Impact of Inflation on Interest Rate in Nigeria: A Cointegration Approach of 1995-2016

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ABSTRACT

This work carefully studied the impact of inflation on interest rate in Nigeria from 1995 to 2016. In specific terms, the study verified the impact of headline inflation, food inflation, and core inflation on interest rate in Nigeria. Secondary data extracted from the Central Bank of Nigeria (CBN) Statistical Bulletin for various years was used while the ex-post facto research design was adopted. Johansen and Juselius cointegration approach was employed considering the necessary assumption tests of classical regression and correlation analysis such as unit root test of stationarity and collinearity test.The findings revealed headline inflation has a long run negative influence on interest rate while food and core inflation had significant positive long run influence on interest rate in Nigeria. Based on these findings, it was recommended that the federal government should work hard to stabilize inflation rates encouraging and supporting the real sector through subsidies and also increase investment in infrastructural facilities. More so, monetary policy makers should use the knowledge of the relationship that exists between interest rate and inflation to manage inflation for better economic stability in Nigeria.

Keywords: Interest rate; Headline Inflation; Food Inflation; Core Inflation and Nigeria

INTRODUCTION

Production and Productivity level of a country is the major element and indicator in issues concerning inflation. This is because the meaning of inflation is not clear in the absence of its essential ingredient which is goods and services simply referred to as "what money can buy. Hence, the industrial sector and the agricultural sector should not be left out as the producers of these goods and services in their aggregate form. A good economic policy is the type that never jeopardizes with the existence of the afore mentioned main sectors especially, the agricultural sector which is usually the main sector of any developing economy, for instance, the interest rate policies which can either make or mar the development of the industrial sector by impacting directly on the GDP level.

Before the oil boom in Nigeria, the agricultural sector was the main sector and the GDP level was super and inflation was merely heard and not experienced quite unlike what is obtainable presently with the sharp diversion to the oil sector with the advent of the oil boom, and interest rate policy of changes to cushion the effect of the influx of wealth as a result of the boom with little or no consideration of the industrial sector by the central bank in her credit Policy measures. Wealth is expressed in a variety of ways. For individuals, net worth is the most common expression of wealth, while countries are measured by gross domestic product (GDP) or GDP per capita. GDP is commonly used as an indicator of the economic health of a country, as well as to check a country's standard of living. Wealth is not to be equated with money. In [1], wealth is the items of economic value that an individual or a nation owns, however money is simply a devised means of exchange and a store and measure of value. It is possible for a country to print billions of its currency in a couple of weeks but it cannot create wealth (human capital, mineral resources, climate and other assets) in the same way. She further reveals that wealth can be created through several means, such as agriculture and primary factors, technology and advancement in science to allow faster creation of wealth, or applying skill (knowledge) and labour to

increase the value of materials. The creation of wealth affects economic growth that can boost demand and trade, create jobs and increase wages and ultimately results in wealth accumulation. Accordingly to Obinatu,[1] all wealth is built from a basic equation: wealth = value x leverage. Believe it or not, every single wealthy person created money flow by creating value through innovation or intuition and leveraging it by redirecting it to further value creation thus accumulating wealth.

Judging from the foregoing, one can deduce that inflation is basically caused by the accumulation of excess wealth and fund from the oil sector without investing same in productive ventures; thereby discouraging investment and making the investment climate unconducive through the various interest rate policies geared towards checkmating the excess money in circulation (contractionary measures). For several years back till now, there is no time one goes to the pages of the national dailies and papers without seeing captions like "Economic Recession," "Worsening Inflationary Pressures", Central Bank of Nigeria (CBN) changes policy on interest rate and so on. All these point to poor economic condition which is due to fluctuations in the price of oil at the international market. Moreover, many economic policies have been put in place to checkmate these attributes like "inflation", "interest" unemployment, and

so on, but to no avail. Impliedly, these economic problems have become endemic and as a result, the Nigerian economy is yet to attain the so much desired economic height despite several research works on the effect of inflation on economic growth.Though inflation may mean different thing to different people; if summarized, it is referred to as the increase in price level without a parallel increase in output.

On the other hand, interest rate is the cost of fund or the expected rate of return on financial assets. Whichever way they are defined, government is interested on both and as such is always careful on issues bordering on them in their monetary policy measures. The reason is because nominal interest rate movements reflects the behaviour in financial markets, where as inflation performance reflects the behaviour in the goods markets and there is no reason, a priori, to believe that equilibrium in both markets will be attained equally quickly. Consequent upon these, the cardinal

question is; are interest rate policy changes the best option to reduce inflationary pressures and its economic effects; bearing in mind the much expected better management of the Dutch disease? In seeking answer to this question, the researcher tries to empirically study the impact of inflation on interest rate in Nigeriafrom 1995 to 2016, with a view to know whether the result will proffer solution to the numerous economic problems facing the economy such as:- Unemployment, Balance of payment (B.O.P) deficit, Balance of trade disequilibrium, Poor external reserve, foreign exchange rate fluctuations, Low gross domestic product, and so on.The remaining part of this paper is divided into review of empirical literature for part two, methodology for part three, Data presentation, analysis and interpretation of results for part four, and Conclusion and recommendations for part five.

REVIEW OF EMPIRICAL LITERATURE

[2], examined the long-run equilibrium relationship between interest rate and inflation in Nigeria covering the period of 1995-2014. The study employed Johansen and Juselius co-integration test, vector error correction model (VECM) and pairwise granger causality test. The findings revealed evidence of long-run

equilibrium relationship between interest rate and inflation rate with strong evidence of unidirectional granger causality flowing from interest rate to inflation rate at the long-run.

[3] empirically estimated the relationship between inflationary expectations and the variations in interest rate in Nigeria. The

study used the Generalized Method of Moment (GMM) estimator and found out that interest rate variation have a negative and significant relationship with inflation rate in Nigeria.

[4] examined the link among inflation, interest and exchange rates on economic growth in Nigeria using a sample period of 1979-2010. He used ordinary least square multiple regression analysis capturing unit root test, Johansen &Juselius co-integration and Granger Causality test and found that inflationary rate is negatively related with real gross domestic product while a positive relationship existed for exchange rates and interest rates though not significant. This is sustainable even in the long run and the implication is that when inflationary rate is rising, it affects the economy negatively as growth is dampened. On causality, no causality was found at both lag 2 and lag 4, between inflation rate and real gross domestic product. But at lag 2, a unidirectional causality running from inflation rate to interest rate and also a unidirectional causality running from interest rate to real gross domestic product were noticed. At lag 4, a unidirectional causality from interest rate to inflation rate, so also an existence causality between interest rate to exchange rate and also a unidirectional causality running from exchange rate to real gross domestic product. It was then submitted that efforts should geared

towards a single digit level, thus enhance growth leading to development in Nigeria economy, making the macroeconomy better-off and alive.

[5], examined the level, nature of association as well as the impact of exchange rate fluctuations on inflationary pressure and other selected macroeconomic indices in Nigeria between 1979 and 2010. They used ordinary least squares multiple regressions, Granger Causality and Co-integration technique. The study also performed a stationary test using the Augmented Dickey-Fuller (ADF) method. The result revealed that exchange rate and inflationary rate are positively related, though not to a very significant extent. This signifies that fluctuations in exchange rate can as well result in a proportionate response in the prevailing inflationary rate. The study also revealed that there is no causality between exchange rate and inflationary rate; a unidirectional causality runs from interest rate to inflation; and Interest rate and real GDP have no significant impact on exchange rate in Nigeria.

[6], examined the threshold effect of inflation on economic growth in Nigeria. They made use of quarterly time series data covering the period of 1981 – 2009. The study applied the threshold model developed by [7], which states that a threshold level of 13 per cent is

significant for Nigeria. Hence below this level, inflation is insignificant; while above the negative magnitude is highly significant. The study discovered a robust relationship with respect to changes in econometric methodology, additional explanatory variables and changes in data frequency.

[8] empirically examined the effect of interest rate, inflation rate, and GDP on macroeconomic growth in Jordan for the period of 11 years (2000-2010). The study adopted ordinary least squares (OLS) multiple regression, co-integration and causality techniques. The result revealed a long term equilibrium relationship existed among variables. Granger Causality results showed that only inflation causes interest rate while others are independent, hence no causality. However, the regression results revealed that inflation has significant effect on growth rate while only prevailing interest rate has significant influence on growth rate. Lastly, testing for interest, inflation rates and GDP all together, found out that current GDP and one lag GDP have influence power to growth rate in Jordan.

[9] analyzed the impact of inflation on economic growth and development in Nigeria for the period of 1970-2010. The methodology adopted was ordinary least squares regression techniques. The findings revealed that inflation have a significant positive effect on economic in

Nigeria. The study further discovered a causal relationship running from GDP to inflation which implies that GDP causes inflation but inflation do not cause GDP. The study then concluded that policymakers should make effort to increase output level in Nigeria through improved productivity as this will help reduce prices of goods and services, so that growth will be boosted.

[10] examined the sensitivity of interest rates and banks investment in Nigeria. The study used Ordinary least squares (OLS) regression analysis and found real lending rates to be significant and highly negatively sensitive to all the incorporated financial indicators in Nigeria during the review periods. A similar study by [11] investigated the impact of interest rate on investment in Nigeria. The study used multiple regressions techniques and discovered that high interest rate negatively affect investment in Nigeria.

[12], examined the effect of changes in interest rates on inflation (measured by consumer price index (CPI) in Nigeria using both descriptive and econometric methods. Four sets of hypotheses were tested by examining the impact of four variables that is prime lending rate; minimum rediscount rate; money supply and treasury bills rate on inflation. The empirical results confirmed that changes in interest rates and increase in the level

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IDOSR JOURNAL OF BANKING, ECONOMICS AND SOCIAL SCIENCES 3(1): 36-47, 2018.

of money supply were associated with rise in inflationary pressures. In conclusion, the researcher noted the need for relevant authority to correct abnormality in inflation rate through the introduction of appropriate interest rates from time to time.

[13], investigated the determinants of inflation in Nigeria using a monthly data from January 2007 to August 2014. The ordinary least square (OLS) method was adopted because of its unique property of best linear unbiased estimator (BLUE). The result showed that expected inflation, exchange rate and money supply influenced inflation, while annual Treasury bill rate and monetary policy rate though rightly signed did not influence inflation in Nigeria within the period under investigation. The study also employed co-integration test analysis which ascertained a long term relationship existed among the variables and they were stationary at order one I (1).

METHODOLOGY

The study is focused on the impact of inflation on interest rate in Nigeria. It spanned from 1995-2016. *Ex-post facto* research design for cause-effect study was adopted. The model for this study was structured in a way to show the impact of inflation on interest rate in Nigeria. The model adopted was a modified model of [2] which captured interest rate and inflation in aggregated form with a special concern in the long-run equilibrium relationship between interest rate and inflation in Nigeria. In this study, the general view is that food inflation, headline inflation, core inflation and interest rates within the economy can be explained by variations in the present and past values of the quantity of money. However, the model for testing the hypothesis was based on the Keynesian liquidity preference theory which determines the interest rate by the demand for and supply of money in stock theory and also on the monetarist theory of inflation. The Johansen and Juselius cointegration model is mathematically represented as follows:

$$\nabla INT_t \quad = \quad C \ + \ \nabla\beta_1 HLI_t \ + \ \nabla\beta_2 FDI_t + \nabla\beta_3 CI_t \ + \ \mu_t \dots \dots \ \textbf{\textit{Equation 1}}$$

Where,

INT_t =   *Interest rate at time t, (Dependent variable). It is represented by prime lending rate*

HLI_t =   *Headline Inflation at time t,*

FDI_t =   *Food Inflation at time t,*

CI_t =   *Core Inflation at time t,*

β_0 =   *Intercept of the regression or constant*

μ_t =   *Stochastic error term associated with the model,*

∇ =   *difference operator*

Apriori Expectation – $\beta_1 - \beta_3 > 0$

Similarly,the Augmented Dickey Fuller (ADF) unit root test statistics is represented by:

$$\Delta(y)_t = \alpha_0 + \alpha_1(y)_{t-1} + \sum_{T=1}^{m} P_i \Delta(x)_{t-1} + U_t \dots\dots\dots\dots\dots\dots\dots\dots\dots Equaton 2$$

Where,

∇= is the difference operator

U_t and V_t = Random terms

t = Linear trend

This test result will be achieved assuming the presence of unit root (non-stationary of the variables) in the null hypothesis (H_0) and no unit root (stationary of the variable) in the alternative hypothesis (H_1). In this regard, decisions were made based on the calculated statistic and McKinnons critical value in comparison with the critical values. A variable is considered non-stationary if its calculated value is less than the Mackinnon's critical value,the existence of a unit root is justified. On the other hand, a variable is considered stationary if its calculated value is higher than the critical value and this confirms the absence of a unit root.

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RESULTS AND INTERPRETATION

Table 1: Descriptive statistics of Variables of Study

Variables	Mean	Std. Dev.	Skewness	Kurtosis	JarqueBera stat.	Prob (J-B)
INT	18.09	2.36	0.87	4.55	4.99	0.0826
HLI	80.57	53.76	0.69	2.29	2.19	0.3339
FDI	81.95	53.70	0.86	2.58	2.86	0.2390
CI	81.91	53.50	0.61	2.23	1.90	0.3861

Source: Researcher's Computation using E-views 9.0
Decision Rule: Pv ≤ 5% Reject null hypothesis
Pv>5% Refuse to reject the null hypothesis

From the above table, the Skewness of 0.873649 and 0.858473 for interest rate and food inflation respectively is very high which is ideal unlike that of headline inflation (0.688192) and 0.608833 for core inflation which is not high enough. The Kurtosis for interest rate is 4.5 which is greater than 3 and is normal while that of headline inflation, food inflation and core inflation are 2.3, 2.6 and 2.2 respectively and are less than 3 indicating platy Kurtosis as against the acceptable lepto Kurtosis of (>3) for researches on financial time series. This simply shows that the observations are not normally distributed.

Also,the result shows that the variables or observations are not normally distributed are the probability values of 0.3, 0.2 and 0.4 for HLI, FDI and CI respectively which are not up to the acceptable probability value that is greater than 5% percent by Jague-Bera.

From the table also, the sum square deviation has no error term which is normal but the standard deviation of 53.8, 53.7 and 53.5 for HLI, FDI and CI from the interest rate of 2.4 are so highly and are capable of giving a misleading result. In view of these inadequacies, the data needs transformation as shown below after graphic presentation.

Table 2: ADF Unit Root test results

Variables	ADF Statistics	C.V @ 5%	P. Value	Order of Integration	Remarks
LINT	-7.81	-3.67	0.0000	1(1)	Stationary at first difference
LHLI	-4.82	-3.67	0.0058	1(2)	Stationary at second difference
LFDI	-4.46	-3.69	0.0124	1(1)	Stationary at first difference
LCI	-2.99	1.96	0.0049	1(2)	Stationary at second difference

Source:Author's extract from E-views 9.0 output

From the above result, LINT ADF test of -7.81, critical value (C.V) of -3.67 and Probability Value of 0.0000. The ADF of -7.81 is more negative than the critical value of -3.67 and the P.V of 0.0000 is less than 5% thereby confirming its stationarity at first differencing. For LHLI, the ADF statistics of -4.82 is more negative than the C.V. of -3.67 and the P. V. of 0.0058 is less than 5%. Also LFDI with ADF of -4.46 which is less than C. V. of -3.69 is acceptable in addition to a P.V of 0.0124 as a confirmation of its stationarity.

Finally, LCI has an ADF test result of -2.99 as against -1.96, C.V. and P. V. of 0.0049 at none re-set under trend and intercept at second difference which shows stationarity at second difference. Summarily, the variable and observations are normally distributed after the unit root test as also confirmed in the preliminary test of the descriptive statistics.

Table 3: Result of Cointegration test

Hypothesized No. of CE(s)	Trace Statistic Approach				Maximum Eigenvalue Approach		
	Eigenvalue	Trace stat.	5% CV	Prob.*	Max-Eigen stat.	5% CV	Prob.*
r=0	0.799	50.228	47.856	0.0294*	32.051	27.584	0.0124*
r≤1	0.409	18.178	29.797	0.5529	10.517	21.132	0.6951
r≤2	0.281	7.661	15.495	0.5024	6.601	14.265	0.5373
r≤3	0.052	1.060	3.841	0.3033	1.060	3.841	0.3033

Source: Author's extract from e-views 9.0

indicates that there is cointegration

The cointegration test result of both trace statistics and maximum eigenvalue approach indicates that there is one (1) cointegrating equation which implies that the variables have long run equilibrium relationship. The cointegrating test result is as shown below

Table 4: Cointegration test result

$$\nabla INT_t \quad = \quad C \quad + \quad \nabla\beta_1 HLI_t + \nabla\beta_2 FDI_t + \nabla\beta_3 CI_t$$

Coefficient	-182.56	-13.084	6.724	6.004
Std. error		(2.234)	(0.973)	(1.433)
t-stat.		-5.86	6.91	4.19
t-tabulated =	2.080			

Source: Author's extract from e-views 9.0 result

Decision Rule: Reject Ho if t-stat. > t-tabulated; otherwise do not reject

The empirical result above (with t-statistics > t-tabulated) indicates that headline inflation (HDI) has a long run significant negative influence on interest rate in Nigeria; food inflation (FDI) has a long run significant positive relationship with interest rate in Nigeria while core inflation (CI) has a long run significant positive impact on interest rate in Nigeria.

CONCLUSION AND RECOMMENDATIONS

Inflation is referred to as the increase in price level without a parallel increase in output. On the other hand, interest rate is summarized as the cost of fund or the expected rate of return on financial assets. This study examined the long run impact of inflation on interest rate in Nigeria. It spanned from 1995 to 2016 and disaggregated inflation into headline inflation, food inflation, and core inflation. Johansen and Juselius cointegration technique was employed while the findings revealed that inflation at disintegrated form (headline inflation, food inflation, and core inflation) hadlong run significant mixed influence on interest rate in Nigeria.Particularly, headline inflation has a long run negative equilibrium relationship with interest rate while food and core inflation have long run positive relationship with interest

rate in Nigeria. Based on these findings, it was recommended that:

- Federal government of Nigeria should work to stabilize inflation rates in Nigeria.
- They should encourage and support the real sector through subsidies and investment in infrastructure.
- Monetary policy makers should use the knowledge of long-run equilibrium relationship that exists between interest rate and inflation to manage inflation for better economic stability.

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DATA USED

Annual time series data from official website of the Central Bank of Nigeria (CBN) and the Nigerian National Bureau of Statistics (NBS) for the period of 1995 to 2016

YEARS	INT	HLI	FDI	CI
1995	20.18	18.3	24.6	17.6
1996	19.74	23.7	30.5	22.2
1997	13.54	26.2	32.8	23.7
1998	18.29	28.3	34.2	25.0
1999	21.32	30.2	36.0	31.4
2000	17.98	32.3	28.4	35.6
2001	18.29	37.5	39.6	37.7
2002	24.85	43.3	44.8	42.4
2003	20.71	49.3	47.4	53.9
2004	19.18	56.7	54.3	62.3
2005	17.95	66.9	66.9	67.7
2006	17.26	72.4	70.6	76.4
2007	16.94	76.3	71.9	83.5
2008	15.14	85.1	83.4	87.7
2009	18.99	95.8	95.8	95.8
2010	17.59	109.6	109.9	107.6
2011	16.02	120.7	103.8	120.3
2012	16.79	135.5	135.0	136.9
2013	16.72	147.0	148.0	147.5
2014	16.55	158.8	162.1	157.6
2015	16.85	173.1	178.1	170.5
2016	17.02	200.3	204.7	196.6

Source: CBN Statistical Bulletin, 2016