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Review of Interest and Exchange Rates Relationship and the Implications for Nigeria's Economy

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Abstract

This study examined the relationship between savings rate and prime lending rate on one hand and exchange rate on the other and how the relationship transmit into the economy. The instability and persistent fall in the value of the Naira and the implications on the economy, warrants another look on this topic. Relying on theories and available data, a system of equations within the seemingly unrelated regression technique was analyzed for the Nigerian economy using quarterly series over 2011 to 2021. The findings reveals that savings rate and prime lending rate had the ability to cause the Naira to appreciate, though they could not do it significantly. The prime lending rate had significant positive relationship at 5% with real output. A point increase in prime lending rate led to 1.53 points increase in real output in the economy. Aggregate investment has the ability to appreciate the Naira, andit did that significantly at 1%. Exchange rate had positive significant relationship at 1%, with real output growthin the economy over the period examined. It is thus recommended among others that monetary policy be fine-tuned to allow the rates unleash their potentials on the economy, while foreign exchange leakages are blocked.

Keywords: Monetary Policy, Interest rate, Exchange rate, SUR model

JEL Code: E5, F31

1 Introduction

Economic intuition suggests that a relationship exists between interest rates and exchange rates in an economy. However, the results of empirical studies are varied and unsettled if not controversial. A reason for this inconsistency is suspected instructural rather than single equation relationships investigated between interest rates, exchange rate and the economy. Another reason interrogated by this study is the use of one interest rate (monetary policy rate) to analyze the relationship between interest rate and exchange rate in the economy. There are other interest rates in the economy like savings rate, discount rate, treasury bill rate, capital market rates. In particular, the savings and lending rates play different roles and have different channels through which the exchange rate may be impacted. The policy rate is often used because, when allowance is made for the inflation rate, risk, taxes, government and institutional investment policy, asset market characteristics, and term structure to maturity

most of which are largely predictable, it determines other rates (Uchendu, 1993). However, this is not necessarily the case in all situations and sometimes the relationship between the policy rate and other interest rates is not as predictable. In Nigeria, this has been the case in recent times. The study bySani, Salisu, Onyia, Anih, and Kanu (2020)alluded to the fact that interest rate differential (measured by the distance between the savings rate and the prime lending rate) affects Banks' operational costs, thereby making the relationship less amenable to the control of the monetary authorities as can be seen in table 1.For instance, and for clearer understanding, figure 1 shows that between 2011 and 2014, policy rate, prime lending rate and exchange rate were relatively stable. However, lending/deposit rates gap (deposit money banks' profit less operating cost) witnessed opposite zigzag relationships all through, except for 2017 to 2018 and 2019 to 2021. Exchange rate drifted far above and away from all the rates starting from 2014 to 2017, and none of the rates seem effective in calmingthe exchange rate. However, exchange rate stabilized over 2017 to 2019 probably because the prime lending rate and savings deposit rate increased marginally over the same period. This picture might mean that better and more robust information on the interest rates - exchange rate nexus may be obtained by analyzing the effects of the deposit and lending rates on exchange rate separately (Table 1).

This study, first, utilized both the savings and lending rates in a recursive equation system to analyze the relationship betweeninterest rates and exchange rate in Nigeria. However, the assumption of absence of feedback from an endogenous variable to another lower in the casual chain was not met, so the study resorted to the seemingly unrelated regression (SUR) model. The discussion thus far introduced the study while the subsequent content covers: empirical literature; **data source and Model Specification; estimation and discursion of results as well as conclusion in that order.**

2. Literature Review

The Mundell-Fleming (small country) model shows that interest rate variation between the home country and the rest of the world (even within an imperfect market scenario) is effective in causing capital account movements to resolve a negative balance of payment problem in the short run and prevent exchange rate depreciation. Also, the Uncovered Interest Parity (UIP) postulates that all things being equal, interest rate returns on the domestic currency should equal the interest rate on each foreign currency asset, less expected appreciation of the domestic currency (Serrano and Summa (2015). Thus, findings about short-term interest rates show that currencies with high-interest rates tend to appreciate (Lim and Ogaki, 2013) but may induce higher future outflow as amortization of interests rise and cause long-run exchange rate depreciation. However, the use of interest rate stimulus to increase investment and economic growth and thereby propel the economy towards external stability is informed by Keynesian investment theory and the Mckinnon-Shaw hypothesis (Uchendu, 1993). Keynesian theory posits that a low-interest rate encourages borrowing for investment, being a part of the cost of capital. However, Makinon-Shaw views administered low-interest rates (financial repression) as detrimental to aggregate savings and the availability of loanable funds. Furthermore, the real interest rate on savings deposits and other financial assets is the opportunity cost of deferred consumption. Thus, aggregate savings and aggregate consumption are both influenced by the real savings rate in opposite directions. The savings rate may influence the exchange rate through the aggregate savings/aggregate consumption channels while a low lending rate may increase gross capital formation and aggregate production which could positively impact the current account balance and cause the exchange rate to appreciate. However, if structural rigidities like poor quality of electricity supply and high cost of fuel among others limit the capacity of investors to respond to price incentives, an increase in aggregate demand may lead to an increase in importation and affect the exchange rate

adversely. This may be compounded if currency substitution exists in the economy and it responds to monetary policy.

This study, therefore, posits that interest rate and exchange rate policies are intertwined, and may pass through more transmission channels that may proceed simultaneously. Hence the relationship should be investigated through a system of equations. The study used the SUR estimation techniques within a Keynesian open economy model to analyze the effect of savings and lending rates on the exchange rate in Nigeria. The period of the analysis is 2011 to 2021 which captures periods of relative monetary tightening and easing. Quarterly data were sourced from the Central Bank of Nigeria (CBN).

The extant literature is replete with studies on the relationship between interest rate and exchange rate in Nigeria and elsewhere. However, the results are inconsistent as they differ with the policy environment, economic situations of the country at the particular time of analysis, the economies' development status and method of analysis. For example, the study by Sani et al., (2020) using Linear and non-linear ARDL model and monthly data covering the period 2000 to 2018 observed a negative relationship between interest rate differential and exchange rate in the BRICS countries. That the exchange rate predominantly responds asymmetrically to interest rate differential in four of the five countries except India and the differential can explain changes in the exchange rate and interest rate in the short run in India. Furthermore, Şen, Kaya, Kaptan, and Cömert (2020) also found a symmetric movement between exchange rate and interest rate in India using Li and Lee (2010) Autoregressive Distributed Lag (ADL) test for threshold cointegration. They found co-movement between interest rates and exchange rates.

Other studies investigating the relationship between interest rate and exchange rate in emerging, developing and developed countries also have conflicting results. Eichenbaum and Evans (1995) found evidence in favor of causation linkage for Japan, Germany, Italy, France and the United Kingdom; in the same way, Furman and Stiglitz (1998) find evidence in favor of causal linkage for nine East Asian countries. On the other hand, Kaminsky and Schumulker (1998) for Indonesia, Korea, Malaysia, Philippines, Thailand and China. Goldfajn and Baig (1998) for Asian countries, and Kraay (1998) for 54 industrial and middle income developing countries found results contrary to Furman and Stiglitz (1998) and Eichenbaum and Evans (1995).

The studies of Goldfajn and Gupta (1999) for 80 countries; Park et al. (1999) for Korea; Basurto and Ghosh (2000) for Indonesia, Korea and Thailand; Dekle et al. (2002) for Korea, Malaysia and Thailand; Gould and Kamin (2001) for Korea, Indonesia and Thailand with Malaysia, Philippines, Mexico; Chortareas and Driver (2001) for 18 OECD countries; Reinhart and Reinhart (2001) for both G3 countries and developing countries; and Pattanoik and Mitra (2001) for India found results supporting the existence of relationship between interest rate and exchange rate. However, Calvo and Reinhart (2002) found results contrary to Reinhart and Reinhart (2001) for developing economies.

Some other studies also have conflicting results even when newly developed empirical techniques are employed. Examples are Chow and Kim (2004) for Indonesia, Korea, Philippines and Thailand; Coporale et al. (2005) for Thailand, Korea, Indonesia and Philippines; Bautista (2006) for six East Asian countries; Belke et al. (2004) for Mercosur countries; Hnatkovska et. al (2008) for Brazil, Korea, Mexico, Thailand, Peru and Philippines and four developed countries, Canada, Germany, Italy and U.S.A. found similar results indicating the relationship between interest rate and exchange rate. On the contrary, Choi and Park (2008) for Indonesia, Korea, Malaysia and Thailand; Goderis and Ioannidou (2008) for 22 countries and Hamrita and Trifi (2011) for U.S. economy found no relationship between these variables. However, Perera, Silva, and Silva (2018), using the Correlation and Linear Regression Model, reveals a strong positive relationship between interest rate and exchange rate in Sri Lanka which is consistent with Interest Rate Parity

theory that a strong positive relationship exists between Interest rate and Exchange rate.

Kayhan, Bayat, and Uður (2013) observed that the results for both developing and developed countries are inconclusive. They reason that this might stem from non-linear causal linkage between the variables. Another deficiency in the literature is the absence of distinction between short and long term. Hence, they were of the opinion that the causal linkage between the variables may change over time, and that using the non-linear causality and frequency domain causality analysis methods might provide fresh and more robust information about the relationship between interest rate and exchange rate. Kayhan, Bayat, and Uður (2013) examines the dynamic relationships between the real exchange rate and the real interest rate in the BRIC-T (Brazil, Russia, India, China and Turkey) countries by employing monthly data. According to frequency domain causality test results, interest rate affects exchange rate in only China and this effect exists only in the long run. On the other hand, exchange rate shocks induce changes in interest rate in the shorter period.

Gudmundsson and Zoega (2016) using VECM investigated the effect of interest rate on exchange rate in a capital control regime in Iceland and found that cutting interest rates from a very high level is not likely to make a currency depreciate in an effective capital control regime. Thus, the study highlighted the importance of effective enforcement of the controls. In the same vain, Saborowski, Sanya, Weisfeld, and Yepez (2014) examines whether capital outflow restrictions are effective in reducing net capital outflow using panel vector autoregression (VAR) in a sample of 37 emerging market economies using data from 1995 to 2010; they found that capital outflow restrictions were effective in places with strong macroeconomic fundamentals and institutions.

Lahiri and Végh (2007) models the trade-off between higher interest rates, output contraction and credit crunch in an optimizing first generation model, and finds that higher interest rates can delay a crisis if not raised beyond a certain point deemed optimal because of the large negative output effect. They opine that optimal interest rate defense involves setting high interest rates both before and at the moment of the crisis. However, Caporale, Cipollini and Demetriades (2005) used bivariate vector error correction mechanism (VECM) to examine the effect of monetary policy tightening on exchange rates during the Asian crisis in four Asian countries of Thailand, South Korea, The Philippines, and Indonesia, and finds that while monetary policy tightening helped defend exchange rate during periods of tranquility, it shows reverse effect during the Asian crisis, which shows the impossibility of interest defense of a currency in the presence of a speculative attack.

On Nigeria, Mordi (2006) observed that inflation, gross domestic product (GDP) growth rate, external reserves, interest rate, and external debt position are among the several factors that determine the exchange rate. However, Hassan, Abubakar, and Dantama (2017) examined the sources of exchange rate volatility in Nigeria from 1989Q1 to 2015Q4 applying the ARCH and ARDL models and find net foreign asset and interest rate to have a statistically positive impact, but fiscal balance, economic openness, and oil price have a statistically insignificant impact on exchange rate volatility in Nigeria.

Adamu and Sanusi (2016) examined the effect of additional monetary tightening on exchange rate volatility in Nigeria from 2007 to 2016 utilizing the GARCH (II) model. The findings show that additional monetary tightening is effective in reducing the rate of exchange rate volatility. They recommended that additional monetary tightening should be used as a complementary tool to stabilize short-term temporary pressure on the foreign exchange market. Also, Musa and Sanusi (2020) applying the autoregressive distributed lag (ARDL) model examined how a capital account affects the relationship between interest rate policy and exchange rate volatility in Nigeria. The study utilized annual time series data sourced from the CBN and the World Development Indicators (WDI) from 1981 to 2017, and found that an increase in interest rate depreciates the exchange rate in the long run

(either in an open or a closed capital account setting) and also in the short run, if the capital account is open.

However, Agu (2010) examines the place of risk in capital movement and the effectiveness of fiscal and monetary policy in combating capital flight in Nigeria with a multi-sectoral general equilibrium model and finds that risk and volatility influence the outflow of capital, but the capital flight does not respond to indirect controls such as monetary policy but rather direct controls.

Amassoma, Nwosa, and Olaiya (2011) adopted a simplified Ordinary Least Squares (OLS) technique to analyze the impact of monetary policy on macroeconomic variables in Nigeria for the period 1986 to 2009 and find that monetary policy had a significant effect on the exchange rate and money supply.

Yinusa and Sanusi (2008) using Vector Error Correction (VEC) technique, examines the consequences of currency substitution and exchange rate volatility for monetary policy in Nigeria and find that exchange rate volatility and currency substitution respond to monetary policy with some lags.

3. Model Specification

Given the preceding discussion, this study adopts the Keynesian open economy model and employs the seemingly unrelated regression analysis proposed by Zellner, (1962).The SUR method estimates the parameters of all equations simultaneously, such that the parameters of each equation, consider information provided by the other equations in the system. This guarantees greater efficiency of the estimated parameters, given the underlying assumptions (Pan et al. 2020).

Our study is therefore anchored on the Keynesian equation which defines the national income as the sum of disposable income that is consumed by households (C), Investment, (I), government expenditure (G) and export minus imports (X-M). The national income equation (Y) is specified as:

$$Y = G + I + G + (X - M). \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Since both aggregate consumption (C) and its residual, aggregate savings (*Ags*) are functions of the savings rate r^s, and planned Aggregate investment (*Agi*) is a function of lending rate(r^l) while a moderate and tolerable inflation is envisaged to drive growth in the economy, it follows that growth in national income can be stated as:

$$yg^r = f(r^s + r^l + def + cab + Inf)$$

Where def,cab and Inf are the government deficit, current account balance and inflation rate respectively.

In the light of the Keynesian and Makinon-Shaw hypothesis, the Mundel-Fleming model, and the Uncovered Interest Parity postulates (Lim and Ogaki 2013), we, therefore, specify our model of the relationship between interest rate policy, exchange rate, and national income as:

$$yg^r = \beta_{11}r^s + \beta_{12}r^l + \beta_{13}Cab/Rgdpg + \beta_{14}Exr + \beta_{15}Agi + \beta_{16}Ags + \beta_{17}Inf + \delta_1 \quad (3)$$

$$\varepsilon = \beta_{21}r^s + \beta_{22}r^l + \beta_{23}Cab/Rgdpg + \beta_{24}Agi + \beta_{25}Ags + \beta_{26}Inf + \beta_{27}Agi\delta_2 + \delta_2 \quad (4)$$

$$\text{Thus } E(\delta_1, \delta_2/r^s, r^l, cab \ldots) = \sigma_{1,2\ldots} \text{ where } \sigma_{1,2\ldots} \neq 0 \text{ and } 1 \neq 2 \neq 3 \ldots$$

Where r^s, r^l, cab, *Agi&Ags*are as previously defined. The βsare coefficients of the exogenous variables and**δ**sare error terms.

The equations *(3) and (4)*were specified as seeminglyunrelatedsince the errors are assumed to be homoscedastic and linearly independent within each equation of the system. The error for each equation may have its own variance and each equation is correlated with the others in the same time period but no inter-temporal correlation. This latter assumption is termed contemporaneous correlation.

4.0 Data Source and Estimation

The data employed for this study were sourced from the Central Bank of Nigeria and they are for 2011 to 2021. They are macroeconomic aggregates on prime lending rate, savings rate, real GDP growth, inflation, exchange rate, current account balance, aggregate savings and investment.

The estimation of equations *(3) and (4)* was preceded by an examination of the properties of the time series on the relevant variables, this is presented on table 4.1 to 4.3 as well as figure 2.

The descriptive statistics (Table 4.1) shows that the data have high variability, that is, they are not clustered around their mean values. In addition, probabilities of the Jarque-Bera statistic indicate that some of the data were also not normally distributed. Though this would not invalidate the result of the analysis given the size of the observations on the data.

The unit root test (Table 4.2) on the data reveals that all the series have unit root and thus integrated of order one I(1). This was confirmed based on theAugmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Tests. These attributes were taken into consideration by estimating the system in difference,accordingly.

The trend of the series employed for the study as presented in figure 2 shows that aggregate investment and savings as well as exchange rate were on consistent rise over 2011 to 2021 with exchange rate being the one which rose sharply though stable over 2016 to mid-2019. Deficit financing was generally on a decline over 2011 to 2021 while current account balance, savings rate and growth rate of real GDP fluctuated or did not follow any regular pattern over the same period. Prime lending rate was relatively stable over 2012 to early 2017 and thereafter declined up till 2011. Inflation series for the period covered ranged between its lowest of 7.8 in the first quarter of 2014 to its peak of 18.2 in the first quarter of 2021 though it earlier reached a peak of 18.5 in the fourth quarter of 2016.

4.2: Post estimation diagnosis

The Bruesch-Pagan diagonal covariance matrix LM test was applied to test the null hypothesis that contemporaneous diagonal covariance matrix is zero (0) pointing to the independence of the errors. The alternative hypothesis is that the errors are correlated if at least one covariance is non-zero. The residual covariance matrix(see appendix E) suggests that the null hypothesis can be rejected and thus, contemporaneous correlation does exist among the equations in the SUR system as the covariance were non-zero.

5. Discussion of results

The Estimate in Table 4.3 and with particular reference to real GDP growth equation, shows that a point rise in Prime lending rate was statistically significant at 5% and promoted real GDP growth by 1.53 points increase, possibly implying that the loans in this respect went to the right sector. One percent increase in savings rate led to 0.51 drop in real GDP growth though statistically insignificant. Current and lagged values of aggregate investment had statistically significant impact at 1% and 5% on real GDP growth engendering 7.4% and 4.4% increases in real GDP respectively. This gives credence to the importance of channeling resources to investment in the economy. Particularly, the potency of previous stock of investment goods on the economy is noteworthy. Lagged inflation rate proved to have had statistically significant positive impact at 1% on the economy, engendering 0.89 point rise in real GDP while current inflation rate had negative but statistically insignificant impact on real GDP over the period considered.

Current and lagged values of exchange rate had positive significant impact at 1%, on real GDP, engendering 11.76 and 12.24 points increases in real GDP over the period considered. Furthermore, the lagged value of current account balance as a ratio of real GDP had positive significant impact at 5% on real GDP though its current value had negative but statistically insignificant impact on real GDP over the period considered. This points to the poor performance of the current account balance in recent times compared to the past and it is possibly a reflection of dwindling foreign exchange earning capacity of the Nigerian economy due to its skewedness to or bias for the crude oil sector.

The regressors in the real GDP equation jointly accounted for about 54% of real GDP growth in Nigeria over the period considered. Existence of autocorrelation among the errors in the system was ruled out based on system residual portmanteau tests for autocorrelations, because

all probability values of the Portmanteau test are bigger than 0.05 at lags higher than one.

In addition, the exchange rate equation shows thatsavings rate and prime lending rate had a depreciating impact (more Naira were given in exchange for a unit of Dollar) on the exchange rate in Nigeria over the period investigated, though the impacts were statistically insignificant. This is consistent with the study by (Sani et al.; 2020) but contrary to the study by (Perera, Silva, and Silva 2018). It is noteworthy that the lag of prime lending rate had appreciating impact on the exchange rate for the period considered. This suggest a lag in monetary policy effectiveness in firming the Naira against the Dollar.

Aggregate investment and inflation had appreciative impact on exchange rate (Dollar for Naira) in the Nigerian economy over the period studied but only the current level of aggregate investment and lagged value if inflation did that significantly at 5% and 1% respectively. Lagged exchange rate (but not immediate) proved to have an appreciative effect on the Naira over the period studied. Also, the result showed that current account balance as a ratio of real GDP had an appreciative impact on exchange rate in the economy over the period studied. This points to the importance of broadening or optimizing the export basket of an economy.

The coefficient of determination (R^2) shows that the regressors jointly accounted for about 42% of changes in exchange rate in the economy within the period covered while system residual portmanteau tests for autocorrelations, ruled out autocorrelation because all probability values of the Portmanteau test are bigger than 0.05 at lags higher that one.

6. Conclusion and policy implications

This study analyzed the relationship between interest rates and exchange ratefor the Nigerian economy. Particularly, it showed the relationship between savings deposit and prime lending rates with exchange rate separately and how this istransmitted to the economy. The findings in this study show that savings rate and prime lending rate had the potential to causethe Naira to appreciate, but could not do that significantly in the Nigerian economy over the period examined. This only points to the fact that monetary policy authority has to be more decisive and assertive in addition to sharpening its strategy in designing the monetary policy in a way that can guarantee it effectiveness for the Naira to firm against the Dollar. The result shows thatPrime lending rate is an effective tool for boosting aggregate real output in the economy and that need to be sustained and improved upon. In the same vein, lagged value of real GDP was found to be important for strengthening the Naira against the Dollar. Thus, raising the level of domestic productivity cannot be overemphasized, if the Naira is not to witness further slid away from the Dollar.

This study also found aggregate investment as a key factor for stabilizing and strengthening the Naira as well as boosting productivity in the economy. It is thus necessary for relevant agencies to fashion policy aimed at synchronizing this nexus going forward. Aggregate investment interacted positively, as expected, with real GDP and aggregate investment also strengthen the exchange rate (Dollar to Naira) and exchange rate impacted economic growth. The nexus between real output and monetary rates was fair as seen from the result.Particularly, the exchange rate relationship with real output growth was good showing that it is desirable to have the Naira appreciate as that will lead to growth in real output in the economy.It is thus recommended thatthe structure of the economy be re-tooled while fine-tuning the monetary policy stance to allow its instruments produce significant impact on the economy. There is also the need to take full advantage of the oil sector and others, by attracting investment to these sectors, and reduce pressure on demand for dollar through localizing crude refining within the economy.

References

Adamu, F.B., &Sanusi, A.R (2016). Effect of Additional Monetary Tightening on Exchange Rate Volatility in Nigeria.https://www.researchgate.net/publication/311856015

Agu, C. (2010). Domestic macroeconomic policies and capital flight from Nigeria: Evidence from amacroeconometric model. *Central Bank of Nigeria Economic and Financial Review*, 48(3).

Amassoma, D., Nwosa, P.I &Olaiya, S.A. (2011). An appraisal of monetary policy and its effect on macroeconomic stabilisation in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences*2(3), 232–237.

Basurto, G. & Ghosh, A. (2000). The Interest Rate-Exchange Rate Nexus in Currency Crises. *International Monetary Fund Staff Papers*, 47, 99-120.

Belke, A., Geisslreither, K. &Gros, D. (2004). On The Relationship between Exchange Rates and Interest Rates: Evidence from the Southern Cone. *Cuadernos De Economia*, 41: 35-64.

Bautista, C. (2006). The Exchange Rate-Interest Differential Relationship in Six East Asian Countries. *Economics Letters*, 92: 137-142.

Calvo, G. & Reinhart, C. (2002). Fear of Floating. *Quarterly Journal of Economics* 117 (2): 379–408.

Caporale, G.M., Cipollini, A. &Demetriades, P.O. (2005). Monetary policy and the exchange rate during the Asian crisis: Identification through heteroskedasticity. *Journal of International Money and Finance*, 24(1), 39–53. doi:10.1016/j.jimonfin.2004.10.005

Choi, I. and Park, D. (2008). Causal Relation between Interest and Exchange Rates in the Asian Currency Crisis. *Japan and the World Economy*, 20: 435-452.

Chortareas, G. E. & Driver, R.L. (2001). PPP and the Real Exchange Rate-real Interest Rate Differential Puzzle Revisited: Evidence from Non-Stationary Panel Data. *Bank of England* Working Paper no. 138.

Chow, H. K. & Kim, Y. (2004). The Empirical Relationship between Exchange Rates and Interest Rates in Post-crisis Asia. *Singapore Management University School of Economics* Working Paper no. 11-2004.

Dekle, R., Hsiao, C. & Wang, S. (2002). High Interest Rates and Exchange Rate Stabilization in Korea, Malaysia, and Thailand: An Empirical Investigation of the Traditional and Revisionist Views. *Review of International Economic*, 10: 64-78.

Eichenbaum, M. & Evans, C. L. (1995). Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates. *Quarterly Journal of Economics*, 110(4): 975-986.

Furman, J. &Stiglitz, J. E. (1998). Economic Crises: Evidence and Insights from East Asia. *Brookings Papers on Economic Activity*, 2: 1-13.

Goderis, B. &Ioannidou, V. P. (2008). Do High Interest Rates Defend Currencies During Speculative Attacks? New Evidence. *Journal of International Economics*, 74: 158-169.

Goldfajn, I. &Baig, T. (1998). Monetary Policy in the Aftermath of Currency Crises: The Case

of Asia. *International Monetary Fund* Working Paper no. WP/98/170.

Goldfajn, I. & Gupta, P. (1999). Does Monetary Policy Stabilize the Exchange Rate Following a

Currency Crisis? *International Monetary Fund*, Working Paper no. WP/99/42.

Gould, D. M. &Kamin, S. B. (2001). The Impact of Monetary Policy on Exchange Rates During

Financial Crises, R. Glick et al. (eds.) *Financial Crises in Emerging Markets, Cambridge University Press*: Cambridge: 384-420.

Gudmundsson, G.S. &Zoega, G. (2016). A double-edged sword: High interest rates in capital

control regimes. *Economics: The Open-Access, Open-Assessment E-Journal,* 10(2016-17): 1-38. doi:10.5018/economics-ejournal.ja.2016-17.

Hamrita, M. E. &Trifi, A. (2011). The Relationship between Interest Rate Exchange Rate and

Stock Price: A Wavelet Analysis. *International Journal of Economics and Financial Issues,* 1(4): 220-228.

Hassan, A., Abubakar, M &Dantama, Y.U. (2017). Determinants of exchange rate volatility:

New estimates from Nigeria. *Eastern Journal of Economics and Finance*, 3(1), 1-12.

Hnatkovska, V., Lahiri, A. &Vegh, C. A. (2008). Interest Rate and the Exchange Rate: A Non-

monotonic Tale. *National Bureau of Economic Research*, Working Paper no. 13925.

Kaminsky, G. &Schumulkler, S. (1998). The Relationship between Interest Rates and Exchange

Rates in Six Asian Countries. *Unpublished* World Bank.

Kayhan, S., Bayat, T. &Ugur, A. (2013). Interest rates and exchange rate relationship in BRIC-T

countries. *Ege Academic Review*, *13*(2), 227-236.

Kraay, A. (1998). Do High Interest Rates Defend Currencies Against Speculative Attacks? *Policy*

Research Working Paper no. 2267.

Lahiri, A. &Végh, C. A. (2007). Output costs, currency crises and interest rate Defense of a peg.

The Economic Journal, 117(516), 216–239. doi:10.1111/j.1468-0297.2007.02008.x

Li, J. & Lee, J. (2010). ADL test for threshold cointegration, *Journal of Time Series Analysis*, 31,

241–54.

Lim, H. S., & Ogaki, M. (2013). A theory of exchange rates and the term structure of interest

rates. *Review of Development Economics*, *17*(1), 74-87.

Mordi, C. N. (2006). Challenges of exchange rate volatility in Economic management in Nigeria.

Central Bank of NigeriaBullion, 30(3).

Musa, A, A. &Sanusi, A. R. (2020). Effect of Interest Rate on Exchange Rate Management in

Nigeria. *Nigerian Journal of Economic and Social Studies*, 62(3).

Pan, X., Guo, S., Han, C., Wang, M., Song, J., & Liao, X. (2020). Influence of FDI quality on

energy efficiency in China based on seemingly unrelated regression method. *Energy*, *192*, 116463.

Pattanoik, S and Mitra, A. K. (2001). Interest Rate Defense of Exchange Rate: Tale of the Indian

Rupee.*Economic and Political Weekly November*, 24: 4418-4427.

Park, Y. C., Wang, Y. & Chung, C. S. (1999). Exchange Rate Policies in Korea: Has Exchange

Rate Volatility Increased After the Crisis?" *East Asian Bureau of*

Economic Research Working Paper no. 367.

Perera, P. R. M. R., Silva, N. L. C. & Silva, N. L. (2018). The impact of interest rate in

determining exchange rate: Revisiting interest rate parity theory. *Journal for Accounting Researchers and Educators,1*(1).

Reinhart, C. M. & Reinhart, V. R. (2001). What Hurts Most? G-3 Exchange Rate or Interest Rate

Volatility. *National Bureau of Economic Research* Working Paper no. 8535.

Saborowski, C., Sanya, S., Weisfeld, H. &Yepez, J. (2014). Effectiveness of capital outflow

restrictions. *International Monetary FundWorking Paper 14/8.*

Sani, Z., Salisu, A. A., Onyia, E., Anih, O. &Kanu, L (2020). Modeling exchange rate-interest

rate differential nexus in BRICS : the role asymmetry and structural breaks. *Economics*

and Business Letters 9(2), 73-83.

Şen, H., Kaya, A., Kaptan, S. &Cömert, M. (2020). Interest rates, inflation, and exchange rates

in fragile EMEs: A fresh look at the long-run interrelationships. The Journal of International Trade & Economic Development, 29(3), 289-318.

Serrano, F. , & Summa, R. (2015) . Mundell–Fleming without the LM curve: the exogenous interest rate in

an open economy. Review of Keynesian Economics, 3(2), 248-268.

Uchendu, O. (1993): Interest rate Policy, Savings and Investment in Nigeria. CBN Quaterly

Review 31(1), 34-52.

Yinusa, D.O. &Akinlo, A.E. (2008). Exchange rate volatility, currency substitution, and

monetary policy in Nigeria. Munich Personal RePEc Archive.

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regression equations and test

for aggregation bias. Journal of the American Statistical Association, 57, 348-368.