

Iheonu, Chimere Okechukwu

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Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/>

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An Autoregressive and Distributed Lag Model Approach to Inflation in Nigeria

Chimere Okechukwu Iheonu¹, Godfrey Ikechukwu Ihedimma², Samuel Nzube Eze³

¹Department of Economics, University of Lagos, Akoka, Nigeria, ¹E-mail: iheonuchimere@yahoo.com (Corresponding author)

^{2,3}Department of Economics, University of Nigeria, Nsukka, Nigeria

Abstract This study scrutinized the precursors of Inflation in Nigeria between the periods 1980 to 2014. The Augmented Dickey-Fuller test was engaged to test for stationarity of the variables while the Autoregressive and Distributed lag (ARDL) Model was applied to capture the affiliation between inflation and selected macroeconomic variables. Our findings revealed that there exists a long run relationship between Inflation, money supply, interest rate, GDP per capita and exchange rate in Nigeria while in the short run, money supply has a significant positive one period lag effect on Inflation and Interest Rate also has a significant negative one period lag influence on Inflation in Nigeria. Recommendations are that in the short run, monetary policies should be geared towards the control of money supply and interest rate in Nigeria in order to regulate Inflation and also, the Nigerian economy can afford to vary any of human capital development or technological advancement to boost productivity without causing inflation as GDP per capita proved insignificant in the short run.

Key words Inflation, ARDL, money supply, interest rate

JEL Codes: C23, C51, E31

1. Introduction

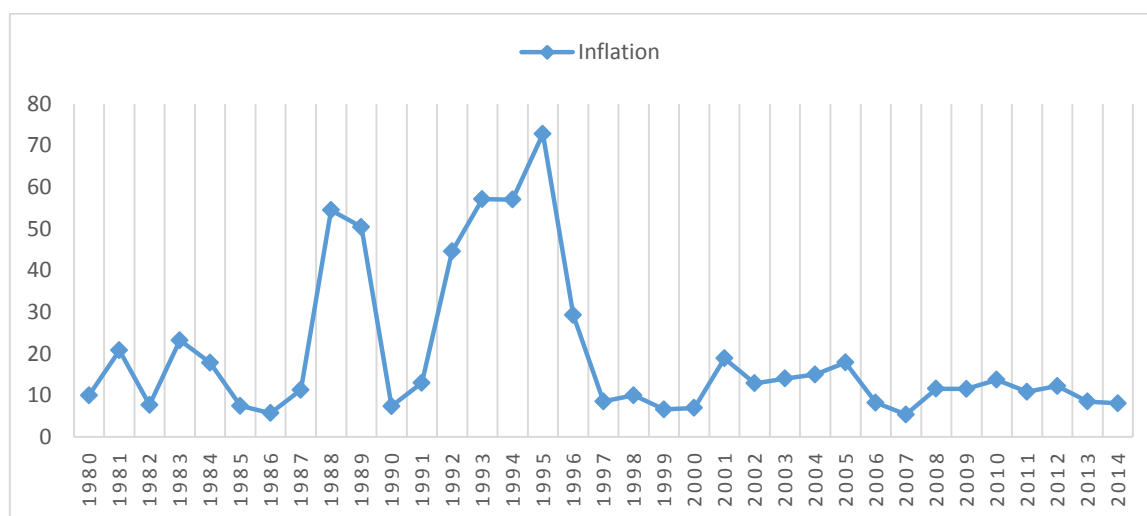
Price Stability in any economy is a key responsibility of the apex banks the world all over including the Central Bank of Nigeria. Unstable prices with an upward trend could be termed Inflation. It is a continuous increase in the prevailing price level accompanied with a fall in purchasing power. According to Jhingan (2002), “Inflation is a persistent and appreciable general rise in price level”. He went further to note that it is not every rise in the price level that is termed inflation. For a rise to be considered inflationary, it must be constant, persistent and sustained. Inflation being an enemy to every economy makes it a necessity for researchers to identify its behaviour and pattern and find lasting solution to forestall its continuous increase.

Inflation just does not reduce the value of a nation's currency but also has other severe consequences to an economy like a distortion in real values as against the nominal equivalents. Inflation affects different people differently. This is because of the fall in the value of money. When prices rise and the value of money falls, some batch of the society gain, some others lose and the rest stand in-between. Conventionally, there are two remunerative batches in all societies which are the fixed income earners and those of the flexible income batch. The fixed income earners are impoverished while those of the flexible income batch are the benefactors. This is as a result of irregular and unsynchronised movements in prices of different goods, assets, services and the like. With the occurrence of inflation, prices stay on the rise, but this rate of increment of respective prices vary. The rise in price of most goods and services are astronomical, for others, it takes an arithmetic progression while many others remain unchanged. Inflation affects the market price of factor incomes such as rents, interests, salaries, profits and dividends. It also results in distortions in the circulation of real income from the impoverished (the fixed income earners) to the benefactor groups (the flexible income earners). On the one hand, the poor and the middle class suffer the most in an inflationary period because of the distortions in real prices as against nominal prices, thus they become impoverished. While on the other hand, businessmen, speculators, real estate holders and others within the flexible income group gain at the expense of the former. There is needless transfer of income and wealth from the poor to the rich. This increase in inequality arising from increase in prices leads to greater suffering for the poor and the middle class whom constitutes the major bulk of the Nigerian populace.

Inflation discourages investment and savings by creating uncertainty about future prices. It also compels businesses and individuals alike to allot time and other resources to speculate about prices and thus hedge against risk of fortuitous changes in price level as this creates distortions in relative prices as well as erode the efficacy of the market pricing mechanism. Iyoha (2002) opined that Nigeria's inflation has been driven by both demand-pull and cost-push factors. The demand-pull factors fuelling the inflationary spiral include expansionary fiscal policy, rapid monetary growth caused by excessive fiscal spending and hefty wage and salary increases while the cost-push factors driving the inflation comprise fuel price increases and or fuel scarcity leading to high transportation costs, inadequate and poor infrastructure services; and supply bottlenecks arising from ports congestion.

Overtime, the rate of Inflation has continued to change due to the unstable macroeconomic environment in Nigeria. In the year 1980, Nigeria recorded an Inflation rate of 10%. This value doubled the year later to 20% as inflation averaged the

value of 20.89% in the 1980s. In the early 1990s, Inflation reached an unprecedented high level of 44.6%, 57.1%, 57% and 72.8% in the year 1992, 1993, 1994 and 1995 respectively. By the end of 1999, inflation eased to 6.6%. Between the year 2000-2004, Inflation had a cyclical movement averaging the value of 12%. This study thus seeks to examine the determinants of Inflation movement in Nigeria.



Source: Authors' presentation from data sourced from WDI, 2015.

Figure 1. Inflation Trend in Nigeria (1980-2014)

2. Literature review

2.1. Theoretical review

Inflation has always been a very serious debate among economist across the globe as different schools of thought identify different causes and solutions to this problem. Theories from these schools have been improved upon to explain this phenomenon. We will critically analysis two of the schools of thought on Inflation starting with the Monetarist Theory of Inflation.

Monetary Theory of Inflation

The monetarist explanation of Inflation is revealed by means of the Quantity Theory of Money, where $MV = PT$ and M is Money Supply, V is Velocity, P is Price Level and T is Transactions or Output. This equation is termed the Fisher's Equation of Exchange, assuming V and T are constant, the price level (P) varies correspondingly with the money supply (M). With flexible wages as assumed by the classical theorists, the economy is believed to be operating at full employment. The labour force, capital stock and Technology also change very slowly over time. Consequently, the chunk of money spent will not affect the level of real output so that doubling the quantity of money in the economy would only result in the doubling of the price level. So Inflation expands at the rate at which the level of money expands. In this analysis, the aggregate supply is assumed to be fixed with full employment being the case in the economy. When the money supply rises it creates more demand for goods but the supply of goods cannot be raised any further as a result of the attainment of full employment of resources. This advances a rise in prices, but it is the continuous rise in money supply that results in Inflation. Monetarists such as Friedman (1969) hold that issues as Inflation is perpetually and ubiquitously a monetary phenomenon that arises from a spry amplification in the quantity of money than in total output. According to him, changes in the quantity of money in circulation leads to the changes in nominal income and this resultant change in Nominal Income leads to a rise in aggregate demand as economic agents try to spend their excess cash balances. Since Aggregate Supply is fixed at full employment level, the increase in Aggregate Demand would result to the increase in prices. This signifies that Inflation is always a monetary phenomenon.

The monetary theory of Inflation is that of a long run theory predicated on the premise that the full employment of resources occurs in the long-run and where the actual output precisely equates potential output in the economy.

Keynesian Theory of Inflation

The Keynesians just like Keynes, emphasized the increase in Aggregate Demand (AD) as the source of demand-pull Inflation.

Where $AD = C + I + G$. Assuming a closed economy, C = Consumption I = Investment G = Government Expenditure.

When the value of AD exceeds the value of Aggregate Supply (AS) at the full employment level, the inflationary gap arises. To Keynes, inflation becomes more rapid as the gap between Aggregate Demand and Aggregate Supply widens, as it is this rise in Aggregate Demand above the level of output that pulls prices up.

Keynes was of the view that money supply affects inflation in a much more variegated way than as suggested by the strict monetarists. Keynes rather urged that Inflation was generated by the outstripping of supply by demand as well as higher costs, pushing inflation higher.

Keynes had it that building Inflation from expectations were just as paramount since it influences wage settlements sought by labour as well as influence other inflation agreements created which are evidenced in the Inflation Rates.

More so, Keynes and his proponents have over time made arguments that there is a trade-off faced by governments that exists between Unemployment and Inflation. This writing by Keynes was as at the time of the great depression which paved way for post-war governments who would not mind lowering Inflation as a trade-off for the creation of full employment. It is rather interesting to note that owing to the rejection of the Keynesian thought starting from the 1970s, the Keynesian Theory of Inflation is not in vogue. However, the Keynesian thought has been reawakened as a consequence of the great depression of 2008 with governments of various economies seeking alternative elucidation to the complications faced today.

2.2. Empirical review

Mansaray-Pearce and Liu (2015) studied the determinants of Inflation in Sierra Leone between the year 1990 and 2013. The Johansen cointegration and the Error Correction Model (ECM) were used. The result revealed that both money supply as well as GDP has negative and significant relationship in the short run while interest rate has a significant negative relationship with Inflation in the short-run. In the long-run, money supply and GDP contributes positively while exchange rate, imports and interest rate contributes negatively to Inflation.

Iya and Aminu (2014) reviewed the determinants of inflation in Nigeria between the periods of 1980 and 2012 by using empirical analysis. Their findings acknowledged that Money Supply and Interest Rate positively influenced Inflation with Government Expenditure and Exchange Rate having exacted negative influence.

Mohanty and John (2014) analysed the interaction among inflation, crude oil prices, output gap, fiscal policy and monetary policy in India for the period 1996-1997 (Q1) to 2013-2014 (Q3). Structural vector auto regressive (SVAR) model was used. Their result showed that various determinants influenced inflation in the given time periods in India. The global price shocks had trickle effect on the domestic price of crude oil predominantly during the period 2009 to 2011. In 2011-2012, inflation was highly determined by fiscal deficit and a negative output gap was registered during 2012-2013.

Ashwani (2014) used a cointegration approach to diagnose the key determinants of inflation in India for the period 1981 to 2011. The study revealed the existence of a long run relationship among inflation, money supply, private and social spending and exchange rate. It was concluded that money supply, private final consumption expenditure and exchange rate significantly contributed to Indian's inflation at that time. It was recommended that there should be a balance between fiscal spending, exchange rate and money supply management for the maintenance of economic growth.

Hossain and Islam (2013) studied the determinants of inflation in Bangladesh; they examined the relationship between inflation, money supply, interest rate, nominal exchange rate and fiscal deficit for the period 1990 to 2010 using the ordinary least square (OLS) method. Their findings showed that inflation is positively and significantly affected by money supply and a year lagged of interest rate. But when the same money supply was lagged by a year together with fiscal deficit, they significantly and negatively influenced inflation. Their study revealed that interest rate, fiscal deficit and nominal exchange rate have no significant relationship with inflation. They cautioned in their recommendation that wages and import of goods and services from abroad to be controlled, as well as the supply of money.

Aurangzeb and Anwar (2012) studied what determines inflation in Pakistan for the periods 1981 to 2010 using Gross Domestic Product, exchange rate, interest rate, fiscal deficit and unemployment using multiple regression analysis techniques and it revealed that GDP negatively relates to Inflation but there existed a positive relationship between Inflation and the other variables aforementioned.

Sahadudheen I. (2012) employed the Johansen-Juselius Cointegration method to study the relationship among inflation, GDP, broad money, interest rate and exchange rate from the first quarter of 1996 to the second quarter of 2009 in India. The study revealed that GDP and broad money affects inflation in the long run positively. On the other hand, there was a negative relationship among inflation, interest rate and exchange rate.

Bashir *et al.*, (2011) examined the determinant of inflation in Pakistan by the use of the Johansen cointegration, vector error correction approaches and the Granger Causality test. Annual time series data was used for the period from 1972 to 2010. Their empirical findings revealed that consumer price index proxy of inflation was found to be positively and significantly influenced by money supply, gross domestic product, imports and government expenditures while government revenue is pulling negative strings on the overall price level in Pakistan. The Granger causality result outlined that inflation is

significantly affected by money supply, GDP, government expenditure and revenue as suggested by the Johansen and VECM approaches. A bidirectional relationship was also found to run from government expenditure to CPI, government revenue to CPI; from CPI to both imports and exports. They concluded by suggesting that, there should be an optimal improvement in all the variables to maintain price stability in Pakistan.

Abidemi and Malik (2010) in their study of inflation and its major determinants for the period 1970 to 2007 in Nigeria examined the inter relationship among the variables; they used the Johansen cointegration analysis and the Error Correction Model (ECM). Their study concluded that money supply, GDP growth rate, imports and first lag of interest rate are positively related to inflation rate, while exchange rate and fiscal deficit are associated with inflation indirectly.

Laryea and Sumaila (2001) also scrutinized inflation process in Tanzania, and made significant proposition with regards the country's inflation. Tanzania's inflation rate averaged an estimated 30 percent in the early 1990s and later dropped to approximately 13 percent at the closing of 1998. With the ECM, the researchers estimated an inflation equation for Tanzania using data of quarterly frequency, for the periods of 1992 to 1998. The result from the econometric analysis showed that inflation in Tanzania in either of the short run or long run, is motivated more by monetary factors and to a lesser scope by either of volatility in output or depreciation of the exchange rate. To these results, they suggested and recommended that to control inflation in Tanzania; the government should pursue tight monetary and fiscal policies. In the long run, it is recommended the government pursues policies aimed at increasing food production in a bid to make light the burden accompanied by supply constraints.

3. Methodology of research

In analysing the macroeconomic determinants of Inflation in Nigeria, the study would make use of a two stage econometric procedure. First, the Augmented Dickey-Fuller (ADF) test would be undertaken to ascertain the order of Integration of the variables, and then the Auto Regressive and Distributed Lag (ARDL) model would be employed to account for long-run and short-run relationship in the model. The ARDL model was introduced originally by Pesaran and Shin (1999) and further extended by Pesaran *et al.* (2001). The ARDL approach has the advantage that it does not require all variables to be $I(1)$ as the Johansen framework and it is still applicable if we have $I(0)$ and $I(1)$ variables in our set.

This study would make use of annual data covering the period 1980-2014 (34 years). According to Mansaray-Pearce and Liu, (2015), the determinants of Inflation are almost the same in most countries but differ in magnitude from one country to another due to country specifics. This study makes use of the data on Inflation, Money supply, Interest rate, Gross Domestic Product (GDP) per capita and Exchange rate. The data is culled from the World Development Indicator (WDI), 2015.

3.1. Model specification

From the selected variables above, we draw a function for Inflation in Nigeria with the form;

$$INF = f(M_2, IR, GDP, EX) \quad (1)$$

Where INF is Inflation rate (annual percentage of consumer prices), M_2 is money supply as proxy by Broad Money Growth (annual %) in Nigeria, IR is Lending Interest Rates, GDP is Gross Domestic Product per capita (constant 2005 US \$), EX is the official Exchange Rate of the Naira against the United State dollars. Since the study is a time series analysis, the equation can be expressed as:

$$INF_t = \alpha_1 + \alpha_2 M_{2t} + \alpha_3 IR_t + \alpha_4 GDP_t + \alpha_5 EX_t + \varepsilon_t \quad (2)$$

Here, ε_t represents the white noise error term at time t , α_1 is a constant which represents the estimated value of Inflation when the explanatory variables are zero. $\alpha_2, \alpha_3, \alpha_4, \alpha_5$ are the slope coefficients of M_2, IR, GDP, EX respectively while t represents the time index. The a priori expectation of the explanatory variables in the model is expected to be;

$$\alpha_2 > 0 \quad \alpha_3 < 0 \quad \alpha_4 > 0 \quad \alpha_5 > 0$$

These expectations are based on economic theory that an increase in M_2, GDP, EX (Exchange rate depreciation) will lead to an increase in INF while an increase IR would lead to a decrease in INF .

4. Presentation and analysis of results

4.1. Unit Root Test

The ADF test is used to test for stationarity of the data. The ADF test consists of estimating the following regression.

$$\Delta Y_t = \alpha + \beta_t + \delta Y_{t-1} + \sum_{i=1}^m \varphi_i \Delta Y_{t-i} + \varepsilon_t \quad (3)$$

Where α represents the drift, t represents deterministic trend and m is an optimal lag length ample enough to ensure that ε_t is a white noise error term.

Table 1. Summary of Unit Root Test result using ADF

Variables	t- statistics	5% critical value	Probability	Order of Integration
INF	-5.776266	-2.957110	0.0000	I(1)
M2	-3.573757	-2.954021	0.0120	I(0)
IR	-6.410516	-2.954021	0.0000	I(1)
GDP	-4.853654	-2.954021	0.0004	I(1)
EX	-4.917336	-2.954021	0.0003	I(1)

Source: Authors' computation (E-views), 2016

From the above table, Inflation, Lending Interest Rate, GDP per capita, and Exchange Rate are all stationary at first difference I(1) while Money supply is stationary at levels I(0). The appropriate modulus operandi of analysis that captures the combination of I(1) and I(0) stationary variables according to Pesaran *et al.* (2001) is the ARDL model. The primary form of the ARDL model is given as:

$$\Delta INF_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta INF_{t-1} + \sum_{i=1}^n \alpha_{2i} \Delta M_{2t-1} + \sum_{i=1}^n \alpha_{3i} \Delta IR_{t-1} + \sum_{i=1}^n \alpha_{4i} \Delta GDP_{t-1} + \sum_{i=1}^n \alpha_{5i} \Delta EX_{t-1} + \beta_1 INF_{t-1} + \beta_2 M_{2t-1} + \beta_3 IR_{t-1} + \beta_4 GDP_{t-1} + \beta_5 EX_{t-1} + \mu_t \quad (4)$$

Where Δ is the first difference operator; α_0 is the drift component; μ_t is the white noise error term.

The equation above connotes the term with the summation sign represents the error correction dynamics i.e. α_1 - α_5 , while the second part β_1 - β_5 represents the long-run relationship. Accounting for the short term relationship, the primary form becomes

$$\Delta INF_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta INF_{t-1} + \sum_{i=1}^n \alpha_{2i} \Delta M_{2t-1} + \sum_{i=1}^n \alpha_{3i} \Delta IR_{t-1} + \sum_{i=1}^n \alpha_{4i} \Delta GDP_{t-1} + \sum_{i=1}^n \alpha_{5i} \Delta EX_{t-1} + \delta ECT_{t-1} + \varepsilon_t \quad (5)$$

Where ECT is the error correction term which is the residuals retrieved from the estimated long-run relationship.

4.2. Lag length selection

The next step in our analysis is to select the optimal lag length for the cointegration equation based on the hypothesis that the residuals are serially uncorrelated. The lag length which minimises the Akaike Information Criterion (AIC), Schwarz Criterion (SC) and the Hannan-Quinn Criterion and at which the model does not have autocorrelation is the optimal lag length. For this analysis, we would make use of the SC as the choice for the selection of our optimal lag length.

Table 2. Lag length selection

Lag Length	AIC	SC	HQC
1	8.092190	8.591026*	8.260033
2	8.003400	8.736268	8.246325
3	8.122725	9.094136	8.439381

Source: Authors computation (E-views), 2016

Based on the result in table 2, the lag length which minimises SC is lag one and thus our optimal lag length. Given our optimal lag length, we proceed to test for long-run relationship among the variables.

Table 3. ARDL Long-Run Result

Dependent Variable: D(INF)

Variable	Coefficient	t-statistics	Probability
C	-32.68187	-1.436165	0.1650
D(INF(-1))	0.503306	2.659596	0.0143**
D(M2(-1))	0.248833	1.366513	0.1856
D(IR(-1))	-2.129582	-2.707927	0.0128**
D(GDP(-1))	-0.045292	-0.771016	0.4489
D(EX(-1))	0.087335	0.450496	0.6568

Variable	Coefficient	t-statistics	Probability
INF(-1)	-0.886451	-4.202161	0.0004*
M2(-1)	0.040485	0.207378	0.8376
IR(-1)	2.128384	2.452684	0.0226**
GDP(-1)	0.037793	1.403096	0.1745
EX(-1)	-0.211615	-2.309082	0.0307**
R-squared= 0.616582	Adjusted R-squared= 0.442300	F-stat(prob)= 3.537857(0.006439)	Durbin-Watson= 1.931329

Source: Authors computation (E-views), 2016

** Significant at 5% * significant at 1%

To investigate the presence of long-run relationships among INF, M₂, IR, GDP, and EX, the bound testing under Pesaran, et al. (2001) procedure is used. The bound testing procedure is based on the F-test. The F-test is basically a test of the assumption of no cointegration among the variables against the premise of its existence, denoted as:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$

i.e., there is no cointegration among the variables.

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$$

i.e., there is cointegration among the variables.

4.3. The Bound Test Approach to Co-integration

From the result in Table 3, we make use of the Wald test to determine if the variables have long run relationship or not.

Table 4. Wald Test

Equation: Untitled			
Test Statistic	Value	Df	Probability
F-statistic	3.801238	(5, 22)	0.0124
Chi-square	19.00619	5	0.0019

Source: Authors' computation (E-views), 2016

Given the result of the Wald Test, the F-statistic value should be compared with the Pesaran critical value at traditional levels of significance. It is noted by Narayan (2005), the current critical values reported in Pesaran *et al.* (2001) cannot be used for small sample sizes because they are predicated on the premise of the existence of large sample sizes. Narayan (2001) provided a set of critical values for sample sizes ranging from 30 to 80 observations. They are 2.496 – 3.346 at 10% level of significance, 2.962 – 3.910 at 5% level of significance and 4.068 – 5.250 at 1% level of significance. Since the F-statistic 3.801238, is greater than the upper bound critical value at 10% level of significance (3.346), we thus reject the null hypothesis and conclude that Inflation, money supply, Interest rate, GDP per capita and Exchange rate have co-movements in the long-run in Nigeria. From the result, we can hence estimate a short run relationship between Inflation and the explanatory variables.

Table 5. ARDL short-run relationship

Dependent Variable: D(INF)

Variable	Coefficient	t-statistics	Probability
C	0.623592	0.290580	0.7737
D(INF(-1))	0.528451	3.180690	0.0038*
D(M2(-1))	0.282748	1.993774	0.0568***
D(IR(-1))	-1.964610	-2.916241	0.0072*
D(GDP(-1))	-0.035001	-0.821581	0.4188
D(EX(-1))	0.045156	0.284419	0.7783
ECT(-1)	-0.884141	-4.473021	0.0001*
R-squared= 0.596131	Adjusted R-squared= 0.502930	F-stat(prob)= 6.396219(0.000312)	Durbin-Watson stat= 1.916505

Source: Authors' computation (E-views), 2016.

*** significant at 10% * significant at 1%

The result in table 5 shows that in the short-run, Inflation has a cogent relationship with its one period lag value i.e. Inflation depends on its previous value in the short-run. The result also shows that money supply and interest rate have a significant one year lag effect on Inflation in the short run in Nigeria while GDP and exchange rate do not have a significant relationship with Inflation in the short-run. From the result, a percentage increase in money supply at year t is precursory to a 0.28 percentage increase in inflation at year $t+1$ in the short run while a percentage increase in interest rate at year t would lead to a 1.96 percentage decrease in Inflation at year $t+1$. From the result, it can also be seen that GDP has a negative relationship with Inflation in the short run while exchange rate has a positive relationship with Inflation in the same short run. The R-squared value of 0.60 indicates that 60 percent of the variations in Inflation is explained by the regressors in the model, and after taking cognisance of the degree of freedom, the adjusted R-squared value of 0.50 indicates that 50 percent of the variation in Inflation is explained by the regressors and the F-statistic probability value of 0.000312 indicates that all the explanatory variables have a joint significant consequence on Inflation in Nigeria in the short-run. The Error Correction Term which denotes the speed of adjustment towards long-run equilibrium is 88.4 percent. This explains that the whole system can achieve a long run equilibrium at the speed of 88.4% annually.

The Durbin-Watson value of 1.9 indicates that this model is free from serial correlation. We go further by using the LM test to confirm the non-existent of serial correlation in our model and also the CUSUM test to examine the stability of the model.

Table 6. Serial Correlation Test

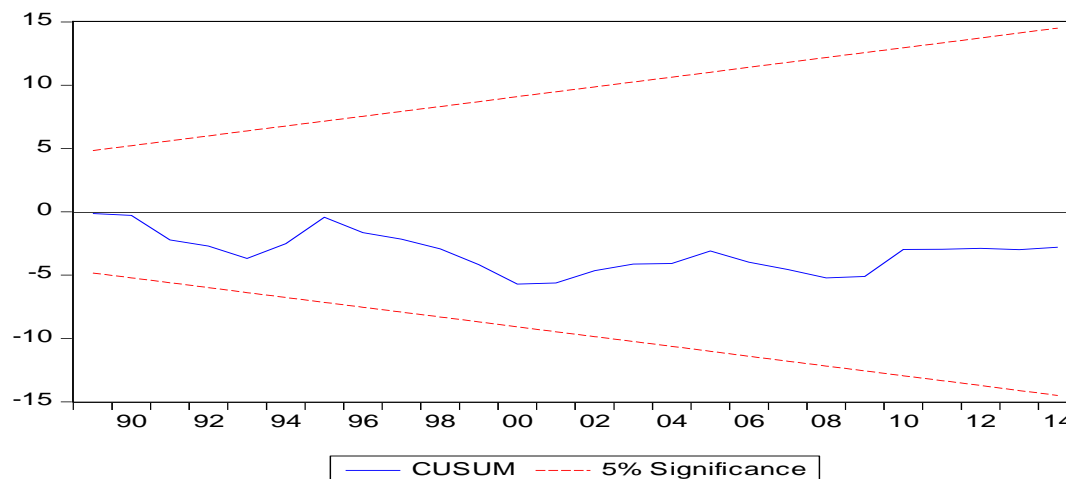
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.085585	Prob. F(1,25)	0.7723
Obs*R-squared	0.112587	Prob. Chi-Square(1)	0.7372

Source: Authors' computation (E-views), 2016

Given the probability value of 0.7372 percent, we fail to reject the null hypothesis and conclude that our short run model is free from serial correlation.

Figure 2. CUSUM Stability Test



Source: Authors' computation (E-views), 2016

The above figure shows that the CUSUM line is within the critical bounds of 5 percent level of significance which indicates that the model has structural stability.

5. Conclusions

In the study, Inflation in Nigeria has been estimated using the Autoregressive and Distributed Lag (ARDL) model technique to cointegration. The empirical result unveils that there exists a long-run relationship among Inflation, Money supply, Interest rate, GDP per capita and Exchange rate in the Nigerian case. The result also showed that in the short run, Money supply has a positive and significant effect on Inflation as the Monetarists predicted. It also showed that Interest rate has a negative and significant influence on Inflation in Nigeria while GDP per capita and Exchange Rate has no significant influence on Inflation in the short-run in Nigeria. The result also shows that in the short-run model, the interaction among Money supply, Interest rate, Exchange rate and Inflation follows a priori expectations while GDP per capita does not follow

a priori expectations. It is therefore recommended that short run policies should be tailored towards the control of money supply and interest rate in Nigeria in order to regulate inflation.

As a result of the negative effect of GDP per capita on inflation, though insignificant, it explains that there is still room to vary any factor of production till overall output as a share of the population counts in yielding to inflation, ceteris paribus. To this effect, the study also recommends that the economy can afford to vary any one significant factor of production in order to boost productivity without fuelling inflation, thus investment in any of human capital development or technological advancement is advocated for in order to account for short-run significance.

References

- Abidemi and Maliq (2010). Analysis of Inflation and its Determinants in Nigeria. *Pakistan Journal of Social Sciences*, 7(2), 97-100.
- Ashwani (2014). Determinants of Inflation in India: A Co-Integration Approach. *International Journal of Multidisciplinary Consortium*, 1(1)
- Aurangzeb and Anwar Ul Haq (2012). Determinants of Inflation in Pakistan, *Universal Journal of Management and Social Sciences*, 2(4).
- Bashir, F. et. al. (2011), Determinants of Inflation in Pakistan: An Econometric Analysis using Johansen Cointegration Approach, *Australian Journal of Business and Management Research*. Vol.1, No. 5 71-82.
- Friedman, M. (1969). The Optimum Quantity Theory. *The Economic Journal*. 80(319).
- T. Hossain and N. Islam (2013). An Economic Analysis of the Determinants of Inflation in Bangladesh. *The International Journal of Social Sciences*, Vol.11, No.1; 29-36
- Iya, I.B. and Aminu, U. (2014). An Empirical Analysis of the Determinants of Inflation in Nigeria. *Journal of Economics and Sustainable Development*, 5(1).
- Iyoha, M. (2002). Budget of Economic Growth and Development. *Bullion Publication of CBN*, 26(2).
- Jhingan, M.L. (2011). *Monetary Economics* (7th ed.). Delhi: Vrinda Publications.
- Mansaray-Pearce, E.A. and Liu, P. (2015). The Determinants of Inflation in Sierra Leone: A Cointegration Analysis. *Journal of Economics and Sustainable Development*, 6(6).
- Mohanty, D. and John, J. (2014). Determinants of Inflation in India. *Journal of Asian Economics*, 36, 86-96.
- Narayan, P.K. (2005). The Savings and Investment Nexus for China: Evidence from Cointegration Tests. *Applied Economics*, 37, 1979–1990.
- Pesaran, M.H and Shin, Y. (1999), “An autoregressive distributed lag modelling approach to cointegration analysis”, In: *Strom, S., Holly, A., Diamond, P. (Eds.), Centennial Volume of Rangar Frisch*, Cambridge University Press, Cambridge.
- 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.
- Sahaduddeen I. (2012). A Cointegration and Error Correction Approach to the Determinants of Inflation in India. *International Journal of Economic Resources*, Vol.3i1, pp 105-112.