



RELATIVE EFFECTS OF EXCHANGE RATE AND INTEREST RATE ON NIGERIA'S ECONOMIC GROWTH

Wasiu Akintunde Yusuf¹, Abdurahman Isik¹, Nafisa Ibrahim Salisu¹

¹Department of Economics, Nile University of Nigeria, FCT Abuja

Abstract

This study examined the relative effect of exchange rate and interest rate on economic growth in Nigeria, with the objective of determining their various implications on Nigeria's economic growth. The study employed quarterly time-series data from 2000:Q1 to 2017:Q2. The Cointegration and Error Correction Methodology (ECM) were adopted. The result indicated that Exchange rate and Consumer Price Index had a significant effect on economic growth, while interest rate had an insignificant effect on economic growth in Nigeria. Therefore, the study recommended that government (regulatory authority) should endeavour to design exchange rate policies that can increase the growth prospects of the Nigerian economy. It also suggests that the government should maintain a low rate of inflation for that would increase investor's confidence and participation as well as attract more capital flows into the economy. Finally, the study recommended that the issue of high lending rate with hidden transaction costs should be seriously monitored and addressed by the regulatory authority (CBN).

Keywords: Cointegration; Consumer Price Index; Error Correction; Exchange Rate; Unit Root.

INTRODUCTION

Background to the Study

The issue of exchange rate and interest rate have been accorded attention in Nigeria. Their dynamic movement raises concern especially with their attendant consequences. The relative effects of these variables place the economy in a vulnerable position while studies across most developing and developed economies had exposed the effects of these variables on their economies. In Nigeria, exchange rate and interest rate policies have changed within the time frame from regulated (1970-1986) to deregulated regimes (1986 to date). Exchange rate is the rate at which one currency is exchanged for another. It is pivotal to the achievement of macroeconomic stability and economic performance of any economy in the global world. The interest rates on its own plays a critical role in the effective distribution of resources targeted at stimulating economic growth. For this reason, interest rate is accorded prominence as



a facilitator of growth. It is expected that exchange rate and interest rate if properly managed could make a difference to the Nigeria's economic growth effort.

The Nigerian economy goes through the difficulties of exchange rate and interest rate dynamics. These are two important variables in any economy owing to the fact that they determine consumption and investment decision of economic agents. However, when not properly managed their dynamic movement can have severe consequences in the economy. Their fluctuations are therefore not desirable in the economy since they increase risk and doubt in both domestic and international transaction and thus discourage investment and trade. Nigerian economy especially is vulnerable to exchange rate and interest rate fluctuations due to its mono-product structure or dependence on oil as well as high dependence on capital flows. This poses challenges for policy makers tasked with macroeconomic stabilisation goals.

Despite the difficult conditions in the economy associated with high exchange rate and interest rate, the Nigerian economy still shows strong resilience but much is not revealed about what effect exchange rate and interest rate have on the economy. It is therefore, important to establish the quantitative direction to understanding the implications of exchange rate and interest rate on Nigeria's economic growth path. This is one of the major motivations of the study. To this end, studies have been conducted by various scholars notable among them are Chughtai *et al* (2015) for Pakistan and Obansa *et al* (2013) for Nigeria; to establish the relative effects of exchange rate and interest rates on economic growth in Nigeria. Obansa *et al* (2013) validates the relevance of exchange rate and interest rate on economic growth in Nigeria using the Vector Autoregressive (VAR) technique. Similarly, this study is conducted to contribute to debate on the relative effects of exchange rate and interest rate on economic growth in Nigeria and differs markedly from other studies in Nigeria as none of the authors employed the Error Correction Methodology (ECM). The ECM shows the extent to which success in portraying the effect of exchange rate and interest rate would be achieved. Consequently, the choice of ECM is justified over VAR approach because it is a forecasting model and more so, it is only applicable when variables are co-integrated. Few empirical studies have been conducted on the effects of exchange rate and interest rate on economic growth in Nigeria and several methodologies have been applied such as Vector Auto-regressive Model (Obansa et al., 2013) and Ordinary Least Square (Imoisi et al., 2010) among others. None of these studies have employed the Error Correction Model. This justifies the use of Error Correction Model to present the relative effect of exchange rate and interest rate on economic growth in Nigeria. This is because ECM has the capacity to adequately capture both the dynamic and the static equilibrium relationships among non-stationary time-series. It also captures the speed of adjustment which restores equilibrium in the dynamic model. With the exception of (Obansa et al., 2013) that

considered the two effects of exchange rate and interest rate on economic growth in Nigeria together, other studies in Nigeria only considered either exchange rate on economic growth (Adeniran et al., 2014) or interest rate on economic growth (Joseph et al., 2018). To this effect, there is paucity of information on studies that both consider the relative implications of exchange rate and interest rate on economic growth in Nigeria. Therefore, to what extent does interest rate contribute to economic growth in Nigeria? Does exchange rate has an effect on economic growth in Nigeria?

Theoretical Review

The price of one country's currency expressed in terms of some other country's currency is referred to as exchange rate. Exchange rate determines the relative prices of domestic and foreign products. It also determines the level of external sector involvement in international trade. Conversely, interest rate is pictured as a compensation for accumulating financial assets and sacrificing current consumption. Monetary policy regimes utilises interest rate and exchange rate as strategic policy instruments to accomplish low inflation rate and stabilize the macro economy. Since early 1970s, the relationship between interest rate liberalization and economic growth has been a centre of attention both empirically and theoretically. In line with the Neoclassical and the Keynesian theories, low interest rate would increase investment spending and economic growth in both developed and developing economies. There is an argument that interest rate liberalization leads to financial development and long run economic growth. Given the re-invention of the financial liberalization concepts in the 1970's, many countries have liberalize their economies by deregulating exchange rate and interest rates, thereby, eliminating credit controls, allowing free entry into the banking sector, permitting private ownership of banks, international trade liberalization and capital flows. The most pertinent of this liberalization are exchange rate and interest rate. Sadly, the Nigerian case in this context has been varied.

Nigeria practised fixed exchange rate regime from Independence up to 1986 when it was abolished and replaced with flexible exchange rate regime. The flexible exchange rate regime as it were is the follow up to the structural Adjustment Programme (SAP), designed to devalue the naira in order to promote exports in Nigeria. But Nigeria is known as an import dependent economy, particularly for her capital goods. And the manufacturing sector to which exchange rate devaluation was aimed at encouraging export is dominated by multinational corporations and incapacitated by low capacity utilization. The result is that this sector is rather troubled by high interest rate, high cost of raw materials for production, naira depreciation, rising inflation, foreign exchange shortages and consumer strong resistances to local products. The choice of exchange rate regime is indeed significant for economic growth efforts. Although a more flexible exchange rate regime can permit an economy to make necessary adjustment more rapidly; but on the margin, more flexible regime is weakly associated



with slightly higher growth rates. In developing and emerging economies such as those in Asia and Africa with less depth in the financial markets, and more incomplete markets, they are less able to deal with real and financial shocks, and hence the choice of exchange rate regime is more important (Oyejide & Udun 2010).

Empirical Review

Joseph et al., (2018) looked at the effect of interest rate on economic growth in Nigeria during the period 1980 to 2016. Using OLS multiple regression technique, the study discovered that inflation and exchange rate have an insignificant negative effect on economic growth while, deposit interest rate had a significant positive relationship with economic growth. Applying the Error Correction Model (ECM), Lorytyer (2017) examined the effect of interest rate on economic growth in Nigeria using annual time-series data from 1980 to 2015. The result showed that interest rate has a significant effect on economic growth. Etale and Ayunki (2016) empirically examined the relationship between interest rate and economic growth in Nigeria. Using annual data from 1985 to 2014, the authors adopted the Error Correction Models (ECM). The findings revealed that interest rate has a negative significant effect on economic growth in Nigeria. The study recommended that monetary authorities should adopt appropriate policies that would promote and stimulate economic growth in Nigeria. In Sri Lanka, the study by Aslam (2016) employed the use of an Ordinary Least Square methodology to investigate the impact of exchange rate on economic growth. The study used time series data from 1970 to 2015. The findings revealed that exchange rate has a positive impact on economic growth in Sri Lanka. Using a simple linear regression model, Chughtai et al., (2015) examined the impact of major economic variables (interest rate and exchange rate) on the economic growth of Pakistan using annual time series data from 1981 to 2013. The study result revealed that both inflation and interest rate impact negatively on growth, while exchange rate has a positive impact on the economy. The study suggests that policymakers should maintain high exchange rate in order to boost the economy and take serious considerations about changing interest rates while controlling inflation rate. The Generalised Method of Moment (GMM) and Simultaneous equations model were employed by Akpan et al., (2015) to explore the effect of exchange rate movement on Nigeria's economic growth. The study used quarterly data from 1986 to 2014. The analysis indicated that there is no direct relationship between exchange rate and output growth. Rather, Nigeria's economic growth has been directly affected by monetary variables. The research suggested that a broad program of exchange rate reform to complement the exchange rate policy adopted. Analysing the impact of exchange rate on economic growth in Nigeria using the Ordinary Least Square technique, Adeniran et al., (2014) used data time-series for the period 1986 to 2013. The study revealed that exchange rate had a positive but insignificant relationship with economic growth. The result also indicated

that interest rate and inflation had a negative impact on economic growth. The study recommended that government should encourage the export promotion strategies in order to maintain a surplus balance of trade and also conducive environment, adequate security, effective fiscal and monetary policy, as well as infrastructural facilities should be provided so that foreign investors would be attracted to invest in Nigeria. Obansa et al., (2013) empirically examined the relationship between exchange rate and interest rate on economic growth in Nigeria from 1970 to 2010, through the use of a Vector Auto-regression Model (VAR) with emphasis on impulse response factor and forecast error variance decomposition. The study revealed that interest rate had a little impact on economic growth in the period of regulation than in the deregulation era. Furthermore, the result showed that exchange rate liberalisation was good for the Nigerian economy as it promotes growth. However, interest rate liberalization does not make any significant impact on the economy as it undermines investment drive. The paper recommended that Interest rate liberalization and deregulation should be replaced with the policy of Interest rate regulation as obtained in the 1970s and early 1980s. Adopting the cointegration and Error Correction Model, Khondker et al., (2012) used annual data from 1980 to 2011 to analyze the relationship between exchange rate and economic growth in Bangladesh. The study revealed that in the long-run a 10% depreciation of real exchange rate would be associated with a 3.2% rise in aggregate output. While, in the short-run, real exchange rate depreciation would result in about half a percent decline in gross domestic product.

METHODOLOGY

Quarterly data with a sample period from 2000:Q1 to 2017:Q2 is adopted. This is to ensure enough data point for the econometric analysis and also to cater for the loss of degree of freedom. The data were sourced from the CBN statistical bulletin 2017 and CBN database.

The model is specified as thus:

$$RGDP = f(CPI, REXR \& RINT) \dots \dots \dots (1)$$

Equation 1 can be presented in its econometric form as thus;

$$RGDP = \beta_0 + \beta_1CPI + \beta_2REXR + \beta_3RINT + \mu \dots \dots \dots (2)$$

Where:

RGDP = Real Gross Domestic Product (proxy for economic growth)

CPI = Consumer Price Index (proxy for inflation)

RINT = Real Interest Rate

REXR = Real Exchange Rate

μ is the error term, β_0 is the constant term; $\beta_1 - \beta_3$ are coefficient of the variables.

Apriori expectation of the model: β_1, β_2 and $\beta_3 < 0$



In view of the importance of a well-managed exchange rate and interest rate for economic growth, this study employs econometric methodologies such as co-integration and Error Correction framework to examine the relative effects of exchange rate and interest rate on Nigeria’s economic growth. The study uses the Error Correction Model (ECM) framework after co-integration has been established among the variables. The ECM is employed to estimate the relative effects of exchange rate and interest rate on economic growth. The use of this approach predicts the cumulative effect taken into account the dynamic effect among exchange rate, interest rate and other examined variable. Once the variables are co-integrated, it becomes easy to distinguish between the long-run and short-run relationship. Therefore, to capture both the long-run and short-run dynamics of exchange rate and interest rate on economic growth in Nigeria, an ECM employing the Johansen co-integration techniques was employed which allows for the estimation of short-run dynamics as well as long-run equilibrium adjustment processes.

RESULTS AND DISCUSSION

The empirical investigation of this study starts with a unit root test which is conducted to examine the order of integration of each of the variables in the model. Thereafter, co-integration analysis is then undertaken and followed by the examination of the long-run and short-run dynamics of exchange rate and interest rate on economic growth and other variable.

Unit Root Tests. To examine the existence of stochastic non-stationarity in the series, the study tests for the order of integration of the individual variables through the unit root test employing the Augmented-Dickey Fuller (ADF) and Philips-Perron (PP) tests. The variables tested are: RGDP, REXR, CPI AND RINT. The result presented in the table below indicated that RGDP, REXR, CPI AND RINT were all stationary at first difference, which implies that they are I(1) series. Given the unit root properties of the variables, the study proceeded to establish whether or not there is a long-run co-integrating relationship among the variables in equation (1) by using the Johansen’s co-integration test.

TABLE 1. UNIT ROOT TEST

Table with 6 columns: VARIABLES, ADF @ LEVEL, ADF @ FIRST DIFF., PP @ LEVEL, PP @ FIRST DIFF., ORDER OF INTEG. Rows include RGDP, REXR, CPI, RINT, and CRITICAL VALUE (1%, 5%, 10%).

Source: Author’s computation using E-views version 10

Note: ***denote significance at 1% level. **denote significance at 5% level.

Co-integration Test. The co-integration test was performed based on the Johansen-Juselius (1990) framework. The objective is to establish whether long-run relationship exists among the variables, using Trace and Maximum Eigen tests. The result revealed long run relationship among variables examined in the study. Specifically, there exists long run relationship among real gross domestic product, consumer price index, real exchange rate and real interest rate reporting one co-integrating equation. Hence, given the objective of this study which look at single or direct relationship between the dependent and explanatory variables from the model as well as the result of cointegration test, the study employed Error Correction Model (ECM).

TABLE 2. JOHANSEN COINTEGRATION TEST

| Series: LRGDP INF REXR RINT | | | | |
|--|------------|-----------|----------------|---------|
| Unrestricted Cointegration Rank Test (Trace) | | | | |
| Hypothesized | | Trace | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None * | 0.291061 | 50.29540 | 47.85613 | 0.0290 |
| At most 1 | 0.274738 | 26.56041 | 29.79707 | 0.1128 |
| At most 2 | 0.061418 | 4.396096 | 15.49471 | 0.8691 |
| At most 3 | 0.000327 | 0.022556 | 3.841466 | 0.8805 |
| Trace test indicates 1 cointegrating eqn(s) at the 0.05 level | | | | |
| * denotes rejection of the hypothesis at the 0.05 level | | | | |
| **MacKinnon-Haug-Michelis (1999) p-values | | | | |
| Unrestricted Cointegration Rank Test (Maximum Eigenvalue) | | | | |
| Hypothesized | | Max-Eigen | 0.05 | |
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None | 0.291061 | 23.73499 | 27.58434 | 0.1442 |
| At most 1 * | 0.274738 | 22.16432 | 21.13162 | 0.0357 |
| At most 2 | 0.061418 | 4.373540 | 14.26460 | 0.8180 |
| At most 3 | 0.000327 | 0.022556 | 3.841466 | 0.8805 |
| Max-eigenvalue test indicates no cointegration at the 0.05 level | | | | |
| * denotes rejection of the hypothesis at the 0.05 level | | | | |
| **MacKinnon-Haug-Michelis (1999) p-values | | | | |

Source: Author's computation using E-views 10

Estimation of the Error Correction Model. Based on the Granger Representation theorem, co-integrated variables will also depict an error correction model (ECM) which shows the short-run dynamics or adjustments of any deviation from equilibrium. ECM is a one-period lagged co-integrating equation as well as first lagged (differences) of the endogenous variables. The result of the estimated model is presented and interpreted in Table 3.

The result in Table 3 depicts negative and significant relationship between the real gross domestic product (rgdp), consumer price index (cpi) and real exchange rate (rexr). The relationship is in line with the apriori expectation and a percentage increase in REXR will lead to 0.001414% decrease in real gross domestic product. Also, a percentage increase in CPI will lead to 0.00613 decreases in real gross domestic



product. However, real interest rate (rint) shows positive and insignificant relationship with real gross domestic product which contradicts the apriori expectation as proposed by economic theory. At 1.912646, the Durbin Watson statistics shows the absence of auto-correlation given its value that is between 1.8 and 2.2. We can therefore reject the null hypothesis of the presence of autocorrelation among the disturbance terms in the model and accept the alternative hypothesis that there is no autocorrelation between the error terms. The fitness of the model is confirmed by the F-statistic (407.7749) which is significant at 1 percent given the value of 0.000000 which led to rejection of null hypothesis that all the explanatory variables introduced in the model are not jointly significant in explaining the variations in real gross domestic product. The error correction term, ECM_{t-1} , was significant at 1% with a high feedback of 86%. It is also negatively signed, showing that the adjustment is in the right direction to restore the long run relationship. This confirms also that any disequilibrium in the short run can be fixed back with a speed of 86% in the long run. The coefficient of determination (R^2) explains 96% of the variations in the dependent variable which is above 50% and even after taking into consideration the degree of freedom, the adjusted coefficient of determination (adjusted R^2) still explains 95% variation in the dependent variable.

TABLE 3. RESULTS OF ERROR CORRECTION MODEL

| Dependent Variable: LRGDP | | | | |
|---------------------------|-------------|-----------------------|-------------|-----------|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 15.47214 | 0.053593 | 288.6952 | 0.0000 |
| CPI | -0.006013** | 0.000168 | -35.76516 | 0.0000 |
| REXR | -0.001414** | 0.000348 | -4.068334 | 0.0001 |
| RINT | 0.000117 | 0.001945 | 0.060206 | 0.9522 |
| ECM(-1) | -0.859077 | 0.064079 | -13.40662 | 0.0000 |
| R-squared | 0.961110 | Mean dependent var | | 16.25767 |
| Adjusted R-squared | 0.958753 | S.D. dependent var | | 0.346391 |
| S.E. of regression | 0.070350 | Akaike info criterion | | -2.402859 |
| Sum squared resid | 0.326638 | Schwarz criterion | | -2.243516 |
| Log likelihood | 90.30150 | Hannan-Quinn criter. | | -2.339493 |
| F-statistic | 407.7749 | Durbin-Watson stat | | 1.912646 |
| Prob(F-statistic) | 0.000000 | | | |

Source: Authors' computation using E-views 10

Note: **denote significance at 5% level.

Diagnostic Test. After the analysis and presentation of the ECM result, several diagnostic tests of the model adequacy were considered to check how “good” the fitted model is. Specifically, the Jarque-Bera (JB) Test of Normality, the Breusch-Godfrey (BG) test for serial correlation, White heteroskedasticity and Ramsey Reset Test were employed. The result is presented in Table 4.

TABLE 4. SUMMARY OF DIAGNOSTIC TESTS FOR THE ECM MODEL

| TEST | GDP |
|-----------------------|-----------------------|
| Jarque-Bera Normality | 6.240075 (0.06415) |
| Breusch-Godfrey (B-G) | 3.277818 (0.3242) |
| Heteroskedasticity | 2.398477 (0.0589) |
| Ramsey Reset | 5.51069 (0.5453) |

Note: The probability is given in parenthesis while the F-statistics are above the probability value.

Source: Author's Computation using E-views Output

The outcome of the diagnostic tests as shown Table 4 is satisfactory. Under the null hypothesis that the residuals are normally distributed, the JB test for residual normality assumption is not disrupted. Table 4 also shows that the error process could be pronounced as normal for the relationship between the dependent variable and explanatory variables. The B-G test which is noted to have stronger statistical power showed the absence of serial correlation. Also, the absence of white heteroskedasticity and specification error was authenticated. The results of the tests suggest that the model is well specified, and hence the results are credible.

CONCLUSION AND POLICY IMPLICATIONS

The paper examined the effect of exchange rate and interest rate on economic growth in Nigeria from 2000:Q1 to 2017:Q2 using Co-integration and Error Correction Model (ECM). The specific objective is to estimate the effect of exchange rate and interest rate on economic growth in Nigeria. In the process of doing this, the hypotheses that both exchange rate and interest rate promote economic growth in Nigeria were validated. The two variables (exchange rate and interest rate) that were used to measure their effect on economic growth contributed to economic growth. Exchange rate was significant, while interest rate was insignificant. The ECM term in indicates a feedback of 86% of the previous quarters with the speed of adjustment to equilibrium very high.

With the negative relationship between the exchange rate and economic growth, it follows that exchange rate is significant and supports economic growth in Nigeria. This result is in tandem with the findings of Obansa et al., (2010), Aslam (2016) and Adeniran et al., (2014). It therefore implies that a well-managed exchange rate can increase the growth prospects of the Nigerian economy.

The negative relationship between CPI and economic growth shows that a decrease in CPI leads to higher economic growth all things being equal. CPI being proxy for economic stability if maintained at a lower rate would increase investor's confidence and participation as well as capital flows into the economy.

From the findings, real interest rate has a positive relationship with real gross domestic product (RGDP) but has an insignificant effect on economic growth. This is



an indication that the lending activities of deposit money banks have little impact on the country's economic growth. The constraint that makes it difficult for banks to lend should be addressed. Likewise, the issue of high lending rate with hidden transaction costs must be seriously monitored and addressed by the regulatory authorities.

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