

Monetary Policy And Economic Development In Nigeria: An Ardl Approach

ABIMBOLA FLORENCE AROTIBA¹ ALEXANDER EHIMARE OMANKHANLEN²

^{1,2}, Department of Banking and Finance
Covenant University, OTA

KM 10, Idiroko Road, Canaan Land, Ota
NIGERIA

Email¹: abimbola.arotibapgs@stu.cu.edu.ng

Email²: alexander.omankhanlen@covenantuniversity.edu.ng

Abstract: This study undertook an investigation to find out the impact of monetary policies on the economic development of Nigeria. Economic development in this study is proxied by the human development indicator which captures both the economic as well as social conditions. Exchange rate, interest rate and inflation rate were used as proxies for monetary policy. The annual data for the analysis from 1991 to 2020 was gotten from the World Bank Statistical Bulletin. The study found that interest rate had a considerable positive influence on the human development indicator in the short run but had an insignificant negative effect in the long run, using Autoregressive Distributed Lag (ARDL) methodology. The exchange rate was also revealed to have an insignificant and positive influence on economic development in the short run as well as in the long run. Based on the findings, the study stated that the government should focus on setting monetary policy rates that will attract investment and bring about an improvement in the human development indicator and consequently, economic development.

Key-Words: Monetary Policy, Economic Development, ARDL

1 Introduction

Monetary policies undertaken by a country will affect the money supply in its economy. This powerful tool if not well-implemented and followed can have an adverse effect on an economy. Some of the objectives of these policies are to manage inflation, consumption, growth, liquidity, unemployment and also the currency exchange rates. Most economists believe that it is best for Central banks or a similar organization that is not controlled by the elected government to conduct the monetary policies. These policies are seen as the first line of defense in terms of restoring economic stability during a slump. [1]

Economic development focuses on helping developing countries improve their fiscal, economic, and social problems. The working conditions, market conditions, education, health, domestic and foreign regulations are all aspects taken into account. [2]. Monetary policy establishment and implementation are shaped by fundamental developments in the global and domestic economic and financial environments. These policies pointed to continuing imbalances in the global economy as reflected in sluggish output growth, rising vulnerabilities in the financial

markets, weakening multilateralism, and growing unfair trade practices. [3]

According to CBN, the goals of monetary policy dwelled on achieving internal as well as external balance of payment. Over the years, attention to the instruments and techniques used to attain these goals has changed. The two fundamental phases of monetary policy in Nigeria are before 1986 and after 1986. There was a great attention to precise monetary control in the first phase and great reliance on the mechanisms of the market in the second phase. To date, a number of variables have hindered the execution of monetary policy in Nigeria, including fiscal generosity, the central bank's lack of operational autonomy, low-quality and insufficient statistics, a weak transmission mechanism and financial system. [4].

1.2 Problem Formulation

Economic development involves both economic and social progress in a country. Economic development involves an elimination or reduction in poverty, unemployment, and inequality. It also involves social progress like quality education, good health, reduction in corruption etc. Nigeria, over the years has not been able to attain price stability which is a situation where the prices of

goods and services fluctuates with little or no changes, rather the nation have a double-digit inflation figure which as at February 2021, stood at 17.33% according to the National Bureau of Statistics.

According to the National Bureau of Statistics, Unemployment rate in Nigeria has also been on the increase with a rate of 33.3% as at December 2020. Also, the currency exchange rate to a strong currency like the dollar has been depreciation over the years. From CBN exchange rate of N113.45 to \$1 as at 2001, to N380 to \$1 as at 2020. The National Bureau of Statistics as of 2019 stated that 40.1 percent of the total population of the nation is living below the poverty line. [5] Nigeria has had several monetary policies implemented over the years to control and manage the supply of money in the economy; yet poverty, unemployment and inequality are very high and still on the increase. There is a need to analyze how these policies have impacted upon economic development. As a result, the purpose of this research is to examine the impact of the exchange rate on Nigeria's economic development.

2. Literature Review

2.1 Theoretical Framework

Monetary policy, according to Keynes, has a significant impact on activities in the economy. Money supply changes can permanently modify variables such as interest rates, aggregate demand, employment, output and income according to the theory. It is believed that there exist equilibrium between unemployment and employment. This suggests that increasing the money supply can result in long-term increases in output. As a result of the aggregate demand and the elasticity of aggregate output supply, money supply has an ultimate impact on the price level. [6]

2.1.1 Modern Perspective on Monetary Policy

Modern monetary economists dispute the Keynesian notion that interest rates are the link between money supply and production. Only two types of assets were examined in the Keynesian analysis: The allocation of bonds and speculative cash balances which were determined by interest rate, which led to changes in output. It is based on the portfolio rebalancing procedure. Because the portfolio of the public comprises of a broad array of assets which includes mortgages, equities, bonds, savings, and so on, when the apex bank purchases securities in the open market, it triggers the wealth

and substitution effects are triggered. As a result, the aggregate money demand will increase, and the economy will grow in the long run.

2.1.2 Substitution Effect Theory

The portfolio of assets of the neo-Keynesians was greatly expanded to cover not only government securities but also industrial bonds, shares, savings, mortgages, and so on. Assume the central bank purchases securities in an open market operation using this type of portfolio; the price of securities will rise, lowering the yield on them. To put it another way, holders of securities sell them to the central bank because they fetch a premium price.

Assume they use bonds to replace their excess cash balances. As interest rates decrease, increased demand for bonds leads to an increase in their market price, lowering their current yield. [6]

2.2 Empirical Literature

Umidjon Duskobilov (2017) carried out a study on monetary policy's impact on economic stability in Uzbekistan. The author examined how the tools of monetary policy relate to economic growth in Uzbekistan. The Error Correction Model was the method used to analyze the data and the results revealed that from 2005-2016 that tools of monetary policy, which included mandatory reserve requirements, refinancing rate, and sterilization volume to GDP, influenced the growth of the county's economy positively and supported the economic regulation of Uzbekistan. [7]

Ifionu & Akinpelumi (2015) carried out a study on The effect and implications of certain macroeconomic variables on money supply with specific reference to the economy of the country, Nigeria. The Ordinary Least Square (OLS) regression was employed in analyzing the data and the results of the analysis revealed that inflation rate and the rate of exchange had a impacted negatively on money supply, while gross domestic product had a positive impact on money supply. [8]

2.3 Gap in Literature

Most researchers who analyzed the relationship between Macro economic policies and economic development measured economic development using either Gross Domestic Product (GDP) or the Gross National Product (GNP). This study makes use of the Human Development Index (HDI), which according to the Economic Times is used to measure a nation's total achievement encompassing both the economic and social dimensions. A

variable that adequately captures not just the economic aspect but also the social aspect will be a more suitable measurement of economic development.

Economic Development comprises life expectancy, education, and income per capita variables, which are used to calculate the Human Development Index. [9]

3. Methodology

3.1 Model Specification

This study employs the human development indicator, inflation rate, rate of exchange to the \$ and interest rate, where the Human Development Indicator serves as the dependent variable. The variables are employed to investigate the impact of monetary policy empirically on economic development using the Autoregressive Distributed Lag (ARDL) technique.

The relationship is stated mathematically as follows:

$$HDI = f(INFR, EXCHR, INTR) \quad (1)$$

where:

HDI = Human Development Indicator.3

INFR = Inflation Rate

EXCHR = Exchange Rate

INTR= Interest Rate

Specifying equation (1) in the ARDL equation yields:

$$\Delta HDI = b_0 + \sum_{j=0}^r b_1 \Delta INFR_{t-j} + \sum_{k=0}^s b_2 \Delta EXCHR_{t-k} + \sum_{l=0}^v b_3 \Delta INTR_{t-l} + \varphi_1 HDI_{t-1} + \varphi_2 INFR_{t-1} + \varphi_3 EXCHR_{t-1} + \varphi_4 INTR_{t-1} + e_2 \quad (2)$$

The difference terms in equation (2) signifies the short-run variables while the lag terms in the latter half of the equation show the long run process. e_2 is the error term while b_i ($i = 1,2,3$) and φ_i ($i = 1,2,3,4$) are the long and short run parameters, respectively. The optimal lag length is to be determined using Akaike information selection criteria

The error correction representation of equation (2) is:

$$\begin{aligned} \Delta HDI &= b_0 + \sum_{j=0}^r b_1 \Delta INFR_{t-j} + \sum_{k=0}^s b_2 \Delta EXCHR_{t-k} \\ &+ \sum_{l=0}^v b_3 \Delta INTR_{t-l} + b_4 ECM2_{t-1} \\ &+ e_{22} \end{aligned} \quad (3)$$

Where: $ECM2_{t-1}$ is the error correction term.

The information is a time series derived from the World Bank's statistical bulletins from the period of 1991 and 2020. The estimation of the model was carried out using STATA 15.

3.2 Unit Root Test

The variables unit root would be examined using the Augmented Dickey-Fuller unit root test.

3.2.1 Augmented Dickey Fuller Unit Root Test

Augmented Dickey Fuller unit root test is carried out and the result is presented in table 1. The results showed all of the variables for the study are not stationary at level. However, after the first order integration, all the variables became stationary.

Table 1: Augmented Dickey – Fuller Unit Root Test Results

Variable	ADF – Statistic		Model
	Level	1 st Difference	
EXCHR	1.536	-2.651*	Drift
INFR	-2.720*	-	Drift
INTR	-3.543*	-	Drift
HDI	0.821	-2.250*	Drift

Source: Author's Computation.

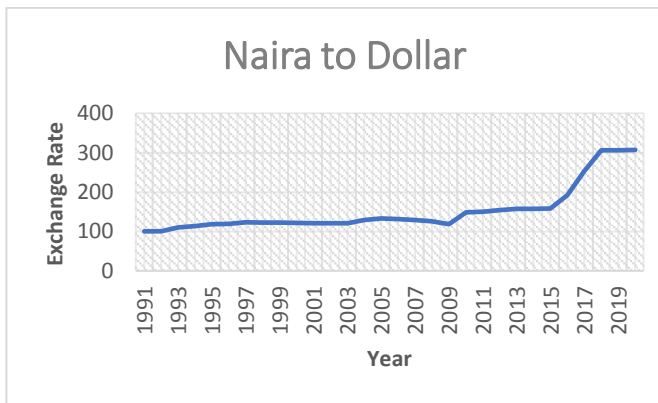
It should be noted that * represents a 5% level of significance and rejection of the null hypothesis of the presence of a unit root.

4. Results

4.1 Trend Plots and Descriptive Statistics of the Variables

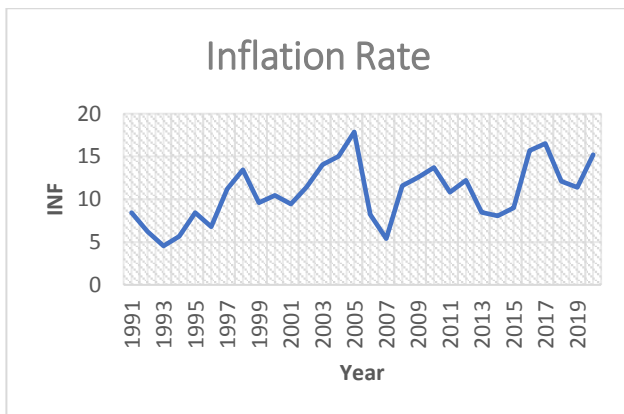
Trend graphs and descriptive statistics are discussed in this section. Plotting time series to acquire a sense of the series' trend is a popular activity. As a result, we plot the series, as shown below:

Figure 1: Trend plot of Exchange Rate (naira to dollar)



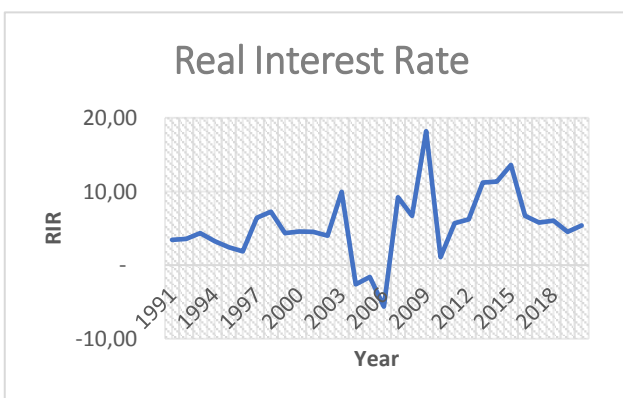
Source: Authors' plot

Figure 2: Trend plot of Inflation Rate



Source: Authors' plot

Figure 3: Trend plot of Real Interest Rate

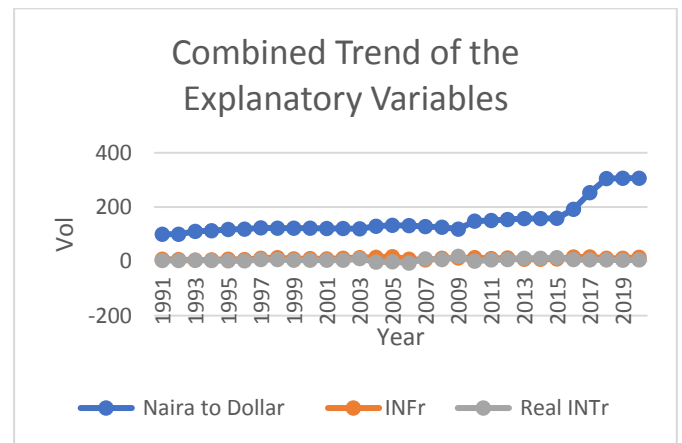


Source: Authors' plot

All the series are mean reverting, and none of them are particularly highly volatile. The exchange rate (naira to dollar) fluctuated through time, with the highest rate recorded in the early 2017, demonstrating that the exchange rate (naira to dollar) has changed through time. Although there

are times when the trend is flat, such as in the mid-1990s, this indicates that the exchange rate remained steady. From 2000s, it trended upward until dropping abruptly in the mid-2010s. The inflation rate and exchange rate trended upward and downward from 1992 to 2020. This implies that both rates have not been stable over the years.

Figure 4: Combined Trend of exchange rate, inflation rate and real interest rate



Source: Authors' plot

In addition, the summary statistics revealed a mean value of 152.4117, .4796333, 10.78528, and 5.391367 respectively for exchange rate, human development indicator, inflation rate, and interest rate. The variables' values are found to be close to their mean values, as seen by their tiny standard deviation values. Also, the maximum values are higher than the average values or mean values.

Table 1: Mean, Standard Deviation Maximum Values and Minimum Values of the Variables

Variab les	Mean	Standar d Deviati on	Minimu m value	Maximu m value
EXCH R	152.41 17	59.9588 7	100.25	306.921
HDI	.47963 33	.035188 6	.42	.54
INFR	10.785 28	3.45738 9	4.55	17.8634 9
INTR	5.3913 67	4.68574 5	5.63	- 18.18

Source: Authors' Computation

Table 2: Skewness and Kurtosis (Nigeria)

Variable	Pr (Skewness)	Pr (Kurtosis)	adj chi2 (2)	p-value
EXCHR	0.0002	0.0254	14.28	0.0008
HDI	0.4764	0.0581	4.26	0.1191
INFR	0.7658	0.4057	0.82	0.6628
INTR	0.4555	0.0930	3.69	0.1577

Source: Authors' Computation

It is revealed that all the variables are positively skewed (skewed right). The Kurtosis coefficient has similarity in signs. It reveals that INFR has a higher sharper peak as indicated by the greater value. All the variables have Kurtosis of less than the conventional 3 but greater than 0. Thus, the variables are not normally distributed but are not excess. Thus, the hypothesis of normality of the variables is rejected. The data set of the variables has a lower central peak and broader, and their tails are shorter and thinner.

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MODEL

$$\Delta HDI = b_0 + \sum_{j=0}^r b_1 \Delta INFR_{t-j} + \sum_{k=0}^s b_2 \Delta EXCHR_{t-k} + \sum_{l=0}^v b_3 \Delta INTR_{t-l} + b_4 ECM2_{t-1} + e_{22}$$

4.2 BOUNDS TEST

Table 3: Bounds Test Result for Level Form Relationship (Level Effect) of the Variables in the ARDL Model

Critical Values (0.1-0.01), F-statistic, Case 3							
90%		95%		97.5%		99%	
I (0)	I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61
Critical Values (0.1-0.01), t-statistic, Case 3							

90%		95%		97.5%		99%	
I (0)	I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37
K	3						
F	2.909						
t	0.600						

Source: Author's computation

The F-test result indicates that the test statistic falls outside the upper Bounds critical Bounds value of 0.1 at 5% level. Therefore, the F-test is significant. Similarly, the t-statistic at the 5 per cent level falls outside the upper Bounds critical value. The test showed that the t-test statistic is greater than the 5 per cent Bounds upper critical value, therefore, indicating the rejection of the hypothesis of no level relationship. Based on this result, we can clearly state that a cointegration exists among (I(0) and I(1)) variables. A level effect of the deterministic regressors exists in the long-run relationship.

4.3 DURBIN-WATSON

Table 4: Durbin-Watson test for autocorrelation

Durbin-Watson statistic (15, 26)	d-	1.944726
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Source: Authors Computation

Table 4 above reveals a Durbin-Watson statistics value of 1.944726, which indicates the absence of autocorrelation since it is approximately 2.

4.4 BREUSCH-GODFREY LM TEST

Table 5: Breusch-Godfrey LM test for autocorrelation

Lags (p)	Chi2	Df	Prob > chi2
1	0.037	1	0.8466

Source: Authors Computation

Table 5 above shows the Breusch-Godfrey LM Chi-square Statistics of 0.037 with the probability value of 0.8466, which further confirms the absence of autocorrelation.

4.5 WHITE TEST

Table 6: White's test for heteroskedasticity

Chi2 (34)	26.00		
Prob > chi2	0.4076		
Source	Chi2	Df	P

Heteroskedasticity	26.00	25	0.4076
Skewness	16.11	14	0.3069
Kurtosis	0.50	1	0.4815
Total	42.60	40	0.3598

Source: Authors Computation

Table 6 above with the probability value of 0.4076 indicates that there is no conditional or unconditional heteroskedasticity (i.e. the residual is constant) in the model.

To examine the effect of monetary policy on economic development, the respective error correction model (equation (3)) was estimated. Before estimating the model, a test for level form relationship of the variables was undertaken to confirm the presence of level effect (cointegration) of the variables in the equation.

4.6 ERROR CORRECTION MODEL

Error Correction Representation for the ARDL Model

The error correction model specified in equation (3) was estimated to analyze the objective. The optimal lag length of the model was determined automatically using the Akaike Information Criterion (AIC). Since the variables has a combination of I(0) and I(1) series and, does not contain I(2) series, the ARDL technique is suitable for this study. None of the variables is sensitive to structural breaks as no variable is I(2). Thus, it is not necessary to add a structural break variable in the model. The estimates of the long run and short run coefficients of the autoregressive distributed lag equation (3) is reported in Table 7 below.

Table 7: Error Correction Estimates of the ARDL Model - (Equation (3))

The dependent variable is HDI – Human Development Indicator				
HDI	Coefficients	Standard Errors	t-Statistics	P-value
Adjustment	.1303893	.2174201	0.60	0.561
Long-Run				
EXCHR	.0004024	.000366	1.10	0.295
INFR	-.019799	.032965	-0.60	0.56
INTR	-.0081977	.019685	-0.42	0.68
		8		5

Short-Run				
EXCHR				
D1	-.0001889	.0001468	-1.29	0.225
INFR				
D1	-.0022682	.0008551	-2.65	0.022
INTR				
D1	-.0003253	.0008551	-0.34	0.740
Constant	-.0806724	.087116	-0.93	0.374
R2				
0.8429				
Adjusted R-Squared				
0.6453				
*F-statistics				
4.25 (0.0104)				

Source: Author's Computation

4.7 ANALYSIS OF RESULTS

The rule for making a decision is that if the t-value (± 2) is greater than the calculated value, we accept the null hypothesis; otherwise, we reject the null hypothesis. Thus;

H₀: Null hypothesis $\beta_0 = 0$

H₁: Alternative hypothesis $\beta_1 \neq 0$

Hypothesis

H₀: Monetary policy does not impact on economic development in Nigeria.

H₁: Monetary policy impact on economic development in Nigeria.

Exchange rate in the long run, showed a positive coefficient of .0004024 with a t-value of 1.10. This implies that an increase in exchange rate does not significantly impact economic development in the long run but an increase in the exchange rate in the long run leads to an increase in economic

development by .04024 per cent. This is clearly demonstrated by the insignificant t-value and p-value of 1.10 and 0.295, respectively. However, in the short-run exchange rate has a negative relationship with economic development with a coefficient of -.0001889 and an insignificant impact on economic development.

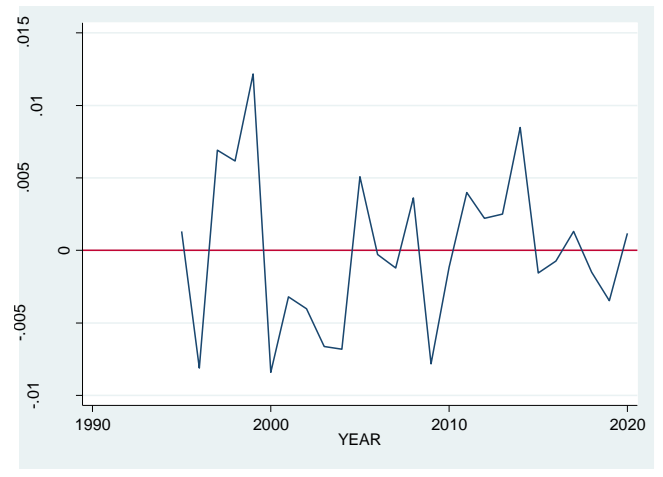
Similarly, inflation rate in the long run, has a positive and insignificant impact on economic development with a coefficient value of -.019799. This implies that an increase in inflation rate brings about a slow down in economic development by 1,9799 percent. The insignificant impact of inflation rate is shown by the t-value of -0.60, which is less than 2 in absolute terms. However, in the short run, the results revealed that inflation rate has a significant impact on economic development in Nigeria with a significant t-value of -2.65 which is greater than 2 in absolute terms.

The results revealed that an increase in the interest rate in the long run brings about a reduction in economic development. This is shown by the coefficient of -.0081977. In the short run similar to the long run, the results revealed that interest rate has no significant impact on economic development in Nigeria. This is demonstrated by the t-value and p-value of -0.34 and 0.740, respectively.

The R^2 value of 0.8439 revealed that the variables explain 84.39 per cent variation in human development indicator (economic development). The remaining 15.61 per cent of the variation in human development indicator is explained by other variables that are not included in the model. The F-statistics value of 4.25 indicates significant impact of the variables. The null hypothesis that the variables jointly have no significant impact on economic development is therefore rejected. This is confirmed by the significant probability value of 0.0104, indicating that there is an insignificant error in rejecting the null hypothesis. Thus, the variables in the equation together significantly affect the economic development of Nigeria.

The residual of the regression equation (3) was also observed and plotted and is shown in figure 5 below.

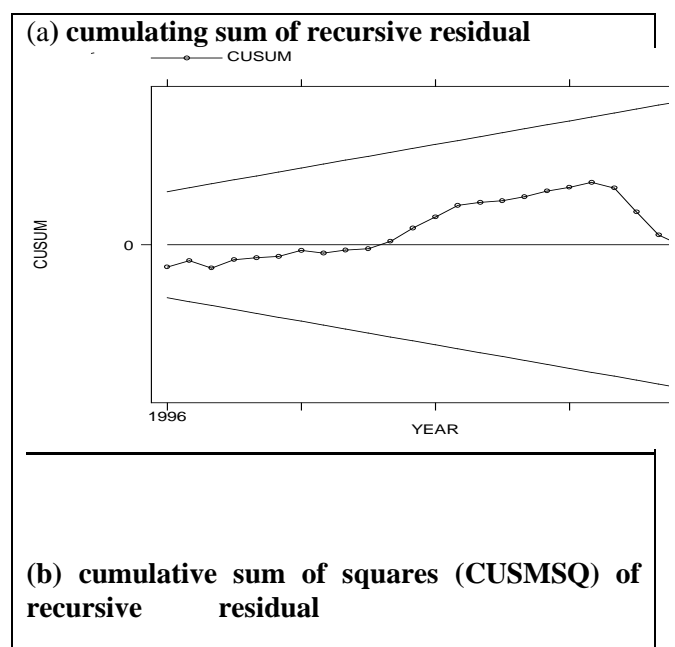
Figure 5: Plot of the ARDL residuals of the regression - equation (3)

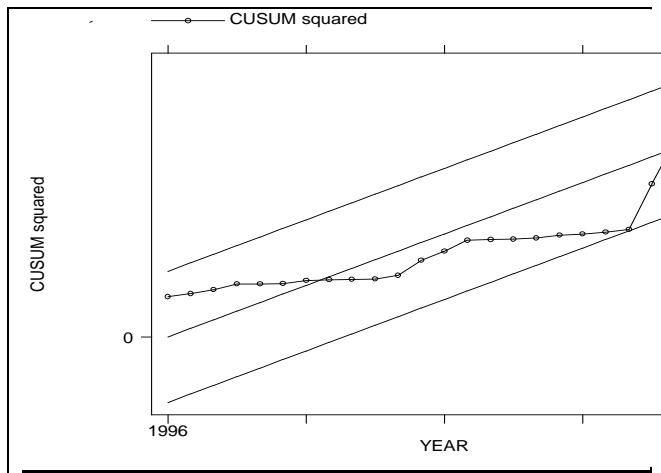


Source: Authors' plot

Figure 5 enables us to check the randomness and predictability of the model (that is, whether the residuals are consistent with random error). The residuals showed asymmetrical movement and have a constant spread throughout the range of the study period. That is, the residuals have asymmetrical and a random movement that constantly spread throughout around the 0 horizontal axes, therefore, pointing to a good fit. Thus, the model is considered correct on average for all fitted values. Also, the recursive residuals (CUSUM) tested for non-linearity and to test for structural change. The plot for the CUSUM is shown in panel (a) of Figure 6 and the CUSUM-OF-SQUARES plot is displayed in panel (b) in the same Figure 6 below.

Figure 6: Cumulative sum (CUSUM) of recursive residual and the cumulative sum of squares (CUSMSQ) of recursive residual tests of model (3)





Source: Author's Plot

The CUSUM - panel (a) and the CUSUM-OF-SQUARES - panel (b) graphs, as shown in Figure 4. shows clearly that parameter constancy exists around the entire study period. Both graphs showed a stable trend movement except for a little inconsistency as shown in panel b. That is, the estimated parameters are stable, given that the recursive errors do not go out of the boundaries of the critical lines throughout the period of the study.

Table 8: Correlation Matrix

	HDI	EXCHR	INFR	INTR
HDI	1.0000			
EXCHR	0.7725	1.0000		
INFR	0.3364	0.4127	1.0000	
INTR	0.3847	0.0763	-0.0534	1.0000

Source: Author's Computation

In table 8, the correlation matrix shows no evidence of high correlation amongst the variables except for exchange rate against human development indicator with the value of 0.7725 which is greater than 0.5.

Table 9: Multicollinearity Test

Variable	VIF	1/VIF
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EXCHR	1.15
INFR	0.867198
INTR	1.15
	0.871298
	1.02
	0.983992
Mean VIF	1.11

Source: Authors' Computation

The variance inflation factor (VIF) values for all the variables are very low. They are lower than the conventional 10, indicating that the explanatory variables; exchange rate (EXCHR), inflation rate (INFR) and interest rate (INTR) in the same model will pose no problem to the estimation result. Therefore, they are used as explanatory variables in the respective regression equations.

5. Conclusion and Recommendations

The study has revealed that economic development proxied by human development indicator in Nigeria is impacted on by monetary policies such as inflation rate, exchange rate to the \$ and interest rate. Results from the analysis also revealed varying degrees of effect of monetary policy on the human development indicator (economic development) both in the long run and short run. The relationship between monetary policy and economic development was also revealed by the coefficient values of the explanatory variables as well as the significant impact or not of these variables on human development indicator (economic development).

The study thus recommends the following:

- The government should pay appropriate attention to monetary policy such as interest rate and exchange rate, given that it has a significant role to play in the economic development of the country.
- The monetary policy also determines the level of investment, which has an impact on the populace and the economy as a whole thus, the government should set rates that will be favorable and attract investment in the economy.

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Authors Contribution

Abimbola Florence Arotiba

Developed the ideas, research objectives and aims as well as the analysis of the data. Prepared, created and presented the published work.

Alexander Ehimare Omankhanlen

Carried out the Management and coordination responsibility for the research activity as well as the planning and execution and also mentorship. Made corrections on aspects of this paper that were deemed erroneous.

Sources of Funding:

The authors acknowledge the sponsorship of this paper as Covenant University.