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MONETARY AND FISCAL POLICY INTERACTIONS AND EXCHANGE RATE MOVEMENTS IN NIGERIA

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Abstract: **This paper aimed at examining the influence of monetary and fiscal policy on exchange rate movements in Nigeria. The study is conducted to cover the period 1985 to 2020 where adequate time series data were obtained from the Central Bank of Nigeria. The methodology of the research followed the 'ordinary least squares' (OLS), threshold regression, impulse response function, and the variance decomposition. At the individual policy level, the OLS result indicated that only broad money supply as a monetary policy variable exerted a positive and significant effect on exchange rate movements. At the fiscal realm, debt and expenditure exerted a positive and significant effect on exchange rate movement while revenue exerted a negative and significant effect. From the threshold regression, the optimal growth rate of money supply, debt, government expenditure, and government revenue that will not aggravate exchange rate depreciation are 6.44%, 7.46%, 6.76%, and 9.14% respectively. The impulse response function reflected that a one-standard deviation shock in both monetary policy and fiscal policy variables causes exchange rate to explode both in the short run and in the long run. The variance decomposition for the monetary policy variables indicate that exchange rate is strongly endogenous both in the short run and in the long run as it constitutes 88.53% of its forecasted error variance in the tenth period. For the fiscal policy variables, exchange rate is only strongly endogenous in the short run as it accounts for 100% of its forecasted error variance in the first period, but it declined rapidly to 59.01% in the long run; with government revenue becoming strongly exogenous in predicting exchange rate in the long run. This calls for both monetary and fiscal policy measures to curb the rising depreciation of the naira.**

Keywords: **Depreciation, Floating Exchange Rate Policy, Macroeconomic Management, Pegging.**

I. INTRODUCTION

The macroeconomic management requires the utilization of several policy tools which include "monetary policy, fiscal policy, exchange rate policy, trade policy, and many others". Such policies are geared towards achieving "sustainable economic growth, price stability, full employment, and a favourable balance of payments" (Khan *et al*., 2002). The highest monetary authority of the state (in this circumstance, the Central Bank) is responsible for formulating sound monetary policy stance that will drive the desired macroeconomic objectives. This is done through the use of diverse policy tools like the open market operations, bank rate policy, minimum required reserves, and other qualitative tools like the moral suasion. On the fiscal counterpart, such operations are conducted by the government through the use of its revenue and expenditure tools (taxation, spending, public debt) to drive set down macroeconomic objectives. "Fiscal policy impacts exchange rates through changes in income, prices, and interest rates as a result of expansionary and contractionary fiscal actions" (Richard, 2007).

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For a nation like Nigeria, which has a strong preference for foreign commodities, amplified demand for foreign bills (such as dollars and pounds) leads to an appreciation of the foreign currency and a depreciation of the home currency. Furthermore, when government spending grows, there is a risk of inflation if such expenditure is not followed by an intensification in domestic productive activity. Such an upswing in domestic prices upturns the price of local commodities on the international market while also lowering the price of imported items (Nwosa, 2017). Due to the low price of imported merchandises, there is a huge demand for foreign goods, which causes the domestic currency to devalue more and the foreign currency to appreciate. Furthermore, the massive inflows of foreign exchange earnings that are normally associated by rising oil prices offer solid foundations for a stable exchange rate through their effect on the country's foreign reserves. In contrast, a diminution in oil prices, like the current scenario, has been followed by an increasing exchange rate depreciation of the native currency.

The use of monetary policy in influencing macroeconomic outcomes can be felt in both the nominal and real variables. A change in monetary policy stance, precipitated by a change in the MRR, is initially conveyed to nominal short-term interest rates, which impacts real interest rates, and lastly influences economic actors' consumption and investment decisions. While these interactions are going on in the financial sector, the influence on aggregate demand and the price level is being conveyed to the real sector. Thus, variations in interest rates can easily communicate the influence of monetary policy actions to the greater economy. Likewise, interest rate regulation is a tool for controlling the expansion of financial savings. Financial policy changes that result in positive real interest rates, as occurred in the 1980s, would increase financial savings and impact financial market depth. For the reason that financial markets were more efficient, free market policies and other indirect strategies could more easily convey their impacts to the greater economy (Adeoye, 2007). “The usage of exchange rate policy is another price-based method. The exchange rate channel has been proven to be especially effective in an economy with a shallow money market but a deep foreign exchange market” (Adeoye and Saibu, 2014).

The monetary authorities use their discretionary ability to influence the money stock and interest rates, making money costlier or less expensive based on the existing economic conditions and policy position. Monetary policy, according to Nnanna (2001), is an attempt to govern the economy through managing the quantity of money and the availability of credit. It is specifically intended to govern the availability, pricing, and direction of credit in order to achieve stated economic objectives such as exchange rate stability. “The major purpose of Nigerian monetary policy has been to maintain price and exchange rate stability, which is vital for achieving sustained economic development and external sector viability” (Sanusi, 2012).

The general objectives of monetary policy in Nigeria in regards to exchange rate stability have been anchored on maintaining a narrow gap between the official and parallel markets and preventing disequilibrium in the foreign exchange market, as well as ensuring exchange rate stability and sustainability, maintaining a favourable external reserve position, and ensuring external balance without jeopardizing the need for internal balance, all while keeping in mind the overall goal of “sustainable output, growth, and employment” (Idika, 1998 and Akinlo, 2007).

In contrast to industrialized countries, where interest rate and exchange rate differentials primarily function as signals for international and domestic asset transactions, the exchange rate channel of monetary transmission does not work. Variations in the exchange rate, on the other hand, affect import demand, a process that relays monetary developments to the external sector. It has been extremely difficult to generate a stable exchange rate in Nigeria, which is strongly reliant on oil export earnings and imports of consumer and industry products. The fixed and floating exchange rate regimes have not produced the best results. The reasons for this might include the fact that our economy is stamped by structural rigidities, bottlenecks, and that the majority of our imports and exports are defined by inelasticity on either the demand or supply side, or both (Ndubuisi, Uma and Obidike, 2017).

The trend in the exchange rate movements of country does not only depend on the movements of international oil prices, but based on the volume of non-oil exports that a country has as well. The growth in non-oil exports is an indication that the domestic economic is diversifying and has produced enough output both for domestic production and for exports. Anything below this will result in massive importation of the essential products which drives up the demand for foreign exchange which hitherto leads to domestic currency depreciation. In case of Nigeria, the growth in the non-oil exports has been exhibiting high volatility over the years. In the 1985 where the country experienced a massive rise in the non-oil exports by 100.93%, the naira was exchanged for ₦0.89/$1 and this indicated a strong value of the naira vis-à-vis the

dollar. Thereafter, some degree of fluctuations in the non-oil exports sets in which drove the exchange rate to as high as ₦17.30/$1 when the nation experienced a negative growth in oil revenue by -9.16%. This greater fluctuation in the growth in non-oil exports further deepened in 1999 where the rate was -42.79% and the naira exchanged for ₦92.69/$1. Meanwhile, the period 1985 to 1999 still recorded periods of greater growth in non-oil exports like 289.78% in 1987 and 25.02% in 1997.

In the 2000s, the growth rate of non-oil exports declined drastically below what where recorded in the 1980s and 1990s, except for 2002 (238.22%), 2008 (164.90%), 2017 (90.12%) and 2019 (124.25%). Most periods were marked with persistent negative growth in non-oil exports. For example, the rate was -6.49% in 2005, -5.22% in 2009, -3.73% in 2012, -15.39% and -30.57% for 2014 and 2015 respectively, and -54.17% as at 2020. In this period of negative growth in net exports, the exchange rate has been depreciating drastically as Figure 1 reflects.

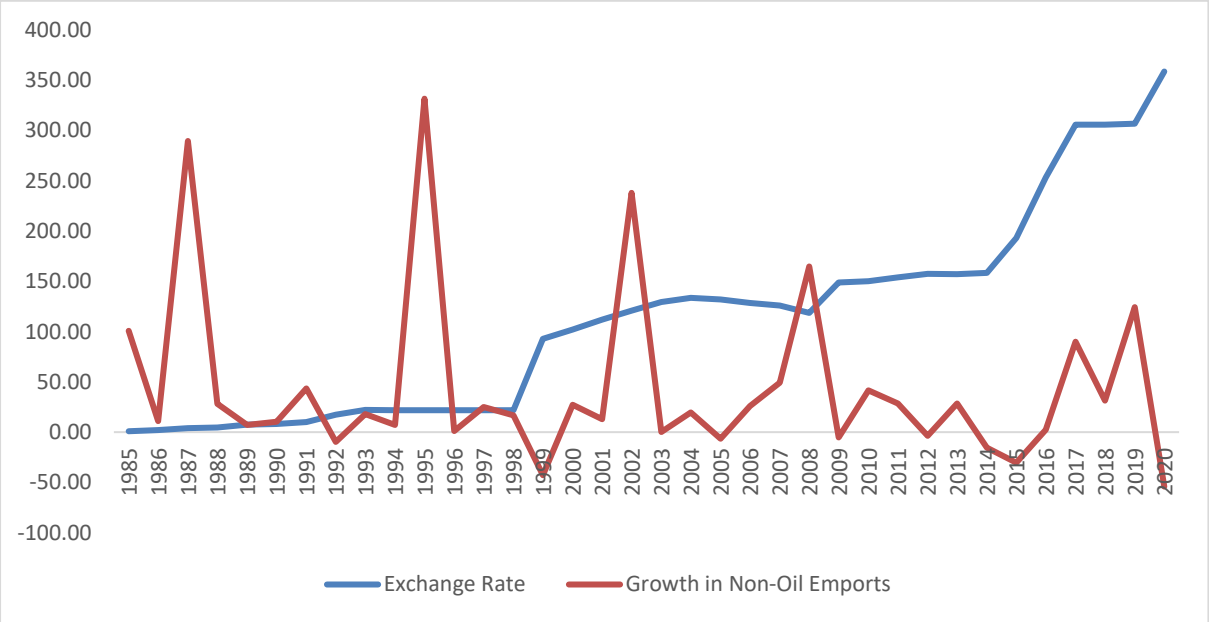

Figure 1: Growth in non-oil Export and exchange rate movements in Nigeria, 1985 – 2020

The exchange rate rose sharply from ₦21.89/$1 in 1998 to ₦92.69/$1 in 1999 which further maintained an upward trend to ₦120.97/$1 s at 2002. This depreciation did not only stop here as the naira further depreciated to ₦132.15/$1 in 2005. Meanwhile, a slight appreciation of the naira from the previous period was recorded in 2008 when the exchange rate declined to ₦118.57/$1. After 2008, the currency has been depreciating consistently to a tune of ₦158.55/$1 in 2014, ₦305.79/$1 in 2017, and ₦358.81/$1 as at 2020 (CBN, 2020).

This drastic depreciation of the naira with attendant harmful impact on the citizens calls for concern on the appropriate technique to address the rapid exchange rate movements over the years. As the case may be, exchange rate stability can be achieved through appropriate monetary and fiscal policies. This has caused the monetary authority to implement various exchange rate policy stance from the fixed to the floating exchange rate regime. At the fiscal counterpart, diverse expenditure and revenue strategies has been implemented but yet, the naira maintained a declining value over the years. In that regards, has monetary and fiscal policy stance been influential in the movements of exchange rate in Nigeria? If it does, what are the monetary and fiscal policy variables that has been exerting a significant influence on exchange rate movement in Nigeria? Also, what are the appropriate levels of the monetary and fiscal policy variables that are sustainable in influencing exchange rate movements in Nigeria? Finally, how does exchange rate respond to shocks in monetary and fiscal policy variables?

The major objective of this study is to investigate the influence of monetary and fiscal policy as they affect exchange rate movements in Nigeria from 1985 to 2020. Specifically, the paper sought to:

i. investigate the influence of monetary policy variables (monetary policy rate, interest rate, and monetary policy rate) on exchange rate movements in Nigeria,

ii. detect the response of exchange rate to shocks in monetary policy variables in Nigeria,

iii. ascertain the influence of fiscal policy variables (revenue, expenditure, and debt) on exchange rate movements in Nigeria,

iv. examine the pooled effect of monetary policy and fiscal policy variables on exchange rate movements in Nigeria, and

v. detect the response of exchange rate to shocks in fiscal policy variables in Nigeria.

This study is done in five major sections. Section 1 being the introductory aspect of the paper is followed with Section 2 which is the literature review. Then, we capture the methodology of the research in Section 3 while Section 4 captures the empirical result. Section 5 then portrays the conclusion and recommendations of the study.

II. LITERATURE REVIEW

2.1.1 Conceptual Clarification

Exchange Rate

"The price of a unit of local currency in terms of foreign currency is known as the exchange rate" (Barth 1922). The interaction of demand and supply in the foreign currency markets results in the formation of a nominal exchange rate at a given moment in time. The exchange rate may alter when demand and supply in the foreign currency market shift, and based on a country's exchange system. A rise in the rate is described as an "appreciation" in terms of the foreign currency, whereas a decline is regarded as a deprecation.

Effective Exchange Rate

A bilateral rate is a local exchange rate specified in terms of a single foreign currency. "Increased exchange rate flexibility since the mid-1970s, on the other hand, has resulted in the development of exchange rate indexes meant to assess the average change of a country's exchange rate versus a number of other currencies over a certain period" (Barth, 1922). The "*effective exchange rate"* is a notion that denotes the average connection between a currency and a group of other currencies. So, "the effective exchange rate index is an average of bilateral exchange rates". Drives in the effective exchange rate index, on the other hand, reflect either an appreciation or depreciation of the local currency with regard to a collection, or basket, of foreign currencies.

Real Effective Exchange Rate

For the reason that the effective exchange rate is constructed as an average of nominal bilateral exchange rates, its index is a nominal one. However, for an effective exchange rate index to be worthwhile in assessing a country's external competitiveness, the nominal index has to be attuned for changes in domestic prices in comparison to those in other countries. "A real effective index is a nominal index that has been modified for relative price fluctuations" (Barth, 1992).

Monetary Policy

Monetary policy constitutes a deliberate action by the monetary authority of a state to control the supply, availability, and cost of credit. Such control is achieved through the use of monetary policy like interest rate adjustments, changes in reserve requirements, open market operations, and other qualitative measures such as moral suasion. Monetary policy is an economic policy that governs the quantity and pace of expansion of an economy's money supply. It is an effective instrument for controlling macroeconomic variables such as inflation, unemployment, growth, and the exchange rate.

Fiscal Policy

Fiscal policy entails a deliberate action by the government to influence macroeconomic variables by adjusting its income and expenditure components. Such policy stance is clearly indicated in the budget. A policy of increased expenditure and reduced taxation is an indication that the government is embarking on an expansionary fiscal policy which is a key to promoting growth and employment. A policy of reduced expenditure and increased taxation is contractionary in nature, and is utilized as a strategy to curtail inflationary pressures in the economy. Even at the fiscal realm, the essence of a policy action has always been to influence the volume of money in circulation within the economy.

2.1.2 Exchange Rate Determination

The selection of an 'exchange rate system' cum the rate at which foreign exchange transactions will take place are both aspects of 'exchange rate policy'. "The relative price structure in local currency terms between products that are traded internationally (tradables) and those that are produced for the domestic market is influenced by a country's exchange rate policy (non-tradables or home goods)" (Johnson, 1985). Furthermore, the total level of local prices will be influenced by 'exchange rate policy'. So, "*the specific 'exchange rate system' and exchange rate level chosen will have a broad influence on the whole economy in terms of pricing incenti*ves" (Barth, 1992). Exchange rate can be determined via options of pegging and floating. These are discussed as follows:

Peg to a Single Currency

There are numerous benefits to 'pegging the value of a currency' to the value of a single currency. Trade between the 'pegging' nation and the nation whose money is applied as the peg possibly will be smoothed. Typically, an emerging economy would peg its money to that of its key trading partner. The uncertainty linked with variations in exchange rates are addressed through pegging. The steadiness of the exchange rate could have a favourable impact on capital flows associated to investment in emerging countries. "Confidence in the emerging nation's currency may be increased if the country whose currency is being pegged is perceived to be pursuing economic policies favourable to price stability" (Barth, 1992). In this situation, acceptable for the 'pegging' country to maintain the peg's level, it is essential also to implement measures that ensure stable pricing. So, "an exchange rate peg may be used to guide macroeconomic policies that promote domestic stability" (Crockett and Nsouli, 1977).

The fundamental disadvantage of an exchange rate 'pegged; to a single currency is that "variations in the rate relative to other nations' currencies may interfere with domestic policy objectives" (Barth, 1992). "*The sway of variations in the exchange values of other currencies* cannot be prevented to some extent, but they may be accentuated by a single currency peg". If, for example, the intervention currency upsurges in value in relation to other currencies, prices of globally traded items would decrease, encouraging import demand and increasing the incentive to transfer resources into output destined only for the home market (nontraded goods). These consequences may run counter to macroeconomic policy's stated goals.

Peg to a Basket of Currencies

An alternate strategy to determining 'exchange rate policy' is to keep a peg to a weighted average of various currency values, occasionally recognised as a "basket peg". This type of trading agreement has two major advantages. By pegging to a basket, a nation is usually able to prevent major fluctuations in its exchange rate in relation to the currencies of numerous trading partners, allowing it to stabilize its nominal effective rate (Barth, 1992). Price volatility caused by currency rate movements is decreased. In general, changes in the exchange rates of industrial nations relative to developing countries, plus the geographical distribution of import sources, would alter local currency import prices. By weighting changes in exchange rates of supply nations by their percentage of the developing country's imports, the effect of any bilateral rate fluctuations on the import price index (in local currency) is mitigated. Thus, a peg to "a basket of currencies" whose currency composition is defined by import shares allows a developing economy to avoid certain import price swings (del Castillo, 2002).

A basket peg, contrariwise, has significant drawbacks. There is a likelihood of technical problems in adopting a peg that would alter each day in comparison to all industrial countries. There are distinct cross rates between developing nations that use different baskets; under a single–currency peg, currencies linked to the same major currency would stay constant vis–a–vis each other. Foreign investors may be less interested in a country pegged to a basket because there may be greater uncertainty about the future rate of the country's currency, mirroring the likelihood that a 'basket peg', as opposed to a 'single currency peg', was more disposed to manoeuvring, principally if facts about the basket's composition were not made public (Johnson, 1985).

Independent Floating

While tying a country's currency rate to a basket reduces volatility, it does not preserve market equilibrium. By offering a technique for estimating the equilibrium exchange rate, independent floating may help to insulate the domestic monetary system from foreign shocks. In principle, "independent floating allows for more constant adjustment of the exchange rate to changes in the demand for and supply of foreign currency, removing the issue of determining the optimal rate level

under a fixed or basket peg" (Barth, 1992). Changes in the demand for and supply of foreign exchange will have an impact on the total external balance and the quantity of official reserves under a fixed-rate system, so influencing the monetary base. In contrast, a 'floating exchange rate' equilibrates the demand for and supply of foreign currency by adjusting the exchange rate rather than the quantity of reserves. For the reason that the monetary base is unaffected by foreign exchange flows in a 'floating rate system', a nation is free to pursue its own monetary policy without regard for balance of payments implications (Quirk *et al*., 1987). Thus, in a 'floating rate system', external imbalances would be reflected in exchange rate fluctuations rather than reserve movements with monetary consequences in a 'fixed rate system' (Barth, 1992). Presently, the managed float system is used by the 'Central Bank' of Nigeria to manage exchange rate in the country.

2.2 Empirical Literature Review

Couple of empirical studies has been conducted at country and cross-country basis to detect the influence of monetary and fiscal policy on exchange rate movements. Based on data from 22 countries in the "Organization for Economic Cooperation and Development" (OECD), Cozier and Selody (1996) imply that money supply has a big and significant positive association with exchange rate. Coneri and Ziba (2001) developed an empirical model for exchange rates using a sample of 42 middle-income developing nations. The paper also provided an ample appraisal of theoretical and empirical data on the many ways in which monetary policy impacts exchange rates. The findings imply that, additionally to monetary policy impacts, open trade policies are required for exchange rate stability.

Pelin (2007) "investigated the impact of fiscal and monetary policy on real exchange rates in Turkey from 1990 to 2003". In keeping with the study's findings, 'expansionary fiscal policy' raises the real exchange rate, but monetary shock has no statistically significant effect. Consistent with the results of variance decomposition, "the impacts of fiscal policy on real exchange rates are more significant than the effects of monetary policy". Mohsin and Lizondo (2008) investigated the use of fiscal measures to maintain the impact of nominal depreciation on the real exchange rate. The study's findings revealed that the extent of the change in the real exchange rate is determined not only by the size of the devaluation and the degree of fiscal adjustment, but also by the method used to decrease the fiscal deficit.

In a unified model for Japan, An and Sun (2008) examined the relationship of monetary policy, foreign exchange intervention, and exchange rate. The theoretical foundations of the study are "signalling" and "leaning-against-the-wind." The study's findings support both the "leaning-against-the-wind" theory and the "signalling" hypothesis, however the evidence for the "signalling" hypothesis is weak. Second, assistance is ineffectual or perhaps harmful. Third, traditional monetary policy has a significant impact on both currency rates and foreign exchange intervention. According to the study, in response to contractionary monetary policy shocks, the exchange rate rises for a short period of time, with the largest effect occurring within several months, and subsequently depreciates over time to its original level in Japan.

For the era 1992 and 2006, Zulu and Paul (2008) assess "the influence of monetary policy on the exchange rate and growth in Zambia". Money supply and liquidity ratio have a positive influence on exchange rate, but monetary policy rate (Minimum Rediscount Rate), exports, and a dummy variable that represents periodic policy changes have a negative and substantial impact on exchange rate, consistent with the research. They suggested that in order to make monetary policy more proactive, more depth in monetary policy and more efficient use of foreign direct investment be introduced.

Udoye (2009) investigated "the drivers of the Nigerian real exchange rate from 1970 to 2006". On the subject of the outcomes of the study, "the one-year previous value of the 'real exchange rate' and the immediate previous value of trade openness are the key predictors of the real exchange rate in Nigeria". The results also divulged that there is proof of a long-run link between the 'real exchange rate, GDP growth rate, and trade openness'. Luca (2012) used "a new VAR identification approach based on expenditure forecast revisions to explore the sway of 'government spending on the real exchange rate' and the trade balance in the United States". The study discovered that following a public expenditure shock, "the real exchange rate rises and the trade balance falls, while the impacts are minor in magnitude" (Luca, 2012).

Michael (2010) examined the influence of 'monetary policy rates' on exchange rate variation in the Nigerian economy using time series data from 1986 to 2005 and discovered that changes in monetary policy rates had a substantial impact on predicting the path of exchange rate movement. Similarly, Aregha (2010) investigated the waves of interest rates on exchange rate stability in Nigeria using time series data from 1970 to 2002, employing the instrumental variable technique, and discovers that variations in interest rates played a negative and highly significant role in the economy's exchange rate determination.

Masha (2011) used time series data from 1982 to 2009 and the Johansen's technique of co-integration analysis to investigate the economic effects of monetary policy measures on exchange rate determination in Ghana. The findings demonstrated that timely monetary interventions result in both short-term and long-term 'exchange rate stability'. So, the government should employ policy instruments such as money supply, interest rates, liquidity, and cash reserve ratios to guarantee 'exchange rate stability'.

Zafar and Sabo (2013) investigated the influence of 'monetary policy' factors on exchange rate movements. Using multiple regression analysis and data from 1980 to 2010, the quantitative evidence disclosed that the money supply, Treasury bill rate, and cash reserve ratio all have a negative and substantial influence on the exchange rate. Empirical findings also indicated that the monetary policy rate is adversely associated to the exchange rate, implying that timely and effective execution of monetary policy choices is the best option to exchange rate control. In line with Ullah and Rauf (2013), a sound exchange rate policy is primarily concerned with the consistent management of short-term monetary policy tools in pursuit of a sustainable and predictable pace of aggregate economic development. They demonstrated that monetary and fiscal policies, along with structural changes, have significant effects on exchange rate stability, not just in terms of shock and crisis protection, but also in terms of equality.

In keeping with Umar (2013), monetary policy is the essential foundation of Nigeria's long-term exchange rate stability. To that purpose, various factors have been suggested as possible drivers of exchange rate stability. These include diversifying exports to reduce reliance on oil, improving trade partnerships, and increasing foreign direct investment inflows. Exploiting data from 1980 to 2011, as well as the 'Granger causality' test and the ECM, the outcomes displayed that money supply has a positive and momentous effect on the exchange rate, whereas monetary policy rate and liquidity ratio have a negative wave on the exchange rate. The study stated that to attain exchange rate stability in Nigeria, adequate monetary policy should be developed and executed.

In Nigeria, Adeoye and Saibu (2014) explored "the link between exchange rate volatility and monetary policy shocks, using the classical ordinary least squares method to investigate the short-run monetary policy drivers of exchange rate volatility in Nigeria". In addition, the ECM was estimated using the Engle-Granger technique after instituting the long-run interaction among the set of integrated variables. The paper's findings reveal that Nigeria's real and nominal exchange rates were both volatile over the time period under consideration. In short, monetary policy variable variation explains exchange rate movement/behaviour via a self-adjusting process with petite or zero interference from the monetary authority. Furthermore, the findings of the causality tests flanked by 'exchange rate volatility' and 'monetary policy variables' revealed a causal bond concerning the historical values of monetary policy variables and the exchange rate. This is clear in the case of interest rate previous values. 'Exchange rate volatility' is caused by a variation in the level of prior values of monetary policy variables. Finally, the article reaffirmed and concluded that the inflation rate, reserves, interest rate, and money supply depreciate and produce volatility in the nominal exchange rate, reinforcing previous conclusions that monetary policy is critical to exchange rate management in Nigeria.

Zakaree, Sani, and Idakwoju (2015) investigated "the influence of Nigeria's public external debt on the currency rate using the OLS approach, and discovered that all of the dependent variables, namely "external debt, debt service payment, and foreign reserve", had a substantial influence on Nigeria's 'exchange rate volatility'. The research advised that the government guarantee that all public borrowings, when and when necessary, be channelled into productive economic activity that can create returns on investment and pay off the debt at maturity.

Kuncoro (2015) examined "the influence of fiscal policy credibility on Indonesian exchange rate stabilization from 2001 to 2013". The study discovered, using quarterly data analysis, that the influence of credible fiscal policy is often dependent on the features of fiscal rule commitment. In the reverse, credible debt policy minimizes exchange rate fluctuation, while the deficit policy has no stimulus on the exchange rate and hence does not help exchange rate stabilization. The study stated that credibility is important in stabilizing the foreign exchange market and suggested that increasing fiscal policy credibility should be an integral aspect of the exchange rate stabilization program.

Alagidede and Ibrahim (2016) researched "the determinants of exchange rate volatility and the implications of excessive swings in the exchange rate on Ghanaian economic development". The study's findings exposed that, while exchange rate shocks tend to mean revert, misalignments tend to rectify slowly. Nearly three-quarters of real exchange rate shocks are self-driven, with the remaining one-quarter ascribed to variables such as government spending and money supply

increases, terms of trade and production shocks. In particular, the findings disclosed that in the short run, production is the most important driver of exchange rate variations, but in the long run, 'exchange rate volatility' is heavily driven by government spending and money supply increases, as well as terms of trade shocks.

Ezeh and Obi (2016) investigated the link flanked by currency depreciation and budgetary adjustment in Nigeria from 1981 to 2014. The study specifically looked at how currency depreciation impacts government spending and revenue in Nigeria. Cointegration, VECM, OLS, and Granger Causality were all used in the study. The study's findings disclosed a positive and causal association flanked by currency depreciation and a few selected fiscal factors. Thus, the report proposed that the Nigerian government rationalize and realign its spending toward productive economic activity in order to drastically decrease budget deficits.

For 1980 to 2015, Nwosa (2017) investigated the link flanked by fiscal policy and exchange rate fluctuation in Nigeria. The OLS method was used in the analysis, and the regression estimate divulged that fiscal policy variables were statistically significant in affecting the Nigerian exchange rate. This shows that fiscal policy factors are important drivers of Nigerian exchange rate volatility. Based on the findings, it was advised that judicious management of revenue, spending, and debt be implemented in order to reduce exchange rate depreciation and maintain a stable exchange rate.

Ndubuisi, Uma, and Obidike (2017) utilized data from 1981 to 2014 "to investigate the effectiveness of monetary policy in ensuring exchange rate stability in Nigeria". The multiple regression approach, the Johansen co-integration test, and the ECM were used in the analysis. The findings divulged that the variables had a long-run connection, as well as the presence of one co-integrating vector in the model. The results also demonstrated that monetary policy had a considerable influence on exchange rates, whereas the ECM demonstrated the amount to which deviations from a steady path reverted to stability. It was suggested that earnest efforts be made to narrow the discrepancy between the official and parallel market currency rates.

2.3 Gap in the Literature

A key point to note form the empirical literature reviewed is that most of the studies has been focusing on treating either monetary or fiscal policy variables as they affect exchange rate movements or exchange rate volatility. The methods have been basically the OLS, cointegration, vector error correction, and Granger causality. Moreover, the studies which to the best of my knowledge were conducted up to 2017, which leaves some time uncovered where some changes in the exchange rate has occurred. In filling the gap and bringing innovation to the subject matter, our study incorporates the OLS, threshold regression, impulse response function, and variance decomposition. Further, a part form examining the influence of monetary policy and fiscal policy separately as the affect exchange rate movement, we also bring the two policy variables together to interact so that we can detect the need for monetary-fiscal policy coordination in exchange rate management; and this study is conducted till 2020.

III. METHODOLOGY

3.1 Model Specification

In ascertaining the influence of monetary and fiscal policy on exchange rate movements, we specify three sets of models which are obtained from the foundation of Nwosa (2017) and Ndubuisi, *et al.* (2017). Model 1 captures the influence of monetary policy variables on exchange rate movements; Model II captures the influence of fiscal policy variables on exchange rate movements in Nigeria; while Model II captures the joint effect of monetary policy and fiscal policy on exchange rate movements in Nigeria.

Model I:

The monetary policy variables of interest include the monetary policy rate, broad money supply, and interest rate. The model is specified as follows:

$$ECHR_t = f(INT_t, MS_t, MPR_t) \qquad Equation\ 1$$

Equation 1 simply states that exchange rate at time t is a function of interest rate (INT) at time t, broad money supply (MS) at time t, and monetary policy rate (MPR) at time t. Transforming Equation 1 into an estimable form and introducing the log of broad money supply to fully linearize the model;

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$$ECHR_t = \beta_0 + \beta_1 INT_t + \beta_2 logMS_t + \beta_3 MPR_t + \mu_t \qquad Equation\ 2$$

Where β_0 is the constant of the regression, β_1 to β_3 are the slope coefficients of the explanatory variables, log is the natural log, and μ is the normally distributed error term.

Model II:

The fiscal policy variables to be captured include total government expenditure, total government revenue, and public debt. The model is specified thus;

$$ECHR_t = f(GEXP_t, GREV_t, DEBT_t) \qquad Equation\ 3$$

We can say from Equation 3 that exchange rate at time t is defined as a function of total government expenditure (GEXP) at time t, total government revenue (GREV) at time t, and total public debt (DEBT) at time t. Equation 3 is transformed into an estimable form after introducing the log function to linearize the model as follows:

$$ECHR_t = \delta_0 + \delta_1 logGEXP_t + \delta_2 logGREV_t + \delta_3 logDEBT_t + \mu_t \qquad Equation4$$

Where δ_0 is the constant, δ_1 to δ_3 are the slope coefficients of the explanatory variables to be estimated, log is the natural log, and μ is the random error term.

Model III:

The model capturing the joint effect of monetary and fiscal policy variables on exchange rate movements in Nigeria is specified thus;

$$ECHR_t = (M_t, F_t) \qquad Equation\ 5$$

Equation 5 states that exchange rate movement at time t is a function of monetary policy variables (M) at time t and fiscal policy variables (F) at time t. In Equation 6, M and F are respectively vectors of monetary and fiscal policy variables and are given as:

$$\begin{cases} M_t = [INT_t, logMS_t, MPR_t] \\ F_t = [logGEXP_t, logGREV_t, logDEBT_t] \end{cases} \qquad \text{Equation 6}$$

Transforming equation 5 into an estimable form we have:

$$ECHR_t = \omega_0 + \omega_1 INT_t + \omega_2 logMS_t + \omega_3 MPR_t + \omega_4 logGEXP_t + \varphi_5 logGREV_t + \varphi_6 logDEBT_t + \mu_t \ Eqn.\ 7$$

Where ω_0 is the constant of the regression, ω_1 to ω_6 are the slope coefficients of the explanatory variables, log is the natural log, and μ is the normally distributed error term.

It is worth noting that exchange rate, interest rate, and monetary policy rate are not being expressed in the log form because they are all in rates already.

3.2 Nature and Sources of Data

The nature of our data is time series, implying that data on each of the variables are obtained over time. In this case, the time selected is from 1985 to 2020. This period is long enough to capture major monetary, fiscal, and exchange rate policies that has been implemented over the years. the data were obtained mainly form the Central Bank of Nigeria statistical bulletin.

3.3 Analytical Technique

Since the objectives of this study is in two-fold – to investigate the influence and to capture the response, we utilize three major approaches. The first is that we utilized the ordinary least squares approach to multiple regression analysis to examine how monetary and fiscal policy influences exchange rate movements. Then, the monetary and fiscal policy variables which exerts significant effect on exchange rate are subjected to threshold regression to detect their optimal levels that will be sustainable for exchange rate stability. Finally, we proceed to use the impulse response function and variance decomposition to capture how exchange rate responds to shocks in monetary and fiscal policy variables.

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IV. EMPIRICAL RESULT

4.1 Descriptive Statistics

The descriptive statistics for exchange rate and both the monetary and fiscal policy variables in Model I and Model II are reflected in Table I.

Table I: Descriptive Features of the Variables

For Model I				
	ECHR	INT	logMS	MPR
Mean	112.0037	18.26861	7.215958	13.59722
Median	119.7685	17.77000	7.447135	13.50000
Maximum	358.8108	29.80000	10.49169	26.00000
Minimum	0.893750	9.250000	3.104553	6.000000
Std. Dev.	100.1918	4.058012	2.448354	3.794393
Skewness	0.781212	0.559292	-0.238578	0.802708
Kurtosis	2.868888	4.337746	1.712297	4.979565
Jarque-Bera Probability	3.687536 (0.1582)	4.561193 (0.1022)	2.828785 (0.2431)	9.744063 (0.0077)
Observations	36	36	36	36
For Model II				
	ECHR	logDEBT	logGEXP	logGREV
Mean	112.0037	7.739444	6.630150	7.073526
Median	119.7685	8.185460	7.018636	7.782058
Maximum	358.8108	10.26568	9.226663	9.316217
Minimum	0.893750	3.812196	2.568106	2.533363
Std. Dev.	100.1918	1.645088	2.019440	2.160673
Skewness	0.781212	-0.621932	-0.580971	-0.720628
Kurtosis	2.868888	2.702256	2.090301	2.195597
Jarque-Bera Probability	3.687536 (0.1582)	2.453772 (0.2932)	3.266494 (0.1953)	4.086429 (0.1296)
Observations	36	36	36	36

Source: Researchers Computation (2022)

Consistent with Table I, exchange rate (ECHR) for the 36 years averaged ₦122.00/$1 with a very high standard deviation of ₦100.19/$1 indicating that the deviation from the mean value is very high. For the study period, the minimum exchange rate was ₦0.89/$1 while the maximum was ₦358.81/$1. The distribution is positively skewed as reflected in the skewness coefficient of +0.78; and is normally distributed since the Jarque-Bera statistic is not significant at the 5% level (P(JB) > .05). The rate of interest (INT) has a mean value of 18.27% with a standard deviation of 4.06% which is minimal. The maximum and minimum rate of interest were 29.8% and 9.25% respectively for the period of analysis. The distribution is also positively skewed as the coefficient of skewness is +0.56. Meanwhile, the distribution is normally distributed as the Jarque-Bera statistic cannot accept the null hypothesis of no normality at the 5% level of significance (P(JB) > .05).

The percentage change in broad money supply (logMS) averaged 7.22% with a standard deviation of 2.45%. The highest value of logMS was 10.49% while the least was 3.10%. The distribution is negatively skewed given the skewness coefficient of -0.24 but it is normally distributed given the aforementioned reason. Then, the monetary policy rate (MPR) average 13.60% with a standard deviation of 3.79%. The minimum and maximum values were respectively 6.00% and 26.00%; while the variable is positively skewed (skewness coefficient = +0.80) but it is not normally distributed (P(JB) < .05).

The percentage change in public debt (logDEBT) averaged 7.74% with a standard deviation of 1.65%. The distribution has a maximum value of 3.81% and a maximum value of 10.27% while it is negatively skewed (skewness coefficient = -0.62) but it is normally distributed given that (P(JB) > .05). The average of the percentage change in government expenditure was 6.63% with a standard deviation of 2.02%. Its minimum and maximum values were respectively 2.57% and 2.57% over the study period. The negative skewness coefficient (-0.58) is an indication that the distribution is skewed to the left. The distribution is normally distributed since the J-B statistic is not significant (P(JB) > .05).

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4.2 Correlation Analysis

To check for the degree of association amid the monetary and fiscal policy variables and exchange rate, the scatter diagram with the respective correlation coefficient is portrayed in Figure 2 to trace them accordingly.

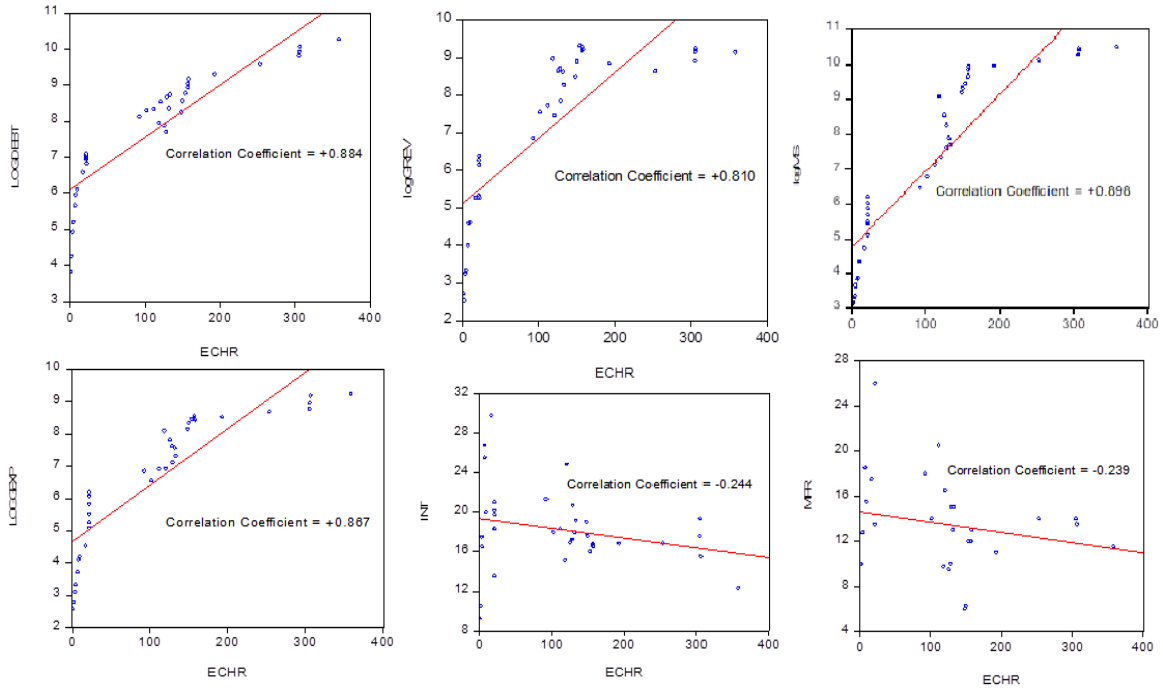

Figure 2: Scatter diagram for correlation analysis

From the scatter diagram in Figure 2, a positive form of association exists amid public debt, government expenditure, government revenue and broad money supply with exchange rate; and a negative association exists amid interest rate and monetary policy rate with exchange rate. All the fiscal policy variables exhibited a strong association with exchange rate as the scatter plots concentrates closely to the fitted line. This is reflected in their correlation coefficients being more than +0.80. For example, the correlation between debt and exchange rate is +0.884 while that of between government expenditure and exchange rate is +0.867. Similarly, the correlation coefficient between government revenue and exchange rate is +0.810. For the monetary policy variables, only broad money supply exhibits high degree of association as the scatter plots are close to the fitted line and its correlation coefficient of +0.886. Meanwhile, both interest rate and monetary policy exhibited weak negative correlation with exchange as reflected in their correlation coefficient of -0.244 and -0.239 respectively as well as the scatter plots being dispersed from the fitted line.

4.3 OLS Regression Analysis

The regression result for the study based on the OLS technique is done in respect to the three models specified. The results are presented as follows:

Table II: OLS regression result for Model I

Dependent Variable: EXCR Method: OLS				
Variable	Coefficient	Standard Error	t-Statistic	Probability
INT	-2.7854	2.1411	-1.3009	0.2026
logMS	37.6285	3.2612	11.5381	0.0000***
MPR	3.5332	2.3805	1.4842	0.1475
C	-156.6773	50.1661	-3.1232	0.0038**
R-squared	0.8212	F-statistic	48.9978	
Adjusted R-squared	0.8045	Prob(F-statistic)	0.0000***	

Source: Researchers' Computation (2022)

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For the monetary policy variables only, the result in Table II showcases that broad money supply is the only monetary policy variable that has a significant influence on exchange rate. As the coefficient signifies, such effect is positive implying that a rise in broad money supply will call for an increase in the exchange rate (depreciation). Thus, a unit percent increase in broad money increases exchange rate by 37.63% on the average. Interest rate (INT) exerts a negative but insignificant effect; while monetary policy rate exerts a positive but insignificant effect on exchange rate. The multiple coefficient of determination indicates that monetary policy variables accounts for 82.12% of the total variations in exchange rate. The overall model is statistically significant because the F-statistic is significant at the 1% level since the p-value is less that the 5% (P < .05).

Table III: OLS regression result for Model II

Dependent Variable: EXCR Method: OLS				
Variable	Coefficient	Standard Error	t-Statistic	Probability
logDEBT	33.7356	15.9439	2.1159	0.0422**
logGEXP	88.6169	25.8668	3.4259	0.0017**
logGREV	-68.3231	19.6381	-3.4791	0.0015**
C	-253.3489	47.2542	-5.3614	0.0000***
R-squared	0.8438	F-statistic	57.6297	
Adjusted R-squared	0.8292	Prob(F-statistic)	0.0000***	

Source: Researches Computation (2022)

Table III captures the result of the fiscal policy variables as the affect exchange rate movements in Nigeria. From the result, public debt and government expenditure exerts a positive and significant effect on exchange rate. The implication here is that an increase in theses variables will lead to an increase in exchange rate (depreciation) and vice versa. The coefficient suggests that a unit percent increase in debt will lead to a 33.74% increase in exchange rate while a unit percent increase in government expenditure leads to 88.62% increase in exchange rate devaluation. This therefore points to the fact that fiscal deficit has been detrimental to exchange rate stability in Nigeria due to the need to finance them with attendant burden of servicing such debt.

On the contrary, government revenue exerts a negative and significant effect on exchange rate implying that a rise in government revenue will lead to an appreciation in the value of the domestic currency and vice versa. This is because an increase in revenue, say from oil, will bring in more foreign exchange which will reduce the need for borrowing. The coefficient indicates that a unit percent increase in government revenue will lead to an average reduction in exchange rate (appreciation) by 68.32% *ceteris paribus*. The r-squared indicates that 84.38% of the total variations in exchange rate is as a result of the variations in the fiscal policy variables. Overall, the model is significant at the 1% level of significance as the F-statistics is significant (P < .05).

Table IV: OLS regression result for Model III

Dependent Variable: EXCR Method: OLS				
Variable	Coefficient	Standard Error	t-Statistic	Probability
INT	-2.5174	1.8248	-1.3796	0.1783
logMS	58.1552	17.6819	3.2890	0.0026**
MPR	-0.6090	2.3227	-0.2622	0.7950
logDEBT	60.7431	18.1293	3.3506	0.0023**
logGEXP	-32.8958	33.6270	-0.9783	0.3360
logGREV	-40.2379	17.3857	-2.3144	0.0279**
C	-220.7630	40.1502	-5.4984	0.0000***
R-squared	0.9103	F-statistic	49.0433	
Adjusted R-squared	0.8917	Prob(F-statistic)	0.0000***	

Source: Researchers' Computation (2022)

The result in Table IV reflects the pooled estimates of both the monetary and fiscal policy variables as they affect exchange rate. Interest rate (INT) still exerts a negative but insignificant effect on exchange rate while monetary policy

rate (MPR) now exerts a negative but insignificant effect on exchange rate. Broad money supply still exerts a positive and significant effect on exchange rate. This indicates that given the fiscal policy variables, a unit percent increase in money supply will lead to a 58.16% increase in exchange rate (depreciation). On the fiscal side, public debt still exerts a positive and significant effect on exchange rate. Given the monetary policy variables, a unit percent increase in public debt will increase exchange rate (depreciation) by about 60.74% on the average. However, government expenditure exerted a negative and insignificant effect on exchange rate; while government revenue still exerts a negative and significant effect (appreciation). The coefficient indicated that given the monetary policy variables, a unit percent increase in government revenue reduces exchange rate by 40.24% on the average. The overall model is significant given the significance of the F-statistic at the 1% level, and both monetary and fiscal policy variables jointly accounts for 91.03% of the total variations in exchange rate.

4.4 Threshold Regression

Since some of our monetary and fiscal policy variables are significant in influencing exchange rate movements, what is the optimal level of these variables that will be sustainable to exchange rate stability? The threshold regression result answers this pertinent question where the results are presented as follows:

Table V: Threshold regression result for broad money supply and exchange rate

Dependent Variable: ECHR Method: Discrete Threshold Regression Threshold variable: logMS				
Variable	Coefficient	Standard Error	t-Statistic	Probability
logMS < 6.444055 -- 14 observations				
logMS	7.504340	2.387871	3.142691	0.0038
C	-21.17372	11.25415	-1.881414	0.0697
6.444055 <= LOGMS < 9.946811 -- 16 observations				
logMS	16.07200	2.173474	7.394614	0.0000
C	-1.970242	18.36192	-0.107300	0.9153
9.946811 <= LOGMS -- 6 observations				
logMS	262.3173	20.87050	12.56881	0.0000
C	-2403.081	214.0959	-11.22432	0.0000
R-squared	0.992073	F-statistic	750.9062	
Adjusted R-squared	0.990752	Prob(F-statistic)	0.000000	

Source: Researchers' Computation (2022)

At the threshold level that is less than 6.44% for broad money supply in Table V, a unit percent increase in money supply leads to a 7.50% increase in exchange rate. At the threshold level greater than 6.44% but less than 9.95, a unit percent increase in broad money supply leads to a 16.07% increase in exchange rate. Then at a threshold greater than 9.95%, a unit percent increase in broad money supply leads to a 262.32% increase in exchange rate. This points to the fact that the optimal threshold level of the growth rate of money supply that is sustainable for exchange rate stability is 6.44% or less. Any level greater than this will lead to exchange rate depreciation. The overall model is significant as portrayed by the F-statistic which is significant at 1% level; and the variable explains 99.23% of the variations in exchange rate beyond the threshold level.

Table VI: Threshold regression result for public debt and exchange rate

Dependent Variable: ECHR Method: Discrete Threshold Regression Threshold variable: logDEBT				
Variable	Coefficient	Standard Error	t-Statistic	Probability
logDEBT < 7.698356 -- 14 observations				
logDEBT	7.455933	3.103368	2.402530	0.0227
C	-31.67011	18.99072	-1.667663	0.1058
7.698356 <= logDEBT < 9.300958 -- 16 observations				
logDEBT	30.88276	7.531381	4.100543	0.0003

C	-128.5282	63.76538	-2.015642	0.0529
9.300958 <= logDEBT -- 6 observations				
logDEBT	161.2417	16.12072	10.00214	0.0000
C	-1296.959	158.4824	-8.183616	0.0000
R-squared	0.9869	F-statistic	451.4715	
Adjusted R-squared	0.9847	Prob(F-statistic)	0.0000	

Source: Researchers' Computation (2022)

With public debt as a threshold variable in the result in Table VI, if the growth in public debt level is less than 7.70, a unit percent increase in public debt will lead to a 7.46% increase in exchange rate depreciation. Also, with a threshold level of public debt that is greater than 7.70% but less than 9.30, a unit percent increase in public debt will lead to a 30.88% increase in exchange rate depreciation. Then at a threshold level greater than 9.30%, a unit percent increase in public debt will cause exchange rate to depreciate by 161.24% on the average. Consequently, the optimal threshold level for growth in public debt is 7.70% or less since it generates the least depreciation. The model explains 98.69% of the total variations in exchange rate at the threshold level and it is overall significant.

Table VII: Threshold regression result for government expenditure and exchange rate

Dependent Variable: ECHR Method: Discrete Threshold Regression Threshold variable: logGEXP				
Variable	Coefficient	Standard Error	t-Statistic	Probability
logGEXP < 6.55258 -- 14 observations				
logGEXP	6.761380	2.824801	2.393578	0.0231
C	-16.79865	12.99876	-1.292328	0.2061
6.55258 <= logGEXP < 8.675658 -- 17 observations				
logGEXP	30.47857	4.583862	6.649101	0.0000
C	-99.79786	35.62452	-2.801381	0.0088
8.675658 <= logGEXP -- 5 observations				
logGEXP	123.9899	25.89804	4.787618	0.0000
C	-805.2323	232.2193	-3.467551	0.0016
R-squared	0.9865	F-statistic	438.0821	
Adjusted R-squared	0.9842	Prob(F-statistic)	0.0000	

Source: Researchers' Computation (2022)

In regards to Table VII where we capture government expenditure, at the threshold level of 6.55% or less, a unit percent increase in government expenditure results in a 6.76% increase in exchange rate depreciation; while at the threshold level that is greater than 6.55% but less than 8.68%, a unit percent increase in government expenditure leads to a 30.48% increase in exchange rate depreciation. Similarly, an increase in exchange rate depreciation to 123.99% will be experienced at the threshold of government spending being greater than 8.68%. It follows that the optimal threshold level for government expenditure is 6.55% or less if exchange rate stability is to be achieved. the overall model is significant and explains 98.65% of the total variation in exchange rate at the threshold level.

Table VIII: Threshold regression result for government revenue and exchange rate

Dependent Variable: ECHR Method: Discrete Threshold Regression Threshold variable: logGREV				
Variable	Coefficient	Standard Error	t-Statistic	Probability
logGREV < 9.138113 -- 29 observations				
logGREV	32.35032	4.599587	7.033309	0.0000
C	-128.1787	31.61075	-4.054909	0.0003
9.138113 <= logGREV -- 7 observations				
logGREV	-945.9453	334.3360	-2.829326	0.0080
C	8948.974	3082.258	2.903383	0.0066
R-squared	0.7623	F-statistic	34.2003	
Adjusted R-squared	0.7399	Prob(F-statistic)	0.0000	

Source: Researchers' Computation (2022)

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Table VIII reflects on the threshold regression result for government revenue and exchange rate, with government revenue as the threshold variable. At a threshold level of government revenue being 9.14% or less, a unit percent increase in government revenue culminates to a 32.35% increase in exchange rate depreciation. Conversely, a unit percent increase in government revenue is associated with a 945.95% decrease in exchange rate depreciation at the threshold level greater than 9.14%. This points out the fact that increasing revenue of the government coupled with little spending and borrowing will ensure exchange rate appreciation. The significance of the overall model is upheld since the F-statistic is significant at the 1% level; and 76.23% of the total variations in exchange rate is explained by the variation in government revenue at the threshold level.

4.5 Impulse Response Functions (IRs)

With the IRFs, we are able to detect how the variables respond to shocks (innovations) in the other variables using the "Cholesky One Standard Deviation Innovations". For our variable of interest which is the exchange rate, we will be able to see how the variable responds to shocks in both monetary and fiscal policy variables over time. Figure 3 captures how exchange rate responds to shocks in the monetary policy variables.

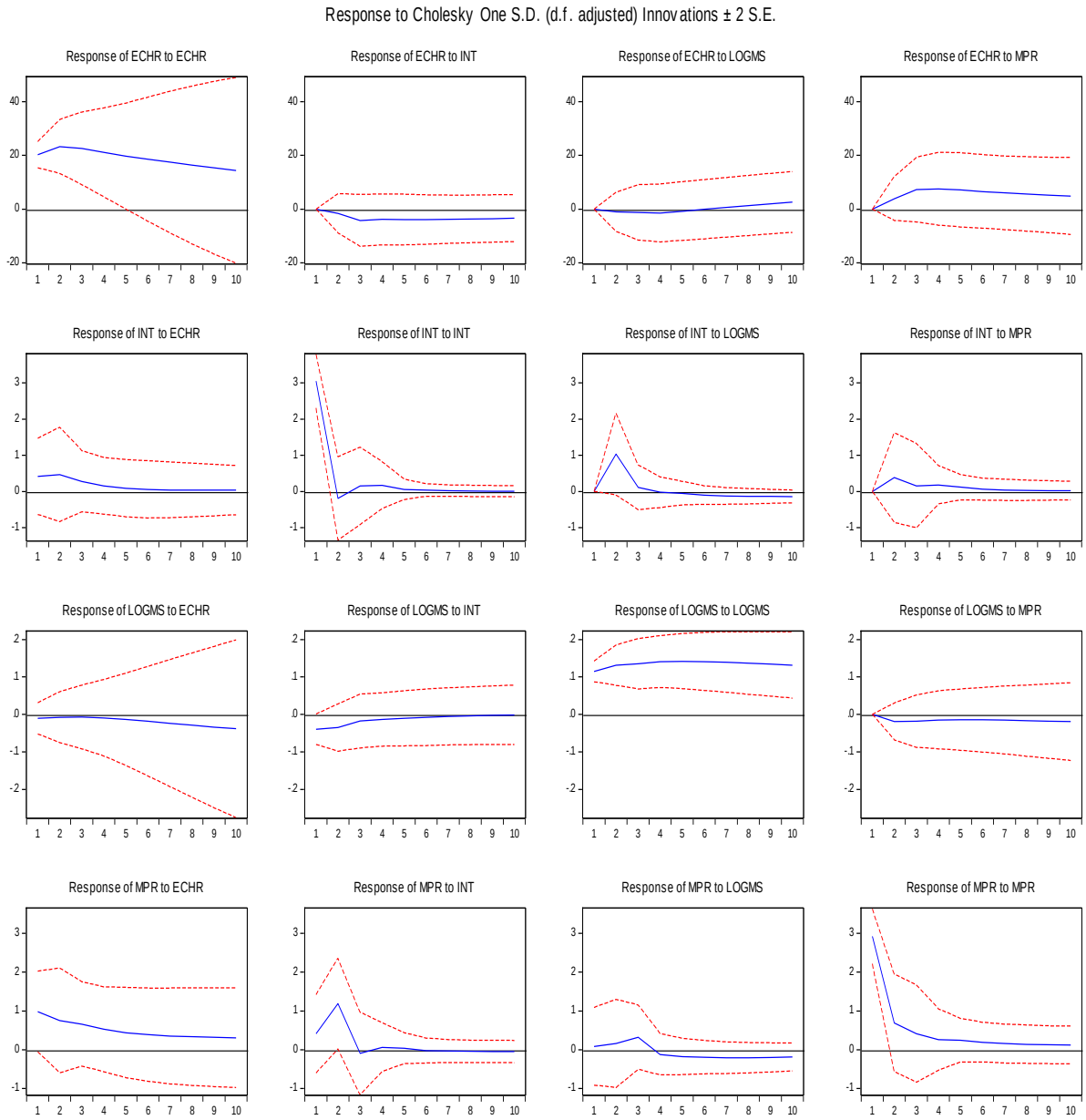

Figure 3: The Response of exchange rate to shocks in monetary policy variables

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As observed form Figure 3, a one standard deviation shock in interest rate, broad money supply and monetary policy rate is matched with an explosive exchange rate both in the short run and in the long run. This is noted from the fact that after the shock, the exchange rate has note returned to be base line rather, it continued to diverge without any form of convergence to the base line. As such, exchange rate has been explosive in nature irrespective of the monetary policy actions. This can be validated given the rising trend in exchange rate without any form of decline over the years.

Variables that indicated some form of convergence are interest rate response to money supply, interest rate response to monetary policy rate, monetary policy rate response to interest rate, and monetary policy response to money supply. For the response of interest rate to money supply shocks, interest rate was explosive in the short run up to the fifth year, but thereafter it converges to the base line. This indicates that the effect of a shock in the money supply will be visible in the short run, but such effect will disappear in the long run. Similarly, the response of interest rate to monetary policy rate is also explosive in the short run but converges towards the base line in the long run. This is because the monetary policy rate is the anchor in setting interest rate. Thus, they will likely move in the same direction in the long run. The same short run and long run behaviour is noticed in monetary policy rate response to interest rate, and monetary policy response to money supply.

For the fiscal policy variables, Figure 4 reflect how exchange rate responds to shocks in government expenditure, government revenue, and public debt.

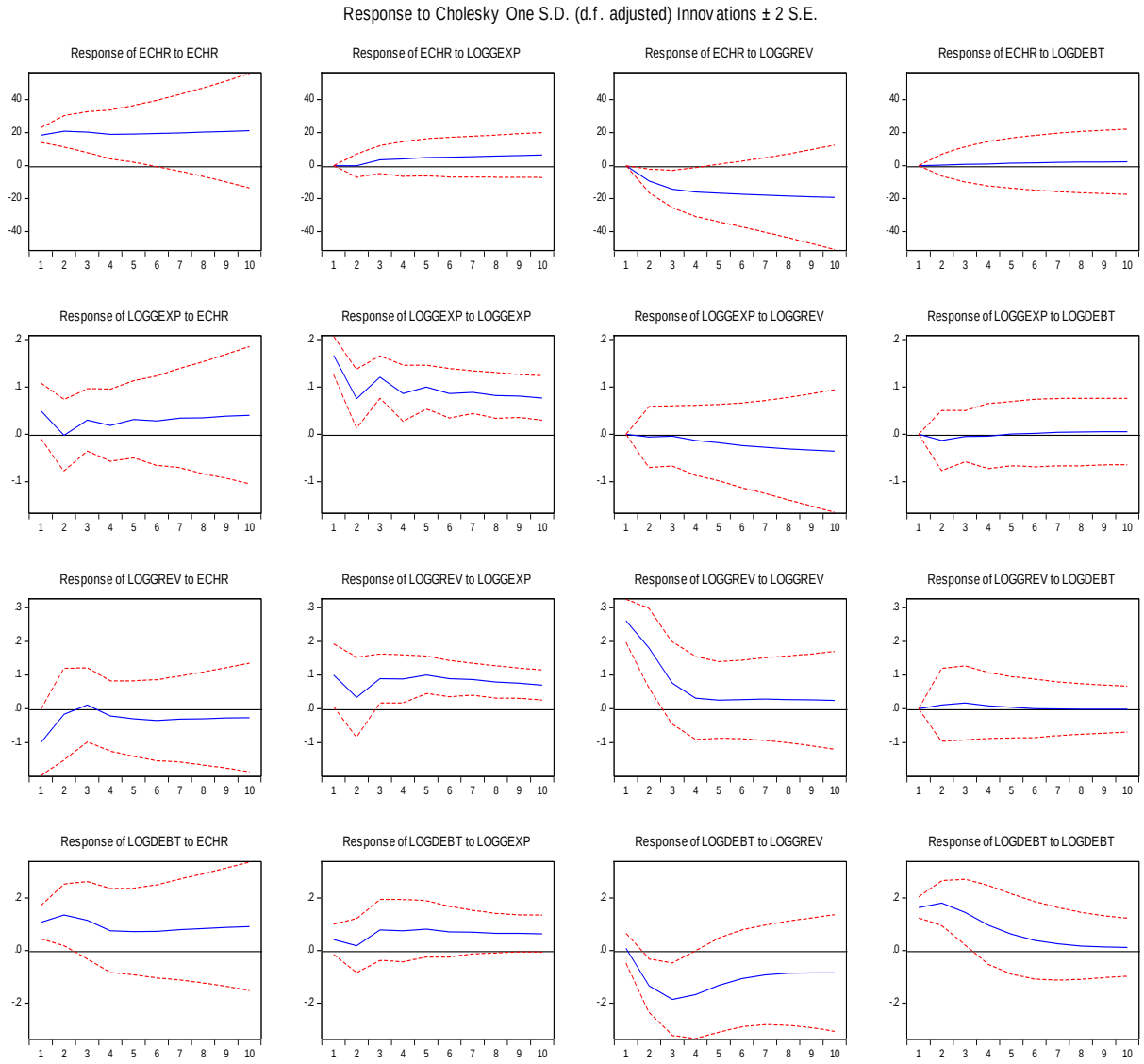

Figure 4: The Response of exchange rate to shocks in fiscal policy variables

It is observable from Figure 4 that exchange rate responds in an explosive manner to shocks in the fiscal policy variables both in the short run and in the long run. The value tends not to return to the base line for the three variables thus pointing out the diverging nature of exchange rate from the equilibrium level. other variables in the IRFs reflects similar explosive nature given a shock in another variable. As such, fiscal policy has not been able to return exchange rate to the equilibrium level as observed from the rising depreciation of the naira over the years.

4.6 Variance Decomposition

The variance decomposition (VD) points out the proportion of the forecasted error variance that is explained by the variable itself and other variables in the model. This aid in the detection of the endogeneity and exogeneity of a given variable. Table IX reflects the VD of exchange rate and monetary policy variables.

Table IX: The variance decomposition from monetary policy variables and exchange rate

Variance Decomposition of ECHR:					
Period	S.E.	ECHR	INT	logMS	MPR
1	20.2216	100.0000	0.0000	0.0000	0.0000
2	31.1276	98.0600	0.2634	0.1126	1.5639
3	39.3702	94.1379	1.3183	0.1731	4.3707
4	45.4750	92.0323	1.6983	0.2375	6.0319
5	50.2362	90.8204	2.0051	0.2186	6.9558
6	54.0821	90.0882	2.2594	0.1888	7.4636
7	57.2679	89.5942	2.4581	0.1799	7.7677
8	59.9547	89.2076	2.6188	0.2122	7.9613
9	62.247	88.8644	2.7511	0.2983	8.0860
10	64.220	88.5291	2.8608	0.4459	8.1640
Variance Decomposition of INT:					
Period	S.E.	ECHR	INT	logMS	MPR
1	3.0761	1.8403	98.1596	0.0000	0.0000
2	3.3066	3.6219	85.2923	9.7598	1.3259
3	3.3277	4.2927	84.4310	9.7466	1.5295
4	3.3409	4.4787	84.0356	9.6737	1.8118
5	3.3450	4.5418	83.8571	9.6707	1.9302
6	3.3478	4.5630	83.7266	9.7466	1.9636
7	3.3508	4.5704	83.5866	9.8667	1.9761
8	3.3538	4.5738	83.4383	10.0067	1.9810
9	3.3569	4.5766	83.2843	10.1560	1.9829
10	3.3600	4.5807	83.1289	10.3065	1.9838
Variance Decomposition of logMS:					
Period	S.E.	ECHR	INT	logMS	MPR
1	0.1218	0.7394	10.648	88.6116	0.0000
2	0.1835	0.4990	8.3363	90.1087	1.0559
3	0.2293	0.4131	5.9238	92.3618	1.3010
4	0.2700	0.4125	4.5314	93.8200	1.2359
5	0.3059	0.5088	3.6510	94.6662	1.1738
6	0.3378	0.7086	3.0463	95.1018	1.1432
7	0.3666	1.0120	2.6101	95.2330	1.1447
8	0.3929	1.4140	2.2827	95.1286	1.1746
9	0.4170	1.9055	2.0293	94.8377	1.2272
10	0.4393	2.4757	1.8290	94.3974	1.2977
Variance Decomposition of MPR:					
Period	S.E.	ECHR	INT	logMS	MPR
1	3.1158	9.9183	1.7282	0.0728	88.2805
2	3.4898	12.5012	12.9453	0.2636	74.2897
3	3.5913	15.1943	12.2998	1.0435	71.4622
4	3.6414	16.8591	11.9929	1.1319	70.0160

5	3.6801	17.9191	11.7502	1.3492	68.9813
6	3.7104	18.7068	11.5634	1.6037	68.1259
7	3.7366	19.3409	11.411	1.8995	67.3484
8	3.7601	19.8868	11.2827	2.1839	66.6465
9	3.7813	20.3769	11.1728	2.4383	66.0119
10	3.8007	20.8269	11.0769	2.6580	65.4380
Cholesky Ordering: ECHR INT logMS MPR					

Source: Researchers' Computation (2022)

Given Table IX, we capture the variance decomposition of each of the monetary policy variables and exchange rate. Exchange rate is observed to account significantly to its forecasted error variance both in the short run and in the long run. For instance, it accounted for 100% in the first period which later declined to 90.82% in the fifth period (the short run horizon). In this short run horizon, interest rate, money supply, and monetary policy rate contributed very little to the forecasted error variance in exchange rate. For first period, the three variables contributed nothing to the total forecasted error variance until the second period where their contribution were still minimal. Even up to the fifth period, the three variables jointly account to only 9.18% of the total forecasted error variance in exchange rate. This points out the fact that exchange rate is strongly endogenous while the monetary policy variables were weakly exogenous in the short run. In the long run (period 6 to 10), exchange rate still accounts for a greater proportion of its forecasted error variance (up to 88.53%) in the tenth period, while the monetary policy variables jointly contributed only 11.47% of the forecasted error variance. This makes exchange rate to be strongly endogenous in the long run while the monetary policy variables remain weakly exogenous in predicting exchange rate. Meanwhile, there has been a little improvement in the forecasting power of monetary policy rate in the prediction of exchange rate in the long run given that its contributes 8.16% as compared to interest rate (2.86%) and money supply (0.45%).

Interest rate is observed to be to be strongly endogenous in predicting itself in the short run. This is due to its ability to contribute up to 98.16% of its forecasted error variance in the first period and this decline slightly to 83.86% in the fifth period. Meanwhile, the monetary policy rate, exchange rate, and money supply jointly account for 1.84% of the forecasted error variance of interest rate in the first period and 16.14% in the fifth period. This points out that exchange rate, money supply, and monetary policy rate were weakly exogenous in predicting exchange rate in the short run. Still, the same behaviour was observed in the long run with interest rate accounting for 83.13% of its forecasted error variance in the tenth period and the other variables jointly account for just 16.87% which is not that much from their short run value. Hence, the variables remain weakly exogenous in predicting the value of interest rate even in the long run. Meanwhile, improvements in money supply has been noted has it constantly contributed an average of 10.31% of the forecasted error variance in interest rate in the long run.

Money supply is observed to be strongly exogenous in predicting itself as it accounts for 88.61% of its forecasted error variance in the first period which continued to rise to 94.67% in the fifth period. In the long run, it contributed up to 94.39% of its total forecasted error variance in the tenth period. This points out that money supply has been strongly endogenous in predicting itself both in the short run and in the long run; while interest rate, exchange rate and monetary policy rate has been weakly exogenous in predicting money supply. The key argument that satisfies this endogeneity of money supply is that money supply is automatically fixed by the monetary authority.

For monetary policy rate, the variable was strongly endogenous in predicting itself in the short run by accounting for 88.28% and 68.98% of its forecasted error variance in the first and fifth period respectively. This decline in its contribution is an indication that other variables has been involved in predicting the MPR. These variables are notably interest rate and exchange rate. Exchange rate contributed 9.92% and 17.92% of the forecasted error variance in MPR in the first and fifth period respectively; while interest rate contributed 1.73% and 11.75% in the same period. Though they still seem to be weakly exogenous, there have been improvements in their influence on the monetary policy rate over the short run. In the long run, MPR accounts for 65.43% of its forecasted error variance which makes it to be fairly strongly endogenous in predicting itself. Meanwhile, both exchange rate and interest rate jointly contributed 31.91% of the total forecasted error variance in MPR in the long run. This makes them to be somewhat fairly strong in predicting monetary policy rate. Meanwhile, money supply has remained weakly exogenous in predicting MPR both in the short run and in the long run.

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For the fiscal policy variables and exchange rate, Table X presents the result of the variance decomposition.

Table X: Variance decomposition of fiscal policy variables and exchange rate

Variance Decomposition of ECHR:					
Period	S.E.	ECHR	logGEXP	logGREV	logDEBT
1	18.4068	100.0000	0.0000	0.0000	0.0000
2	29.3275	89.7484	0.0009	10.2421	0.0084
3	38.5932	79.4457	0.8720	19.6379	0.0442
4	46.0907	72.6141	1.3669	25.9397	0.0790
5	52.9035	68.2679	1.9163	29.6841	0.1315
6	59.1907	65.2910	2.2552	32.2662	0.1874
7	65.2157	63.1095	2.5715	34.0749	0.2440
8	70.9918	61.4224	2.8248	35.4585	0.2942
9	76.5984	60.0870	3.0623	36.5129	0.3376
10	82.0579	59.0054	3.2734	37.3472	0.3739
Variance Decomposition of logGEXP:					
Period	S.E.	ECHR	logGEXP	logGREV	logDEBT
1	0.1738	8.1895	91.8104	0.0000	0.0000
2	0.1900	6.8654	92.5654	0.0915	0.4776
3	0.2272	6.5732	92.9621	0.0918	0.3727
4	0.2441	6.2954	92.9996	0.3548	0.3500
5	0.2662	6.6857	92.2837	0.7343	0.2961
6	0.2822	6.9686	91.4125	1.3496	0.2692
7	0.2990	7.5052	90.2181	2.0166	0.2600
8	0.3135	8.0523	88.9053	2.7826	0.2596
9	0.3277	8.7282	87.4349	3.5702	0.2665
10	0.3408	9.4482	85.8722	4.4038	0.2755
Variance Decomposition of logGREV:					
Period	S.E.	ECHR	logGEXP	logGREV	logDEBT
1	0.2971	11.3172	11.3229	77.3598	0.0000
2	0.3494	8.4031	9.1286	82.3641	0.1040
3	0.3692	7.6188	14.0450	78.0309	0.3051
4	0.3817	7.4517	18.5140	73.6938	0.3403
5	0.3967	7.4503	23.5648	68.6568	0.3279
6	0.4090	7.7243	26.9500	65.0169	0.3087
7	0.4203	7.8543	29.8040	62.0491	0.2924
8	0.4296	7.9933	31.9329	59.7933	0.2804
9	0.4378	8.0827	33.7190	57.9276	0.2705
10	0.4449	8.1725	35.1493	56.4155	0.2626
Variance Decomposition of logDEBT:					
Period	S.E.	ECHR	logGEXP	logGREV	logDEBT
1	0.2007	28.6626	4.4887	0.1966	66.6519
2	0.3305	27.2945	1.9762	16.4072	54.3219
3	0.4292	23.3807	4.5571	28.3712	43.6908
4	0.4830	20.9227	6.0559	34.4576	38.5636
5	0.5162	20.2754	7.8385	36.6535	35.2323
6	0.5381	20.4846	8.9753	37.6066	32.9333
7	0.5568	21.2011	9.9720	37.8560	30.9706
8	0.5737	22.1120	10.7079	37.9137	29.2663
9	0.5904	23.1274	11.3309	37.8489	27.6927
10	0.6070	24.1623	11.8175	37.7777	26.2423
Cholesky Ordering: ECHR logGEXP logGREV logDEBT					

Source: Researchers' Computation (2022)

Consistent with Table X, the VD of exchange rate in regard to the fiscal policy variables is presented in the first segment. It is observed that ECHR has been strongly endogenous in predicting itself in the short run, accounting for 100% of its forecasted error variance which later declined to 68.27% in the fifth period. Of all the fiscal policy variables, only government revenue contributed roughly 29.68% of the forecasted error variance in exchange rate in the fifth period. In the long run, exchange rate still maintained a greater proportion of its forecasted error variance of up to 59% in the long run making it to be strongly endogenous. Meanwhile, government expenditure still continued to thrive in influencing the forecasted error variance in exchange rate by accounting for up to 37.34% in the tenth period. This implies that out of all the fiscal policy variables, only government revenue has been able to tactically curtail rapid exchange rate movements in Nigeria. The endogeneity and exogeneity of other variables can be discussed in a similar manner. For instance, government expenditure is strongly endogenous in predicting itself both in the short run and in the long run while exchange rate, government revenue, and public debt were weakly exogenous in predicting government expenditure both in the short run and in the long run.

In the third segment of Table X, government revenue is strongly endogenous in predicting itself in the short run and in the long run but government expenditure has been accounting for a little bit more (23.56% in the fifth period) of the total forecasted error variance; and even more in the long run (35.15%). Lastly, public debt has been strongly endogenous in predicting itself in the short run up to the second period by accounting for 54.32% of its total forecasted error variance while government revenue, government expenditure, and exchange rate jointly accounts for 45.68% in the same period. But in the long run, public debt becomes weakly endogenous in predicting itself by accounting for only 26.24% of its total forecasted error variance. Thus, exchange rate, government expenditure, and government revenue became strongly exogenous in predicting public debt as they jointly account for 73.76%.

Meanwhile, government revenue accounted for 37.78% of the total forecasted error variance which points out that it is less revenue that drive debt; and government expenditure accounts for 11.82% implying that it is the need to fund the deficit created by little revenue that calls for borrowing. Similarly, the exchange rate contributed 24.16% of the total forecasted error variance, pointing out that it could also be an indication for borrow since high exchange rate imply domestic currency depreciation. As such, the value of the domestic currency will be lower compared to the dollar which creates the need to balance up the gap as a result of the demand for import goods.

V. CONCLUSIONS AND RECOMMENDATIONS

Exchange rate stability is necessary for a sound macroeconomic management and the achievement of such is pre-requite for a vibrant economy. In that way, policy options are targeted towards achieving the objective of exchange rate stability. In this study we examine the effectiveness of two policies – monetary policy and fiscal policy. The monetary policy is within the ambience of the highest monetary authority (the Central Bank in our case) while the fiscal policy is conducted by the government using its revenue and expenditure tool. Given these policy options, this study has brought forth the interaction between monetary policy and fiscal policy and how they drive exchange rate movements in Nigeria from 1985 to 2020. In the quest of achieving this, we subjected our study to examining the individual policy as the affect exchange rate and then pooled the two policies to see their joint effect. this led to the specification of three sets of models. We further checked for the optimal level of monetary and fiscal policy variables that will ensure exchange rate stability, along with examining how exchange rate responds to shocks in monetary and fiscal policy variables. The monetary policy variables utilized were interest rate, broad money supply, and monetary policy rate; while the fiscal policy variables include government expenditure, government revenue, and public debt.

We utilized the ordinary least squares method of multiple regression analysis to check on the influence of the individual and joint policy options as the affect exchange rate. the threshold regression was utilized to ascertain the threshold level of monetary and fiscal policy variables that will be sustainable for exchange rate stability; while the impulse response function and variance decomposition were utilized to ascertain how exchange rate responds to shocks in monetary and fiscal policy variables.

The OLS result for Model I indicated that out of the three monetary policy variables (interest rate, broad money supply, and monetary policy rate), only money supply wielded a positive and significant effect on exchange rate in Nigeria. This indicates that as broad money supply increases, exchange rate also increases and vice versa. The monetary policy variables were noted to explain 84.94% of the total variations in the exchange rate in Nigeria. For Model II, all the fiscal

policy variables (government expenditure, government revenue, and public debt) all exerted a significant effect on exchange rate. Both public debt and government expenditure exerted a positive effect while government revenue exerted a negative effect. This imply that an increase in government expenditure and public debt leads to an increase in exchange rate depreciation in Nigeria; while an increase in government revenue reduces exchange rate depreciation. The fiscal policy variables jointly explained 84.38% of the total variations in exchange rate. In the pooled model of both monetary and fiscal policy variables, only broad monetary policy exerted a positive and significant effect on exchange rate among all the monetary policy variables; while public debt and government revenue exerted a significant effect among the fiscal policy variables. Public debt exerted a positive effect while government expenditure exerted a negative effect. This implies that given the fiscal policy variables, an increase in money supply will likely increase exchange rate depreciation in a substantial manner. Likewise, an increase in public debt will lead to a significant increase in exchange rate depreciation while an increase in government revenue will decrease exchange rate depreciation in a significant manner, given the monetary policy variables. Both monetary and fiscal policy variables explain 91.03% of the total variation in exchange rate. We can conclude here that monetary-fiscal coordination is necessary for exchange rate stability in Nigeria.

The threshold regression identifies the threshold level of the monetary and fiscal policy variables that will be sustainable for exchange rate stability. For the monetary policy variable that has a significant effect, a threshold level of 6.44% growth in monetary policy was detected. Any growth rate that is beyond the threshold level will cause significant exchange rate depreciation. For the fiscal policy variables, the threshold level of public debt growth, government expenditure growth, and government revenue growth were detected to be 7.46%, 6.76% and 9.14% respectively. Any growth rate beyond the stated threshold level of public debt and government expenditure will lead to a significant exchange rate depreciation. Since a higher threshold in broad money supply, public debt and government expenditure cause a greater magnitude in exchange rate depreciation; and that a higher threshold level in government revenue causes a lower level of exchange rate depreciation, it is valid to conclude here that for Nigeria to achieve exchange rate stability, a fully coordinated contractionary monetary and fiscal policy must be implemented.

The impulse response function indicated that exchange rate has been explosive in nature given shocks in monetary and fiscal policy variables. The variance decomposition of exchange rate indicates that exchange rate has been strongly endogenous in predicting itself while monetary policy variables were weakly exogenous in predicting exchange rate in the short run and in the long run. At the fiscal policy realm, exchange rate still remains strongly endogenous in predicting itself in the short run and in the long run. Meanwhile, the fiscal policy variables were weakly exogenous in predicting exchange rate movements in the short run. In the long run, government expenditure and public debt still remains weakly exogenous in predicting exchange rate movement; while government revenue was fairly strongly exogenous in predicting exchange rate movement in the long run by accounting for almost 37.35% of the forecasted error variance. We can conclude here that exchange rate has been diverging from equilibrium rate given shock s from monetary and fiscal policy variables, but the fiscal policy variable that has been reducing exchange rate depreciation was the growth in government revenue.

Given the findings, the following recommendations are given:

i. The monetary policy variable that has a significant effect on exchange rate is money supply. The variable has a positive and significant effect on exchange rate, implying that a rise in money supply will culminate to greater exchange rate depreciation. This points out that a contractionary monetary policy is needed to reduce exchange rate depreciation. Here, a decrease in money supply will reduce exchange rate depreciation in Nigeria.

ii. The fiscal policy variables that influences exchange rate movements are government expenditure, public debt, and government revenue. Increase in government expenditure and public debt increases exchange rate depreciation while increase in government revenue reduces exchange rate depreciation. This means that a contractionary fiscal policy is also desirable for exchange rate stability in Nigeria. An increase in government revenue and a decrease in debt and public expenditure will drive exchange rate stability in Nigeria.

iii. Exchange rate has been explosive in responding to shocks to both monetary and fiscal policy variables. As such, a coordination of both monetary and fiscal policy is desirable for exchange rate stability. As such, the threshold levels in monetary and fiscal policy variables must be maintained to achieve the desired result.

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