and insignificant impact on economic growth of Nigeria. This study concluded that inflation is dangerous to the economy of Nigeria as such, must be curbed. The study therefore recommended that effort should be made my monetary authorities in Nigeria to reduce money supply using various fiscal and monetary policy instruments thereby reducing the availability of money in circulation which will in turn reduce inflation rate in Nigeria.

KEY WORDS:- *inflation rate, economic growth, exchange rate, auto regressive distributed lag model, Central Bank of Nigeria.*

I. INTRODUCTION

The cardinal objective of macro economic policies is primarily to foster and enhance economic growth and to keep inflation rate as low as possible. Inflation is a phenomenon that threatens all economics because of its perceived undesirable effects. The problem of inflation surely is not a new phenomenon. It has been a core economic problem of Nigeria over the years. Inflation is a household economic indicator for all market oriented economics, it is important to note that though inflation is always looked upon in a negative light, mild or creeping inflation may have a positive effect or impact on an economy. It is believed that mild inflation greases the wheel of growth of any economy. Mild inflation would encourage producers and sellers to produce and purchase more and make extra profit from the slight increase in price of a certain product thereby increasing production capacity, creating more employment and increasing economies of scale. However, chronic inflation is very harmful and inimical to any economy (Omoke and Ugwuanyi 2010[1]).

Pursuing and maintaining price stability continues to be an indispensable objective of monetary policy targets for most countries in the world today. The emphasis given to price stability in conduct of monetary policy is with a view to promoting sustainable growth and development as well as strengthening the purchasing power of the domestic currency amongst others. The Central Bank of Nigeria (CBN) employs the monetary targeting framework in the conduct of its monetary policy. This is based on the assumption of a stable and predictable relationship between money supply and inflation. Consequently, the need to understand the relationship between inflation and economic growth of the Nigerian economy become imperative and the dynamics of inflation became central to the success of monetary policy to ensure the achievement of price stability. The effect of inflation (price instability) in the growth and development of the Nigerian economy cannot be over-emphasized.

According to Umaru and Zubairu (2012[2]) failure to pay adequate attention to price instability in managing monetary policy in order to maintain sustainable national growth and development cum strengthening purchasing power of the local currency is tantamount to steering the ship of state economy to a halt. Admittedly, the necessity to advance research on the dynamics of inflation and its effect on economic growth in Nigeria became crucial to researchers, policymakers, Central Bank of Nigeria among others.

This paper is segmented into five segments, with the first segment being the introductory segment, and then the review of related literature and theories associated with inflation and economic growth. The third segment emphasizes on the methodology employed in this study, thereafter, followed by data analysis and results interpretation in the fourth segment. The last segment concludes the study and proffers some recommendations.

II. Review of Related Literature

2.1 Concept of Inflation

Inflation is described as the general and recurrent rise in the overall level of prices for goods and services. It is measured as an annual percentage increase. As inflation rises, every naira one owns buys one a smaller percentage of a good or service. The value of a naira does not remain constant during inflation. The value of a naira is measured in terms of purchasing power, which is the real, tangible goods that money can buy. When inflation rises, there is usually a decline in the purchasing power of money. Inflation is measured by the consumer price index, which reflects annual percentage change in the cost borne by an average consumer when he or she buys a basket of goods and services that may be fixed or varied from time to time usually on annual basis. The Laspeyres formula is generally used (Anyanwaokoro, 1999[3]). There are a few causes of inflation where aggregate demand rises faster than aggregate supply, thereby increasing the cost of goods and services. The imbalance of aggregate demand and supply is associated with government's deficit, expansion of bank's interest rates and increase of foreign demand. Considering the influence of inflation on economic growth, Hossain, Ghosh and Islam (2012[4]) posit that besides high inflation level which constrains economic performance or zero inflation that actually stagnates it, mild (single digit) inflation rate is sine qua non for economic prosperity. In spite of that the problem posed by inflation is a global phenomenon since it cuts across both developed and emerging economies; therefore, its control remains a "nightmare" to economic policymakers throughout the world. Nowadays in Nigeria, concerns have been raised over the persistent rise in inflation rate with attendant eroding of value of naira and general price instability. In that regard various scholars hold diverse views on inflation and growth relationship some of which are summarized below: Barro (2013[5]) observes that the severity of inflation on growth in the short run is insignificant, but adversely affects living standards. Likewise, Kasidi and Mwakanemela (2013[6]) argue that inflation has a negative impact on growth stressing that there is no long run relationship with growth. Furthermore, Bruno & Easterly (1998) affirm that growth declines significantly during high inflation periods, adding that inflation nevertheless promotes growth when its rate is at lower levels. This means that high inflation does not promote growth; it affects economic growth negatively after attaining a certain threshold (i.e. the level at which effect begins). Jones and Manuelli (2001[7]) trace lull in economic activities cum growth to inflationary pressures, which manifest in several respects: waste in time and resources by individuals and businesses while trying to safeguard their wealth from inflation. This phenomenon likely brings about inefficient allocation of production resources with a general decline in macroeconomic performance. Also, decreased savings brings about decreased investments, which ultimately diminishes growth level. General uncertainty about future price levels discourages investment and likely lower capital formation in the economy. Besides, the returns on investments are reduced by inflation; for this reason investors may invest in short-term capital rather than making long-term investments. Investors would rather invest in assets that can hedge against inflation (property, equity) instead of productive assets such plant and equipment (Jones and Manuelli, 2001[7]). This may further weaken the production capacity of the economy, incessant labour negotiations waste resources and rise in nominal wages resulting in unproductiveness and lower growth. Ambler (2003) posits that higher inflation discourages competitiveness in international trade with trading partners, affecting export-import trading relations, thereby resulting in disequilibrium in the balance of payments in form of a current account deficit. Reduced foreign exchange capacity in any economy over time will limit a country's ability to enhance its current account deficit. In addition, with the relaxed competition in international markets, profits accruing to merchandise sector will decrease. In essence, resources will move away from the merchandise sector into the non-merchandise sector. Inflation understates the real value of depreciation (i.e. the amount or percentage by which goods or services decrease in value over time, usually one year). In this case, higher profits are declared resulting in higher tax paid on profits. This situation is likely to be unfavourable to companies desiring to make additional investments. Consider an economy where an individual splits his wealth into two parts, namely: capital stock and money. Of course money is earmarked for consumption and investment. A higher inflation level could result in decreased consumption rate, while investment may increase because investment, ceteris paribus, brings in a higher return. However, with the low return on money, the net return becomes low, and because of that investment and capital stock level drop. In consequence, economic growth drops on account of lower consumption, lower investment and lower capital stock. During higher inflationary pressures, there are likely outcomes: First is an increase in the growth rate because, as depreciation rises, the tax paid on capital is reduced. Secondly, there is a decrease in growth rate. As the volume of money enlarges likewise does the nominal interest rate.

Unfortunately, inflation rate creates confusion with regard to buying, selling, borrowing, investing, and so on. For any of these, one needs to anchor one's decisions on current and future prices. Uncertainty creates confusion about these prices, thereby discouraging investment with accompanying decreased capital stock in an economy. This brings about a higher chance of correctly forecasting shorter-term prices than longer-term ones. However, willing investors will expect to be compensated for their risk due to the increased uncertainty making investing more costly for borrowers.

2.1.2 Types of Inflation in Nigeria

Broadly speaking, inflation can be grouped into four types according to its magnitude.

1. **Creeping inflation:** This occurs when the rise in price is very slow. A sustained annual rise in prices of less than 3 percent per annum falls under this category. Such an increase in prices is regarded safe and essential for economic growth.

2. **Walking inflation:** This occurs when prices rise moderately and annual inflation rate is a single digit. This happens when the rate of rise in prices is in the intermediate range of 3 to less than 10 percent. Inflation of this rate is a warning signal for the government to control it before it turns into running inflation.

3. **Running inflation:** When prices rise rapidly at the rate of 10 to 20 percent per annum, it is called running inflation. This type of inflation has tremendous adverse effects on the poor and middle class its control required strong monetary and fiscal measures.

4. **Hyper inflation:** Hyper inflation occurs when price rises very fast at double or triple digit rates. This could get to a situation where the inflation rate can no longer be measurable and absolutely uncontrollable prices could rise many times everyday. Such a situation brings a total collapse of the monetary system because of the continuous fall in the purchasing power of money.

Basically, two causes of inflation have been identified, namely, demand-up and costs push inflation.

i. **Demand-pull inflation** is caused by an increase in the conditions of demand; these could either be an increase in the ability to buy goods or an increase in the willingness to do so.

ii. **Cost – push inflation** arises from anything that causes the conditions of supply to decrease. Some of these factors include a rise in the cost of production, an increase in government taxation and a decrease in quantity of foods produced.

2.2 Concept of Economic Growth

Economic growth means the increase in the overall productivity that is measured by the gross domestic product (GDP). Productivity in this context means the tendency or the ability of a state to produce goods and services from its own resources. Any rise in the productivity marks the increase in the economic growth.

Nell in Munyeka (2014[8]) refers to economic growth as the most important single measure of the performance of an economy. Economic growth connotes an increase in the capacity of a country to produce goods and services by comparing contemporary output level with previous ones. Thus, the comparison may result in a positive or negative growth. Conventionally, it is measured as the percent rate of increase in real gross domestic product, or RGDP. Growth is normally calculated in real terms such as inflation adjusted terms so as to minimize the effect of inflation on the price of an economy's total production.

2.2.1 Types of economic growth

Economic growth is further divided into two, which are: real economic growth and nominal economic growth.

i. Real economic growth

Real economic growth is when the rate of change of overall productivity is rising. That is, if a state is becoming more capable of producing goods and services with each passing year because of an increase in natural and human resources or any other factors available, then it is said to have risen in its real economic growth.

ii. Nominal economic growth

The nominal economic growth is contrary to the real economic growth. The nominal economic growth is when the GDP of a state is rising merely because there is an increase in the prices of commodities or if the pay rates are rising. This is just the growth in numbers where there is no growth in real sense because the state is not showing any extraordinary progress in real sense. So this kind of economic growth is determined by the rate of inflation which is exactly not what a state should aim for.

Economic growth is not exactly measured in terms of increased production of goods and services. Yes that is what the productivity is but some goods and services are more valuable than the rest. It means that the quantity does not matter, what matters is the quality and the value of the goods and services. That is what is meant by the real productivity. Hence, economic growth is measured in U.S. dollars.

2.2.2 Factors affecting economic growth

There are several factors that impair economic growth some of which are unemployment, inflation, brain drain, poverty, lack of natural resources, lack of human resources, dearth of foreign investments, education setbacks, social evils, terrorism, disturbed law and order situation, poor healthcare facilities, bad living standard etc (Wikipedia,2017).

2.3 Implication of Inflation on Economic Growth

The traditional Keynesian model comprises of the Aggregate demand (AD) and Aggregate Supply (AS) curves, which aptly illustrates the inflation growth relation sip. According to this model, in the short run, the (AS) curve is upward sloping rather than vertical, which is its critical features. If the AS curve is vertical, Changes on the demand side of the economy affect only prices. However, if it is upward sloping changes in AD affect both prices, and output, Dornbusch, et al, (1996[9]). This holds with the fact that many factors drive the inflation rate and the level of output in the short-run. These include changes in expectations, labour force, prices of other factors of production, fiscal and /or monetary policy.

In moving from the short-run to the hypothetical long-run, the above mentioned factors and its shock on the steady state of the economy are assumed to balance out. In this steady state situation, nothing is changing, as the name suggests. The dynamic adjustment of the short-run AD and AS curve yields an adjustment path which exhibits an initial positive relationship between inflation and growth, however, turns negative towards the later part of the adjustment path.

Therefore, even if the prices of goods in the economy have increase, output would not decline, as the producer has to fulfill the demand of the consumer with whom the agreement was made. The aggregate supply-aggregate demand (AS-AD) framework also postulated a positive relationship between inflation growth whereas growth increased, so did inflation. In the 1970's however, the concept of stag inflation gained permanence, and the validity of the positive relationship was questioned. Widely accepted at that time, the Philips curve relationship had appeared to not hold. This was evidenced by periods of low or negative output growth, and inflation rates that were historically high. During this period, prices rose sharply, while the economics around the world experienced massive unemployment.

2.4 Theoretical Review

2.4.1The Monetarists: The monetarists, following from the Quantity Theory of Money (QTM), have propounded that the quantity of money is the main determinant of the price level, or the value of money, such that any change in the quantity of money produces an exactly direct and proportionate change in the price level. The QTM is traceable to Irving Fisher's famous equation of exchange: MV=PQ, where M stands for the stock of money; V for velocity of circulation of money; Q is the volume of transactions which take place within the given period; while P stands for the general price level in the economy.

Transforming the equation by substituting Y (total amount of goods and services exchanged for money) for Q, the equation of exchange becomes: MV=PY. The introduction of Y provides the linkage between the monetary and the real side of the economy. In this framework, however, P,V, and Y are endogenously determined within the system. The variable M is the policy variable, which is exogenously determined by the monetary authorities. The monetarists emphasize that any change in the quantity of money affects only the price level or the monetary side of the economy, with the real sector of the economy totally insulated. This indicates that changes in the supply of money do not affect the real output of goods and services, but their values or the prices at which they are exchanged only. An essential feature of the monetarists model is its focus on the long-run supply-side properties of the economy as opposed to short-run dynamics (Dornbush, et al, 1996[9]).

2.4.2 The Keynesian: The Keynesian opposed the monetarists view of direct and proportional relationship between the quantity of money and prices. According to this school, the relationship between changes in the quantity of money and prices is non-proportional and indirect, through the rate of interest. The strength of the Keynesian theory is its integration of monetary theory on the one hand and the theory of output and employment through the rate of interest on the other hand. Thus, when the quantity of money increase, the rate of interest falls, leading to an increase in the volume of investment and aggregate demand, thereby raising output and employment. In other words, the Keynesians see a link between the real and the monetary sectors of the economy an economic phenomenon that describes equilibrium in the goods and money market (IS-LM). Equally important about the Keynesian theory is that they examined the relationship between the quantity of money and prices both under unemployment and full employment situations. According, so long as there is unemployment, output and employment will change in the same proportion as the quantity of money, but there will be no change in prices. At full employment, however, changes in the quantity of money will induce a proportional change in price. Olofin (2001) thus, this approach has the virtue of emphasizing that the objectives of full employment and price stability may be inherently irreconcilable.

2.4.3 The Neo-Keynesian: The neo-Keynesian theoretical exposition combines both aggregate demand and aggregate supply. It assumes a Keynesian view on the short-run and a classical view in the long-run. The simplistic approach is to consider changes in public expenditure or the nominal money supply and assume that expected inflation is zero. As a result, aggregate demand increases with real money balances and, therefore, decreases with the price level. The neo-Keynesian theory focuses on productivity, because, declining productivity signals diminishing returns to scale and, consequently, induces inflationary pressures, resulting mainly from over-heating of the economy and widening output gap.

2.5 Empirical Review

Hussain, Shabir and Kashif (2016[10]) explored the impact of macroeconomic indicators such as inflation rate, exchange rate and interest rate on GDP of Pakistan covering a sample period of 32 years from1980 to 2011. The research made use of secondary data sourced from website of the State Bank of Pakistan and the World Bank. Descriptive statistics and multiple regressions were used for analysis. The variables contained in the model consisted of GDP as dependent variable, while the explanatory variables were interest rate, exchange rate and inflation rate. The study revealed that inflation rate and interest rate had a significant negative impact on GDP, while exchange rate related significantly and positively with GDP. Based on the results and analysis, it was recommended that the government should adopt tight monetary policy measures to control inflation. Bakare, Kareem and Oyelekan (2015[11]) assessed the effects of inflation rate on economic growth in Nigeria using annualized time series data for the period 1986 – 2014. The secondary data were sourced from CBN Statistical Bulletin. The ADF econometric technique was used to determine the stationarity of the series, while Granger causality test was employed to ascertain the causal direction of dependent and independent variables. The study found out that inflation rate related negatively and significantly with economic growth. Also, the finding test indicated that GDP granger caused inflation, and inflation did not granger cause GDP. Regarding policy implication of the result, it was recommended that productive activity should be intensified in the economy so as to reduce and stabilize prices of goods and services for the purpose of promoting economic growth. Chughtai, Malik and Aftab (2015[12]) investigated the impact of major economic variables like inflation rate, interest rate and exchange rate on economic growth of Pakistan. Secondary data spanning the period 1981 – 2013 were utilized for this study. Findings from multiple linear regression revealed that both inflation and interest rates related negatively with economic growth, whereas exchange rate had significant positive effect on the economy.

Semuel and Nurina (2015[13]) analyzed the effect of inflation, interest rates and exchange rates on GDP of Indonesia. There was a significant negative relationship of inflation and interest rates on GDP and a significant positive relationship of the exchange rates on the GDP, while inflation had a non-significant influence on GDP. Agwu (2015) explored the factors that contribute to economic growth in Nigeria. For the purpose of realizing the research objectives, Vector Error Correction Mechanism (VECM) was applied in order to ascertain the short-run and long-run dynamics of economic growth. The long-run estimate indicated that government expenditure and oil revenue boosted economic growth, while interest rate and inflation rate had significant negative effects on economic growth. The paper suggested stiffer measures to lessen incidences of corrupt practices in the economy. Agalega, and Antwi (2013[14]) examined the impact of macroeconomic variables on GDP in Ghana covering from 1980 – 2010. Annualized time series data were obtained from Bank of Ghana publications and bulletins, Ghana Statistical Service, the Institute of Statistical, Social and Economic Research (ISSER). The study applied multiple linear regressions to prove that there existed a fairly significant positive correlation between GDP, Interest rate and inflation, but inflation and interest rate could only achieve causation in GDP by mere 44 percent. The paper also proved that there existed positive relationship between inflation and GDP, while interest rate was negative. It was suggested among others that the government together with the Bank of Ghana should develop and pursue prudent monetary policies that could target lowering and stabilizing both the micro and selected macroeconomic indices in order to positively drive the economy. Kasidi and Nwakanemela (2013[14]) studied the impact of inflation on economic growth in Tanzania. Annual time-series data for the period 1990 - 2011 were employed for analysis. Correlation coefficient and co-integration technique established the relationship between inflation and GDP and coefficient of elasticity were used to measure the degree of responsiveness of change in GDP to changes in general price levels. Findings indicated that inflation had a negative effect on economic growth. The study further established that there was no co-integration (absence of long-run relationship) between inflation and economic growth in Tanzania within the period studied.

Omoke and Ugwuanyi (2010[1]) tested the relationship between money, inflation and output by employing cointegration and Granger-causality test analysis. The findings revealed no existence of a cointegrating vector in the series used. Money supply was seen to Granger cause both output and inflation. The result suggest that monetary stability can contribute towards price stability in Nigerian economy since the variation in price level is mainly caused by money supply and also conclude that inflation in Nigeria is to much

extent a monetary phenomenon. They find empirical support in context of the money-price-output hypothesis for Nigerian economy. M2 appears to have a strong causal effect on the real output as well as prices. Using Okun's law, "each percentage point of cyclical unemployment is associated with a loss equal to 2% of full-employment output; if full-employment output is $10 trillion, each percentage point of unemployment sustained for one year costs $200 billion". Williams and Adedeji (2004[15]) examined price dynamics in the Dominican Republic by exploring the joint effects of distortions in the money and traded-goods markets on inflation, holding other potential influences constant. The study captured the remarkable macroeconomic stability and growth for period 1991 to 2002. Using a parsimonious and empirically stable error-correction model, the paper found that the major determinants of inflation were changes in monetary aggregates, real output, foreign inflation, and the exchange rate. However, there was an incomplete pass-through of depreciation from the exchange rate to inflation. The authors established a long-run relationship in the money and traded-goods markets, observing that inflation was influenced only by disequilibrium in the money market.

Anidiobu, Okolie and Oleka (2018[16] examined the effect of inflation on economic growth in Nigeria utilizing annualized data covering the period 1986 – 2015, which were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin of various issues. This study employed ex-post research design because the variables were based on events that had already taken place, which the researcher could neither control nor manipulate. Some preliminary tests were performed to ensure data stationarity, and also ascertain how well the series were distributed. While Augmented Dickey-Fuller (ADF) was adopted for the former, descriptive statistics explained the latter. Ordinary Least Square (OLS) technique was used to estimate the variables. Real Gross Domestic Product (RGDP) formed the dependent variable, Inflation Rate (INFR), Interest Rate (Interest Rate) and Exchange Rate (EXCHR) made up the independent variables. Statistical outcomes were interpreted based on a 5 percent level of significance. The regression results indicated that INFR had a positive and non-significant effect on economic growth (measured by RGDP) in Nigeria for the period studied. The study recommended that government should adopt tight monetary policy measures to stabilize tide of inflationary pressures on our economy. It also recommended that political leaders should minimize unjustified public spending and promote fiscal prudence.

Aminu and Anono (2012[17] investigated the impact of inflation on economic growth and development in Nigeria between 1970-2010 through the application of Augmented Dickey-Fuller technique in testing the unit root property of the series and Granger causality test of causation between GDP and inflation. The results of unit root suggested that all the variables in the model were stationary and the results of Causality suggested that GDP causes inflation and not inflation causing GDP. The results also revealed that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity. A good performance of an economy in terms of per capita growth may therefore be attributed to the rate of inflation in the country.

III. METHODOLOGY

3.1 Research Design

This study adopts the *ex-post facto* research design as it deals with event that had taken place and secondary data were readily available for collection. Real GDP was adopted as the effect variable, while inflation rate was employed as the causal variable, while exchange rate was used as the control variable. The model was estimated using the Ordinary Least Square (OLS) method. Since we are making use of annualized time-series data and the study cover a long sample period, we made sure our data set were not impaired by unit root; hence we tested for stationarity of the series by employing the Augmented Dickey-Fuller (ADF).

3.2 Source of Data Collection

Data for this study are elicited from Central Bank of Nigeria Statistical Bulletin of 2018[18] under. The study period covers 1981 through 2018.

3.3 Method of Data Analysis

This study used descriptive statistics, unit root test, correlation and ordinary least squares (OLS) linear regression model in testing the hypothesis of the study. E-view 9.0 econometric statistical software package was used for the analysis.

3.4 Model Specification

This research paper adapted the economic model previously used by Anidiobu, et al (2018[16]) that researched on the Analysis of Inflation and Its Effect on Economic Growth in Nigeria. The study, which had earlier been reviewed in the preceding section are specified below:

$Y = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \varepsilon_i$ …….…..... (1)

The model is rewritten as:

$RGDP = \beta_0 + \beta_1 INTR + \beta_2 INFR + \beta_3 EXCH(R + \varepsilon_i$ .... (2)
Where RGDP is real gross domestic product, β_0 = constant, β_1, β_2 and β_3 are coefficients. INFR is inflation rate, INTR is interest rate, EXCHR is official exchange rate and ε is error term. However, this study adapted the scholars' work by excluding interest rate as a controlled variable since exchange rate is already included as a controlled variable. This was done to check for multi co-linearity and avoid over bloating the model. In that regard, our regression model is specified thus:
$LogRGDP = \beta_0 + \beta_1 INFR + \beta_2 EXCHR + \varepsilon_i$..... (3)
Where RGDP is real GDP and other acronyms in the model (INFR, EXCHR and ε) remain as explained above.

IV. DATA ANALYSIS AND INTERPRETATION

4.1 Descriptive Statistics

Table 4.1 Descriptive Statistics

	EXR	IFR	RGDP
Mean	104.4552	19.33263	33737.67
Median	111.1675	12.55000	23068.85
Maximum	306.1000	72.84000	70333.00
Minimum	4.536700	5.380000	13779.26
Std. Dev.	78.39935	17.25014	19604.06
Observations	38	38	38

Source: Author's analysis using e-view 9 output with data in Appendix

From the table of descriptive statistics above, the means of exchange rate, inflation rate and real gross domestic product were N104.45, 19.33% and N33737.67 billion respectively. When their minimum stood at N4.544, 5.38& and N19604.06 billion, their maximum were N306.1, 72.84 and N70333 billion respectively. The number of years covered by this study is 38 years, hence the number of observation being 38.

4.2 Correlation Matrix

Table 4.2 Correlation Matrix

	EXR	IFR	RGDP
EXR	1.000000		
IFR	-0.445803	1.000000	
RGDP	0.821999	-0.340353	1.000000

Source: Author's analysis using e-view 9 output with data in Appendix

Correlation test to see the relationship that exists amongst variables; from the correlation matrix above, the result shows that all the three variables are negatively or inversely correlated, which implies that an increase in any of the variables, would bring about a decrease in the other variables and vice versa.

4.3 Diagnostic Test (Unit Root Test)

Table 4.3 Unit Root Test

Variables	Augmented Dickey-Fuller test statistic	Probability Value	ADF Critical at 5%	Inference
EXR	-3.537770	0.0125	-2.945842	I(1)
IFR	-3.471794	0.0147	-2.945842	I(0)
RGDP	-5.590692	0.0000	-2.951125	I(1)

Source: Author's analysis using e-view 9 output with data in Appendix

The unit root test result shows that the order of integration of the variables comprises of a mixture of 1(0) and 1(1), as such the most appropriate model to be adopted in analyzing data remains Auto - Regressive Distributed Lag (ARDL) Model.

4.4 Inferential Results
Results of ARDL Model
Table 4.4 Results of ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(RGDP(-2))	-0.600931	0.134084	-4.481750	0.0001
LOG(IFR(-2))	-0.034801	0.009357	-3.719036	0.0009
LOG(EXR)	-0.019654	0.013234	-1.485105	0.1487
C	0.126771	0.131182	0.966372	0.3421
R-squared	0.997752	Mean dependent var		10.30495
Adjusted R-squared	0.997190	S.D. dependent var		0.555135
S.E. of regression	0.029425	Akaike info criterion		-4.020808
Sum squared resid	0.024243	Schwarz criterion		-3.668915
Log likelihood	80.37454	Hannan-Quinn criter.		-3.897988
F-statistic	1775.641	Durbin-Watson stat		2.264983
Prob(F-statistic)	0.000000			

Source: Author's analysis using e-view 9 output with data in Appendix

The ARDL result as shown in the table above suggests that both inflation rate and exchange rate have negative impacts on real gross domestic product. This result is in support or in tandem with the results elicited from the correlation analysis earlier conducted. The result further revealed that a percentage increase in inflation rate would bring about a 0.035 percent decrease in real gross domestic product. Also, a percentage increase in exchange rate would bring about a 0.02 percent decrease in real gross domestic product, and vice versa.

A keen examination of the result shows that inflation rate had a negative significant impact on real gross domestic product at 5% level of significance as supported by the corresponding probability value of 0.0009 which is < 5% significance level. Exchange rate can be said to have exerted a negative, yet insignificant impact on real gross domestic product as shown by its corresponding probability value of 0.1487 which is > 5% significance level.

The R-squared as well as the Adjusted R-squared of 0.99 showed that the explanatory variables accounted for more than 99% variations in the explained variable.

F-statistic of 1775.6 showed that the model is a good fit as confirmed by its corresponding probability value of 0.000000 which means that the model is significant both at 1% and 5% levels of significance.

Durbin-Watson stat. of 2.26 suggests that the variables are free from auto-correlation since it is very close to 2.

4.5 Test of Serial Correlation

Table 4.5 Test of Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.499901	Prob. F(2,26)	0.2418
Obs*R-squared	3.723918	Prob. Chi-Square(2)	0.1554

Source: Author's analysis using e-view 9 output with data in Appendix

In line with the rules, the Breusch-Godfrey Serial Correlation LM Test table above shows that the probability values of 0.2418 and 0.1554 are statistically insignificant at 5% level of significance, the model is said to be free from serial correlation.

4.6 Test of Heteroskedasticity

Table 4.6 Test of Heteroskedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	3.797156	Prob. F(7,28)	0.0051
Obs*R-squared	17.53173	Prob. Chi-Square(7)	0.0143
Scaled explained SS	5.189151	Prob. Chi-Square(7)	0.6369

Source: Author's analysis using e-view 9 output with data in Appendix

The Heteroskedasticity test above suggests the problem of Heteroskedasticity since the p-values of F-stat. and Obs*R-squared are < 5% significance level. However, the Scaled explained SS suggest the absence of Heteroskedasticity.

4.7 Test of Normality

This test is conducted to ensure that the data employed in this study are normally distributed. Observing from the normality diagram (see appendix) as well as the Jaque Bera value of 1.65 which is >5% significant level confirms that the data are normally distributed.

4.8 Correlogram Q-Statistic

This test is carried out to further test for auto correlation and to consolidate the result of Durbin Watson Stat. which suggested that the variables are free from auto correlation. From the correlogram Q- Stat. table (see appendix) indicates that all p-values were >5% hence the conclusion that the model was free from auto correlation.

V. CONCLUSION AND RECOMMENDATIONS

This study empirically analysed the impact of inflation on economic growth of Nigeria using time series data covering a period of 38 years, between 1981 and 2018. Auto Regressive Distributed Lag (ARDL) model approach was employed to ascertain the impact of inflation of economic growth of Nigeria.

The result of the (ARDL) model suggested that inflation rate had a negative significant impact on economic growth of Nigeria, agreeing with economic expectations that inflation maintains an inverse relationship with economic growth proxied by real gross domestic product. This result is in consonance with the empirical documentations of Hussain, Shabir and Kashif (2016), Chughtai, Malik and Aftab (2015) and Semuel and Nurina (2015) who also recorded negative relationships between inflation and economic growth, but in negation of the work of Aminu and Anono (2012) who recorded a positive impact of inflation on economic growth. The controlled variable employed in this study (exchange rate) was found to have a negative and insignificant impact on economic growth of Nigeria within the period under review. This study concludes that inflation is dangerous to the growth of an economy, most especially to developing and fragile economy as that of Nigeria.

This study therefore recommends that;

1. Government and key monetary authorities such as Central Bank of Nigeria and ministry of finance should adopt a contractionary monetary policy in order to curb excess money supply in the economy which could in turn lead to inflation.
2. Both monetary and fiscal policy instruments should be employed and harnessed so as to work in tandem in regulating interest rates, government taxes and its spending activities all in a bit to control and regulate the availability of money in the economy.

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APPENDICES

Data Employed for Analysis

YEAR	EXR	RGDP	IFR
1981	110.39	15,258	20.81
1982	109.86	14,985.08	7.7
1983	109.84	13,849.73	23.21
1984	113.20	13,779.26	17.82
1985	99.90	14,953.91	7.44
1986	51.89	15,237.99	5.72
1987	14.72	15,263.93	11.29
1988	4.5367	16,215.37	54.51
1989	7.3916	17,294.68	50.47
1990	8.0378	19,305.63	7.36
1991	9.9095	19,199.06	13.01
1992	17.2984	19,620.19	44.59
1993	22.0511	19,927.99	57.17
1994	21.8861	19,979.12	57.03
1995	21.8861	20,353.20	72.84
1996	21.8861	21,177.92	29.27
1997	21.8861	21,789.10	8.53
1998	21.8861	22,332.87	10
1999	92.6934	22,449.41	6.62
2000	102.1052	23,688.28	6.93
2001	111.9433	25,267.54	18.87
2002	120.9702	28,957.71	12.88
2003	129.3565	31,709.43	14.03
2004	133.5004	35,020.55	15
2005	132.147	37,424.95	17.86
2006	128.6516	39,995.50	8.24

2007	125.8331	42,922.41		5.38
2008	118.5669	46,012.52		11.54
2009	148.8802	49,856.10		11.54
2010	150.298	54,612.26		13.72
2011	153.8616	57,511.04		10.84
2012	157.4994	59,929.89		12.22
2013	157.3112	63,218.72		8.84
2014	158.5526	67,152.79		8.06
2015	193.2792	69,023.93		9.01
2016	253.4923	67,931.24		15.68
2017	305.8000	68,490.98		16.52
2018	306.1000	70,333.00		12.09

Source: CBN Statistical Bulletin of 2018

Dependent Variable: LOG(RGDP)				
Method: ARDL				
Date: 01/15/20 Time: 08:26				
Sample (adjusted): 1983 2018				
Included observations: 36 after adjustments				
Maximum dependent lags: 4 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (4 lags, automatic): LOG(IFR) LOG(EXR)				
Fixed regressors: C				
Number of models evalulated: 100				
Selected Model: ARDL(2, 2, 1)				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(RGDP(-1))	1.594804	0.129397	12.32491	0.0000
LOG(RGDP(-2))	-0.600931	0.134084	-4.481750	0.0001
LOG(IFR)	-0.028277	0.009987	-2.831283	0.0085
LOG(IFR(-1))	0.046672	0.010609	4.399165	0.0001
LOG(IFR(-2))	-0.034801	0.009357	-3.719036	0.0009
LOG(EXR)	-0.019654	0.013234	-1.485105	0.1487
LOG(EXR(-1))	0.019435	0.012657	1.535452	0.1359
C	0.126771	0.131182	0.966372	0.3421
R-squared	0.997752	Mean dependent var		10.30495
Adjusted R-squared	0.997190	S.D. dependent var		0.555135
S.E. of regression	0.029425	Akaike info criterion		-4.020808
Sum squared resid	0.024243	Schwarz criterion		-3.668915
Log likelihood	80.37454	Hannan-Quinn criter.		-3.897988
F-statistic	1775.641	Durbin-Watson stat		2.264983
Prob(F-statistic)	0.000000			
*Note: p-values and any subsequent tests do not account for model selection.				

UNIT ROOT TEST

Null Hypothesis: IFR has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on AIC, maxlag=10)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.471794	0.0147
Test critical values:	1% level		-3.626784	
	5% level		-2.945842	
	10% level		-2.611531	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(IFR)				
Method: Least Squares				
Date: 01/15/20 Time: 08:33				
Sample (adjusted): 1983 2018				
Included observations: 36 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
IFR(-1)	-0.502593	0.144765	-3.471794	0.0015
D(IFR(-1))	0.302230	0.164287	1.839654	0.0748
C	9.954901	3.626141	2.745315	0.0097
R-squared	0.269453	Mean dependent var		0.121944
Adjusted R-squared	0.225177	S.D. dependent var		15.44895
S.E. of regression	13.59879	Akaike info criterion		8.137494
Sum squared resid	6102.591	Schwarz criterion		8.269453
Log likelihood	-143.4749	Hannan-Quinn criter.		8.183551
F-statistic	6.085813	Durbin-Watson stat		1.767674
Prob(F-statistic)	0.005626			

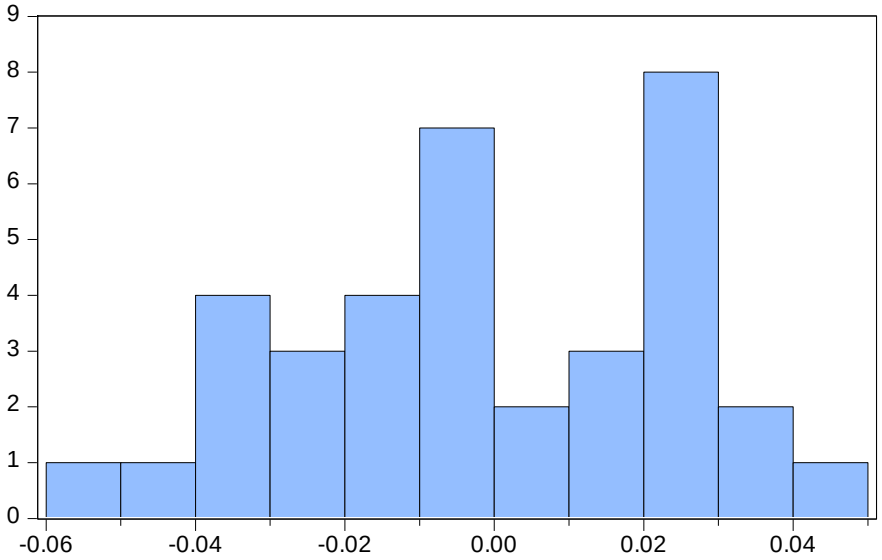
Null Hypothesis: D(EXR) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on AIC, maxlag=10)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.537770	0.0125
Test critical values:	1% level		-3.626784	
	5% level		-2.945842	
	10% level		-2.611531	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(EXR,2)				
Method: Least Squares				
Date: 01/15/20 Time: 08:35				
Sample (adjusted): 1983 2018				
Included observations: 36 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXR(-1))	-0.537859	0.152033	-3.537770	0.0012
C	2.942650	3.402118	0.864946	0.3931
R-squared	0.269066	Mean dependent var		0.023148
Adjusted R-squared	0.247568	S.D. dependent var		22.82964
S.E. of regression	19.80308	Akaike info criterion		8.863505
Sum squared resid	13333.51	Schwarz criterion		8.951478
Log likelihood	-157.5431	Hannan-Quinn criter.		8.894210
F-statistic	12.51582	Durbin-Watson stat		1.879317
Prob(F-statistic)	0.001190			

Null Hypothesis: D(RGDP,2) has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=10)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.590692	0.0000
Test critical values:	1% level		-3.639407	
	5% level		-2.951125	
	10% level		-2.614300	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(RGDP,3)				
Method: Least Squares				
Date: 01/18/20 Time: 00:22				
Sample (adjusted): 1985 2018				
Included observations: 34 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RGDP(-1),2)	-1.473531	0.263569	-5.590692	0.0000
D(RGDP(-1),3)	0.348110	0.175920	1.978795	0.0568
C	54.10941	185.8207	0.291191	0.7728
R-squared	0.586543	Mean dependent var		6.394118
Adjusted R-squared	0.559868	S.D. dependent var		1631.308
S.E. of regression	1082.249	Akaike info criterion		16.89557
Sum squared resid	36309178	Schwarz criterion		17.03025
Log likelihood	-284.2247	Hannan-Quinn criter.		16.94150
F-statistic	21.98877	Durbin-Watson stat		2.202616
Prob(F-statistic)	0.000001			

DIAGNOSTIC TEST

Date: 01/15/20 Time: 08:48						
Sample: 1981 2018						
Included observations: 36						
Q-statistic probabilities adjusted for 2 dynamic regressors						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob *
.*| . |	.*| . |	1	-0.158	-0.158	0.9816	0.322
. | . |	. | . |	2	-0.014	-0.040	0.9892	0.610
. |*. |	. |*. |	3	0.154	0.150	1.9744	0.578
. | . |	. |*. |	4	0.056	0.109	2.1064	0.716
. | . |	. | . |	5	-0.004	0.030	2.1070	0.834
. |*. |	. |*. |	6	0.118	0.106	2.7457	0.840
. |*. |	. |*. |	7	0.101	0.122	3.2236	0.864
.*| . |	. | . |	8	-0.066	-0.037	3.4377	0.904
**| . |	**| . |	9	-0.226	-0.305	6.0298	0.737
. |** |	. |*. |	10	0.271	0.144	9.8902	0.450
**| . |	.*| . |	11	-0.223	-0.190	12.608	0.320
. |*. |	. |*. |	12	0.099	0.136	13.163	0.357
. | . |	. | . |	13	-0.013	-0.048	13.172	0.435
**| . |	**| . |	14	-0.232	-0.224	16.512	0.283
.*| . |	**| . |	15	-0.185	-0.241	18.743	0.226
. | . |	.*| . |	16	-0.052	-0.171	18.931	0.272
*Probabilities may not be valid for this equation specification.						

NORMALITY TEST



Series: Residuals
Sample 1983 2018
Observations 36

Mean	4.44e-15
Median	-0.001279
Maximum	0.046828
Minimum	-0.054195
Std. Dev.	0.026319
Skewness	-0.119518
Kurtosis	1.978567
Jarque-Bera	1.650696
Probability	0.438083

Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	3.797156	Prob. F(7,28)		0.0051
Obs*R-squared	17.53173	Prob. Chi-Square(7)		0.0143
Scaled explained SS	5.189151	Prob. Chi-Square(7)		0.6369
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 01/15/20 Time: 08:50				
Sample: 1983 2018				
Included observations: 36				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010537	0.002412	4.368400	0.0002
LOG(RGDP(-1))	-0.000227	0.002379	-0.095492	0.9246
LOG(RGDP(-2))	-0.000689	0.002465	-0.279631	0.7818
LOG(IFR)	-0.000108	0.000184	-0.585764	0.5627
LOG(IFR(-1))	-0.000172	0.000195	-0.884233	0.3841
LOG(IFR(-2))	-0.000177	0.000172	-1.031443	0.3112
LOG(EXR)	-0.000255	0.000243	-1.048166	0.3035
LOG(EXR(-1))	0.000436	0.000233	1.873621	0.0715
R-squared	0.486992	Mean dependent var		0.000673
Adjusted R-squared	0.358741	S.D. dependent var		0.000676
S.E. of regression	0.000541	Akaike info criterion		-12.01307
Sum squared resid	8.20E-06	Schwarz criterion		-11.66117
Log likelihood	224.2352	Hannan-Quinn criter.		-11.89025
F-statistic	3.797156	Durbin-Watson stat		1.910082
Prob(F-statistic)	0.005105			

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.499901	Prob. F(2,26)	0.2418
Obs*R-squared	3.723918	Prob. Chi-Square(2)	0.1554
Test Equation:			
Dependent Variable: RESID			

Method: ARDL				
Date: 01/15/20 Time: 08:52				
Sample: 1983 2018				
Included observations: 36				
Presample missing value lagged residuals set to zero.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(RGDP(-1))	0.327222	0.228417	1.432561	0.1639
LOG(RGDP(-2))	-0.344769	0.239445	-1.439865	0.1618
LOG(IFR)	0.001636	0.010003	0.163562	0.8713
LOG(IFR(-1))	0.003626	0.010669	0.339826	0.7367
LOG(IFR(-2))	-0.003063	0.009367	-0.327026	0.7463
LOG(EXR)	0.018890	0.016973	1.112910	0.2759
LOG(EXR(-1))	-0.011831	0.014215	-0.832345	0.4128
C	0.130072	0.149511	0.869981	0.3923
RESID(-1)	-0.631593	0.365038	-1.730210	0.0954
RESID(-2)	-0.244371	0.237756	-1.027821	0.3135
R-squared	0.103442	Mean dependent var		4.44E-15
Adjusted R-squared	-0.206905	S.D. dependent var		0.026319
S.E. of regression	0.028913	Akaike info criterion		-4.018889
Sum squared resid	0.021736	Schwarz criterion		-3.579023
Log likelihood	82.34001	Hannan-Quinn criter.		-3.865364
F-statistic	0.333311	Durbin-Watson stat		2.018355
Prob(F-statistic)	0.955575			