DETERMINANTS OF INFLATION IN NIGERIA

GEORGINA OKPOA ASEMOTA Ph.D[1]
gasemota@biu.edu.ng

ABSTRACT

In an attempt to empirically identify the determinants of inflation in Nigeria, this study expands existing paradigm by including structural variables to some monetary and fiscal policy variables. The study sourced secondary quarterly data covering the period 1981Q1 to 2016Q4 from the Central Bank of Nigeria and National Bureau of Statistics on ten variables including Transportation, Rainfall and Utilities. An Autoregressive Distributed Lag-Error Correction Model (ARDL-ECM) was formulated and the estimation technique used was the Fully-Modified Ordinary Least Square Co-integrating Regression method. Preliminary investigations include testing for data normality using descriptive statistics, stationarity test using the Augmented Dickey Fuller and Lag Length Selection using the Akaike Information Criteria, Schwatz Information Criteria and the Hannan Quinn Information Criteria. The results show that money supply and agriculture have significant impact on general price movement in the short run while taxation impacts general price movement in the long run. The study however failed to provide evidence to support transportation and rainfall as significant determinants of inflation dynamics in both the short run and long run. Based on the findings of the study, policy recommendations include controlling money supply and boosting agricultural production in order to control prices in the short run while for long run price stability objective, manipulating taxation is recommended.

SECTION 1-INTRODUCTION

1.0 Introduction

It is quite appropriate for policy makers to be overtly concerned about achieving low inflation rates because stabilizing prices is not only a policy objective in itself, it is also an essential policy tool required for the success of other policy objectives.Unfortunately, the outcomes of most government policies in developing countries directed at keeping inflation rates low most often than not either fall short of expected results or yield contrary results or at best, policy successes are short-lived (Oluba, 2008; Fielding, 2008 & Ajayi& Atanda, 2012).

The reasons for the unsuccessful attempts are not farfetched. Fielding (2008); Labonte and Makinen(2007) and Sims (2009) argue that the widely accepted views that inflation is always and everywhere a monetary phenomenon and the keynesian view that inflation is caused by excess demand are rather over-simplified and is only relevant to developed economies where markets are efficient and integrated and inter-sectoral resource mobility are smooth and fast. Missio, Jayme and Oreiro(2015) asserted that developing countries have certain structural constraints that perpetuate inflationary pressures. For the Chilean economy, Jameson (1986) identified a weak agricultural sector as the structural bottleneck while to Fischer and Mayer (1980), the rigidity of food supply and the instability in the purchasing power of exports is the major causes of inflation in Latin America. Contrary to the monetarists and the keynesian views that these factors are unfortunate imperfections which can be ignored, structural theorists take such factors as fundamental initiators ofinflationary pressures and they believethat to successfully curb inflationary pressures, policy makers need to expand their paradigm beyond attempting to identify if the prevailing inflation is strictly a monetary phenomenon or as a result of excess demand because when efforts to control inflation fails, it is the ultimate reflection of the existence of other drivers of inflation that are yet to be identified (Fielding, 2008; Missio, Jayme & Oreiro, 2015).

[1]Dr. (Mrs) Georgina Okpoa Asemota is a Lecturer in the Department of Economics, Banking and Finance, Faculty of Social and Management Sciences, Benson Idahosa University, Benin City, Nigeria.

The structuralists argue that factors responsible for inflationary pressures are peculiar to each country specific. They therefore recommend that the typical strategy policy makers should adopt therefore is to distinguish specific institutions and structural characteristics peculiar to their region and to formulate models based on their distinct characteristics (Foley & Taylor, 2004).Unfortunately more recent Nigeria-base inflation related researches such as Akinbobola (2012), Ogundipe and Egbetokun (2013) ignored structural factors in their models while Asekunowo (2016) made a weak attempt to acknowledge structural factors by adding a dummy variable capturing union density and product market activities. This therefore creates a gap as policy makers are yet to appreciate fully all relevant issues concerning inflation dynamics. This gap raises the concerns expressed in the following questions:

i. Can the any combination of monetary and fiscal policy adequately control inflation in Nigeria?
ii. Are there some significant veritable sources of price variations that are often neglected in inflation models in Nigeria?

Under these circumstances, it is of utmost importance to return to the topic bordering on the determinants of inflation in Nigeria and to provide appropriate answers to the questions hitherto highlighted. This study therefore aims to reduce the gap created by dearth of researches on structural issues concerning inflation introducing some quantitative but often ignored fundamental structural data that are most likely to explain inflation dynamics in Nigeria. For the sake of clarity, the rest of the paper is structured into sections. To wit, the proceeding section is a review of related literature while the section 3 is dedicated to discussions of materials and methods used. The results obtained from the data anaysed is discussed in section 4 and the last section in this study is concerned with the conclusions drawn from previous sections and the policy recommendation arising therefrom.

SECTION 2- LITERATURE REVIEW

2.1 Conceptual Literature

The concepts of inflation given in Vegh (1992), Jhinghan (2003); Umaru and Zubairu (2012) include: (a) a continuous increase in the amount of money in circulation and over time (b) a sustained rise in the prices of broad spectrum of goods and services (c) general trend of price increases or (d) expansion in aggregate income. From the works of Haberler (1960), Jhinghan (2003), Totonchi (2011), Umaru and Zubairu (2012), Oseni (2013) and Asekunowo (2016), it can be inferred that inflation can be classified either as chronic, continuous or intermittent depending on its persistence; or as demand pull, cost push or external according to its source; or as headline, core and food inflation according to the composition of items used for evaluation. One common typological classification is according to its magnitude of intensity. This is done by measuring the magnitude of inflation as the rate of change of the consumer price index (CPI) or the implicit price deflator of gross domestic prices and then categorizing inflation as creeping inflation for rates less than 3%, trotting inflation for rates less than 10%, while double digit rates between 10-20% are categorised as running inflation. When prices rise at rates higher than 20%; this is termed as galloping inflation, runaway inflation or hyperinflation. Umaru and Zubairu (2012) however observed that this classification varies from country to country and depends on a country's level of development or a country's inflation history. For example**,** developed countries attach lower values for their magnitude of inflation intensity while higher values are given to the magnitude of intensity in war-time than in peace-time such that 20% in war-time is regarded as trotting inflation.

2.2 Theoretical Literature

The workhorse for the theoretical position on inflation is rooted in the classical theory of exchange also referred to as the quantity theory of money expressed as follows:

$$\frac{M_t V_t}{Y_t} = P_t \qquad \ldots\ldots\ldots\ldots\ldots \qquad 4$$

Where M_t=stock of money

V_t=velocity of the circulation of money in time t
P_t= Price level in time t
Y_t= Number of transaction (or real output) in time t
t=0, 1, 2, 3.............

The monetarists built their premise on inflation on the quantity theory of money. They argued that at the macro level, money supply is the most significant cause of changes in price levels. (see Brunner & Meltzer,1973; Friedman, 1957 as in Darryl, 1975; Levacic & Rebmann, 1982; Meltzer, 2002; Forthin, 2003; Vernengo, 2006 and Williamson, 2008).However, critics believe that the monetarist view is incomplete stating that there are other determinants of prices besides money supply(Blinder, 2003).

By stressing that inflationary pressures are overt expressions of structural maladjustments inherent in phases of development, the Structuralists explained that monetarist theories is more relevant to developed countries where markets are efficient and resource mobility is smooth and fast and less relevant in economies characterised with market imperfections and structural rigidities. As a starter, the Structuralists believe that developed and developing countries are characterized by structural and technological differences and the real character of the inflationary process is much more pronounced in underdeveloped countries than in the industrial ones. Therefore, policies appropriate for developed countries are unlikely to be right for the much poorer and structurally less developed nations(Myrdal, 1944; Streeten, 1986; , Vernengo, 2006; Filippo& Fee, 2009& Carriolle, 2012).

From the large number of theories explaining price dynamics, it is appropriate to conclude that a country's vulnerability to inflation is driven by many factors and developing countries are more vulnerable to inflationary pressures. This implies that all significant factors need to be identified in order to effectively model inflation dynamics in developing countries including Nigeria.

2.3 Empirical Literature

A lot of inflation related studies have been conducted over the years. For the oil--rich Gulf Cooperation Council (GCC),Kandil and Morsy (2009) used the Vector Error Correection Techniques on a panel data of six countries for the preriods 1970 to 2007, The result show that the external factors were more significant determinants of price variations than the internal factors. Baldini and Ribiero (2008)studied an unbalanced panel data of 22 sub-saharan african countries employing the VAR technique. The result reveal that fiscal dominance could be a direct source of price variability.

Some notable inflation related researches conducted for Nigeria over the years include Asogu (1991), Moser (1995), Fakiyesi (1996), Masha (2000), Batini (2004), Feridun and Adebiyi (2005), Fabayo and Ajilore (2006), Fielding (2008), Amassoma, Nwosa and Olaiya (2011), Okwo, Eze and Nwoha (2012). More recent Nigeria-based empirical studies include Alade (2015) who established a growth-friendly inflation threshod rate 8%, Ngerebo (2016) and Njoku and Dike (2016) who established that monetary variables significantly explained inflation dynamics.

However, structural factors are rarely investigated though a lot of them were highlighted in literature. For example, some of the structural impediments to price stability identified by Batini (2004) and Fabayo and Ajilore (2006) are summarized as fiscal largesse, lack of operational autonomy of the Central Bank, insufficient and low quality statistics, Weak transmission mechanism, Weak financial system, the degree of exposure to external shocks, the extent to which changes in the exchange rate are "passed through" into domestic prices, the extent of existing indexation in price and wage contracts and the potential ability of the CBN to forecast inflation. No empirical proof was however given to what extent any of these variables affect prices. Taking a cue from the premise that structural factors may be significant determinants of inflation, Asekunowo (2016) sought to identify the traditional and institutional variables responsible for inflation phenomenon in Nigeria. The study built an Autoregressive Distributed Lag (ARDL) model using variables such as real wages, real profits, output gaps, real exchange rates crude oil prices in addition to a dummy institutional variable capturing union density and product market regulation. By sourcing and analysing secondary data for periods covering 1974 to 2013, the result showed that the institutional variable was insignificant.

Section 3- Research Methods

3.1 Theoretical Framework

The framework for the analysis used in this study is the Aggregate Demand-Aggregate Supply (AD-AS) framework. The Aggregate supply (AS) is the total value of the output available at each possible price levels while the aggregate demand (AD) is the value of output that will be purchased at each possible price level.

The AD function is given as

$$Y=Y^d(\frac{M}{P},\ Z_1) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad (1)$$

Where Y is the output level, M is the nominal supply of money, P is the general price level and Z_1 is a vector of exogenous variables that affect the location of the IS-LM curves.

On the other hand, AS depends on the economy's level of potential output and input cost and it also describes the price adjustment mechanism of an economy. The AS function is given as:

$$P_{t+1}=P_t[1+\lambda(Y-Y^*)] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad (2)$$

Where P is the general price level, Y and Y* are actual output and potential output respectively. The difference between Y –Y* is the output gap such that if $Y \neq Y^*$, prices will keep adjusting overtime until $Y=Y^*$. The speed of adjustment is controlled by the parameter λ. Where λ is large, Prices moves very fast and the AS mechanism returns the economy to its potential output relatively quickly. Where λ is small, prices move very slowly and policies directed to manipulate AD may be used to speed up the process of returning the economy to its potential output level.

In the AD-AS framework, short run equilibrium occurs when total output demanded is equal to output supplied. The AD-AS model is an improvement over the Aggregate Expenditure (AE) model in two major areas. Firstly, the AD-AS model sets aside the fixed price assumption of the AE model and secondly, in the AD-AS model, the explicit role of aggregate supply is prominently acknowledged and incorporated in its analysis. The AD-AS framework is adopted for this paper because in line with this study, the AD-AS framework ensures that neither the factors affecting the demand side nor the supply side are overlooked.

3.2 Model Specification

Guided by the research objectives and adapting the work of Adamgbe (2008), the implicit form of the model used in this study is as follows:

$$INF = f(INF_{t-1}, AGR, EXR, GEX, GTX, INV, MS, RNF, TRP, UTL) \quad \ldots\ldots\ldots \quad (3)$$

Where:

INF =Inflation Rate
AGR = Agricultural Production
EXR = Exchange Rate
GEX = Government Expenditure
GTX= Government tax revenue
INV = Investment
MS = Money Supply
RNF = Rainfall
TRP = Transportation
UTL = Utilities

In order to reduce the problem of heteroskedasticity, all variables where used in their log forms. Expressing equation (3) in the framework of an Auto-Regressive Distributed Lag - Error Correction model (ARDL-ECM) gives the following:

$$\Delta LPT_t = \alpha_0 + \alpha_1 \sum_{i=1}^{k} \Delta LPT_{t-i} + \alpha_2 \sum_{i=1}^{k} \Delta LAGR_{t-i} + \alpha_3 \sum_{i=1}^{k} \Delta LEXR_{t-i} + \alpha_4 \sum_{t=1}^{k} \Delta LGEX_{t-i} + \alpha_5 \sum_{t=1}^{k} \Delta LGTX_{t-i} + \alpha_6 \sum_{i=1}^{k} \Delta LINV_{t-i} + \alpha_7 \sum_{t=1}^{k} \Delta LMS_{t-i} + \alpha_8 \sum_{t=1}^{K} \Delta RNF_{t-i} + \alpha_9 \sum_{i=1}^{k} \Delta LTRP_{t-i} + \alpha_{10} \sum_{i=1}^{k} \Delta LUTL_{t-i} + \beta_1 LPT_{t-1} + \beta_2 LAGR_{t-1} + \beta_3 LEXR_{t-1} + \beta_4 LGEX_{t-1} + \beta_5 LGTX_{t-1} + \beta_6 LINV_{t-1} + \beta_7 LMS_{t-1} + \beta_8 LRNF_{t-1} + \beta_9 LTRP_{t-1} + \beta_{10} LUTL_{t-1} + \lambda ECM_{t-1} + \mu_t \quad \ldots\ldots\ldots \quad (5)$$

Where α_0 is the drift component, the parameters $\alpha_1, \alpha_2 \ldots\ldots \alpha_{10}$ are the short run coefficients and the terms with the summation ($\sum$) signs represent the error correction dynamics while Δ is the first-difference. $\beta_1, \beta_2 \ldots\ldots\ldots \beta_{10}$ are the parameters that correspond to the long run relationships, λ is the speed of adjustment parameter and ECM is the model residuals while μ is the error term. k is the determined lag length for the explanatory variables (see Shresta & Chowdhury, 2005; Chowdhury, 2011). In line with theoretical positions, the a priori sign expectations for the parameters are:

Short run sign expectations: α_1, α_2, α_3, α_4 and $\alpha_7, \alpha_9 > 0$; α_5, α_6, α_8 and $\alpha_{10} < 0$

Long run sign expectations: β_1, β_3, β_4, $\beta_7 > 0$; β_2, β_4, β_5, β_6, β_8, β_9, and $\beta_{10} < 0$

3.3 Data Description and Sources

The study employed quarterly time-series data for the period 1981(Q1) to 2016(Q4), making a total of 143 observations per variable. The choice of this period is strictly based on availability of data. Secondary data were obtained from various issues of the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS) Statistical Bulletins.

3.4 Methodology

The estimation technique used in this study is the ARDL-ECM technique credited to Pesaran, Shin and Smith (2001). The study began with an investigation of the order of stationarity in order to establish that none of the variables is I(2). The Augmented Dickey-Fuller (ADF) unit root test is employed to check for data stationarity while the optimal lag length was determined using the OLS iteration process. By applying this process, the model adopted is the model with the lowest Akaike Information criteria (AIC), Schwatz information criteria (SIC) or Hannan Quinn information criteria (HQ) values. Where there are conflicts, the SIC criteria for lag length selection is chosen because it is known to be a consistent model selector (Giles, 2018).

The first stage of this study investigated the existence of a long-run relationship using the Wald test commonly referred to as the bounds test. The verified existence of long run equilibrium relationship makes it essential to estimate the parameter of the associated error correction term (ECM) in order to determine the speed of convergence to equilibrium level after a shock. Pesaranet al. (2001) argue that it is extremely important to check for the stability of its parameters. The study employed the commonly used cumulative sum (CUSUM) for this purpose. The results of the various tests are presented and discussed in the next section.

ECTION 4- PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

4.1 PRESENTATION OF RESULTS

4.1.1 Descriptive Statistics

The result of the descriptive statistics of the variables conducted in the course of the study is shown in Table 4.1 below.

Table 4.1 Descriptive Statistics

	LINF	LAGR	LEXR	LGTX	LINV	LMS	LRNF	LTRP	LUTL
Mean	2.9878	12.08370	3.225034	11.00949	10.89488	13.19865	4.043947	7.794639	8.347456
Median	3.3861	12.46153	3.090804	10.81269	11.00959	13.12412	4.191338	7.504606	8.234643
Maximum	5.1935	16.50679	5.283559	14.20945	13.77892	16.81273	5.581877	11.88040	10.37017
Minimum	-0.0619	7.983798	-0.597837	7.343549	7.651971	9.461294	1.419267	7.048855	6.543163
Std. Dev.	1.6147	2.393156	1.925535	2.348848	2.025607	2.396338	1.107226	0.679325	1.143052
Skewness	-0.4662	-0.224715	-0.720301	-0.197910	-0.127488	-0.013278	-0.319304	1.858005	0.094717
Kurtosis	1.9016	1.659979	2.166444	1.547060	1.626474	1.610391	1.799878	10.42788	1.972791
Jarque-Bera	12.1078	11.65292	16.15920	13.22829	11.38425	11.26836	10.78066	402.3960	6.364420
Probability	0.0024	0.002948	0.000310	0.001341	0.003372	0.003574	0.004560	0.000000	0.041494

Source: Author's Computation

The result reveal that all variables are significantly normally distributed, showing very negligible differences between their mean values and their median values. The standard deviations are also of relatively lower values, revealing no evidence to suspect outliers in the variables. The data are also slightly skewed and except for the log of transportation (LTRP) and the log of utilities (LUTL) which are slightly skewed to the right, all other variables are slightly skewed to the left. Regarding the level of peakedness, LTRP is absolutely platykurtic judging from the difference between its value of 10.43 and 3.00 for normal kurtosis. All other variables are leptokurtic. The Jarque-Bera statistics confirm at the 5% level of significance that each of the series is normally distributed.

4.1.2 Stationarity Test

The ARDL-ECM technique requires that none of the variables used should be I(2). In order to establish this criterion, the study tested the stationarity of the variables using the ADF test. The result of the test is presented in table 4.4 below:

Table 4.4: Unit Root Test

	LINF	LAGR	LEXR	LGEX	LGTX	LINV	LMS	LRNF	LTRP	LUTL
ADF results at levels	-2.146	-1.469	-2.054	-2.538	-0.629	-0.194	-0.474	-4.174	-0.954	-.0153
ADF results at first difference	-15.58	-4.439	-10.19	-2.439	-9.073	-5.112	-12.46	-	-10.02	-5.219
ADF results at second difference	-	-	-	-7.142	-	-	-	-	-	-
Order of stationarity	I(1)	I(1)	I(1)	I(2)	I(1)	I(1)	I(1)	I(0)	I(1)	I(1)

Source: Author's computation using E-views 8 ADF critical values: 1% =3.47; 5%=2.89

The results of the unit root test presented in Table 4.4 were significant at 1% level. Rainfall (LRNF) is stationary at levels {I(0)} while the inflation (LINF), agriculture (LAGR), exchange rate(LEXR), tax (LGTX), investment (LINV), money supply (LMS), transportation (LTRP) and Utilities (LUTL) are stationary at first difference{I(1)}. However, government expenditure (LGEX) is stationary at second difference {I(2)}. The study therefore drops LGEX as one of its explanatory variables thereby restating the model in order to exclude LGEX. It then becomes appropriate to apply the ARDL-ECM technique to the reformulated model.

4.1.3 Lag Length Selection

The study then proceeds to determine the appropriate lag lengths for the variables by iterating the model using several different lag lengths ranging from 4 lags to 1 lag length. The optimal lag length is decided using the results from various information criteria. The estimated results for optimal; lag length selection is presented in table 4.5 below:

Table 4.5: Lag Length Selection Criteria

	(4LAGS)	(3 LAGS)	(2 LAGS)	(1 LAG)
Akaike Information Criteria (AIC)	-1.2209	-1.2880	-1.4058	-1.2062
Schwatz Information Criteria (SC)	-0.2357	-0.4742	-0.8119	-0.8051
Hannan Quinn information criteria (HQ)	-0.8205	-0.9573	-1.1645	-1.0432

Source: Author's computation using E-views 8

The results presented in table 4.4 were extracted from the AIC, SC and HQ results reported in the printouts from the OLS computation of the various models listed in the table. Using the Maximum Likelihood criteria, the decision rule is to select the model with the lowest values as the model with the optimal lag length. Based on this criterion, the most preferred model is model 3 which shows that the optimal lag length is 2. The study therefore commences by using two lag lengths for each of the explanatory variables. In order to proceed with the estimation, the study tested the adopted model for serial correlation of errors and for stability. The result of the test is presented in table 4.5 below.

Table 4.5: Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.679786	Prob. F(2,108)	0.5089
Obs*R-squared	1.715635	Prob. Chi-Square(2)	0.4241

Source: Author's Computation using E-views 8

The result of the Breusch-Godfrey test is presented in table 4.5 above. The null hypothesis guiding the test assumes that the error terms are serially correlated. The P. value of the F- statistics however indicates a rejection of the null hypothesis thereby supporting the conclusion of no serial correlation.

4.1.4 Test for Long Run Relationship

Based on the rejection of the null hypotheses of serial correlation and parameter instability, this study then proceeds by verifying the existence of a long-run relationship using the wald test also called the Bounds test. The null hypothesis C20=C21=C22=C23=C24= C25=C26=C27=C28=0 is tested against the alternative hypothesis C20≠C21≠C22≠C23≠C24≠C25≠C26≠C27≠C28≠0. The computed value is compared with the bipolar critical values given in Pesaran et al. (2001pp.300) . The result of the computed values is presented in table 4.6 below.

Table 4.6 Bounds Test Result

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	2.295567	(9, 110)	0.0211
Chi-square	20.66010	9	0.0142

Source: Author's Computation using E-views 8

The computed F-statistic value given in table 4.6 at k=9 degree of freedom is 2.296 at 5% level of significance. Comparing this with the corresponding pair of critical values at k=9 degree of freedom and at 5% given in table CI(iii) case III for an unrestricted intercept and no trend model given as 2.14 and 3.30 for the lower and the upper bounds respectively, show that neither the null nor the alternative hypothesis can be rejected.

4.1.5 ARDL-ECM Estimation

The study then commenced on the ARDL-ECM estimation. The result is presented in Table 4.8 below:

Table 4.8: ARDL-ECM Estimation
Dependent Variable: D(LINF)
Method: Fully Modified Least Squares (FMOLS)
Date: 27/08/18 Time: 11:11
Sample (adjusted): 1982Q2 2015Q4
Included observations: 135 after adjustments
Cointegrating equation deterministics: C

Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINF(-1))	-0.435371	0.088714	-4.907547	0.0000
D(LINF(-2))	-0.484638	0.059215	-8.184316	0.0000
D(LAGR(-1))	0.105127	0.048013	2.189564	0.0307
D(LAGR(-2))	0.127927	0.039429	3.244466	0.0016
D(LEXR(-1))	-0.041646	0.048790	-0.853563	0.3953
D(LEXR(-2))	-0.114901	0.049529	-2.319879	0.0223
D(LGTX(-1))	-0.080632	0.055703	-1.447526	0.1507
D(LGTX(-2))	-0.071288	0.057912	-1.230965	0.2211
D(LINV(-1))	-0.150253	0.099872	-1.504458	0.1354
D(LINV(-2))	-0.104861	0.101210	-1.036081	0.3025
D(LMS(-1))	0.376637	0.119056	3.163525	0.0020
D(LMS(-2))	0.010839	0.123894	0.087483	0.9305
D(LRNF(-1))	-0.003821	0.022879	-0.167000	0.8677
D(LRNF(-2))	-0.032369	0.019463	-1.663118	0.0992
D(LTRP(-1))	0.006740	0.024187	0.278648	0.7811
D(LTRP(-2))	0.013592	0.016467	0.825422	0.4110
D(LUTL(-1))	0.039297	0.062726	0.626477	0.5323
D(LUTL(-2))	0.035307	0.060194	0.586556	0.5587
LINF(-1)	-0.067643	0.059247	-1.141704	0.2561
LAGR(-1)	-0.060615	0.053205	-1.139273	0.2572
LEXR(-1)	0.078438	0.027559	2.846227	0.0053
LGTX(-1)	-0.073161	0.031279	-2.338983	0.0212
LINV(-1)	0.070973	0.045043	1.575663	0.1181
LMS(-1)	-0.025153	0.051555	-0.487888	0.6266
LRNF(-1)	0.025084	0.040944	0.612630	0.5414
LTRP(-1)	-0.005646	0.030516	-0.185035	0.8536
LUTL(-1)	-0.027008	0.050991	-0.529667	0.5975
ECM(-1)	-0.513816	0.131840	-3.897262	0.0002
C	-0.238981	0.473353	-0.504868	0.6147

R-squared	0.548330	Mean dependent var	0.038180
Adjusted R-squared	0.429021	S.D. dependent var	0.140267
S.E. of regression	0.105990	Sum squared resid	1.190796
Durbin-Watson stat	1.568115	Long-run variance	0.012654

Source: Author’s Computation using E-views 8

Table 4.8 shows the result of the co-integrating regression using the fully modified OLS (FMOLS) method. The R-squared value indicate that the model explains 54.8% of the observed variation in inflation rates. The Durbin Watson statistic of 1.57 also reduces any reason to suspect auto-correlation of the variables used. The ECM is rightly signed and its value suggests at the 1% level of significance that 51.4% of any deviation from long run equilibrium path is corrected in the next period. .

The sign expectations for the long run variables were as predicted for LAGR, LEXR, LGTX, LMS. However, only LEXR and LGTX were significant at the 5% level. The short run results also reveal that DLINF, DLAGR, DLEXR(-2) and DLMS(-1) are significant at the 5% level however, the parameter sign for short run exchange rate (DLEXR) was against expectations.

The ARDL-ECM model requires that the dynamic model is stable. To test for instability this study employed the Hansen Instability test. The result of the test is presented in Table 4.9

Table 4.9: Hansen Instability Test for ARDL-ECM Model

Cointegration Test - Hansen Parameter Instability
Date: 03/09/18 Time: 19:51

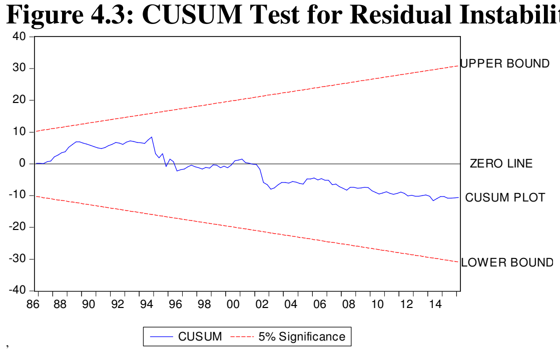
Equation: UNTITLED
Series: D(LINF) D(LINF(-1)) D(LINF(-2)) D(LAGR(-1)) D(LAGR(-2)) D(LEXR(-1)) D(LEXR(-2)) D(LGTX(-1)) D(LGTX(-2)) D(LINV(-1)) D(LINV(-2)) D(LMS(-1)) D(LMS(-2)) D(LRNF(-1)) D(LRNF(-2)) D(LTRP(-1)) D(LTRP(-2)) D(LUTL(-1)) D(LUTL(-2)) LINF(-1) LAGR(-1) LEXR(-1) LGTX(-1) LINV(-1) LMS(-1) LRNF(-1) LTRP(-1) LUTL(-1) ECM(-1)
Null hypothesis: Series are cointegrated
Cointegrating equation deterministics: C

Lc statistic	Stochastic Trends (m)	Deterministic Trends (k)	Excluded Trends (p2)	Prob.*
47.61984	28	0	0	< 0.01

Source: Author's computation using E-views 8

The null hypothesis guiding the Hansen Instability Test states that the series are cointegrated. The null hypothesis is supported at 1% level of significance as evidenced by the p.value of <0.01. The study also applied the CUSUM test in order to check for residual instability. The result of the CUSUM test is presented in figure 4.3 below.

Figure 4.3: CUSUM Test for Residual Instability for ARDL-ECM Model



Source: Author's Computation using E-views 8

The result of the residual stability test as shown in figure 4.3 reveals that the plot of the recursive residuals about the zero line are within the upper and lower bounds of the pair of critical lines. Based on this result the null hypothesis of residual instability is rejected.

4.1.6 Test for Dynamic Relationship

The empirical work done in this study is concluded by testing the dynamic relationship existing between inflation rates and each of the explanatory variables in the short run. This was done using the Wald Test. The result is presented in table 4.10 below:

Variable	F.Statistic	P.value	Remarks
ΔLINF	12.78026	0.000	A relationship exist
ΔLAGR	2.204373	0.1148	No relationship exist
ΔLEXR	0.184033	0.8321	No relationship exist
ΔLGTX	0.908131	0.4061	No relationship exist
ΔLINV	0.054187	0.9473	No relationship exist
ΔLMS	3.198085	0.0444	A relationship exist
ΔLRNF	5.709416	0.0043	A relationship exist
ΔLTRP	0.035883	0.9648	No relationship exist
ΔLUTL	0.007635	0.9924	No relationship exist

Source: Author's compilation from Wald Test Estimate using E-views 8

Critical values @5%: lower bound =3.79; upper bound = 4.85

The software printout of the Wald Results can be found in appendix 5 while a summary of the results of the various Wald test is compiled in a table form and presented in table 4.10. The result shows that at 5% level of significance a relationship exist between inflation rates and the lag values of ΔLINF, ΔLMS and ΔLRNF separately.

4.2 DISCUSSION OF FINDINGS

The broad objective of the study is to examine the relationship between inflation and some macroeconomic variables in Nigeria with the specific aim of testing how relevant monetary, fiscal and structural variables are in influencing observed variations in inflation rates in Nigeria. The bounds test and the Johansen cointegration test confirmed the existence of long run relationship among the variables while the R-squared result obtained in the ARDL-ECM estimation show that the model explains 54.8% of the observed variations in general prices. The Error correction term was rightly signed and its value suggests that 51.4% of deviations from long run equilibrium path are corrected in the next period.

The Wald test also confirmed that dynamic relationships exist between inflation and its lag values. The study also confirmed the existence of dynamic relationships between inflation and money supply and rainfall respectively. The test however failed to confirm dynamic relationships between inflation and agricultural production, exchange rate, tax, investment, transportation and utilities.

The results of the ARDL-ECM estimation also reveal that the two lag values of agriculture, taxation, investment, money supply and transportation are in line with the a priori parameter sign expectations while the lag values of inflation, exchange rate and utilities were against parameter sign expectations. The computed P-value also reveal that at 5% level, only DLINF, DLAGR, DLEXR(-2) and DLMS(-1) are significant. The long run results reveal that LAGR, LEXR, LTRP and LUTL met the parameter sign expectations. However, the P-values show that only LEXR and LGTX are significant at the 5% level of significance.

Based on the results, it is plausible to conclude that monetary policy has a short run effect on inflation while fiscal policy has long run effect on inflation. Of the five variables used to represent structural impact (LAGR, LINV, LRNF, LTRP and LUTL), only agriculture had significant impact on inflation and only in the short-run. Finally, the result of the short run dynamic relationship done through the Wald test confirms a dynamic relationship between rainfall and inflation and money supply and inflation at 5% level of significance.

SECTION FIVE- CONCLUSION AND RECOMMENDATIONS

This study was basically carried out with the aim of finding the impact of some macroeconomic variables on inflation dynamics in Nigeria with the specific objective of examining the short run and long run effects of monetary policy, fiscal policy or structural variables on inflation. The result indicates that monetary variables affect prices in the short run while fiscal variables have long run effects on prices. The study failed to give enough evidence on the effect of structural variables on prices because only one of the five structural variables used in this study was significant at 5% level. The study however confirmed the existence of a dynamic relationship between rainfall and prices.

Based on the findings of this study, policy recommendations arising from its empirics are that price stability can be achieved in the short run if money supply and exchange rates are effectively controlled. Giving more attention to agricultural production also have a positive impact on controlling prices and as such policies geared at encouraging agricultural production should be formulated. Finally, due to the dynamic relationship between rainfall and prices, efforts to check the effect of low rainfall through proper irrigation and the effect of too much rainfall through adequate draining systems and ecological laws will go a long way to stabilize prices.

Based on the structural theory of sluggish response of prices to price control measures due to structural impediments, the study also recommends further research on other structural variables using low frequency data.

REFERENCES

Adamgbe, E. (2008). "Price volatility, expectations and monetary policy in Nigeria". *CBN Economic and Financial Review* (4) 12-27.

Ajayi, F. O. and Atanda, A. A. (2012). Monetary policy and bank performance in Nigeria: A two-step cointegration approach‡ *African Journal of Scientific Research, 9(1)*,462-475.

Akinbobola, T.O. (2012). "The Dynamics of Money Supply, Exchange Rate and Inflation in Nigeria", *Journal of Applied Finance and Banking*, 2(4), 117-141

Alade, S. O. (2015). Determination of an Optimal Threshold for the Central Bank of Nigeria's Monetary Policy Rate. CBN working Paper Series, January 2015.

Amassoma, D., Nwosa, P. I. and Olaiya, S. A. (2011)." An Appraisalm of Monetary Policy and its Effect on Macroeconomic Stabilization in Nigeria". Journal of Emerging Trends in Economics and Management Sciences" (JETEMS). 2(3);232-237

Asekunowo,V.O. (2016). The causes of Persistent Inflation in Nigeria.*CBN Journal of Applied Statistics,* 7(2)49-75

Asogu, J.O.(1991). "An Econometric Analysis of the Nature and Causes of Inflation in Nigeria", CBN Economic and Financial Review, 29(3)

Baldini, A. & Ribiero, M. P. (2008). Fiscal and Monetary Anchors for Price Stability: Evidence from Sub-Saharan Africa. IMF working Paper WP/08/121

Batini, N. (2004). Achieving and maintaining price stability in Nigeria. *IMF Working Paper:* WP/04/97

Blinder, A. S. (2003). Central-bank credibility: Why do we care? How do we build it? American Economic Review, 90(5):1421–1431

Brunner, K. And Meltzer, A.H. (1973). *The Federal Reserve attachment to the free Reserve Concept.* Washington: House Committee on Banking & Currency

Cariolle, J. (2012). Measuring Macroeconomic Instability. A Critical Survey of some Developing countries. *Foundation for Research and Studies on International Development* (FERDI), Clermont-Ferrand, France. Working Paper P48,

Chowdhury, M.B.(2011). Remittances flow and financial development in Bangladesh Economic Modelling, *Elsevier*, 28(6), pp 2600-2608

Darryl, F. (1975). "An approach to monetary & fiscal management". *Federal Reserve Bank of St. Louis Review*. 50(11). 6-10

Fabayo, J. A. and Ajilore, O. T. (2006). Inflation: How much is too much for economic growth in Nigeria? *Indian Economic Review;* 41(2)129-147

Fakiyesi, O.M. (1996). Further empirical analysis of inflation in Nigeria. *Central Bank of Nigeria Economic and Financial Review,* 34 (1), 489-499.

Feridun, M. and Adebiyi, M. A. (2005). Forecasting inflation in developing economies: The case of Nigeria. *International Journal of Applied Econometrics and Quantitative studies: .2(4)103-132*

Fielding, D. (2008). Inflation Volatility and Economic Development: Evidence from Nigeria. University of Otago. Economics Discussion Papers. No. 0807.ISSN 1178-2293

Filippo, O. and Fee, K. (2009). "Measures of economic slack, cost pressure and inflation. *Discussion series.* Federal Reserve Bank of Cleveland publication

Fischer, B. and Mayer, T. (1980). On the Structuralist View of Inflation in Some Latin American Countries: A Reassessment. *Keil Working Paper* , 103

Foley, D., & Taylor, L. (2004). "A Heterodox Growth and Distribution Model." Paper presented in the "Growth and Distribution Conference," University of Pisa,June 16–19.

Fortin, P. (2003),Do we measure inflation correctly? In *Zero Inflation, The Goal of Price Stability,* R.G. Lipsey (ed.), C.D. Howe Institute Policy Study 8, pp. **109** ff., March.

Friedman, M. (1957).*The Quantity Theory of Money – A Re-statement,*‖ in M. Friedman, ed, Studies in Quantity Theory of Money. University of Chicago Press, pp. 3 - 21

Giles, D. E. (2018).Review of Handbook of Quantile Regression.*Statistical Papers*, 59, 849-850

Haberler, G. (1960). *Inflation: its causes and cure.* American Enterprise Association; Washington D.C.

Jameson, K. (1986). "Latin American structuralism: a methodological perspective", *World Development***,**
v. 14, n. 2, 223-232.

Jhingan, M. L. (2003). *Macroeconomic Theory*, Mysore Road, Bangalore: Vrinda Pvt Ltd

Kandil M. and Morsy, H. (2009). Determinants of Inflation in GCC.*IMF Working Paper WP/09/82*

Labonte, M. and Makinen, G. (2007). *Central Bank and Economic Performance: What does the evidence show?.* United States Congressional Research Service; RL31955

Levacic, R. and Rebmann, A. (1982). "*Macroeconomics",*(2nd ed.) London: Macmillan

Masha, I**.** (2000). New Perspective on Inflation in Nigeria, *CBN Economic and Financial Review*, 38(2)

Meltzer, Allan H. (2002), *Present and Future in an Uncertain World*: in T. Sanford, ed. *The Interest Rate Dilemma,* New York: KCG Productions, pp. 37-56

Missio, F., Jayme, F. G. and Oreiro, J. L. (2015). The Structuralist Tradition in Economics: Methodological and Macroeconomics Aspects. *Revista de Economia Política, 35(139), pp. 247-266*

Moser, G. (1995). The Main Determinants of Inflation in Nigeria. IMF Staff Papers 42

Myrdal, Gunnar (1944). *An American dilemma: The negro problem and modern democracy*. New York: Harper & Bros

Ngerebo, T. A. (2016). "Monetary Policy and Inflation in Nigeria". International Journal of Finance and Accounting. 5(2):67-76 DOI:10.5923/j.jijfa.20160502.01

Njoku, C. O. and Dike, S. (2016). "Monetary Policy and Economic Stability in Nigeria: An Empirical Analysis. International Journal of Research in Management, Science & Technology. (E-ISSN:2321-3264). 4(1). www.ijrmst.org

Ogundipe, A. A. &Egbetokun, S. (2013). "Exchange Rate, Pass-through to Consumer Prices in Nigeria", *European Scientific Journal*, 9(25), 110 – 123.

Okwo, I. M., Eze, F. and Nwoha, C. (2012). "Evaluation of Monetary Policy Outcomes and its Effect on Price Stability in Nigeria". Research Journal of Finance and Accounting. ISSN 2222-1697. 3(11)www.iiste.org

Oluba, M. (2008). "Inflation targeting or mis-targeting". *SMC working paper* No. 05/2008

Oseni, E. (2013). Achieving Price Stability in Nigeria: Monetary Policy Rate Approach vs. Foreign Exchange Policy Approach. *Australian Journal of Business and Management Research*, 3(2): 32-43. ISSN: 1839 – 0846

Pesaran, M.H., Shin, Y. & Smith, R.J. (2001)."Bounds Testing Approaches to the Analysis of Level Relationships", *Journal of Applied Econometrics*, 16: 289-326.

Shrestha, M. B. & Chowdhury, K. (2005). ARDL modeling approach to testing the financial liberalization hypothesis, Economics Working Paper Series 15

Sims, C. (2009). "Inflation Expectations, uncertatinty and Monetary Policy" . Princeton University Publication. sims@printon.edu

Streeten, P. (1986). *First Things First: Meeting Basic Human Needs.* Baltimore, MD: Johns Hopkins University Press for the World Bank

Totonchi, J. (2011). Macroeconomic Theories of Inflation.*2011 International Conference on Economics and Finance Research IPEDR 4 IACSIT Press, Singapore*

Totonchi, J. (2011). Macroeconomic Theories of Inflation.*2011 International Conference on Economics and Finance Research IPEDR 4 IACSIT Press, Singapore*

Vegh, C. (1992). "Stopping High Inflation: an analytical Overview". IMF Staff Paper 39.

Vernengo, M. (2001). "Staffa, Keynes and the years of high theory". *Review of Political Economy; Taylorf and Francis Journal. Vol. 13(3): pp. 343-354*

Williamson, J. (2008) "Exchange rate economics", *Working Paper Series*, Peterson Institute for international economics, Washington.