International Policy Brief Series
Social Science and Law Journal of Policy Review and Development Strategies
p-ISSN: 2315-8387 | e-ISSN: 2354-1628
SSLJPRDS
February, 2025
Vol. 11, No. 1

Exchange Rate Dynamics and Inflation Targeting Monetary Policy in Nigeria: Evidence from Normalized Co-Integration Analysis

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Article DOI:
10.48028/iiprds/ssljprds.v11.i1.14

Keywords:
Exchange rate, Exchange rate channel, Inflation targeting, Monetary policy, Normalized co-integration, Nigeria

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Abstract

In Nigeria, monetary targeting has been a major strategy of the Central Bank of Nigeria (CBN) to control inflation. This strategy involved adjusting the various monetary tools to reign in the growth of the money supply and subdue inflationary pressure. This paper examined exchange rate dynamics and inflation targeting monetary policy in Nigeria from 1986 to 2023 under the Mundel-Fleming and inflation targeting frameworks. The variables used in this paper are inflation rate, exchange rate premium, nominal interest rate, oil price, government debt and broad money supply, food price. From the results, exchange rate premium had a positive but insignificant relationship with inflation targeting policy, nominal interest rate is negatively related to inflation rate. Oil price and inflation targeting are negatively related, while, the relationship between food prices and inflation targeting was negative and insignificant and the relationship between food prices and inflation targeting was negative and insignificant. It can be concluded that inflation targeting of the Central Bank of Nigeria has not contributed to exchange rate stability in Nigeria in the contemporaneous period, as a result, the volatility of the exchange soars with much depreciation of the domestic currency. Hence, the implication is that exchange rate stability and inflation targeting are both monetary policy strategies that can be used to manage an economy's price stability. Therefore, the combination of inflation targeting and exchange rate targeting, with a priority on the exchange rate, can be an optimal monetary strategy for the Nigerian economy.

Background to the Study

Inflation targeting is a monetary policy strategy in which a central bank announces a point or a range of inflation forecast, it intends to achieve and makes effort to keep actual inflation around the target using interest rate and other monetary policy instruments. Inflation targeting emphasizes transparency and accountability (CBN, 2016: 139. The monetary policy rate which is at the disposal of the Central Bank of Nigeria has been used to tame inflation, manage liquidity and for determining other market rate is the proxy for inflation targeting. The price of a unit of currency expressed in terms of other currencies is termed exchange rate. Meanwhile, the exchange rate dynamics refers technically to the response of the exchange rate following some shocks as an economy operates pure flexible exchange rate. The exchange rate of the domestic economy plays a very important role in inflation-targeting particularly for emerging and developing countries like Nigeria and therefore, managing the exchange rate can be effective on inflation targeting. However, in a flexible exchange rate system, inflation targeting can lead to indeterminacy and as such, macroeconomic fluctuations can be driven by self-fulfilling expectations. On a general note, the Nigerian central bank moving toward inflation-targeting needs to strengthen their macroeconomic framework and thus, develop systematic approach to policy decision-making (Nordstrom *et al,* 2009). The enhanced role of inflation-targeting in developing and emerging economies are summarized thus: i) pass through from the exchange rate to inflation target reflects lower policy credibility, ii) inflation targeting mitigates the impact on output of relatively short-term currency movement, iii) it promotes financial stability and reduces fragility , iv) it helps to mitigate the adverse consequences for external stability, v) it reduces the scope of exchange rate flexibility by amplifying exchange rate shocks and constrain policy implementation.

In Nigeria, monetary targeting has been a major strategy of the CBN over the years to control inflation. This strategy involves adjusting various monetary tools, such as the monetary policy rate (MPR) to reign in the growth of the money supply and subdue inflationary pressure. However, despite the monetary interventions, the CBN appears failing to reign in the rising price levels in Nigeria as inflation soars. Over the past decade, Nigeria has witnessed a tremendous rise price level. The annual average inflation rate rose from a single digit 8.0 percent in 2014 to 24.7 percent in 2023. As of October 2024, the monthly inflation rate reached 33.7 percent while the food component experienced higher inflation, crossing 40.5 percent in October, 2024. Core inflation which entails all items less farm produce and energy rose to 26.2 percent (NESG, 2024). The persistent rise in inflation and the unsuccessful hawkish monetary and exchange rate interventions motivated this paper. The pursuit of exchange rate stability is one of the critical macroeconomic objectives of the Nigerian policymakers. In Nigeria, this objective has not been achieved as the economy faces persistent exchange rate volatility driven by domestic and external economic conditions. In Nigeria, exchange rate volatility is worsened by the country's over-dependence on imports, limited foreign exchange (FX) earning sources due to the overreliance on crude oil exports, FX market illiquidity, high inflation and speculative activities (NESG, 2024). Meanwhile, the Central Bank of Nigeria has allowed the Naira to trade freely on willing-buyer, willing- seller basis since June 2023 towards inflation targeting instead of controlling the money supply.

There exists a perennial challenge of FX shortage in Nigeria, despite the country having great potential to enhance the productivity and export volumes of the non-oil sector activities, including agriculture and manufacturing.

The objective of this paper therefore is to examine the relationship between exchange rate dynamics and inflation targeting in Nigeria using the normalized co-integration approach between 1986 and 2023. The rest of this paper is structured as follows: Section 2 presents the empirical literature review and the research gap; section 3 provides the methodology and data while section 4 presents the empirical results. Section 5 is on the conclusion and policy implications.

Empirical Literature Review

This section presents empirical developments in the literature on exchange rate dynamics and inflation targeting monetary policy. The literature is abounding with similar empirical studies on the subject matter. Few of the studies are presented. For example, Ozdemir and Yigit (2009) examined inflation targeting and exchange rate dynamics in Turkey. The data set includes 690 daily observations that span the period from January 2, 2006 to 15th September, 2008. The SETAR-TARCH-M analytical approach was adopted. The results show that the threshold specifications that allow the conditional variance as well as the conditional mean to vary between regimes exhibit different dynamics in each regime and produces superior forecasts below the threshold levels of the model for both the Euro and the US Dollar than the forecasts produced by the random walk model. The study concluded that the free float exchange rate regimes can only be supported above the threshold levels of the exchange rates in Turkey. Sek, Ooi, and Ismail (2012) investigated the relationship between exchange rate and inflation targeting regime in three developed and three emerging Asian economies that have adopted inflation targeting regimes using multivariate GARCH model under BEKK specification. The variables include nominal local currency per USD exchange rate, industrial production and consumer price index from 1960 M1 to 2010 M12. The results show significant inflation and output movements in both periods. The study concludes that the implementation of inflation target regimes does not lead to trade-off of inflation –output in Asia but the trade-off relationship is detected in developed economies.

Ogbonna (2018) analyzed inflation dynamic, exchange rate and efficacy of monetary policy in Nigeria from 1960-2008. The variables of the study were exchanging rate, money supply and trade balance. The vector autoregressive model (VAR) was utilized. The result showed that the deregulation of the domestic economy as occasioned by Structural Adjustment Programme (SAP) has significantly diluted the efficacy of exchange rate as a monetary policy instrument for the management of Nigeria's aggregate money stock and trade balance developments. The study recommended that the Central Bank of Nigeria (CBN) can continue to play a stabilizing role in the economy through the continuation of prudent monetary policies and frequent interventions in exchange rate management to smoothen out shocks. Bello, Sanusi & Aliu (2019) examined inflation dynamic and exchange rate-pass through in Nigeria for the period 1995Q_1 to 2018Q_2 using the Smooth Transition Regression (STR) model. The variables used were consumer price index, aggregate import price, real

marginal cost, and exchange rate. The empirical evidence revealed the existence of two inflation regimes during the period under review. Food inflation, energy inflation, firm's marginal cost, and imported inflation accounted for most of the changes in the prices of composite consumer's basket in low exchange rate regimes. Similarly, the results show that regime changes in inflation are largely caused by exchange rate (transition variable) depreciation or devaluation of the naira. The study recommended that monetary policy response to low inflation regime must target the various components of the consumption basket while efforts to curtail persistent high inflation must include a stable exchange rate of the naira. The e study employed the new Keynesian Philips curve approach (NKPC).

Ighoroje and Orife (2022) examined exchange rate fluctuations and inflation rate in Nigeria between the periods 1987 to 2019. The variables used were inflation rate, official exchange rate, value of imports and growth rate of gross domestic product. The results show that macroeconomic variables are not the major causes of inflation rate in Nigeria. Social and political issues such as unrests, consumer confidence, and political landscape can trigger inflation. The study recommended that despite the use of monetary and fiscal policies on controlling inflation and unemployment, governments should pursue diplomatic missions aimed at creating good image for the country and public confidence in the citizenry. Valogo, Duodu, Yusif and Baidoo (2023) investigated the effect of exchange rate on inflation in the inflation targeting framework in Ghana from 2002 to 2018 using the threshold autoregressive (TAR) method. The result showed that exchange rate depreciation beyond a monthly threshold of 0.70 percent has a significant positive pass-through effect on inflation, which gives credence to the relevance of threshold level. Mirza, Naqvi Syed and Sabri (2023) evaluated exchange rate pass-through and inflation targeting regimes under energy price shocks from twenty-one inflation targeting economies for the period 1997- 2020 and applied the non-linear autoregressive distributed lag model to test the hypotheses empirically, considering possible asymmetries. The results confirmed that exchange rate depreciation increases domestic prices, while rate appreciation reduces them in the long-run. The study also showed that rising energy prices contribute to higher inflation targeting countries. These finding suggested that inflation targeting economies face a serious challenge in maintaining their core price stability goal due to exchange rate pass-through especially during energy shocks.

Research Gap

The existing gap as identified in the empirically reviewed studies are as follows: In terms of geographical locations, while most previous studies (Mirza *et al,* 2023; Valogo et al, 2023; Sek *et al.,* 2012; Ozdemir & Yigit, 2009, Aizenman *et al,* 2008; Ebeke & Azangue, 2015) focused on emerging market economies and Ghana, this study focused on Nigeria. In relation to scope, this paper is the most updated compared to (Valogo *et al,* 2023, Mirza *et al,* 2023, Eneh & Amakor, 2022, Bello, Sanusi & Aliu, 2009). In terms of methodology, while Valogo *et al,* (2023) used the autoregressive approach, Mirza et al, 2023 used the non-linear autoregressive approach and Valogo *et al,* 2023 used threshold autoregressive, this paper used the normalized co-integration approach. For variables utilized, food prices, energy prices, government expenditure was used in the estimation process, while the Mundel-Fleming model and inflation targeting were used as the theoretical framework.

Methodology

Theoretical Framework

The theoretical frameworks of this study were the Mundel- Fleming exchange rate and inflation targeting models. The Mundell-Fleming model also known as the ISLM-BOP model is an economic model which describes the workings of a small economy (Nigeria) open to international trade in goods and financial assets, and provides a framework for monetary (inflation dynamic) policy analysis. One of the basic assumptions of the model is fixed price level. The model is given as:

$$Y = C(Y-T) + I(r^*) + G + NX(e) \quad (1)$$

Where Y = output; C = Consumption; Y = income; T = tax; I = Investment, r* = World interest rate; G = Government expenditure; NX = Net export and e = exchange rate. Economic policy depends on the exchange rate system of Nigeria whether fixed, floating or managed float. Inflation targeting is a monetary policy framework where the Nigerian Central Bank follows an explicit target for the inflation rate for the medium-term. The assumption is that the best that monetary policy authorities can do to support long-term growth of the economy is to maintain price stability, and price stability is achieved by controlling inflation and maintain a stable exchange rate.

Model Specification

In line with the theoretical frameworks and in consonance with the objectives of this paper which is to examine the long-run relationship between exchange rate dynamics and inflation targeting, the model of this paper adapts the empirical works of Okoli*et al* (2016); Nwosa and Oseni (2012) and Klau (1998). The model of this paper in its functional form is thus specified as follows:

$$MPR = F(EXRP\ NOR, OILP, M_2/GDP, GOVDBT, FOODP) \quad (2)$$

Where MPR is the monetary policy rate, proxy for inflation targeting rate; EXRP is the exchange rate premium, NOR is nominal interest rate, OILP is oil price proxy for energy prices, M2/GDP is broad money supply, measure for money growth, GOVDEBT is government debt and FOODP is food price. Equation (2), when transformed in its mathematical form becomes:

$$MPR_t = \beta_1(EXRP) + \beta_1(NOR) + \beta_2 L_n(OILP) + \beta_3(M_2/GDP) + \beta_4 L_n(GOVDBT) + \beta_5 L_n(FOODP) + \quad (3)$$

When equation (3) was specified in its stochastic/econometric form, it becomes

$$MPR_t = \beta_{1Ln}(RER) + \beta_2(NOR) + \beta_3 L_n(OILP) + \beta_4 L_n(M_2/GDP) + \beta_5 L_n(GOVDBT) + \beta_6 L_n(FOODP) + Ui \quad (4)$$

Definition of Variables and Justification of the Model

The variables of the model are described and justified as follows: *Monetary Policy Rate (MPR)***:** The monetary policy rate is the dependent variables. Monetary policy rate is the anchor rate. This is the inflation targeting rate used by the Central Bank of Nigeria when the CBN increases or reduces the interest rate in order to keep inflation at a desirable rate. *Exchange rate premium (EXRP):* The exchange rate premium measures the spread between the recognized official market exchange rate and the Bureaux de Change (BDC) rate. The exchange rate premium can also be measured by the differential between the official and inter-bank market exchange rates. The exchange rate premium is not expected to go beyond 5 percent for the foreign exchange market to be considered stable (CBN, 2016; Kallianiotis, 2016). *Nominal Interest Rate (NOTRS):* Generally, lower interest rate means people can afford to borrow more money, so have more money to spend. This makes the economy grow and inflation increase. In short, inflation is one of the indicators used to measure economic growth, which can be controlled by interest rate, which in turn affect inflation. As the economy grows with inflation, the purchasing power of each dollar declines over time (Awomuse & Alimi, 2012).

The relationship between nominal interest and inflation rate is summarized by the Fisher hypothesis, which has important implications for monetary policy and Central Banking decision-making (Laatsch & Klien, 2002; Fahmy & Kandi, 2003; Akinlo, 2011). *Oil Price (OIL P):* The price at which the crude oil is sold at the international market influences the domestic economy. The oil price-inflation nexus has generated substantial discussion in academic, business and policy circles. Adebayo (2020) suggested a positive co-movement between the inflation and oil price between 2014 M_2 and 2017M_1 and a unidirectional causality running from oil price to inflation. Oil is a major decider of the cost of production. If the oil price increases, it will increase the transportation cost, thereby increasing the cost of goods and services. The relationship between oil price and inflation is ambiguous-negative and positive relationship. *Broad Money Supply (M_2/GDP):* The stock of money in an economy which includes currency in circulation, demand deposit, savings and fixed deposit as well as other assets that is in spendable forms. It is a broad definition of money supply that depends on the jurisdiction (CBN, 2016). *Government Debt (GOVTDEBT):* This refers to the financial obligations of a government as a percentage of the market value of aggregate output produced in the country. An increase in the price level directly reduces the real value of government debt, as well as the ratio of debt to GDP. Holding other things constant-higher prices increase nominal GDP. Nguyen (2015) showed that public debt has a significantly positive effect on inflation, while in the opposite direction; as inflation has a significantly negative effect on public debt. *Food Price (FOP):* Food prices refer to the average price of particular food commodities globally and across countries. The price of goods not only provides an important indicator of the balance between agricultural production and market demand, but also has strong impacts on food affordability and income. Egwuma, Ojeleye and Adeola (2017) showed that real GDP, food import and crude oil price were positively related to food price inflation in the long-run. However, real GDP and food import were the key determinant of food price inflation.

Estimation Technique and Procedure

The Normalized Johansen co-integration are the techniques of this study. Co-integration is a data testing method that determines if there is a relationship between two or more time series related series. Co-integration analysis aims to identify causal relations between variables by determining if the stochastic trends are shared by the series. In order to examine the features of the data used in any study (or to gain a more precise idea of the distribution of the variables), a first test of the data in form of descriptive statistics is usually carried out. The statistics are the mean, which measures the average value of the series; the maximum and minimum values of the series; standard deviation (std. Dev.) which measure the spread in the series: Skewness which measures the asymmetry of the distribution of the series around its mean and the kurtosis, which measures the peakedness or flatness of the distribution of the series are other statistics. Jarque-Bera, which is a test for nominal distribution tests for the null hypothesis of the series. The three conventional levels of statistical significance are 1percent (0.01), 5 percent (0.05) and 10 percent (0.10). If the computed probability value for the test is greater than any of the three statistical significances, we do not reject the null hypothesis otherwise, we reject it (Ezie, 2022). This preliminary test is used to describe the strength and direction of the linear relationship between two or more variables. Correlation, like covariance measures the degree to which any two variables vary together. It is assumed under multiple regression analysis, that, all the series are stationary at level (that is, the order of integration of each of the series is zero, I (0). The unit root test is used to determine the stationarity or non-stationarity of a given time series. The variables in this study were tested for unit root using the Augmented Dickey Fuller (ADF) and Philips-Perron (PP) approaches. The stationarity conditions of the variables are important to avoid the problem of spurious results due to explosive data (Babangida & Asan-UI, 2021). The ADF test is an extension of the Dickey-Fuller test by allowing a higher order of autoregressive process, such that:

$$\Delta X_t \quad \alpha_o + \alpha_1 X_{t-1} + \alpha_2 t + \sum_{i=2}^{p} b_i \Delta X_{t-1} + U_t \qquad 5$$

Where P is the number of lagged changes in X_t necessary to make U_t serially uncorrelated. Testing the null hypothesis H_o: $\alpha_1 = 0$ against the H_a: $\alpha_1 < 0$, the null of unit root is rejected if the observed t-statistic is sufficiently negative compared to the critical value given at the accepted level of significance. The general concept of co- integration is that there exists an equilibrium or a long-run relationship between a set of time-series variables. The series are of different order of integration and therefore, following Pesaran, Shin and Smith (2001), the bound co-integration test become the appropriate test. The autoregressive distributed lag (ARDL) co-integration is specified as follow:

$$\emptyset(L,P)Y_t = \sum_{i=1}^{p} \beta_i (L,q_i)\, x_{it} + \vartheta w_t + U_t \qquad (6)$$

Where;

$\emptyset(L,P) = 1 - \emptyset_1 L - \emptyset_2 L^2 \quad \emptyset_p L^p$

$\beta(L,q) = 1 - \beta_1 L - \beta_2 L^2 \quad \beta_q L^q$ for $i = 1, 2, 3 \ldots\ldots\ldots k$, $U_t \sim ii\ d\ (0, \vartheta^2)$

L is a lag operator such that $L^0 y_t = X_t$, $L^1 y_t = Y_{t-1}$ and W_t is the s x 1 vector of deterministic variables such as the intercept term, time trends, seasonal dummies or exogenous variables with the fix lags. $P = 0, 1, 2 \ldots, m$, $i = 1, 2 \ldots, K$: namely a total of $(m+1)^{k+1}$ differentmodels. The maximum lag order, m, is chosen.

Sources of Data

Table 1: Sources of Data

Variables	**Definition and Measurement**	**Sources**
MPR	Dependent variable, proxy for inflation target	Central Bank of Nigeria (CBN)
EXRP	Exchange rate premium	CBN
NOR	Nominal interest	CBN
OILP	Oil price, proxy for energy cost	International Energy Agency
M_2/GDP	Broad money supply-proxy for financial deepening	CBN
GOVDEBT	Government debt as a % of GDP	CBN
FOODP	Food price as a % of GDP	CBN

Source: Researchers' Compilation (2024)

Empirical results, analyses and discussion of findings

Empirical Results

Table 2: Descriptive Statistics of the Variables

	MPR	**EXRP**	**NOR**	**OILPRICE**	**M_2/GDP**	**GOVTDEBT**	**FOODPRICE**	**INF_1**
Mean	19.059	128.45	18.856	40.87088	8.41E+12	6702.909	89.86398	18.909
Std. Dev.	17.432	112.407	3.866	32.1893	1.1E+12	7559.12	30.198	17.50997
Skewness	1.79148	0.743	0.56569	1.271434	1.237535	1.260794	0.07017	1.78685
Jarque-Bera	25.228	3.680897	2.96349	9.994589	9.50249	9.873901	0.755403	25.01612
Prob.	0.000	0.158	0.227	0.006	0.008	0.007	0.685	0.0000
Note: INF= Inflation; EXCH = Exchange rate premium; INT = Nominal exchange rate; OILPRICE = oil price; M_2= Broad money supply; GOVDEBT = Government Debt; $INFL_1$= Inflation at inertia (previous inflation)								

Source: Researchers' computation using EView 10.

In conducting the descriptive and prescriptive statistics, all the variables were in their nominal form. The results of the descriptive statistics were presented in Table 1. The evaluation of the results shows that MPR, EXRP, NOR, OILPRICE, M2/GDP, GOVTDEBT, FOODPRICE and INF_1 had average values of 19.059, 128.45, 18.856, 40.87088, 8.41, 6702.909, 89.86398 and 18.909. This revealed evidence of significant variation in all the variables. Table 2 showed the correlation matrix result.

Table 3: Correlation Matrix (Pairwise)

	INF	EXRP	NOR	OILPRICE	M_2/GDP	GOVTDEBT	FOODPRICE	INF_1
MPR	1.00000	-0.405						
EXPR	-0.405	1.00000						
NOR	0.338	-0.029012	1.00000					
OILPRICE	-0.3367	0.15697	-0.4324	1.00000				
M_2/GDP	-0.304	0.6934	-0.1671	0.3077	1.0000			
GOVTDEBT	-.0314	0.9603	0.03702	-0.0086	0.699347	1.00000		
FOODPRICE	-0.433	0.93059	-0.1374	0.37058	0.619356	0.850067	1.00000	
INF_1	0.6367	0.3995	0.3626	-0.2965	-0.29778	-0.31034	-.0.381617	

Source: Researchers' Computation using EView 10

All the variables employed in the correlation analysis were not statistically significant at both 1, 5 and 10 percent levels respectively. From the results it showed that there is a negative relationship between exchange rate premium and nominal interest rate, negative relationship between nominal interest rate and oil price and negative relationship between oil price and government expenditure and negative relationship between nominal interest rate and food prices.

Table 4: Unit Root Result using Augmented Dickey Fuller (ADF) and Phillip Perron

At level				**At First Difference**			
Variable	**ADF Stat**	**5% Level**	**Prob**	**ADF Stat**	**5% Level**	**Prob Value**	**Order of Integration**
MPR	-0.75382	-2.9484	0.8196	-3.428245	-2.9484	0.0166	I(1)
LEXCH	-2.39382	-2.94383	0.1503	-4.685855	-2.9484	0.0006	I(1)
LINTR	-2.22014	-2.94383	0.2029	-4.4383	-2.9484	0.0012	I(1)
LOILPRICE	-0.64974	-2.94383	0.9893	-5.2787	-2.9484	0.0001	I(1)
LM_2/GDP	-2.29393	-2.94383	0.1503	-3.1653	-2.9484	0.0323	I(1)
LGOVTDEBT	-2.258343	-2.94383	0.0970	-3.4647	-2.9484	0.0152	I(1)
LFOODPRICE	-2.258343	-2.94383	0.7245	-8.026654	-2.9484	0.0000	I(1)
LINF-1	-1.52568	-2.94383	0.1562	-4.705059	-2.9484	0.0008	I(1)

Source: Researchers' Computation using EView 10

Table 4 showed the results of the unit root test. The result showed that all the variables are integrated of order one, I(1). Since all the variables were stationary at the same order of integration, that is 1(1), it indicates the need for further treatment and analysis and hence, the need for co-integration test using Johansen Co-integration test to check for existence of long or short run relationship of the equation. Table 5 presents the co-integration test results.

Table 4: Johansen Co-integration Tests

Trace Test				Max-Eigen Test		
H_o	Trace Statistic	0.05 Level of Sig.	Prob. Value	Max-Eigen Statistic	0.05 Level of Sign	Prob Value
None*	248.6080	159.5297	0.0000	69.62324	52.36261	0.0004
At most 1*	178.9848	125.6154	0.0000	53.23549	46.23142	0.0077
At most 2*	126.7493	95.75366	0.0001	46.94906	40.07757	0.0072
At most 3*	78.799	69.8889	0.0081	32.54258	33.87687	0.1396
At most 4*	46.257	47.85613	0.0701	23.86220	27.58434	0.5009
At most 5*	22.394	29.79707	0.2771	12.48127	21.13162	0.2740
At most 6*	9.913663	15.49471	0.2874	9.148302	14.26460	0.3817
At most 7*	0.7665362	3.841466	0.3817	0.765362	3.841460	0.0715

Source: Researchers' Computation using EView 10.

Table 5 showed the Johansen co-integration result. From the results, the trace statistic showed 4 co-integrating equations at the 0.05 level of significance. For the max-eigen, there were 3 co-integrating equations at the 0.05 level of significance. This implies that using the trace statistic and max-eigen value test, there was co-integration, since at the null hypothesis of none, the probability value is less than 5%. It therefore, rejected null hypothesis and concluded that there was a co-integration (long-run relationship between exchange rate dynamic and inflation targeting). The long-run equation was provided by the normalized co-integrating coefficients presented in Table 6.

Table 6: Normalized Co-integrating Coefficients (Standard Error in Parenthesis)

MPR	EXPR	NOR	OILPRICE	M_2/GDP	GOVDEBT
1.00000	-0.836774	2.394658	1.363066	-6.56E-12	0.22143
	(0.13214)	(0.78805)	(0.15619)	(9.9E-12)	(0.0261)
	FOODPRICE				
	0.295606				
	(0.30421)				

Source: Authors' computation using EView 10

Table 6 presented the normalized co-integrating coefficients. It was suggested that exchange rate premium had a positive relationship with inflation targeting. Note the signs changes when interpreting normalized co-integrating coefficients. As such, a percentage change in exchange rate premium resulted to an 84 percent increase in inflation targeting with insignificant standard error of 0.132. Nominal interest rate had a negative relationship with inflation targeting, again with insignificant relationship with inflation targeting. Furthermore, oil price, proxy for energy had a negative relationship with inflation targeting. This implies that as oil price increases by 1%, inflation targeting increases by 1.4 percent, all things being equal. On its own, broad money supply had a positive relationship with inflation

with a significant standard error. Government debt had a negative relationship with inflation targeting with an insignificant standard error. From the results, food price, had a negative relationship with inflation targeting in Nigeria. To ensure the reliability of the estimate for prediction, the residual diagnostic test was carried out. All residual diagnostic tests, namely Breush-Godfrey serial correlation LM, Breusch-Pagan Heteroskedasticity and Jarque-Bera normality were presented in Table 7.

Table 7: Residual Diagnostic Tests

Test	**Prob.**
Breusch-Godfrey Serial Correlation LM Test	0.06
Breuch-Pagan Heteroskedasticity	0.3058
Jarque-Bera Normality Test	0.635250

Source: Authors' computation using EView 10.

Table 7 presented the Breusch-Godfrey test for serial correlation result. The probability value of 0.0645 which is greater than 0.05 implies that the residuals of the variables are not serially correlated. It shows that there is no correlation between consecutive residuals or error terms. Thus, the null hypothesis of no serial correlation is not rejected, which satisfies the assumption of no serial correlation. Consequently, the model shows a good precision, therefore could be used for forecasting. From the diagnostic results, the heteroskedasticity test by Breusch-Pagan-Godfrey test showed that the probability value of 0.1892 is greater than 0.05 signifying that the residuals of the variables were homoscedastic. It implies that the error term is the same across all variables of the independent variable. Further in the diagnostic test for reliability of the estimates, the normality test of Jarque-Bera test has a value of 0.635250, which is greater than 0.05, it indicates that the residuals of the variables are normally distributed which satisfies the normality assumption. In order words, it could be used for forecasting and policies. The model was tested for stability using CUSUM tests. Figure 1 showed that it was stable within the 5 percent level of significance over the years under consideration and can be used for policy purposes.

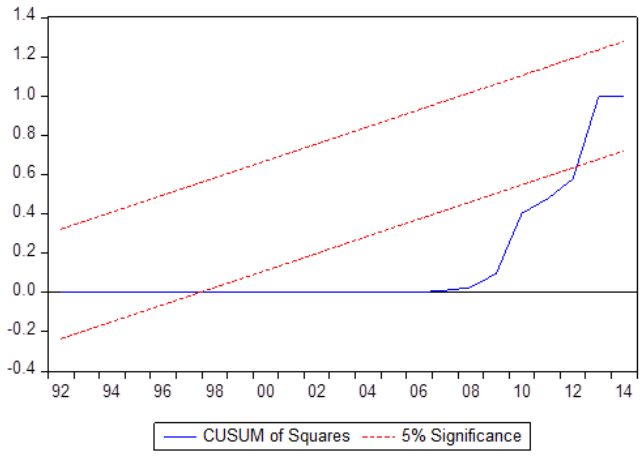

Figure 1: Cumulative Sum Square Stability Test

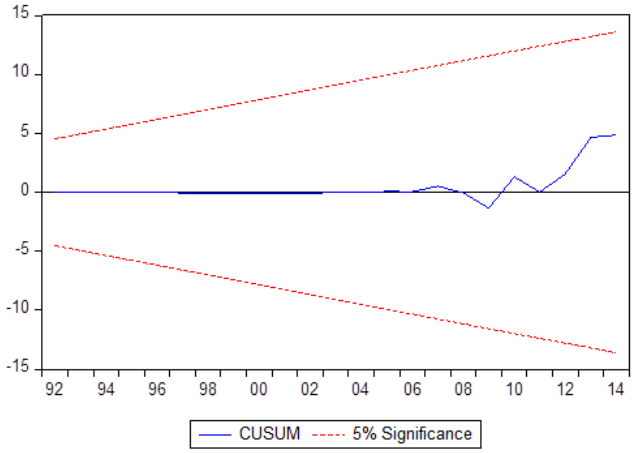

Figure 2: Cumulative Stability Test

Discussion of Findings

In the line with the objective of this paper, the findings were discussed. From the results, exchange rate premium had a positive but insignificant relationship with inflation targeting policy. This implies that the higher the overvaluation of the domestic currency, the higher the inflation rate. The inflationary trend in Nigeria is unprecedented and driven predominantly by both supply and demand side shocks. The inflation rate directly impacts private consumption. Nigeria's increased inflation rate has led to a drastic reduction in the purchasing power of households. These households are experiencing a significant loss of real income and decreased living standard of living due to rising cost of food items in the Nigerian markets (PWC, 2022). Nominal interest rate, an explanatory variable in the model, is negatively related to inflation rate. Lowering the inflation target can reduce both the nominal interest rate and inflation rate in the long-term. Interest and inflation rates tend to move in opposite directions, which makes it easier for the apex bank to raise or lower the interest rates through the monetary policy rate (MPR). The conventional view among economists is that higher interest rate reduce inflation. However, the prolonged period of low inflation and low interest rates in advanced economies following the global financial crises appears to be inconsistent with the conventional economist's view. Do lower interest rate increases inflation (the conventional view) or do lower interest rate led to lower inflation (Neo- Fisherian view) (Matheson, undated). Oil price and inflation targeting are negatively related, in contrast, Choi *et al* (2017) showed the effect of oil price on inflation is asymmetric, with positive oil price shocks having a larger effect than negative oil price shock. Toni (2024) showed a positive relationship between oil price and inflation targeting, as such 10 percent rise in oil price causes an average of 0.5 percent inflation. Money supply has a positive relationship with inflation targeting. These results are in contrast with the results of Abeng *et al* (2021) who showed a negative and statistically significant relationship between money supply and inflation targeting. There is a negative relationship between government debt and monetary policy rate (inflation targeting). This is theoretically expected, a priori, when policy makers tighten fiscal policy in response to a rise in inflation expectation, it could result in a negative correlation of changes in debt and inflation expectations (Celasun *et al,* 2004). On the other

hand, fiscal policy actions which affect debt may also directly influence inflation expectation through aggregate demand effects. The relationship between food prices and inflation targeting was negative and insignificant. In developing countries like Nigeria, food prices can have a significant impact on inflation targeting and the adequacy of inflation targeting framework. Food prices contribute more to headline inflation item in developing countries than advance economies. However, changes in food costs can cause substantial changes in inflation targeting even as food price inflation is more volatile than core inflation (changes in food stuff and energy). In developing countries, where the contribution of food prices to headline inflation is generally higher than in advanced economies, the adequacy of an inflation targeting framework for curbing inflation is very much contested.

Conclusion and Policy Implications

From the results, exchange rate premium had a positive but insignificant relationship with inflation targeting policy. This implies that the higher the overvaluation of the domestic currency, the higher the inflation rate. It can be concluded that inflation targeting of the Central Bank of Nigeria has not contributed to exchange rate stability in Nigeria in the contemporaneous period, as a result, the volatility of the exchange soars with much depreciation of the domestic currency. Hence, the implication is that exchange rate stability and inflation targeting are both monetary policy strategies that can be used to manage an economy's price stability. Therefore, the combination of inflation targeting and exchange rate targeting, with a priority on the exchange rate, can be an optimal monetary strategy for developing countries.

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