KWARA STATE UNIVERSITY, MALETE, NIGERIA

SCHOOL OF POSTGRADUATE STUDIES (SPGS)

EFFECTS OF CENTRAL BANK ANNOUNCEMENTS ON THE EXCHANGE RATES DYNAMICS IN NIGERIA

A M.Sc THESIS SUBMITTED AND PRESENTED

BY

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DECLARATION

I hereby declare that this thesis titled "Effects of Central Bank Announcements on the Exchange Rates Dynamics in Nigeria" is a record of my research. It has neither been presented nor accepted in any previous application for higher degree.

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APPROVAL

This is to certify that this thesis by Mayokun Ruth Ogunseye has been read and approved as meeting the requirements of the Department of Accounting and Finance for the award of the degree of Masters (M.Sc.) in Department of Accounting and Finance.

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DEDICATION

This work is dedicated to the Almighty God. He gives wisdom and from His mouth comes knowledge and understanding.

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Abstract

The nexus between macroeconomic policy announcements and the exchange rate returns is important for financial stability and reserve managements provides the basis for the overall monetary policy framework. Similar to stocks, bonds and other financial assets, the exchange rate responds to announcements from monetary authorities play a significant role in any economy. This study examined the effects of central bank announcements on the exchange rates dynamics in Nigeria and the specific objectives are to; examine the extent at which foreign exchange intervention news affect the exchange rates of dollar to naira in Nigeria; determine the degree to which foreign exchange intervention shocks affect the returns on exchange rates of dollar to naira in Nigeria; investigate the quantitative influence of interest rate's announcement on the exchange rate returns in Nigeria and determine how monetary policy committee (MPC) announcement impacts the exchange rates in Nigeria. Event driven models were employed to analyse how the expectation of daily exchange rate and its daily return respond to all the 88 Monetary Policy Committee meetings and selected Central Bank of Nigeria's announcements that 'contain information on exchange rate stabilisation' from January 02, 2005 to September 25, 2020. The study considered announcements that involve direct intervention via the Wholesales Dutch Auction System \Retail Dutch Auction System\ Bureau De Changes, long-term interest rate and inflation rate, and balance of trade positions. Ordinary Least Square (OLS) was employed as the estimation technique. The exchange rate is expected to depreciate in all the three days before, on the announcement day, and all the three days after the announcement. There is no sufficient evidence that either the Monetary Policy Committee meeting or CBN announcement affects the behaviour of the log-return. Hence, unlike the MPC meetings, the announcements affect the exchange rate but not its return. This study recommended amongst others that the monetary should unified all foreign exchange windows of exchange rates. A uniform exchange rate, as against the multiple regime currently in place should be implemented. The multiple regime causes wide band and fluctuations which may be detrimental to the real sector.

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

The exchange rate has daring consequences for the wellbeing of any economy. In literature some macroeconomic factors that could cause sporadic swings in the exchange rate are identified. The nexus between macroeconomic news announcements and the exchange rate returns is important for financial stability, reserve managements, market control, and the overall monetary policy framework. Similar to stocks, bonds and other financial assets, the exchange rate responds to announcements from monetary authorities (Hausman, & Wongswan, 2011; Chatrath, Miao, & Ramchander, 2014; Ben-Omrane, & Savaser, 2016; Boudt, Neely, Sercu, & Wauters, 2019; Boudt *et al*., 2019; Pyo and Lee, 2020; Indriawana, Jiao, & Tsec, 2021). Macroeconomics announcements in forms of scheduled, unscheduled, regular or periodic macroeconomic surprises from the central banks contain information that may cause a drift on the mean behaviour of the exchange rate. Announcement releases is are major source of information for foreign exchange market participants (Ekincia, Akyildirim and Corbet, 2019).

Many studies confirm the impact of federal open market committee (FOMC) and monetary policy committee (MPC) meetings and macroeconomic announcements on asset prices in the financial market (Lyócsa, Molnár, and Plíhal, 2019; Hussaina and Ben Omrane, 2020; Indriawana, Jiao and Tsec, 2021), the cryptocurrency market (Pyo and Lee, 2020) and the forex market (Corbet, Dunne, and Larkin, 2020; Boudt *et al*., 2019). Pyo and Lee (2020) shows that in absence of FOMC announcements, Bitcoin price increase on the day before the announcement but decreased on announcement day. Lyócsa *et al.* (2019) find that during quantitative easing announcements, stock realized volatility increases but decline five days after announcement in all countries investigated. Corbeta *et al.* (2020) find significant increases

in stock volatility prior to FOMC announcements. The increase in volatility is substantial when the market is forewarned of an announcement and surprise news cause longer short-term volatility. Indriawana *et al.* (2021) confirms a post-FOMC announcement drift on long-term US and German bond futures. The post-FOMC increase investment in bonds to four times the ratio of buy-and-hold assets after expansionary shocks.

Studies by Li *et al.* (2015), Ben Omrane and Savaser (2016) and Ben Omrane *et al*. (2019) analyse the 'stable' effects of central bank announcements on the exchange rate. The 'unstable' announcement effects were considered for exchange rate returns (Cheung *et al.,* 2019; Ben Omrane *et al.,* 2019) and exchange rate volatility (Ben Omrane and Savaser, 2017). Ben Omrane *et al*. (2019) assess whether the impact of announcements is stable over-time, by considering the reaction of euro-dollar rate returns to both US and European news throughout the global financial crisis and the Euro zone debt crisis. They find that announcement impact coefficients vary substantially over-time.

Some authors (Boudt *et al*., 2019; Ekincia *et al.,* 2019; Tamgac, 2021) argue that the exchange rate's respond to news surprises depends on whether the news is positive or negative. Tamgac (2021) shows that announcements associated to the domestic country have a more effect on the USD\Turkish lira exchange rate in relation to surprises associated with the US. There is an asymmetry response, with bad news on US having greater impact than good news, and good news for domestic country having more effects than bad. As noted by (Boudt *et al*., 2019), news creates a large shift in the joint distribution of stock and exchange rate returns. A positive surprise raises the value of the low exposure domestic activities causing persistent decline in foreign exchange exposure.

The implication of the central bank announcements for the behaviour of exchange rate remains an incessant debate, particularly, for emerging economies where the exchange rate affects macroeconomic stability. The news about the economy has two effects: positive (good news)

and negative (bad news). It is positive when the good news is positively correlated with returns and negatively related to volatility, and vice versa. Bauwens *et al.* (2005) and Nowak *et al.* (2009) assume that if an announced figure for a real activity variable is larger than the market expectations and the variable contributes to economic growth, the news is classified as positive.

The effect of macroeconomic news announcements on the volatility of foreign exchange rate depends on the state of the economy. In Nigeria, the central bank is concern with maintaining the exchange rate stability in the exchange rate. The apex bank stabilises the exchange rates by embarking on measure that will ensure an exchange that equate the demand for and supply of foreign exchange in the foreign exchange market. They do this by passing several announcements that carry information shocks, which often influence the value of the exchange rates. The macroeconomic news, which includes releases on inflation, unemployment, Gross Domestic Product (GDP), as well as on the monetary policy rate, money supply, and the balance of payments are then announced by the constituted authorities to inform the public about the state of the economy. This news is made public via scheduled and unscheduled announcements.

Existing literature on this issue is mixed, with ample evidence from advanced economies and few studies on emerging markets. It has been observed that despite the importance of exchange rate to most developing countries, particularly in Africa and Nigeria, this subject has not attracted much research attention. In Nigeria, despite periodic announcements made by the Central Bank of Nigeria (CBN), the economy is still puzzled with the wave of foreign exchange scarcity and excessive exchange rate fluctuation, which has caused a large gap between the official rate and the parallel market rate, with which many businesses depend. This motivate the need to confirm whether such regular and periodic news intervention is effective to curb the behaviours the volatile exchange rate and its returns.

1.2 Statement of the Problem

The exchange rate fluctuation is a key factor that influence economic activities as there has been excessive volatility of the Naira against major exchange rates in Nigeria since the adoption of flexible exchange–rate regimes in 1986. Consequently, sustained exchange rate volatility was thought to have led to distortion of production patterns and sharp fluctuations in external reserve. The fluctuation in the exchange rates and its return reflects some credible monetary and exchange–rate policy activities by the central bank to strengthen the Naira against other major currencies.

A long-standing puzzle in international finance is the difficulty of tying floating exchange rates to information shocks from macroeconomic fundamentals. Macroeconomic news from fundamental variables as money supply, outputs, and interest rate do convey information shocks that predict future changes in exchange rates. Monetary authorities often embark on measures through passing announcements that affect the exchange values of their currencies in the foreign exchange markets. These announcements effects are compounded if there is even more track record of stable macroeconomic policies that consistently anchor market expectations about future monetary base and exchange rate policy. However, most undeveloped and incomplete financial markets make the effect of this information shock to hedge against exchange rate risk too costly and sometimes impossible, so that the costs of exchange rate volatility can be substantial for individual agents, forex markets and the economy. The extent to which these announcements has affected the exchange rate has been subject to empirical verification.

In Nigeria, the macroeconomic announcements are typically made periodically by the central bank in form of circulars or through monetary committee meeting and are closed watched by participants in the market. Most issues on macroeconomics announcement which included

regular circular on information on money supply, credit to other sectors, year-on-year all item inflation rate, average inter-bank call rate, monetary policy rate, treasury bill rate 91-day tenor, 3-month tenor deposit rate of banks, monthly average prime lending rate, spot price of Nigeria's reference crude oil. The Foreign exchange participant focus on these announcements from these indicators during their daily operation decisions.

A typical announcement often made is the foreign exchange intervention. Information imperfections make the foreign exchange markets to drive exchange rates away from values consistent with their underlying macroeconomic fundamentals. The Apex bank often published circular on interventions which involves the purchases or sales of foreign exchange. Severally other announcements, which affect the balance of payment are periodically made. Such involve news information related to exports and imports. In Nigeria, one of the causes of instability in exchange rate is dependency nature of the economy on foreign goods importation. Not only are capital goods and raw materials imported but also the importation of consumer goods is ever increasing. Thus, import have consistently exceeded exports in value terms leading to excess demand, pressure on the exchange rate and a large and thriving parallel market for foreign exchange. The CBN regular published announcement to check the activities of the importers and regulate the foreign exchange.

The extent at which these announcements have influence the exchange rate in Nigeria requires empirical verification. While there is no know precursory study, which address this issue for Nigeria at the moment, this study provides a guide on the direction of policies in the foreign exchange market. The study investigates the intraday reaction of Naira-dollar exchange rate returns to the domestic macroeconomic news We then use stable parameter to investigate whether the currency return response to macroeconomic news is sensitive to changes in market foreign exchange intervention and announcement of monetary policy committee meeting.

1.3 Research Questions

This study is motivated by the need to provide answer to some pressing questions that characterize price discovery process for exchange rate dynamics in the Nigeria foreign exchange markets. In particular, our focus is on the issues that relate how the CBN macroeconomic news affects the exchange rates and its returns. Hence the study provides answer to the under-listed questions:

i. How does foreign exchange intervention broadcast affect the exchange rates?
ii. What is the effect of foreign exchange intervention news on the returns on exchange rates?
iii. How does interest rate announcement influence the exchange rate returns?
iv. How does monetary policy committee (MPC) announcement triggers impact on the exchange rates?

1.4 Objectives of the Study

The general objective of the study is to examine the effect of central bank announcements on exchange rate dynamics in Nigeria. The specific objectives are to:

i. examine the extent at which foreign exchange intervention news affect the exchange rates of dollar to naira in Nigeria.
ii. determine the degree to which foreign exchange intervention shocks affect the returns on exchange rates of dollar to naira in Nigeria.
iii. investigate the quantitative influence of interest rate's announcement on the exchange rate returns in Nigeria.
iv. determine how monetary policy committee (MPC) announcement impacts the exchange rates in Nigeria.

1.5 The Research Hypotheses

The study is guided by the following research hypotheses:

$\boldsymbol{H_{01}}$: Foreign exchange intervention news does not significantly affect the exchange rates in Nigeria.

$\boldsymbol{H_{02}}$: Foreign exchange intervention news does not significantly affect the exchange rates returns in Nigeria.

$\boldsymbol{H_{04}}$: There is no significance effect between interest rate announcement and the exchange rates returns in Nigeria.

$\boldsymbol{H_{05}}$: The monetary policy committee (MPC) announcement has no significant impact on the exchange rates.

1.6 Justification for the Study

Determining the interactions between macroeconomic announcements and exchange rate dynamics has numerous significance which cannot be over emphasized. In facts, in both theory and practice the issue of the effects of information shocks on the exchange rates and its returns has both research and policy interests.

On the one hand, it is of research significance, and would be germane to academia, researchers, economists and forex experts. Since macroeconomic news affect transactions in the forex market, and cause significant fluctuations in the exchange rate researchers are concerned about the announcement effects of exchange rate behaviour. This is because only very few of such studies, if any, have been empirically investigated in Africa. Thus, this study is done to add to the existing ones, there by broadening the educational nexus in Africa and Nigeria, in particular. Essentially, the study investigates the impact of both MPC meetings and macroeconomic announcements on the behaviour of exchange rate in Nigeria.

On the other hand, this work is of policy significance and would be useful to policy makers because if, on empirical findings, we realised that news from fundamentals of exchange is

significantly and thus affects the exchange rate in Nigeria, this may offer the monetary authority a possible guide in the conduct of their conventional monetary policy instruments. The fluctuation of the exchange rate occasioned by macroeconomic news may either be positive or negative. A positive effect would be a signal that news may increase exposure to domestic activities causing persistent decline in foreign exchange exposure and vice versa. Aside, it could signal an implication on the efficacy of monetary transmission mechanism in Nigeria.

1.7 Scope of the Study

This research effort is a study of a developing country, Nigeria. The choice is made out of the researcher's interest given the nations present economic circumstances in the international terrain. The study relies on historical quantitative data, which are already available in secondary form. The researcher employs daily time series data spanning from January 02, 2005 to September 25, 2020.

1.8 Organisation of the Study

For a systematic and scientific approach, this study is divided into five chapters, which are further sub divided into sections. Chapter one being the introductory chapter presents the general background to the study; the statement of the problem; the importance of the study; the research hypotheses; the scope of the study; the limitation of the study; and the structure of the study. Chapter two present theoretical and empirical reviews on exchange rate, macroeconomic announcement. The theoretical framework and methodology of the study are presented in chapter three. Chapter four concentrates on the presentation and analysis of results. Finally, the summary of the findings, the recommendations and conclusions are contained in chapter five.

CHAPTER TWO

LITERATURE REVIEW

This chapter focuses on the review of literature related to this study. The chapter include; conceptual review, theoretical review and empirical review.

2.1. Conceptual Review

Foreign exchange (forex) is the exchange of one currency (domestic currency) for another (foreign currency). For instance, in the content of United State and Nigeria foreign exchange relationship, forex means the exchange of naira (₦) for Dollar ($) and vice versa. The rate at which this exchange of currencies is done is called the foreign exchange rate or simply exchange rate. The exchange rate can be defined from two different perspectives which are the Nominal Exchange Rate (NER) and the Real Exchange Rate (RER). The nominal exchange rate is the rate at which one currency is exchange for another. It is the price of one currency in terms of another. It represents the number of units of one currency that exchange for a unit of another currency (Suranovic, 2020). The nominal exchange rate between naira and dollar refers to the number of naira required to purchase a dollar and vice versa.

In practice, the nominal exchange rate determines the cost of importers and the level of revenue to the exporter. It is the rate at which importers and exporters transact. It is the rate at which foreign exchange are traded. On the other hand, the real exchange rate is simply the nominal exchange rate deflated by the index of relative price. It represents an index for determining a country's international competitiveness. Economists often refer NER as simply the exchange rate. The real exchange rate normally comes into play when there is need to deflate the (nominal) exchange rate for theoretical purpose or for policy making.

The exchange rate has been observed not to be stable but to fluctuate overtime. The changes in exchange rate between countries is due to changes in the demand for or supply of forex in the

foreign exchange market. However, there are some factors which cause changes in demand and supply of foreign exchange. These factors are discussed below:

2.1.1 Changes in relative prices

Changes in the relative price level usually cause changes in the exchange rate. Suppose the price level in Nigeria rises relative to the US price level. This will lead to rise in the prices of Nigerian goods in terms of naira. Thus, Nigerian goods will become more expensive in the US. This will result to reduction in the Nigerian export to the US. As such, the supply of dollars to Nigeria will diminish and exchange rate will rise in favour of US.

2.1.2 Changes in interest rates:

Changes in interest rate also lead to changes in the exchange rate. If interest rate rises in Nigeria, there will be a large inflow of capital from foreign countries. As a result, the exchange rate of Nigeria naira will appreciate relative to the foreign currencies. The opposite will be the case, if interest rate falls in Nigeria.

2.1.3 Changes in Exports and Imports:

The demand and supply of FOREX are also influenced by changes in exports and imports. If the exports of Nigeria are more than imports, the demand for naira will increase so that the rate of exchange moves in favour of Nigeria. Conversely, if imports are more than exports, the demand for the foreign currency increases and the rate of exchange will move against naira.

2.1.3 Capital market:

Short term or long-term capital movements also influence the exchange rate. Capital flows tend to appreciate the value of the currency of the capital-importing country and depreciate

the values of the currency of the capital exporting country. The exchange rate will move in favour of the capital importing country and against the capital exporting country.

2.1.4 Influence of Banks:

Banks also affect the exchange rate through their operation. These operations include the purchase and sale of bank drafts, latter of credits arbitrage, dealing in bills of exchange etc. These operations influence the demand and supply of foreign exchange. For instance, if the commercial banking system issued a large number of drafts and letter of credit on foreign banks, the demand for foreign currency will rise.

2.1.5 Changes in bank rate:

The bank rate also influences the exchange rate. If the bank rate rises in Nigeria relative to other countries, more funds will flow into Nigeria from abroad to earn high interest. It will tend to raise the demand for naira and exchange rate will move in favour of Nigeria.

2.1.6 Influence of speculation

The growth of speculation also influences the exchange rate. Speculation causes short-run fluctuation in the exchange rate (Jhingan, 2018). Uncertainty in the international money market encourages speculation in foreign exchange. If the speculators expect a fall in the value of naira in relation to a foreign currency in the near future, they will sell naira and start buying the foreign currency that they expect to appreciate in value. Consequently, the supply of naira will increase and its exchange rate will fall.

Stock exchange influence: Stock exchange operations in foreign securities such as debentures, bonds, shares etc exert significant influence on the exchange rate. If the stock exchange helps in the sale of securities to the foreigners, the demand for the domestic currency (naira) will rise on the part of the foreigners and the naira exchange rate will rise relative to the foreign currency in the FOREX market.

2.1.7 Policies of exchange control and protection:

Policies of exchange control and protection, such as tariffs, interventions, bonds etc. discourages imports and lead to fall in the demand for foreign currency. As a result, the exchange rate of the domestic country appreciates vis-à-vis the foreign currency.

2.1.8 Nature of the economy

Whether a country is developing or developed has significant effect on the exchange rate. If a country is developing, it needs to import large quantities of raw materials and capital goods for its development. But its capacity to export is low. Therefore, its demand for foreign exchange is more which leads to the depreciation of its exchange rate vis-à-vis a developed country whose exchange rate appreciates.

2.2. Theories of Exchange Rate Determination

2.2.1. The Purchasing Power Parity (PPP) model

The basic concept underlying the PPP is that arbitrage forces will lead to the equalization of good prices internationally once the prices of goods are measured in the same currency. This model says that in the presence of transaction costs and other barriers to trade, identical products which are sold in different markets will sell at the same price expressed in terms of a common currency. There are at least three versions of the PPP: Absolute PPP (APPP), Relative PPP (RPPP) and Generalized PPP (GPPP).

The APPP is based on interpretation of law of one price and is specified as:

$$ER = \frac{P}{P*} \quad \text{.....(Eq 2.1)}$$

In this case, exchange rate is determined by the behaviour of relative price. An increase in in relative price leads to exchange rate depreciation while increase in relative price implies appreciation of domestic currency. An extension of this model was observed in the Swan-Salter dependency economy where there is no specialization in the production of a particular good,

but each country produces two goods – tradable and non-tradable. The traded good is perfect substitute for foreign good and it can be considered as foreign good and so, exchange rate is the number of unit of traded good required to purchase a unit of non-tradable good.

The absence of terms of trade and trade policy render this concept useless because in the real world, policy and fundamentals tend to shape the behaviour of exchange rate. Incorporating these policies in the exchange rate model, a new measure called relative PPP (RPPP) was developed. The RPPP holds in the presence of these distortions. RPPP argues that the exchange rate will adjust by the amount of the inflation differentials between the two economies, that is,

$$\%\Delta ER = \%\Delta P - \%\Delta P^* \quad \text{.....(Eq 2.2)}$$

Equation (2) was built on a model where countries produce three goods, two of which are tradable and the last one non-tradable. In this case, no single relative price holds and the production structure implies the existence of two distinct exchange rate. A third approach I the GPPP, which generally formula is provided is:

$$ER = \frac{P_A}{P_A^*}\left[\frac{b(P_N^*/P_T^* + (1-b)}{\beta(P_N/P_T) + (1-\beta)}\right] \quad \text{.....(Eq 2.3)}$$

Equation (3) says that the relative price of non-tradable goods relative to tradable goods will influence the exchange rate. If the domestic price of non-tradable good increases relative to tradable goods, exchange rate will fall (appreciate). This is because PPP holds only in terms of tradable goods. A rise in non-tradable goods when aggregate price (P_A) does not change implies that price of tradable goods (p_T). Also, a rise in the price of tradable good (P_T) while aggregate price does not change implies that the price of non-tradeable goods (P_N) has fallen and this will lead to exchange rate depreciation.

2.2.2. The Productivity Differential Approach

Montiel (1999) develop a theoretical model that shows the channel through which exchange rate is affected through productivity behaviour of the economy. The model was an extension of the Balassa-Samuelson exchange rate-sectoral productivity nexus. Following Balassa-Samuelson framework, the improvement in the tradable sector drives labour to that sector and this lead to excess demand for non-tradable goods. To restore equilibrium, exchange rate has to appreciate. To show how capital flow together with other government policy determine exchange rate, the labour market condition and the external balance equilibrium is specified as follows:

$$Y_N(\underset{+}{e},\underset{-}{\phi}) = (1-\theta)c/e + g_N \quad \text{.....(Eq2.4)}$$

$$\pi^* f^* = \phi Y_x(\underset{+}{e},\underset{-}{\phi}) + Y_m(e,\phi) + (r^* + \pi^*) f^* - \left[\tau(\varepsilon + \pi^*) + \theta\right]c - g_m \quad \text{.....(Eq 2.5)}$$

Where Y_N is the non-tradable good, e is exchange rate, ϕ is terms of trade, θ is the share of spending devoted to importable while c is private expenditure and g_m is government spending on importable. The country's credit position is f^* with world inflation being π^* and Y_x, Y_m are exportable and importable goods while ε is depreciation and τ is a parameter. Equation (4) says that supply of non-tradable good should be equal to demand for goods from private sector $(1-\theta)c/e$ and public sector, g_n..

2.2.3. The IS-LM-BP theory

The IS-LM-BP model (also known as IS-LM-BP or Mundell-Fleming model) is an extension of the IS-LM model*, which was formulated by the economists* Robert Mundell *and* Marcus Fleming*,* who made almost simultaneously an analysis of open economies in the 60s. Basically, we could say that the Mundell-Fleming model is a version of the IS-LM model for an open economy. In addition to the balance in *goods* and financial markets, the model incorporates an analysis of the *balance of payments*.

The IS-LM-BP framework focus on how macroeconomic policy impact on the external and internal balance and by extension, the exchange rate. The model was an extension of Keynesian IS-LM framework. To begin with, Mundell (1962) claimed that perfect capital mobility implies that all securities in the market are perfect substitute and so, there is no distinction between spot and forward exchange rate. The structural equation is provided in the following equations

Equilibrium goods market: $(T-G)+(S-T)+(M-X)=0$

$$(I-S)=(T-G)+(X-M) \quad \text{.....(Eq 2.6)}$$

Equilibrium money market: $M^s = M^d$ .....(Eq 2.7)

Equilibrium current account: $X-M=-K$ .....(Eq 2.8)

Where T, G, S, X, M, M^s, M^d and K represent taxes, government spending, domestic saving, exports, import, money supply, money demand and capital flow respectively. The behavioural equations of the above equations is presented:

$$S = S_0 + S_1 Y,\ T = T_0,\ I = I_0 - I_1 i;\ M = M_0 + M_1 Y,\ X = X_0$$

$$M^s = M;\ M^d = M_0 + M_1 Y - M_2 i$$

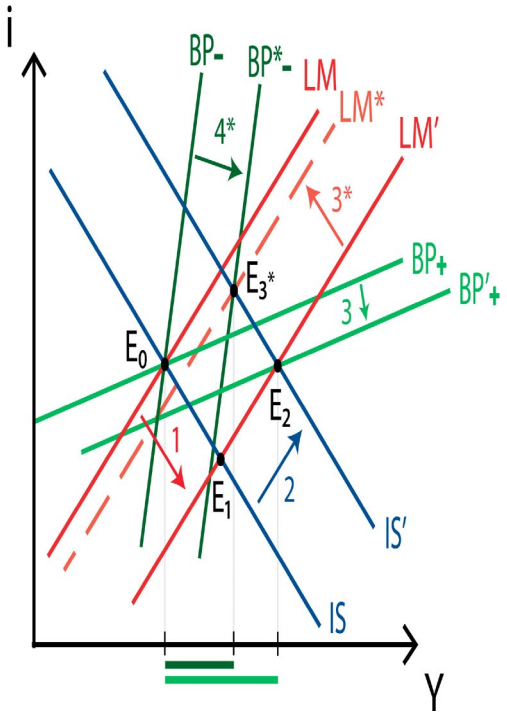
$$X = X_0 + eX_1;\ M = M_0 + M_1 Y - eM_{2,}\ K = K_0 + iK$$

The money sector is determined by interest rate while current account is determined by capital flow and exchange rate. The macroeconomic equilibrium is ascertained at a point where the three equations are solved for interest rate and income simultaneously. Under fixed exchange rate regime, Central Bank usually decide on whether to use sterilized policy or not. Sterilization operation is a specific combination of monetary and exchange rate policy. When the Central Bank buys or sells foreign currency, this changes the position of money supply. The purpose of sterilization is to offset this effect by selling or buying securities at the same rate it is buying or selling foreign currency.

In a situation where government expansion leads to increase in income, money demand is expected to increase, leading to rising interest rate and hence capital inflow which then generate current account surplus. If exchange rate is pegged, Central Bank will buy foreign currency and simultaneously sell domestic currency, mounting additional pressure on interest rate and generating further capital inflow. The capital flow prevents interest rate to rise further and sterilization prevents money supply to expand. Thus, either exchange rate or non-sterilization must be embarked upon (that is under free capital mobility, either fixed exchange rate or monetary independence must be adopted. That is money supply has to increase (loosing monetary independence) or exchange rate has to appreciate (losing exchange rate dominance).

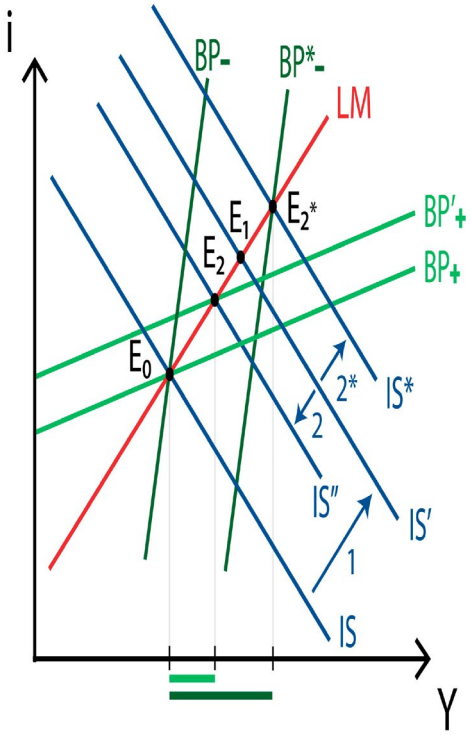
An expansionary monetary policy will shift the LM curve to LM', which makes the equilibrium go from point E_0 to E_1. However, since now exchange rates are flexible, the balance of payments deficit will depreciate the domestic currency. This will increase net exports, shifting the IS curve to IS'. Also, since domestic assets are less expensive, the BP curve will shift to the right (to either BP'+ or BP'-). Therefore, with high capital mobility, final equilibrium will be at point E_2. Monetary policy works well under these assumptions. It's actually the more efficient the higher capital mobility is.

Figure 1:
Effect of an expansionary monetary policy on the exchange rate



An expansionary fiscal policy will shift the IS curve to IS', moving the equilibrium from point E_0 to point E_1. Depending on capital mobility, it will result to a BOP surplus (high capital mobility, BP+ curve) or a balance of payments deficit (small capital mobility, BP- curve). In the case of a BOP surplus, and considering flexible exchange rates, there will be an appreciation of the domestic currency. This will decrease net exports, which will shift the IS' curve to the left. Also, since domestic assets are more expensive, the BP+ curve will shift to the left. The final equilibrium will therefore be at point E_2. If there is a BOP deficit (the case for the BP- curve), the result will be the same one as in the monetary policy case (being E_2* the final equilibrium).

Figure 2:
Effect of an expansionary fiscal policy on the exchange rate



2.2.4. Monetary Theory of Exchange Rate Determination

Monetary models to exchange rate determination are basically stock models that derived from the IS/LM/Phillip Curve model. So, monetary approach maintains that exchange rate is determined predominantly by shifts in the demand for and supply of money. The model was built on three plausible assumptions: there is stable money demand function, there is a vertical or perfectly inelastic aggregate supply function and there is purchasing power parity. The demand function comprises a few variables derived from the standard money demand function that is given by:

$M^d = \kappa PY; \kappa > 0$ …….. (Eq 2.9)

The money demand in the foreign country, by the same token, will be

$M^{d*} = \kappa^* P^* Y^*$ …….. (Eq 2.10)

Where * denotes foreign. At equilibrium, money demand is equal to money supply denoted:

$M^s = M^d = M$ (equilibrium money market in home)

$M^{s*} = M^{d*} = M^*$ …….. (Eq 2.11)

$$\frac{M^s}{M^{s*}} = \frac{\kappa PY}{\kappa^* P^* Y^*} \quad \text{…….. (Eq 2.12)}$$

$$\frac{M^s}{M^{s*}} = ER\frac{\kappa Y}{\kappa^* Y^*} \quad \text{…….. (Eq 2.13)}$$

$$ER = \frac{M^s}{M^{s*}}.\frac{\kappa^*}{\kappa}.\frac{Y^*}{Y} \quad \text{……..(Eq 2.14)}$$

In above equations, ER = P/P* and Equation (14) is the monetary exchange rate determination. The equation tells us that exchange rate is determined by three terms: relative money supply, relative income and relative elasticities of income. An increase (decrease) in domestic money supply relative to foreign supply will increase (decrease) exchange rate depreciation (appreciation). An increase (decrease) in foreign income relative to domestic income will increase (decrease) exchange rate (depreciation/appreciation).

2.3. Taxonomy of Macroeconomic Announcements in Nigeria

A variety of macroeconomic announcements have been considered in the literature. In Nigeria, the macroeconomic announcements are typically made periodically by the central bank of Nigeria in form of circulars or through monetary committee meeting and are closed watched by participants in the market as part of the conduct of monetary policy. The monetary authority provides better information and announcements that regulates the structure and functioning of the macro-economy as well as the transmission mechanism of monetary policy.

2.3.1. Forex intervention announcements

Several years, the central bank has embarked on discretionary trading of foreign exchange by intervening in the forex market on order to influence the exchange rate. They do this by making periodic or regular intervention announcements. Monetary authority buys or sells foreign exchange in the foreign exchange market in order to affect the exchange rates. According to Suranovic (2007) most governments intervene in the forex markets by acting as the buyers or sellers of the last resort of foreign exchange. Such interventions, if not sterilized would result in an increase (or decrease) in the domestic currency base.

In Nigeria, the daily foreign exchange interventions carried out by the CBN are often the purchase or sale of naira, almost always against the US dollars with the aim of influencing the ($/₦) exchange rate. The purchases of foreign exchange are usually intended to push down the naira value of the exchange rate, and the sales are usually intended to push it up. When CBN intervenes against the naira, the CBN's portfolio of foreign assets increases while its naira deposits decrease. As a matter of fact, the exchange rate remains in its status quo. Therefore, by combining expansionary open market operations with the sales (or purchases) of foreign exchange, the Central Bank can expand the monetary base without depreciating the exchange rate (Dreher and Vaubel, 2005). With this, if intervention is to be done in Nigeria without

significantly affecting money supply then, the foreign exchange trading room would immediately report any naira sale to the open market trading room, which then buys some domestic bonds, so that the daily money supply is unaffected.

That foreign exchange intervention appears to be more common in emerging market economies (like the Nigerian economy) is partly a reflection of structural characteristics of such economies that often contribute not only to tremendous exchange rate volatility but also to larger effects of such fluctuations on the real economy. Indeed, as suggested by Disyatat and Galati (2015) when foreign exchange market is thin and dominated by a relatively small number of agents, it is likely that the exchange rate will be volatile if the monetary authorities do not provide some guidance and support.

Most of these aforementioned problems above: exchange rate volatility, imperfect financial market, this foreign relatively small number of agents etc are prevalence in Nigeria, particular as consequent of the early 1980s oil crises. In order to relief the Nigerian economy from the odious effect of these problems, the Nigerian government intervenes in the forex market in mid 1980s and exchange rate which was before fixed since 1960 became floated. Since 1986 when exchange rate was floated in Nigeria, the CBN under the auspices of the forex trading department has periodically intervened in the foreign exchange market. As part of the International Monetary Funds (IMF) conditions under the Structural Adjustment Programmes (SAP), the CBN has intervenes in form of foreign exchange purchases in order to accumulate foreign reserves for the government.

Arising from Nigeria's high import propensity of finished consumer goods, the foreign exchange earnings from oil continued to generate output and employment growth in other countries from which Nigeria's imports originated. This development necessitated a change in policy on 22nd July 2002, when the demand pressure in the foreign exchange market intensified

and the depletion in external reserves level persisted. The CBN thus, re-introduced the Dutch Auction System (DAS) to replace the IFEM. Since its introduction, the DAS has been largely successful in achieving the objectives of the monetary authorities. Generally, it has assisted in narrowing the arbitrage premium from double digit to a single digit, until the emergence of irrational market exuberance in the fourth quarter of 2003. Secondly, the DAS has enhanced the relative stability of the naira, vis-à-vis the US dollar-the intervention currency. Specifically, the naira has fluctuated within a single digit band, since the DAS was introduced.

2.3.2. The MPC Announcements

The MPC meeting held deliberate and presents keep macroeconomic position in forms of announcements. Specifically, the MPC is responsible for fixing the benchmark interest rate. The committee meets quarterly, except otherwise in the event of an emergency and publishes its decisions after the meeting. The committee review economic and financial conditions in the economy, as well as determine appropriate stance of policy in the short to medium term. Also, the committee communicate monetary/financial policy decisions effectively to the public and ensure the credibility of the model of transmission mechanism of monetary policy. The table below present summary of schedule MPC meeting for the year 2021.

Table 1: 2021 MPC Meeting

Months	Meeting No.	Day 1	Day 2
January	277	Jan. 25, 2021	Jan. 26, 2021
March	278	Mar. 22, 2021	Mar. 23, 2021
May	279	May. 24, 2021	May. 25, 2021
July	280	Jul. 26, 2021	Jul. 27, 2021
September	281	Sep. 20, 2021	Sep. 21, 2021
November	282	Nov. 22, 2021	Nov. 23, 2021

The Monetary Policy Committee (MPC) of the Central Bank of Nigeria usually provide macroeconomic information on the benchmark interest rate, the asymmetric corridor, the cash reserve ratio and the lliquidity rratio. The MPC Committee observed that broad money supply (M3) grew marginally by 0.30 per cent in February 2021, following a substantial growth of

13.54 per cent in December 2020. This was driven largely by the contraction in Net Foreign Assets (NFA). The Committee also noted that Net Domestic Assets (NDA) grew by 3.02 per cent in February 2021, from 2.22 per cent in December 2020. At the end of May 2021 meeting, the MPC committee resolved to hold the monetary policy rate and all other policy parameters constant, with the following decisions reached benchmark interest rate (MPR) retained at 11.50%, the asymmetric corridor remained at to +100/-700 bps around the MPR, the cash reserve ratio retained at 27.50%; and the liquidity ratio retained at 30.00%.

2.4. Exchange Rate Policy in Nigeria

Exchange rate policies in developing countries are often sensitive and controversial, mainly because of the kind of structural transformation required, such as reducing imports or expanding non-oil exports, which invariably imply a depreciation of the nominal exchange rate and such domestic adjustments, due to their short-run impact on prices and demand, are perceived as damaging to the economy. The Nigerian exchange rate has undergone different episode. Of the episode two periods stand out as times of pronounced fluctuations: the 2005 – 2006 period, and during the global financial crisis of 2008 – 2009. In particular, for the US dollar, additional periods are observed due to its larger sample: 1986–1988 periods of exchange–rate reforms and the 1998 – 1999 periods arising from exchange–rate policy changes.

In the 1980s, specifically from 1981 to 1985, the exchange rate of Naira against the US dollar very stable. At this point in time, the Naira was superior to the US dollar. For instance, 1US dollar was exchanged for N0.64, N0.67, N0.75, N0.80 and N0.99 in 1981, 1982, 1983, 1984 and 1985 respectively. The average AFEM intervention rate which closed at N82.33 to a dollar in 1995 appreciated to N81.48 per dollar in 1996. The rate depreciated continuously to N81.98, N84.84 and N91.83 in 1997, 1998 and 1999 respectively. The rates in the bureaux de change showed similar trend. At the bureaux de change, the rate closed at N83.69 to a dollar in 1995,

appreciated to N83.15 per dollar in 1996 before depreciating to N99.26 per dollar in 1999. The parallel market premium moved from 1.6 per cent in 1996 to 3.2 per cent in 1999. Meanwhile, the market determined exchange rate at the IFEM has remained within the pre-determined fluctuation bands.

The system, which has been criticized by the International Monetary Fund, has kept the official rate at about 307 naira per dollar. It uses this to supply cheap foreign exchange to government departments and select companies, including fuel importers. It created an importers and exporters window in 2017, in which the naira was allowed to weaken after an economic contraction in 2016. The official exchange rate was N305 in January 30, 2017 based on the official exchange rate, while the parallel market rate hovered between N480 to N520. Nigeria operates a system of multiple exchange rates in a bid to control demand for dollars.

The exchange rate system in Nigeria has undergone significant changes from 1960s to date. The fixed exchange rate system was in usage in the 1960s. However, between 1970s and 1980s when SAP was initiated, diverse types of floating exchange rate systems was adopted. The fixed exchange rate regime induced an overvaluation of the naira and was supported by exchange control regulations that engendered significant distortions in the economy, hence gave rise to massive importation of finished good with the adverse consequences for domestic production, balance of payments position and the nation's external reserves level. With failures associated with these exchange rate systems, in a bid to enthrone sanity in the foreign exchange market, the CBN re-introduced DAS in July 2002 with the objectives of realigning the exchange rate of the naira, conserving external reserves, enhancing market transparency and curbing capital flight from the country.

Table 2: Exchange Rate Policies

Year	Policies
1999	The foreign exchange market was freed up in 1999 with the re-introduction of the inter-bank foreign exchange market (IFEM) with a view to reducing rent seeking behaviour and restore stability in the market
2002	Replacement of the Inter-Bank Foreign Exchange Market System with the Retail Dutch Auction System (RDAS)
2006	Introduction of the Wholesale Dutch Auction System (WDAS) for further liberalisation
2009	Q1: Re-introduction of the RDAS, partial suspension of trading in the inter-bank market, directives to oil companies and government agencies to sell foreign exchange earnings to the central bank only, suspension of the sale of foreign exchange to the Bureaux de Change (BDCs). Q2: Re-introduction of WDAS, oil companies and government agencies again permitted to sell foreign exchange directly to authorized dealers of their choice, resumption of sales to BDCs
2010	Reduction in the number of BDCs foreign exchange is sold to through the withdrawal of 132 class 'A' licenses in November
2011	Wholesale Dutch Auction System-Forward (WDAS-FWD) Market was introduced as foreign exchange risk management tool
2012	Reduction of the net open position (NOP) limit to 1.0 percent, from 3.0 percent, to curtail the demand pressure in WDAS, introduction of quarterly reviews of the foreign exchange activities of banks to ensure compliance
2015	RDAS introduced and closed in February, movement of eligible demands to inter-bank segment, exclusion of 41 items from the list of goods valid for foreign exchange at the official window, limited usage of naira-denominated cards overseas to US$300 per person, per day, stringent regulations and supervisions of BDCs, reduction in weekly sales to BDCs from US$15,000.00 to US$10,000.00 per BDC
2016	Introduction of a two-way quote interbank foreign exchange market; banks to execute all foreign exchange traded with corporates on FMDQ-advised FX trading and surveillance systems; International Money Transfer Operators required to remit foreign currency to the agent banks for disbursement in naira to the beneficiaries and the foreign currency proceeds to be sold to BDCs; authorised dealers to allocate at least 60% of total foreign exchange purchases for importation of raw materials, plant and machinery
2017	Release of guidelines to ease access to PTA and school fees; continuous intervention of CBN in the interbank market; allocation of foreign exchange to small scale importers
2021	Release of guidelines to regulate Naira 4 Dollar scheme for Diaspora Remittances, modalities for payout of diaspora remittance, amendment to diaspora remittance procedure.

Source: Authors review from various issues of CBN Annual Reports and Circulars

2.5. Macroeconomic Indicators in Nigeria

The indicators of economic activity are published regularly for most variables, both time series and survey data on market forecasts became available from the central bank. The macroeconomic situation is more challenging now than in 2015-2016, when oil prices fell sharply and Nigeria experienced its first recession in 25 years. In the current situation, Nigeria has fewer buffers and policy instruments to cushion adverse effects. The Excess Crude Account is depleted, external reserves are highly reliant on short-term flows, and policy uncertainty affects investor confidence. Before the 2016 recession, Nigeria's economy was growing fast at 6.3%. By contrast, before COVID-19 struck, the economy was growing at 2.2%. Inflation was in single digits in 2014, compared to about 12% in 2019. The general government fiscal deficit was 4.4% of GDP in 2019, compared to 1.8% in 2014. Nigeria's economy entered a recession in 2020, reversing three years of recovery, due to fall in crude oil prices on account of falling global demand and containment measures to fight the spread of COVID–19.

The fiscal deficit, financed mostly by domestic and foreign borrowing, widened to 5.2% in 2020 from 4.3% in 2019, reflecting pandemic-related spending pressures and revenue shortfalls. Total public debt stood at $85.9 billion (25% of GDP) on 30 June 2020, 2.4% higher than a year earlier. Domestic debt represented 63% of total debt, and external debt, 37%. High debt service payments, estimated at more than half of federally collected revenues, pose a major fiscal risk to Nigeria. As published on the CBN, the major issues of macroeconomic concern and macroeconomic indicator includes: exchange rate, trade balance, inflation rate, treasury bill rate, money supply, prime lending rate, monetary policy rate, deposit rate of banks, and the prime lending rate.

2.5.1. Exchange rates

The movement in the naira exchange rates exhibits persistent depreciation amid intermittent appreciation, reflecting some degree of volatility in the series over the years under study. For example, between September 2013 and September 2014, daily exchange rate at the Bureau-de-Change (BDC), hovered around N158 to N162.70 per US dollar on average. Afterward, it depreciated further until it revolved around N192 per US dollar in February 2015, following which the depreciation continued with steady fluctuations, hovering between N195 and N199 per US dollar through July 2016.

Following the technical devaluation policy implemented in June 2016, naira exchange rate rose and experience a sharp depreciation to N280 per US dollar, with the variability in the exchange rate becoming more pronounced—a possible volatility clustering. On August 9, 2017, the value of exchange rate hit the global peak, at N364 per dollar. Since then, and through the rest of the study period, exchange rate has hovered around N360 per dollar. Nigeria Exchange Rate against USD averaged 379.500 (NGN/USD) in Apr 2021, compared with 379.500 NGN/USD in the previous month.

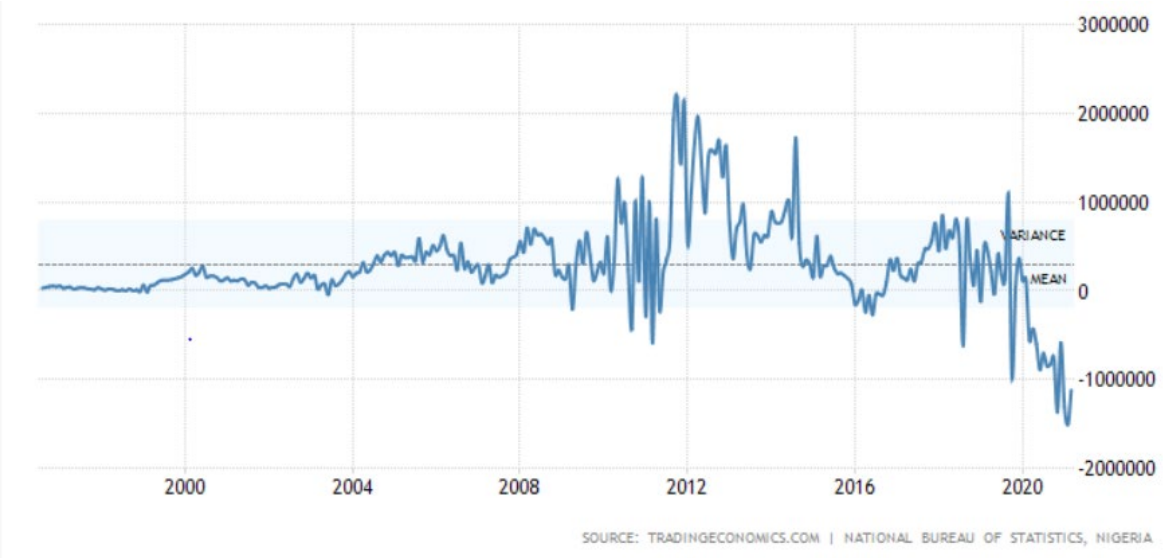
Figure 3: Plot of Exchange rate

2.5.2 Balance of trade

Balance of Trade in Nigeria averaged 176342.72 NGN Millions from 1981 until 2021, reaching an all-time high of 2177553.08 NGN Millions in October of 2011 and a record low of -1507542.69 NGN Millions in February of 2021. This page provides - Nigeria Balance of Trade - actual values, historical data, forecast, chart, statistics, economic calendar and news. Nigeria Balance of Trade - data, historical chart, forecasts and calendar of releases - was last updated on July of 2021. Nigeria's trade deficit widened to NGN 1123.3 billion in March of 2021 from NGN 554.5 billion in the same month a year ago.

Imports surged 44.4% to NGN 2194 billion while exports rose at a softer 11% to NGN 1070 billion. Considering the first quarter of 2021, the country's trade gap widened to a record high of NGN 3944 billion from NGN 330 billion in the same period a year ago, as imports surged 54% to NGN 6851 billion, its highest level in over 12 years, due to higher purchases of energy goods (1347%), agricultural goods (141%) and raw materials (109%). Conversely, exports fell 29.3% to NGN 2907 billion, as shipments fell primarily for manufactured products (-43.7%) and crude oil (-34.5%). China, India, the Netherlands, Spain and the US were the main trading partners in Q1

Figure 4: Plots of the trade balance

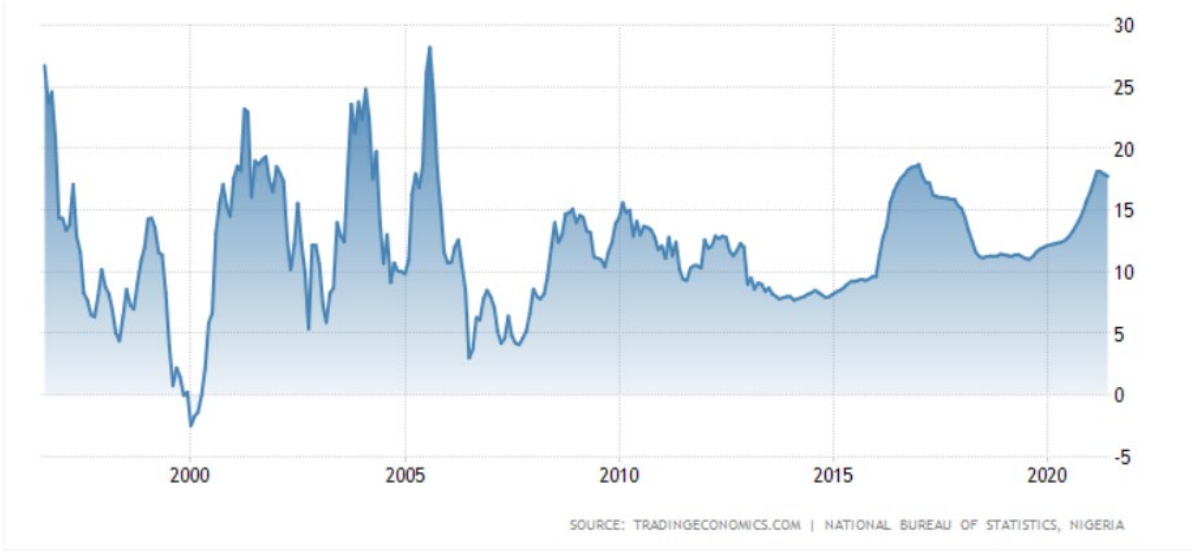


2.5.3. Inflation rates

In Nigeria, the Consumer Price Index (CPI) measures the change over time in prices of 740 goods and services consumed by people for day-to-day living. The index weights are based on expenditures of both urban and rural households in the 36 states. The most important categories in the CPI are Food and Non-Alcoholic Beverages (51.8 percent of total weight); Housing, Water, Gas and Other Fuel (16.7 percent) and Clothing and Footwear (7.7 percent). Transports account for 6.5 percent of total index and Furnishings and Household Equipment Maintenance for 5 percent. Education represents 3.9 percent of total weight, Health 3 percent, Miscellaneous Goods and Services 1.7 percent and Restaurants and Hotels 1.2 percent.

The Nigeria's annual inflation rate eased to 18.12% in April of 2021, the first decline since August 2019, down slightly from a four-year high of 18.17% in March. Food inflation dropped to 22.72% from a nearly 16-year peak of 22.95% in the prior month. Meanwhile, prices continued to rise sharply for transport (14.9% vs 14.7%); health (15.9% vs 15.8%); furnishings (12.6% vs 12.2%); clothing & footwear (13.2% vs 12.9%); miscellaneous goods & services (11.5% vs 11.4%) and housing & utilities (10.1%, the same as in March).

Figure 5: Plots of Inflation rates



2.5.4. Treasury bills and bonds

The Federal Government of Nigeria, through the CBN issues Nigerian Treasury Bills (NTB) to provide short-term funding for government budget deficit and the Federal Government (FGN) Bond for long term project financing. The NTBs are usually issued through a competitive bidding process, quoted and traded on FMDQ's platform. In April 2021, according to the primary market auction result, NTB Yield held the 91-day and 182-day constant at 2.00% and 3.50% respectively. The 364-days Bill increased by 100 base point to 9.00% from its previous 8.00% interest. This increase in the 364-days Treasury Bill Yield may be seen to have a negative correlation in the stock exchange market as investors sell off their volatile positions and buy risk-free assets like treasury bills.

The Bonds yield required by investors to loan funds to governments reflects inflation expectations and the likelihood that the debt will be repaid. The FGN Bond 10ears reached an all-time high of 17.31 in February of 2015. Nigeria 10 year Bond Yield was 12.65 percent on Friday July 16, 2021 according to over-the-counter interbank yield quotes for this government bond maturity. Figure 2 shows the Plots of the FGN Bonds.

Figure 6: Plots of **the *FGN Bonds***

Table 3: Selected Treasury bills and FGB

Auction Date	Security Type	Tenor	Auction No.	Auction	Week	Maturity Date	Total Subscription	Total Sales	Range Bid	Succesful Bid Rate	Rate Desc.	Stop Rate	True Yield	Amount Offered
7/19/2021	BOND	10 YEAR	07-19-2021 10 YEAR	Primary	4th Week	2/23/2028	5600.41	1350.61	11.9000-13.9800	11.9000-12.3500	Issue	12.35	0.00	50000.00
7/19/2021	BOND	20 YEAR	07-19-2021 20 YEAR	Primary	4th Week	3/18/2036	7300.44	5100.16	11.0000-14.0000	11.0000-13.1500	Issue	13.15	0.00	5000.00
7/19/2021	BOND	30 YEAR	07-19-2021 30YEAR	Primary	4th Week	3/27/2050	1560.26	5500.20	12.7500-14.5000	12.7500-13.2500	Issue	13.25	0.00	50000.00
7/15/2021	OMO	103 DAY	07-15-2021 103 Day	OMO	3rd Week	10/26/2021	5500.00	5000.00	6.9800-70000	6.9800-7.0000	Issue	7.00	0.00	5000.00
7/15/2021	OMO	173 Day	07-15-2021 173 Day	OMO	3rd Week	01/04/2022	6800.00	5000.00	8.4800-8.5000	8.4800-8.5000	Issue	8.50	0.00	5000.00
7/15/2021	OMO	355 Day	07-15-2021 355 Day	OMO	3rd Week	07/05/2022	45180.00	10000.00	9.9500-10.1000	9.9500-10.1000	Issue	10.10	0.00	10000.00
7/14/2021	NTB	91 Day	07-14-2021 91 Day	Primary	3rd Week	10/14/2021	6693.44	5239.06	2.5000-10.0000	2.500-2.5000	Issue	2.50	0.00	52390.06
7/14/2021	NTB	182 Day	07-14-2021 182 Day	Primary	3rd Week	1/13/2022	11817.98	7459.98	3.4900-12.0000	3.4000-3.5000	Issue	3.50	0.00	25372.32
7/14/2021	NTB	364 Day	07-14-2021 364 Day	Primary	3rd Week	7/14/2022	556164.80	137300.96	8.1500-9.7500	8.1500-8.6700	Issue	8.67	0.00	71598.13
07/08/2021	OMO	110 DAY	07-08-2021 110DAY	OMO	2nd Week	10/10/2021	2500.00	2000.00	6.9800-7.2500	6.9800-70000	Issue	7.00	0.00	5000.00
07/08/2021	OMO	180 Day	07-08-2021 180DAY	OMO	2nd Week	01/04/2022	5550.00	5000.00	8.4000-8.7500	8.4000-8.5000	Issue	8.50	0.00	5000.00
07/08/2021	OMO	327 DAY	07-08-2021 327DAY	OMO	2nd Week	5/31/2022	27670.00	10000.00	10.0000-10.1000	10.0000-10.1000	Issue	10.10	0.00	10000.00
6/30/2021	NTB	91 DAY	06-30-2021 91DAY	Primary	5th Week	9/30/2021	5025.40	2263.04	2.5000-10.0000	2.5000-2.5000	Issue	2.50	2.52	2878.85
6/30/2021	NTB	182DAY	06-30-2021 182DAY	Primary	5th Week	12/30/2021	5125.96	3314.96	3.5000-12.0000	3.5000-3.5000	Issue	3.50	3.56	20000.00
6/30/2021	NTB	364DAY	06-30-2021 364DAY	Primary	5th Week	6/30/2022	435847.34	158040.24	8.9000-12.9900	8.9000-9.1500	Issue	9.15	10.07	58857.01
6/23/2021	BOND	10 YEAR	23-06-2021 10YEAR	Primary	4th Week	3/17/2027	66210.00	54310.00	10.0000-14.0000	10.0000-12.7400	Issue	12.74	0.00	50000.00
6/23/2021	BOND	15 YEAR	23-06-2021 15YEAR	Primary	4th Week	3/27/2035	127450.00	104900.00	8.4000-14.3000	8.4000-13.5000	Issue	13.50	0.00	50000.00
6/23/2021	BOND	30 YEAR	23-06-2021 30YEAR	Primary	4th Week	3/27/2050	223820.00	171090.00	12.4500-14.9900	12.4500-13.7000	Issue	13.70	0.00	50000.00
6/17/2021	OMO	89 Day	06-17-2021 89Day	OMO	3rd Week	9/14/2021	3000.00	3000.00	6.9800-7.0000	6.9800-7.0000	Issue	7.00	0.00	5000.00
6/17/2021	OMO	159Day	06-17-2021 159Day	OMO	3rd Week	11/11/2021	9200.00	4300.00	8.4700-8.9900	8.4700-8.5000	Issue	8.50	0.00	5000.00
6/17/2021	OMO	348 Day	06-17-2021 348Day	OMO	3rd Week	5/31/2022	50900.00	10000.00	10.0000-10.2500	10.0000-10.1000	Issue	10.10	0.00	10000.00
6/16/2021	NTB	91 DAY	06-16-2021 91DAY	Primary	3rd Week	9/16/2021	14372.95	1605.54	2.5000-10.0000	2.5000-2.5000	Issue	2.50	2.52	2523.74
6/16/2021	NTB	182DAY	06-16-2021 182DAY	Primary	3rd Week	12/16/2021	2638.45	1101.95	3.5000-12.0000	3.5000-3.5000	Issue	3.50	3.56	1700.00
6/16/2021	NTB	364DAY	06-16-2021 364DAY	Primary	3rd Week	6/16/2022	264727.85	27868.65	9.1000-10.8990	9.1000-9.4000	Issue	9.40	10.37	10614.11
06/10/2021	OMO	96 Day	06-10-2021 96 Day	OMO	2nd Week	9/14/2021	7000.00	5000.00	6.9800-7.1000	6.9800-7.0000	Issue	7.00	0.00	7000.00
06/10/2021	OMO	166 Day	06-10-2021 166 Day	OMO	2nd Week	11/23/2021	7300.00	5000.00	8.4800-8.7500	8.4800-8.5000	Issue	8.50	0.00	5000.00
06/10/2021	OMO	348 Day	06-10-2021 348 Day	OMO	2nd Week	5/24/2022	67785.79	20000.00	10.0500-10.2500	10.0500 - 10.1000	Issue	10.10	0.00	20000.00
06/09/2021	NTB	91 DAY	06-09-2021 91 DAY	Primary	2nd Week	09/09/2021	6861.22	5060.52	2.5000-10.0000	2.5000-2.5000	Issue	2.50	2.52	4744.29
06/09/2021	NTB	182DAY	06-09-2021 182 DAY	Primary	2nd Week	12/09/2021	11702.15	10094.15	3.4500-12.0000	3.4500-3.5000	Issue	3.50	3.56	11702.15
06/09/2021	NTB	364DAY	06-09-2021 364 DAY	Primary	2nd Week	06/09/2022	308485.21	164106.06	9.0000-12.9900	9.0000-9.6400	Issue	9.64	10.67	78714.78
06/03/2021	OMO	89 Day	06-03-2021 89 Day	OMO	1st Week	8/31/2021	4000.00	4000.00	6.9900-7.1000	6.9900-7.0000	Issue	7.00	0.00	5000.00
06/03/2021	OMO	180 Day	06-03-2021 180Day	OMO	1st Week	11/30/2021	8780.00	4300.00	8.4700-8.9900	8.4700-8.5000	Issue	8.50	0.00	5000.00
06/03/2021	OMO	348 Day	06-03-2021 348Day	OMO	1st Week	5/17/2022	49040.18	10000.00	10.0500-10.5000	10.0500-10.1000	Issue	10.10	0.00	10000.00
5/27/2021	OMO	96 DAY	05-27-2021 96DAY	OMO	4th Week	8/31/2021	3000.00	3000.00	7.0000-7.0000	7.0000-7.0000	Slop	7.00	0.00	10000.00
5/27/2021	OMO	96 DAY	05-27-2021 96DAY	OMO	4th Week	8/31/2021	3000.00	3000.00	7.0000-7.0000	7.0000-7.0000	Slop	7.00	0.00	10000.00
5/27/2021	OMO	180 DAY	05-27-2021 180DAY	OMO	4th Week	11/23/2021	8000.00	8000.00	8.4800-8.5000	8.4800-8.5000	Slop	8.50	0.00	10000.00
5/27/2021	OMO	348 DAY	05-27-2021 348DAY	OMO	4th Week	05/10/2022	47125.20	30000.00	10.0000-10.2500	10.0000-10.1000	Slop	10.10	0.00	30000.00
5/26/2021	NTB	91 DAY	05-26-2021 91 DAY	Primary	4th Week	8/26/2021	4430.98	3123.98	2.4500-10.000	2.4500-2.5000	Issue	2.50	2.52	24175.79
5/26/2021	NTB	182DAY	05-26-2021 182 DAY	Primary	4th Week	11/25/2021	5527.56	4118.56	3.4900-12.0000	3.4900-3.5000	Issue	3.50	3.56	19157.66
5/26/2021	NTB	364DAY	05-26-2021 364 DAY	Primary	4th Week	5/26/2022	286464.65	143884.92	9.0000-13.9900	9.0000-13.9900	Issue	9.65	10.68	19842.35
5/20/2021	OMO	89 Day	05-20-2021 89Day	OMO	4th Week	8/17/2021	2000.00	2000.00	7.0000-7.0000	7.0000-7.0000	Issue	7.00	0.00	5000.00

2.5.5. Money supply M2

Nigeria Money Supply M2 includes M1 plus short-term time deposits in banks. Money Supply M2 in Nigeria increased to 38849025.37 NGN Million in May from 38382883.36 NGN Million in April of 2021. Money Supply M2 in Nigeria averaged 12793143.18 NGN Million from 2000 until 2021, reaching an all-time high of 38849025.37 NGN Million in May of 2021 and a record low of 648506.60 NGN Million in January of 2000. This page provides - Nigeria Money Supply M2 - actual values, historical data, forecast, chart, statistics, economic calendar and news. Nigeria Money Supply M2 - values, historical data and charts - was last updated on July of 2021.

Figure 7: Plots of the Money supply M2

Table 4: Nigeria money supply

Nigeria Money	Last	Previous	Highest	Lowest	Unit
Interest Rate	11.5	11.5	14	6	%
Cash Reserve Ratio	27.5	27.5	31	1	%
Money Supply M0	2790895.5	2796471.37	2908462.4	38580.37	NGN
Money Supply M1	16278040.69	15996570.46	16551196.56	74220.52	NGN
Money Supply M2	38849025.37	38382883.36	38849025.37	648506.6	NGN
Forex Reserves	33420	34250	62081.86	63.22	USD
Deposit Interest Rate	3.05	3.13	27	2	%
Lending Rate	11.13	11.21	37.8	6	%

2.5.6. Prime lending rate

Prime and Maximum Lending rates are considered the two major types of lending rates in the Nigerian financial sector. Prime lending rate refers to the average prevailing lending rate charged by most deposit money banks in Nigeria to some of its more favoured customers. The CBN provides monthly weighted average Bank Lending Rate. Lending Rate in Nigeria decreased to 11.13 percent in March from 11.21 percent in February of 2021. Lending Rate in Nigeria averaged 14.11 percent from 1961 until 2021, reaching an all-time high of 37.80 percent in September of 1993 and a record low of 6 percent in April of 1975.

Nigeria Lending Rate - values, historical data and charts - was last updated on July of 2021. Nigeria Bank Lending Rate was reported at 11.290 % pa in May 2021. This records an increase from the previous number of 11.240 % pa for Apr 2021. Nigeria Bank Lending Rate data is updated monthly, averaging 16.660 % pa from Jan 2006 to May 2021, with 185 observations. The data reached an all-time high of 19.660 % pa in Nov 2009 and a record low of 11.130 % pa in Mar 2021.

Figure 8: Plots of the Prime lending rate

2.5.7. Deposit interest rate

Deposit interest rate is the rate paid by commercial or similar banks for demand, time, or savings deposits. In furtherance of the transparency and full disclosure stance of the Central bank of Nigeria, the Monetary Policy Committee has decided that henceforth the lending rates obtainable in all Deposit Money Banks (DMBs) be made public to guide business decisions. In 2020, deposit interest rate for Nigeria was 4.65 %. Though Nigeria deposit interest rate fluctuated substantially in recent years, it tended to increase through 1971 - 2020 period ending at 4.65 % in 2020. The Deposit Interest Rate is Nigeria refers to Weighted Average 3 Month Deposit Rates in Commercial Banks. Deposit Interest Rate in Nigeria decreased to 3.05 percent in March from 3.13 percent in February of 2021.

Deposit Interest Rate in Nigeria averaged 9.50 percent from 1970 until 2021, reaching an all-time high of 27 percent in September of 1993 and a record low of 2 percent in April of 1976. This page includes a chart with historical data for Deposit Interest Rate in Nigeria. Deposit Interest Rate in Nigeria - values, historical data and charts - was last updated on July of 2021.

Figure 9a: ***Deposit Interest rate (2000-2020)***

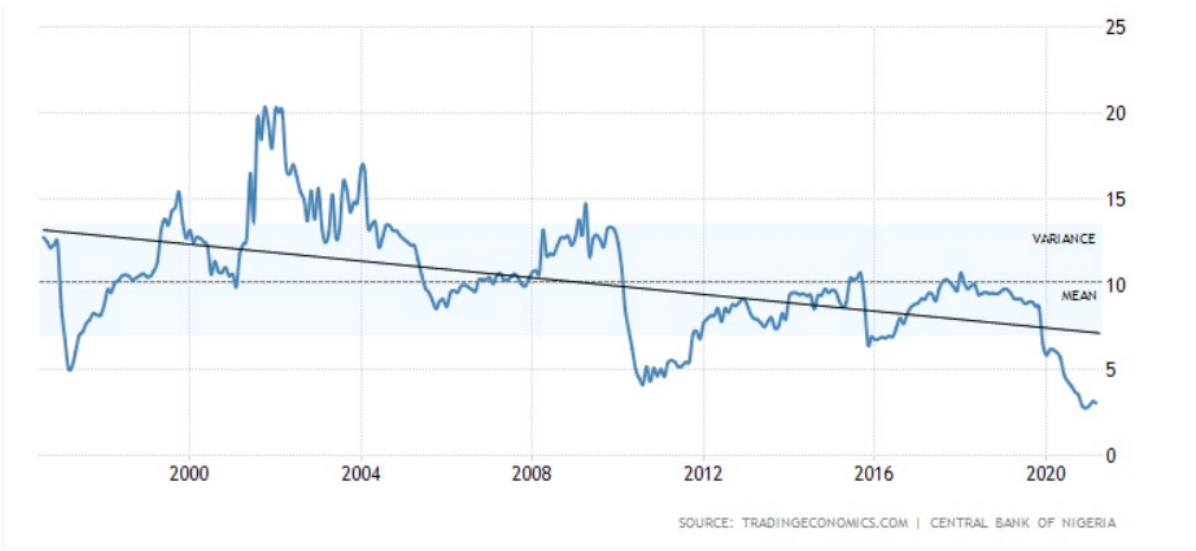


Figure 9b: Deposit Interest rate (1970-2020)

Table 5: Fixed Deposits Interest Rates of Nigerian Banks July 9, 2021

S/N	Name of Bank	Demand Deposit	Savings Deposit	Time Deposit
1	Access Bank	0.45	1.15	8.96
2	Citi Bank Nigeria	0.00	1.20	0.70
3	Coronation Merchant Bank	-	-	7.18
4	Ecobank Nigeria	0.01	1.15	5.90
5	FCMB	0.15	1.15	0.25
6	Fidelity Bank	0.50	1.15	11.22
7	First Bank of Nigeria	-	-	0.15
8	FBN Merchant Bank	-	-	6.75
9	FSDH	-	-	10.00
10	Guaranty Trust Bank	0.38	1.15	5.21
11	Globus Bank Ltd.	0.01	1.15	4.00
12	Heritage Bank	-	4.20	13.88
13	Keystone Bank Ltd	0.71	1.15	7.71
14	Nova Merchant Bank	-	-	11.56
15	Providus Bank	1.15	0.75	3.88
16	Rand Merchant Bank Nig. Ltd	0.00	0.00	6.96
17	Polaris Bank	-	1.15	5.83
18	Stanbic IBTC Bank	0.01	1.15	2.86
19	Standard Chartered Bank	0.00	1.20	3.17
20	Sterling Bank	0.00	1.15	7.08
21	SunTrust Bank	0.00	4.10	5.30
22	Titan Trust Bank	0.00	1.15	2.65
23	Union Bank	0.16	1.15	7.44
24	United Bank for Africa	0.07	1.15	1.00
25	Unity Bank	0.45	1.90	4.00
26	Wema Bank	0.97	1.15	4.77
27	Zenith Bank	0.06	1.15	4.05

2.6. Empirical Literature

The effect of macroeconomic news on asset price has been well considered. Theoretical models on how exchange rate react to macroeconomic news is based on the idea that if the foreign exchange markets are efficient, expected information ("news") shock would spiral in the market exchange rates. The unanticipated exchange rate changes can only be caused by the influx of unanticipated relevant news. Since 1980s empirical literature has adopted different approaches to testing the impact of macroeconomic announcements caprices on exchange rate dynamics. Most of the previous literature that examines news effects on financial markets looked at the US and European news announcements.

Indriawana, Jiao, and Tsec (2021). We examine the impact of monetary policy announcements on long-term US and German bond futures. The use the transaction-level data during the post-financial crisis period and observe a sizable post-announcement drift in government bond markets. As found, a trading strategy of investing in the market after expansionary shocks and shorting the market following contractionary surprises yields up to four times the Sharpe ratio of buy-and-hold investment. The post-FOMC announcement drift coincides with more informative order flows in the post-announcement period, and it persists for 15 days. In the absence of pre-FOMC announcement drift.

Tamgac (2021) verify the impact of announcements of domestic and US-based news on policy-related fundamentals on the USD\Turkish lira exchange rate. The results shows that announcements associated to the domestic country have a more effect on the exchange rate in relation to surprises associated with the US. There is an asymmetry response, with bad news on US having greater impact than good news, and good news for domestic country having more effects than bad.

Ayadi *et al*. (2020) examine the simultaneous effect of OPEC production decisions and press releases, oil and gasoline inventory surprises, as well as US and Canadian macroeconomic

news announcements on oil and Canadian dollar volatilities around US and European financial crises. They use a multivariate volatility model and implement an impulse response analysis to decompose the exogenous impacts into direct and indirect effects induced by volatility spillover. They find evidence of context-specific impacts and show that 67% of the total accumulated effect of OPEC decision to maintain production on oil volatility is induced by volatility spillover from the Canadian foreign exchange rate.

Mujahid and Ben-Omrane. (2020) analyze the impact of US macroeconomic news announcements on the Canadian benchmark stock index return and volatility using high-frequency 5-min data. They found that several US news releases exert a statistically significant influence on the Canadian stock market return and volatility. They show that during the 2008 US recession, slightly more US news announcements exhibit significant impacts on the Canadian equity returns, with relatively pronounced effects. The results support suggests that US macroeconomic fundamentals form a linkage between Canadian and US financial markets.

Caruso (2019) monitors a massive flow of macroeconomic news every day and react to the unexpected component of each release. The paper shows that a "Nowcasting Surprise Index", constructed by aggregating forecast errors from a now casting model using model-based weights, resembles the surprise indexes proposed in the recent literature or constructed by practitioners, which cumulate survey-based forecast errors weighted by using the average effect of news on asset prices. This suggests that market operators and a nowcasting model filter the macroeconomic data flow similarly and confirms the link between news about macroeconomic indicators and asset prices. The paper shows that recent cumulated news in macroeconomic data accounts for a non-negligible part of asset price behaviour.

Omrane *et al.* (2019) investigate the intraday reaction of euro-dollar exchange rate returns to the US and European macroeconomic news during a period that spans the global financial crisis

and the Euro-zone debt crisis, from November 1st, 2004 and March 31st, 2014, using intraday data. They assess whether announcements' impact is stable over time. They use time-varying parameter path analysis to investigate whether the currency return response to macroeconomic news is sensitive to changes in market risk and interest rates. The study find that news impact coefficients vary significantly over time. Our results also show that higher market risk measured by VIX dampens the effect of US news on euro-dollar returns. The study find that the impact coefficients of macroeconomic news vary significantly over time.

Corbet, Dunne, and Larkin (2019) find significant increases in stock volatility and market returns prior to FOMC quantitative easing announcement. The increase in volatility is substantial when the market is forewarned of an announcement. Also, any surprise announcement cause longer short-term volatility persistence. Lyócsa, Molnár and Plíhal (2019) examines the impact of policy rate and quantitative easing announcements on stock realized volatility before, during, and after the event in Canada, France, Germany, Italy, Japan, the U.K., and U.S volatility. They find that during announcement of the domestic central bank, volatility increases, but there is decline in volatility five days after an interest rate announcement in countries sampled. The result further show that quantitative easing announcements have no impact on stock market volatility not only at but also five days before and five days after the announcement date.

Ekincia, Akyildirim and Corbet (2019) investigate the effects of macroeconomic announcements made in the United States on trading activity of stocks listed in Borsa Istanbul. The influence of these releases on the selected variables are an important source of information for market participants. The results show a clear negative impact on weighted bid, ask and mid-prices in the five-minute period post-release. The results also present implications for market dynamics and signal that liquidity consumption (through market orders) largely dominates l

Both fiscal and monetary authorities must have strong economic base- in terms of capacity to produce for exports, in addition to having a robust and diversified source of revenue, driven by functional infrastructure, among other. ,biquidity provision (through limit orders) in the five-minute period following the release.

Maserumule and Alagidede (2018) explore the intraday reaction of South African (SA) rand-dollar returns to the US macroeconomic news with 10-minute bid-ask quotes from 2 January 2014 to 31 December 2015. They found that exchange volatility rises after the release of news information, whether surprised the market or not. They also establish that both SA and US news affect the rand-dollar volatility, although negative news impinge greater impact on the volatility relative to positive news.

Boudt *et al.* (2019) use intraday data to estimate the daily foreign exchange exposure of U.S. multinationals and show that macroeconomic news affects these firms' foreign exchange exposure. The News creates a substantial shift in the joint distribution of stock and exchange rate returns that has both a transitory and a persistent component. For example, a positive domestic demand surprise, as reflected in higher-than-expected nonfarm payroll, increases the value of the low-exposure domestic activities and results in a persistent decrease in foreign exchange exposure.

Cheung, Fatum, and Yamamoto (2018) examine the time- and state-dependent nature of US and Japanese macro news on the yen-dollar rate before, during, and after the financial crisis, using a 5-minute quotes spanning the 1 January 1999 to 31 August 2016. They find that while the US news impact the exchange rate after the crisis than before the crisis, the after-crisis influence of Japanese news is irrelevance.

Mueller, Tahbaz-Salehi, and Vedolin (2017) investigate the effect of FOMC news on the five-minute high-frequency spot exchange rate data for "G10" currencies[1] spanning from January 1, 1994, to December 31, 2013. They established the exchange rate dynamics are linked to fundamentals. The trading strategy "short the USD" and "long other currencies" is significantly affected by the FMOC scheduled announcements. The result confirm that exchange rate returns are higher for currencies with higher interest rate differentials vis-a-vis the USD.

Evans and Speight (2010) applied standard regression techniques to examine the foreign exchange market reaction of short-run euro-dollar, euro-sterling and euro-yen exchange rates returns volatility to macroeconomic announcements using 5-min returns windows, from January 2002 to July 2003. The study simultaneously controls for the distinct calendar effects, intraday volatility pattern and a latent volatility factor. They establish that news emanating from the US observed to cause statistically significant influences on volatility. Also, they found significant response of large responses for the Euro-Sterling and Euro-Yen rates volatility to UK Industrial Production and Japanese GDP news shocks.

Hashimoto and Ito (2009) employed standard OLS to estimate how Japanese macroeconomic news within minutes impact on the dollar-yen exchange rate between 1 January 2001 to 31 December 2005. They found that macroeconomic news, in addition to the magnitude of surprise increase foreign exchange deals and price volatility in the immediately after the announcement. The study shows that for most of news components whose surprise items have return impacts on deals and volatility sequel to the announcement. In sum, while some news items do not have return impacts, others significantly affect deals and volatility.

Faust *et al.* (2007) applied random coefficient regression to access the joint movements of exchange rates and U.S. and foreign term structures around 10 macroeconomic announcements, plus the FOMC 5-minute, 20 minutes exchange rate returns for dollar exchange rates versus the DM/euro and DM/pound, covering the high-frequency data from 1987 to 2002. They discovered that a stronger than expected macro announcements appreciates the dollar.

Laakkonen (2007) use a 5-minute frequency data spanning 28 October 2003 to 20 January 2004 to investigate the response of USD/EUR exchange rate volatility on US and European news by using the Flexible Fourier Form method. The study divides news into two categories: one conveys news on conflicting information on the state of the economy, while the other contain the news that were consistent. The conflicting announcements were found to increase volatility more than the consistent news. The study reveals that although news significantly increased volatility, the US announcement was the most important.

Andersen *et al. (*2002) applied weighted least square (WLS) and autocorrelation consistent (HAC) estimation to access the response of 5-minute real-time high-frequency exchange rate quotations to 15 USA macroeconomic announcements and macroeconomic expectations on the conditional means of U.S. dollar spot exchange rates versus pound-dollar, mark-dollar, euro-dollar, franc-dollar, and yen-dollar. The result shows sign effect, which refers to the fact that exchange rates reacts to announcement in an asymmetric fashion.

2.7. Gaps in Literature

The empirical reviews show that there are some areas on these subject matters yet untouched.

- First, most available studies on the relationship between announcements and exchange rate are focused on developed countries (Hausman, & Wongswan, 2011; Chatrath, Miao,

& Ramchander, 2014; Ben-Omrane, & Savaser, 2016; Boudt *et al*., 2019; Pyo and Lee, 2020; Indriawana, Jiao, & Tsec, 2021). Developing countries like Nigeria are left out.

- Most of the studies did not study macroeconomics announcements, FOMC/MPC announcements and exchange rate dynamics under a unified interactive framework.
- Lastly, only one available study (Pyo and Lee, 2020), at least to the best of our knowledge is applied event models, and this study is based on the cryptocurrency markets.

CHAPTER THREE

THEORETICAL FRAMEWORK AND METHODOLOGY

3.1. Theoretical Framework

This study analysed exchange rate behaviours in the context of monetary models. The models focus on the roles of macroeconomic fundamentals in the forecast of the nominal rate of exchange. We adopt the flexible-price monetary model (FPMM) protocol. The FPMM assumes that goods prices are perfectly flexible, implying that the PPP holds instantaneously at all times. This model was first developed by Frenkel (1976), and Bilson (1978). The exchange rate equation for the FPMM could be derived from its major assumptions that: (a) prices, nominal interest rates and nominal exchange rates adjust instantaneously to clear goods, money and foreign exchange markets; (b) there are stability in monetary conditions; (c) money demand function is stable; and (d) PPP holds continuously. These assumptions can be expressed thus:

$$p = m^s - m^d \quad \text{..... (Eq 3.1)}$$

$$p^* = m^{s^*} - m^{d^*} \quad \text{..... (Eq 3.2)}$$

$$m^d = \alpha y - \beta i \quad \text{..... (Eq 3.3)}$$

$$m^{d^*} = \alpha y^* - \beta i^* \quad \text{..... (Eq 3.4)}$$

$$p = s + p^* \quad \text{..... (Eq 3.5)}$$

where p is the price level, m is the money supply, y is the real income and i is the nominal interest rate, s is the exchange rate while superscript d is the demand variable and superscript s is the supply variable while superscript $*$ indicate the corresponding foreign variable. Equation (15) represents the proposition of a stable monetary condition while Equation (16) stands for the proposition of stability in the foreign monetary condition. Equation (17) indicates that the demand for nominal money balance is a stable function of real income and nominal interest rate in the domestic country as well as in the foreign country as shown in Equation (18). Parameter α measures income elasticity of demand while parameter β measures the

interest rate semi elasticity of demand for money. Equation (5) shows the PPP condition in which: (a) there is one-to-one movement in the domestic price level and the exchange rate adjusted foreign price level; and (b) the adjustment of the exchange rate to offset the inflation differential.

What these indicate is that without alterations to the underlying structure of a model of exchange rate, the underlying regime of exchange rate specifies the set of independent variables. With the assumption that money supply could be exogenously determined by the monetary authorities in the domestic and foreign countries (that is $ms = m$ and $ms* = m*$), if Equations (15) to (18) are combined, we have:

$$p - p* = (m - m*) - (y - y*) + (i - i*) \quad \text{..... (Eq 3.6)}$$

If Equation (5) is substituted into (20), we will obtain:

$$s = (m - m*) - (y - y*) + (i - i*) \quad \text{..... (Eq 3.7)}$$

This is the FPMM of exchange rate determination which leads to an exchange rate equation depicting the nominal exchange rate (s) as the relative price of two national monies (dependent variable) being determined by the independent variables which are the relative money supply, relative income and relative interest rate differential.

Further assumption is that the PPP does not hold in the short run, but in the long run. This means that the PPP condition is temporarily violated when the short run price stickiness sets in, and consequently, the exchange rate has to reflect the monetary policy's short term liquidity effect. Recalling the Fisher effect as indicating that the nominal interest rate is made up of real interest rate and expected inflation, if the differential of the spot exchange rate and the long run equilibrium rate as well as the differential of expected long run inflation between the domestic and foreign countries positively explain expected depreciation of the exchange rate,

$$E(s) = -\lambda + (s_t - \overline{s}) + \pi_t^e - \pi_t^{e^*} \quad \text{..... (Eq 3.8)}$$

where is λ the speed of adjustment to equilibrium, $\overline{s}$ denotes long run equilibrium? If the Fisher equation ($i = r_t + \pi^e$] and its foreign version are combined, they yield:

$$s_t - \overline{s} = \frac{1}{\lambda}\{(i_t - \pi_t^e) - (i_t^* - \pi_t^{e^*})\} \quad \text{..... (Eq 3.9)}$$

The simple explanation of Equation 23 is that the gap between spot rate and its long run equilibrium level is proportionate to the real interest rate differentials between two countries. As already stated, a stiff monetary policy is therefore required so as to raise interest rate differentials. The short run interest rate captures the liquidity effect. If PPP holds in the long run, this is represented as:

$$\overline{s} = \overline{p} - \overline{p} \quad \text{..... (Eq 3.10)}$$

It is assumed that the differentials of interest rate and expected inflation must be equal thus:

$$\overline{r} - \overline{r} = \pi_t^e - \pi_t^{e^*} \quad \text{..... (Eq 3.11)}$$

We can consequently re-state equation (25) as:

$$\overline{s} - s_t = \frac{1}{\lambda}\{(\overline{\imath} - i_t) - (\overline{\imath} - i_t^*)\} \quad \text{..... (Eq 3.13)}$$

If equations (25) and (26) are combined, they produce:

$$s_t = (m_t^* - m_t) - \beta_y(y_t^* - y_t) + \beta_\pi(\pi_t^{e^*} - \pi_t^e) \quad \text{..... (Eq 3.14)}$$

$$s = (m - m^*) - \alpha(y - y^*) + \gamma(i - i^*) + \delta(\Delta p^e - \Delta p^* e) \quad \text{..... (Eq 3.15)}$$

Which shows the effect of money stock differentials, real income differential, and interest rate differentials on exchange rate. The model offers good explanations on why movements in international prices and changes in international money stocks account for exchange rate changes while clarifying that such movements are due to rationale foreign exchange market that yields exchange rates which exhibit deviations from PPP based on the realities of economic fundamentals and not in isolation from these fundamentals. Essentially, we focus on the effect of announcements related to each of these components on the exchange rates.

3.2. Population and Sample Size

A population is the entire group that you want to draw conclusions about. A sample is the specific group that you will collect data from. The size of the sample is always less than the total size of the population. The study follow previous studies (Cheung, Fatum, & Yamamoto, 2019; Pyo and Lee, 2020) and apply daily high-frequency data. This study employs daily Naira price of US Dollar exchange rate (USD/NGN), as well as dummies for reported dates of MPC meetings and CBN announcements. For this study the population size is the entire daily exchange rates of naira to dollars since the inception of naira in 1973, as well as all macroeconomics announcements to curtail the exchange rates since the aforementioned years. However, our sample will be taken from January 02, 2005 to September 25, 2020, which gives us a total of 3935 observations. The USD/NGN data was downloaded from the CBN webpage. We focus on this given the constraint of data availability on macroeconomics and MPC meetings announcements.

3.3. The Data and Variables Employed

Although Pyo and Lee (2020) select announcement data related to the employment rates and price index, but due to peculiar nature of Nigeria which exchange rate is sensitive to forex reserves (Kalu, *et al.* 2019); financial assets (Bala-Sani and Hassan, 2018) and official interventions (Dayyabu *et al.,* 2016), we employ announcement dates targeted at the behaviour of the exchange rate.

The Exchange Rates (LEXRT, and LRETN)

Exchange rate (EXRT) series was found to exhibits nonlinear pattern with jumps. As suggested by Lahmiri, *et al.* (2018), such chaotic series can be transformed to obtain suitable estimates. We apply natural-log in accordance with studied by Pyo and Lee (2020). Our study uses two measures for exchange rate – daily logarithm of exchange rates (log-exchange rate: LEXRT) and logarithm of daily exchange rate returns (log-return: LRETN).

We take the simple average of the daily bid-ask price quotes and obtain the middle price quote (Bauwens & Giot, 2000). We eliminate all data on weekends and national holidays since the quoted prices may have some bias based on low transaction volumes. We filter the data for possible outliers cause by compilation errors and adjust the data for 01\02\2005 with extreme values. We calculate daily log-returns as the log of the ratio of the exchange rate of consecutive daily mid-prices multiplied by 100. Table 3.1 presents summary statistics on the exchange rate, log-exchange rates and log-return.

The MPC Meeting (MPCM)

This research covers periods in which 88 MPC meetings were held and published[2]. Usually, the MPC meeting takes place for two consecutive days once in every two months (specifically, in January, March, May, July, September and November). Since both days detail outcomes of same policy stance, we use one date for the periodic meeting in order to avoid double counting and compounding effects. Two communiques are often published at the end of every meeting – one is a summary document of MP decisions without personal statement, and the other is a detail document on MP with personal statement from some key MPC members. In the case where meeting dates differ from publication date, we adopt the date for the MPC meeting in order to avoid duplication. We assigned a dummy D_t^{MPCM} which takes 1 on announcement day for MPCM, 0 otherwise.

The CBN Announcements (STAB, INTR and BofT)

The CBN announcements were released either periodic or on regularly basis. Available information shows that the CBN disseminates over 2000 circulars (news) published on its website[3] between September 4, 2006 and September 25, 2020. We scrutinise these

documents and obtain a total of 913 circulars that are directed towards exchange rate stabilisation. We group the circulars into three categories – first is circulars that involve direct intervention via the WDAS\RDAS[4]\Special intervention for Bureaux de Change, BDCs (STAB); second is circulars on long-term interest rate and inflation rate (INTR); and third is circulars that involve announcements on balance of trade (BofT). The RDAS intervention was eliminated on Feb 18, 2015 but from March 3, 2015, the CBN continue to make special intervention through sales of forex to the BDCs. We include announcements on forex sales to BDCs from February 19, 2019 to September 25, 2020 to consolidate the RDAS' suspension. A total of 735 circulars on WDAS\RDAS\BDCs was included as STAB dummy for the estimation.

To investigate the effect of these CBN announcements on the dynamics of exchange rates, we attach a dummy D_t^{STAB} which takes 1 on announcement day for STAB circulars, and 0 otherwise. We observe that the CBN periodically auction treasury bills to mop-up excess money in circulation, which may as well lead to exchange rate appreciation. We assigned a dummy D_t^{INFR} which takes 1 on announcement day for Treasury Bill Auction, 0 otherwise. We identify approximately 43 announcements for this. Lastly, we categorise all CBN announcements on Pilgrims (Tourism), Trade (Import and Exports) and Remittances which affect the reserves and the exchange rate as Balance of Trade issues as BofT. We incorporate 135 of these announcement dates for this study. We attach a dummy, D_t^{BofT} which takes 1 on announcement day, 0 otherwise. Table 2.1 (Appendix A) presents selected CBN circulars with Titles (hyperlinked), published dates and categorisation as MPCM, STAB, INTR or BofT.

3.4. Model Specification

In order to assess the influence of MPC meetings and CBN announcements on the dynamics exchange rate, we model contemporaneous and past of announcements days on the log-exchange rates (equations 29 and 32) and log-returns (equations 30 and 31). In accordance with some studies (Ben Omrane *et al.,* 2019; Pyo and Lee, 2020), we set up event driven models to analyse how news surprises on three days before the announcement day (*t*-3, *t*-2 and *t*-1), on the announcement D-day (*t*) and on three days after the announcement day (*t*+1, *t*+2 and *t+3*) explain the dynamics of exchange rate and its returns. The first set of models analyse the 'stable' effects of announcements on the log-exchange rate (29) similar to Li *et al.* (2015) and the 'unstable' effects for exchange rate log-return (30) in line with Ben Omrane *et al.* (2019) and Pyo and Lee (2020).

$$\mathrm{LEXRT}_t = \alpha_0^* + \sum_{i=-3}^{3} \alpha_{t+i}^{STAB}\, D_{t+i}^{\mathrm{STAB}} + \sum_{i=-3}^{3} \alpha_{t+i}^{INTR}\, D_{t+i}^{\mathrm{INTR}} + \sum_{i=-3}^{3} \alpha_{t+i}^{BofT}\, D_{t+i}^{\mathrm{BofT}} + \varepsilon_t \dots\dots (EQ3.16)$$

$$\mathrm{LRETN}_t = \beta_0^* + \sum_{i=-3}^{3} \beta_{t+i}^{STAB}\, D_{t+i}^{\mathrm{STAB}} + \sum_{i=-3}^{3} \beta_{t+i}^{INTR}\, D_{t+i}^{\mathrm{INTR}} + \sum_{i=-3}^{3} \beta_{t+i}^{BofT}\, D_{t+i}^{\mathrm{BofT}} + \varepsilon_t \dots\dots (EQ3.17)$$

The second sets of models, (31) and (32) provide the stable and unstable effects of the exchange rate' responds to the combined effect of both MPC meeting and macroeconomic announcements on log-return and on log-exchange rate

$$\mathrm{LRETN}_t = \beta_0^{**} + \sum_{i=-3}^{3} \beta_{t+i}^{\mathrm{MPCM}}\, D_{t+i}^{\mathrm{MPCM}} + \sum_{i=-3}^{3} \beta_{t+i}^{\mathrm{STAB}}\, D_{t+i}^{\mathrm{STAB}} + \sum_{i=-3}^{3} \beta_{t+i}^{\mathrm{INTR}}\, D_{t+i}^{\mathrm{INTR}}$$
$$+ \sum_{i=-3}^{3} \beta_{t+i}^{\mathrm{BofT}}\, D_{t+i}^{\mathrm{BofT}} + \varepsilon_t \dots\dots\dots \quad (3.18)$$

$$\mathrm{LEXRT}_t = \alpha_0^{**} + \sum_{i=-3}^{3} \alpha_{t+i}^{\mathrm{MPCM}}\, D_{t+i}^{\mathrm{MPCM}} + \sum_{i=-3}^{3} \alpha_{t+i}^{\mathrm{STAB}}\, D_{t+i}^{\mathrm{STAB}} + \sum_{i=-3}^{3} \alpha_{t+i}^{\mathrm{INTR}}\, D_{t+i}^{\mathrm{INTR}}$$

$$+\sum_{i=-3}^{3} \alpha_{t+i}^{\mathrm{BofT}} D_{t+i}^{\mathrm{BofT}} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.19)$$

The model (28) and (29) indicate not only the effect MPC meetings, but also the effect of the three CBN macroeconomic announcement on the log-exchange rate and log returns. The explanatory variable, $D_t^X - \forall X \epsilon \{\mathrm{MPCM}, \mathrm{STAB}, \mathrm{INTR}, \mathrm{BofT}\}$ – is a dummy that indicates 1 for announcement (contemporaneous) day and 0 otherwise, for each variable X[5]. The independent variables $D_{t+i}^X, i \epsilon \{-3, -2, -1, 1, 2, 3\}$ are dummies lagged by *i* (past and future) days from announcement day. Following Pyo and Lee (2020), we hypothesise and statistically verify that the variance of error terms, ε_t, follows GARCH (1,1). The *t*-test for the variance of the GARCH (1,1) components of ε_t for all the log-exchange rate and log-return are significant, hence support (33) specification (Table 3.2 – 3.4).

$$\varepsilon_t = \delta + \sigma_t z_t$$

$$z_t \sim nid\ (0,1), \forall\ t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(EQ 3.20)}$$

$$\sigma_t^2 = \omega_0 + \omega_1(\varepsilon_{t-1})^2 + \Omega\sigma_{t-1}^2;\ \sigma_t^2 > 0$$

The intercepts $\alpha_0^* \, and \, \beta_0^*$ indicate the expected value of log-exchange rate and log-return, respectively, when no CBN announcements are not released. The constant terms α_0^{**} and β_0^{**} imply the mean value of exchange rate, without both meetings being held and announcements being disseminated. The vector $[\alpha_0^*, \alpha_0^{**}, \alpha_0^{**}, \beta_0^{**}] > 0$ as the exchange rate is non-negative.

3.5. The Methodology and Estimation Procedure

In order to estimate the coefficients, α_{t+i}^X and β_{t+i}^{X} of D_{t+i}^X, for each i in our event driven model (equation 29-32), we employ the ordinary least squares (OLS). The OLS is a method for estimating the unknown parameters in a linear regression model. This method

minimizes the sum of squared vertical distances between the observed responses in the dataset and the responses predicted by the linear approximation. Assuming that a set of n paired observations on (x_j, y_j), $i = 1,2, n$ are available which $satisfied$ the linear regression model $y = \beta_0 + \beta_1 X + \varepsilon$. We write the model for each observation as:

$$y_j = \beta_0 + \beta_1 x_j + \varepsilon_j, (i = 1,2, n) \quad \text{.....EQ 3.21}$$

The OLS minimizes the sum of squares: $S(\beta_i) = \sum_{j=1}^{'\gamma} \varepsilon_j^2 = \sum_{j=1}^{'\gamma} (y_j - \beta_0 - \beta_1 x_j)^2$, with respect to β_i. The derivatives of $S(\beta_i)$ with respect to β_i; $\frac{\partial S(\beta_0, \beta_1)}{\partial \beta_i} = -2 \sum_{j=1}^{n} (y_j - \beta_0 - \beta_1 x_j) = 0$. Hence, we obtain $\hat{\beta}_1 = \frac{\Sigma x_i y_i - \frac{1}{n} \Sigma x_i \Sigma y_i}{\Sigma x_i^2 - \frac{1}{n} (\Sigma x_i)^2} = \frac{Cov[x,y]}{Var[x]}$, and $\hat{\beta}_0 = \overline{y} - \hat{\beta}_1 \overline{x}$. And the Scoefficient of determination R^2 is defined as a ratio of "explained" variance to the"total" variance of the dependent variable y: $R^2 = \frac{\sum_i^n (\hat{y} - \overline{y})^2}{\sum_i^n (y_i - \overline{y})^2}$.

We applied this formula for $\hat{\beta}_i$ to obtain the values for the coefficients, α_{t+i}^X and β_{t+i}^X of D_{t+i}^X, for each i measures the change in the mean level of the log-exchange rate or log-return, given that an announcement (for instance, on intervention) or MPC meeting occurs at time *t*, being day(s) before, D-day or a day(s) after announcement\meeting. If α_{t+i}^X > (<) 0, it means that the mean value exchange rate is expected to depreciate (appreciate) by approximately α_{t+i}^X multiply by 100 percent for that particular day *i* of the CBN announcement. We apply the least squares to estimate our models using the coefficient covariance method of heteroscedasticity and autocorrelation consistent (HAC). For event driven regression, the *F*- and *t* statistics (t_i) are more useful as for model evaluation.

CHAPTER FOUR

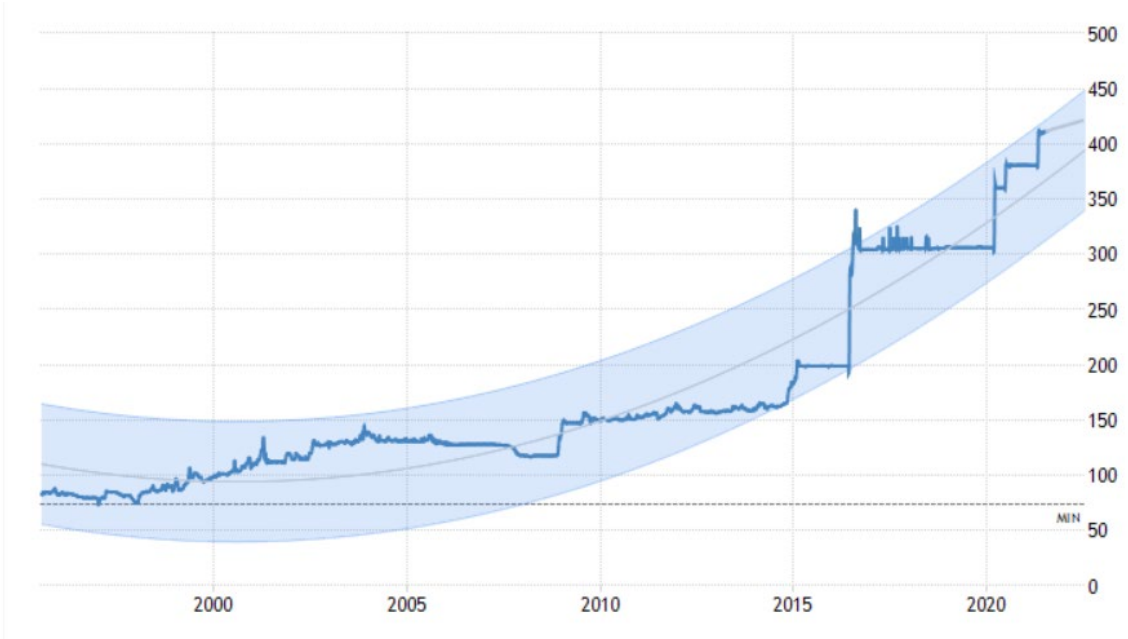
DATA PRESENTATION, ANALYSES AND INTERPRETATION

4.1. Preliminary Analysis

4.1.1. Data Trend

Figure 10 shows the time series plots for the actual exchange rate. The plot indicate there are jumps, pulse and vertical patterns. The jumps are era for exchange rate regime switches and period of devaluation. The time series plots show notable and extreme outliers, with sharp protrusions. Recently, there was the exchange rate adjustment (unification) for importer and exporter window in a bid to avoid devaluation and as well as push down pressure on the reserve due to forex shortage occasioned by low income from oil revenue around the epic of the 2020 COVID 19 pandemics. Since the path overtime appears nonlinear, we transform the series by taking its natural log before our estimation. The exchange rate has undergone different episode before, during and post the global financial crisis of 2008 – 2009. Nigeria operates a system of multiple exchange rates in a bid to control demand for dollars, the official exchange rate was N305 in January 30, 2017, and up to 450 in 2020.

Figure 10: Linear Scale USD/NGN Exchange Rate plot



4.1.2. Deterministic Statistics

Table 6 presents the statistical properties for exchange rate, log-exchange rate and log-return series. The average exchange rates for the period studied is 182.461 naira, while the minimum and maximum are about 150 and 379 naira respectively. The standard deviation of the variance of dynamic of the exchange rate (R_σ) shows that there is high spread in the exchange rate, and low spread in the log-return. The daily official close for Naira appears stable around some domain between days except for periods of jumps. The skewness which assesses the extent to which a variable's distribution is symmetrical shows that both the exchange rates, EXRT and its logarithms, LEXRT with skewness value of 0.912 and 1.14 respectively are considered as appropriately skewed, while the logarithm of the exchange rate returns dataset has heavier tails than a normal distribution (more in the tails).

Both log of returns and daily variance series indicate high presence of outliers that may generate heteroskedastic, as their distribution is extremely leptokurtic, as well as highly positively skewed. The distributions of exchange rate and log-exchange rate are positive asymmetric (skewed) and moderately peaked (mesokurtic). The Jarque-Bera statistics shows

by its probability values, $\rho(JB)$ indicate that all the data series are significant, rejecting the normality null.

Table 6: Data Deterministic Statistics

Central Tendencies	Mean	Median	Max.	min.
EXRT	182.461	150.825	379.500	74.520
LEXRT	2.231	2.178	2.579	1.872
LRETN	0.0000043	0.000000	0.411	-0.022
Variations Measures	R_σ	Skewness	Kurtosis	$\rho(JB)$
EXRT	74.148	1.145	2.721	0.0000
LEXRT	0.154	0.912	2.323	0.0000
LRETN	0.009	38.808	1658.95	0.0000

$\rho(JB)$ is the probability of Jarque-Bera (JB) used for the normality test for each series. R_σ is standard deviation.

4.2. Estimated Models

Table 7 presents how log-exchange rate (LEXRT) respond to announcements, if no MPC meeting was held. The process reflects 3930 observations after adjustments. As shown, the exchange rate responds well to CBN announcement disseminated for intervention, interest rate and inflation control, and trade balance. The intercept α_0^* shows that the expected value of the log-exchange rate is approximately 2.3387/218NGN when CBN does not release circular related the exchange rate. The estimates α_{t+i}^{STAB} show that the mean of log-exchange rate appreciate on expectation of intervention on announcement day and day after WDAS/RDAS/BDCs auction. The exchange rate is expected to appreciate by 7% on the day of intervention announcement but the expectation of this announcement on the exchange rate reduces to 6% and 4.2% on two day and three day after. All past, present and future released announcement related on BOT, α_{t+i}^{BofT} cause appreciation shock. The CBN announcements related on interest rate/inflation, α_{t-i}^{INTR} are positive signed, cause exchange rate depreciation. All the variables are identified as significant. Disseminated news on interest rate/inflation is significant at 5%, while others are highly significant at 1%.

On the log-return, while Table 8 shows how log-return (LRETN) respond to announcements, if no MPC meeting was held. The data could not establish evidence that the log-return could be explained by these events. As indicated except for a day, β_{t-1}^{BofT} and two days, β_{t-2}^{BofT} before announcements, all past, contemporaneous and lead dates for the various announcements do not explain the behaviour of the log-returns series, as well as not statistically significant.

Table 7: LEXRT without MPCM announcement

Parameters	Estimates	σ_α	t_α	$p(t_\alpha)$
α_0^*	2.338730	0.002919	801.3437	0.0000
α_{t-3}^{STAB}	-0.039958	0.006925	-5.7700	0.0000
α_{t-2}^{STAB}	-0.058610	0.007173	-8.1705	0.0000
α_{t-1}^{STAB}	-0.076471	0.006187	-12.3608	0.0000
α_t^{STAB}	-0.070962	0.006334	-11.2030	0.0000
α_{t+1}^{STAB}	-0.075928	0.006188	-12.2694	0.0000
α_{t+2}^{STAB}	-0.060175	0.007163	-8.4007	0.0000
α_{t+3}^{STAB}	-0.042354	0.006924	-6.1173	0.0000
α_{t-3}^{INTR}	0.048299	0.019074	2.5322	0.0114
α_{t-2}^{INTR}	0.049676	0.019067	2.6054	0.0092
α_{t-1}^{INTR}	0.044851	0.019064	2.3527	0.0187
α_t^{INTR}	0.046304	0.019063	2.4290	0.0152
α_{t+1}^{INTR}	0.047282	0.019075	2.4788	0.0132
α_{t+2}^{INTR}	0.053014	0.019076	2.7791	0.0055
α_{t+3}^{INTR}	0.051819	0.019077	2.7163	0.0066
α_{t-3}^{BofT}	-0.038366	0.010618	-3.6133	0.0003
α_{t-2}^{BofT}	-0.037400	0.010588	-3.5324	0.0004
α_{t-1}^{BofT}	-0.037773	0.010592	-3.5662	0.0004
α_t^{BofT}	-0.038231	0.010581	-3.6132	0.0003
α_{t+1}^{BofT}	-0.039570	0.010585	-3.7382	0.0002
α_{t+2}^{BofT}	-0.039391	0.010578	-3.7238	0.0002
α_{t+3}^{BofT}	-0.036080	0.010606	-3.4019	0.0007
ω_0	0.0001	0.0000031	33.4517	0.0000
ω_1	1.1060	0.0409	27.0226	0.0000
Ω	0.1648	0.0103	15.9772	0.0000
$\bar{R}^2$		0.3295		

F-statistic	94.5782
Prob(F-stat)	0.0000

The statistics – σ_α, t_α and $p(t_\alpha)$ are the standard error, the t - value and probability of t value for α, respectively. The same apply for each β parameter estimates.

Table 8: LRETN Equation without MPCM announcement

Parameters	Estimates	σ_β	t_β	$p(t_\beta)$
β_0^*	0.0000047	0.000027	1.7765	0.0757
β_{t-3}^{STAB}	-0.000047	0.000065	-0.7153	0.4745
β_{t-2}^{STAB}	-0.000004	0.000067	-0.0663	0.9472
β_{t-1}^{STAB}	0.000058	0.000058	1.0066	0.3142
β_t^{STAB}	0.000043	0.000059	0.7297	0.4656
β_{t+1}^{STAB}	-0.000065	0.000058	-1.1136	0.2655
β_{t+2}^{STAB}	-0.000056	0.000067	-0.8255	0.4091
β_{t+3}^{STAB}	-0.000054	0.000065	-0.8270	0.4083
β_{t-3}^{INTR}	-0.000040	0.000179	-0.2216	0.8247
β_{t-2}^{INTR}	-0.000031	0.000179	-0.1740	0.8618
β_{t-1}^{INTR}	-0.000055	0.000179	-0.3073	0.7586
β_t^{INTR}	-0.000003	0.000179	-0.0150	0.9880
β_{t+1}^{INTR}	0.000018	0.000179	0.0996	0.9206
β_{t+2}^{INTR}	-0.000063	0.000179	-0.3540	0.7234
β_{t+3}^{INTR}	-0.000050	0.000179	-0.2784	0.7807
β_{t-3}^{BofT}	-0.000082	0.000100	-0.8215	0.4114
β_{t-2}^{BofT}	0.000395	0.000099	3.9806	0.0001
β_{t-1}^{BofT}	0.000414	0.000099	4.1621	0.0000
β_t^{BofT}	0.000175	0.000099	1.7594	0.0786
β_{t+1}^{BofT}	-0.000048	0.000099	-0.4864	0.6267
β_{t+2}^{BofT}	-0.000039	0.000099	-0.3959	0.6922
β_{t+3}^{BofT}	-0.000053	0.000100	-0.5361	0.5919
ω_0	0.000005	0.0000002	25.0000	0.0000
ω_1	8.4986	0.1886	45.0548	0.0000
Ω	0.2335	0.0034	69.3200	0.0000
$\bar{R}^2$		0.0105		
F-statistic		1.0166		
Prob(F-stat)		0.0913		

The statistics – σ_α, t_α and $p(t_\alpha)$ are the standard error, the t - value and probability of t value for α, respectively. The same apply for each β parameter estimates.

Table 9 presents the result for the event driven model that analyses how log-exchange rate returns (LRETN) responds to combine effect of MPC meeting held and CBN announcements released. We find that the expected value of log exchange rate without both meetings and news released is 2.337 (approximately, 217.7NGN) with an accompanying 95% confidence interval (C.I.) between 2.31 and 2.342. While the CBN disseminates announcement on MPC meeting, the exchange rate is expected to rise (depreciate) from surprises occasioned by information from all days before, on the announcement day, and all days after the announcement day. The contemporaneous dummy for MPCM, α_t^{MPCM} indicates that the mean value of the exchange rate may depreciate by approximately 0.95% on news of schedule meeting in the forex market.

The coefficient of the one day before the MPC meeting α_{t-1}^{MPCM} shows that the average value of exchange rate is expected to rise (depreciate) by 0.587% on expectation of meeting the following day. This is in consistent with Lucca and Moench (2015) who observed approximately 49 basis points increase in the S&P 500 index a day before the FOMC announcement, and in which about 80% of them signalled a pre-FOMC announcement drift. Contrary, Lyócsa *et al.* (2019) find that quantitative easing announcements does not impact stock realized volatility not only on news release but also five days before and five days after announcement date. Ekincia *et al.* (2019) show a negative impact of announcement release on the weighted bid, ask and mid-prices in the post-release period.

Analogous to the case without the meeting announcement, the dummies for intervention, α_{t+i}^{STAB} provide evidence that the exchange rate decreases (appreciate) on expectation of the WDAS/RDAS auction for day before, D-day and day after announcements. We notice that the forex intervention shocks explains approximately 7% for the log-exchange rate, ceteris paribus. We observe that the exchange rate responds more on announcement on intervention a day

before (7.65%) and a day after (7.57%) than on the announcement day (7.07%). A possible reason for this is that the central bank's pronouncements on intervention sends strong signal that may motivate or mitigate forex hoarding.

The precise degree of effect however depends on a credible monetary policy transmission mechanism. In the forex market, we observe that intervention via the RDAS is time-constraint within the opening window hours, but forex demands and official supply in banks and BDCs operate 24 hours. Hence, the expectation from whether RDAS bids may be successful or not may cause short term hoarding leading to temporary depreciation. If the bid is successful during the window, information gets to market participants and increase supply effects is expected to relieve the hoardings on that day.

The dummies for trade balance, α_{t+i}^{BofT} shows that the mean value of the exchange rate appreciates on expectation of announcement on trade issues for the days before, D-day and day after announcements. We observe that the trade balance surprises explain about 3.8% variation of the log-exchange rate caprices on the announcement day. In addition, the log-exchange rate increased by approximately 4.5% on the day before the announcement and by 4.6% on the announcement day. Our finding collaborates Hussaina and Ben Omrane (2020) observed that US macroeconomic news fundamentals exhibit a significant influence on the Canadian stock return and volatility. In particular, during the 2008 recession, more US news announcements exert significant impacts on the Canadian equity returns.

The α_{t+i}^{INTR} for i show that the mean of log-exchange rate responds to around 5% to news related macroeconomic variable on long term interest rate and inflation control. This may be associated with possible risk premium for market changes due to the announcement. Aside the intervention shocks, the depreciation drift occasioned by other macroeconomic announcements in the forex market may be seen as a premium to the exchange rate shock. With approximately

4.62%, we observe that the average value of the exchange rate depreciates on the announcement day, increased more on the day after the announcement by 4.73% and two days after the announcement by about 5.32% and independently move slowly down on the third day after with approximately 5.19%. This announcement reveals to market participants the information about imminent and economic conditions that the central bank intend to adapt for the economy.

The announcements related to the intervention, price control and trade balance on exchange rate are all statistically significant. The various dummies for the macroeconomic variable reject the null for the past, present and future on how exchange rate respond to announcements from the central bank. The result supports Hausman and Wongswan (2011) on how global stock price indices respond to news surprises in the US days before and after. We find a light conflict with Pyo and Lee (2020) who observe that the effect of announcement on BTC price is rather difficult to affirm because most of the variable for the three days before and after the announcement are not significant and bear no explanatory power.

The effect of MPC meeting schedule was not statistically significant. This indicate that exchange rate does not respond to the monetary policy committee meeting's announcement. The explanatory has low (approximately, 33%) prediction power, while the overall model is highly significant. Since our interest is examined how exchange rate respond to the dichotomy of CBN announcements, the model significance is important relative to its explanatory ability that concerns with prediction of exchange rate through the announcements.

Table 10 present the result when we access the combined effects of MPC meetings and the CBN announcements for log returns. The result was inconsistent with some study by Lucca and Moench (2015) on how the returns for global stock indices respond to FOMC and US macroeconomic news. Our result shows that the log-returns does not respond to both announcement from MPC Meeting and CBN released macroeconomic announcements. Like

with log-returns without MPC meetings, in absence of surprises from both meeting and announcements, the parameter estimates for the intercept, β_0^* indicates that the expected value of the log-return series is meagre of 0.00045%.

The Forex intervention announcement impinge mixed effects on the expected value of exchange rate for announcement day and day before or after as the exchange rate respond with appreciation or depreciation shocks. Not surprisingly, all the variables are insignificant except dummy for the BofT announcement for a day before, β_{t-1}^{BofT} and two days before, β_{t-2}^{BofT}, which are both highly significance. The combined effects for both as reported from the Wald test is not significant. The overall event model lacks explanatory power and the combined effects for all past, contemporaneous and leads announcement shocks are insignificant. The data evidence is not strong to support that both MPCM meetings- and macroeconomic announcements influence the return.

Table 9: The LEXRT Model with MPCM Announcement

					0.95 C.I.	
Parameters	Estimates	σ_α	t_α	$p(t_\alpha)$	Low	High
α_0^*	2.337214	0.00305	766.2823	0.0000	2.3312	2.3431
α_{t-3}^{MPCM}	0.009395	0.013065	0.719108	0.4721	-0.0162	0.0350
α_{t-2}^{MPCM}	0.012582	0.013128	0.958364	0.3379	-0.0132	0.0383
α_{t-1}^{MPCM}	0.005871	0.013126	0.447289	0.6547	-0.0199	0.0316
α_t^{MPCM}	0.009526	0.013130	0.725518	0.4682	-0.0162	0.0353
α_{t+1}^{MPCM}	0.011209	0.013065	0.857921	0.3910	-0.0144	0.0368
α_{t+2}^{MPCM}	0.010768	0.013053	0.824956	0.4094	-0.0148	0.0364
α_{t+3}^{MPCM}	0.005255	0.013066	0.402203	0.6876	-0.0204	0.0309
α_{t-3}^{STAB}	-0.039697	0.006952	-5.709944	0.0000	-0.0533	-0.0261
α_{t-2}^{STAB}	-0.058227	0.007191	-8.097162	0.0000	-0.0723	-0.0441
α_{t-1}^{STAB}	-0.076495	0.006204	-12.330350	0.0000	-0.0887	-0.0643
α_t^{STAB}	-0.070742	0.006365	-11.114200	0.0000	-0.0832	-0.0583
α_{t+1}^{STAB}	-0.075720	0.006218	-12.177730	0.0000	-0.0879	-0.0635
α_{t+2}^{STAB}	-0.060650	0.007197	-8.426752	0.0000	-0.0748	-0.0465
α_{t+3}^{STAB}	-0.042981	0.006951	-6.183429	0.0000	-0.0566	-0.0294
α_{t-3}^{INTR}	0.048716	0.019089	2.552081	0.0107	0.0113	0.0861
α_{t-2}^{INTR}	0.050504	0.019085	2.646304	0.0082	0.0131	0.0879
α_{t-1}^{INTR}	0.045299	0.019083	2.373803	0.0177	0.0079	0.0827
α_t^{INTR}	0.046235	0.019084	2.422647	0.0155	0.0088	0.0837
α_{t+1}^{INTR}	0.047346	0.019095	2.479509	0.0132	0.0099	0.0848
α_{t+2}^{INTR}	0.053203	0.019096	2.786100	0.0054	0.0158	0.0906

α_{t+3}^{INTR}	0.051928	0.019099	2.718944	0.0066	0.0145	0.0894
α_{t-3}^{BofT}	-0.038601	0.010644	-3.626440	0.0003	-0.0595	-0.0177
α_{t-2}^{BofT}	-0.037433	0.010616	-3.526219	0.0004	-0.0582	-0.0166
α_{t-1}^{BofT}	-0.038026	0.010618	-3.581323	0.0003	-0.0588	-0.0172
α_{t}^{BofT}	-0.038142	0.010607	-3.595998	0.0003	-0.0589	-0.0173
α_{t+1}^{BofT}	-0.039590	0.010604	-3.733613	0.0002	-0.0604	-0.0188
α_{t+2}^{BofT}	-0.039391	0.010594	-3.718360	0.0002	-0.0602	-0.0186
α_{t+3}^{BofT}	-0.035791	0.010620	-3.370028	0.0008	-0.0566	-0.0150
ω_0	0.000028	0.0000009	31.111111	0.0000		
ω_1	1.104331	0.040375	27.351920	0.0000		
Ω	0.165190	0.010834	15.247070	0.0000		
$\bar{R}^2$		0.328865				
F-statistic		70.98400				
p (F-statistic)		0.000000				

The statistics – σ_α, t_α, and $p(t_\alpha)$ are standard error, t - value and probability value of α, respectively.

Table 10: The Log-return (LRETN) with MPCM Announcement

Parameters	Estimates	σ_β	t_β	$p\ (t_\beta)$
β_0^*	0.000045	0.000029	1.578286	0.1146
β_{t-3}^{MPCM}	-0.000042	0.000123	-0.345836	0.7295
β_{t-2}^{MPCM}	-0.000016	0.000123	-0.127053	0.8989
β_{t-1}^{MPCM}	-0.000049	0.000123	-0.394117	0.6935
β_{t}^{MPCM}	0.000061	0.000123	0.492858	0.6221
β_{t+1}^{MPCM}	-0.000003	0.000123	-0.023323	0.9814
β_{t+2}^{MPCM}	0.000152	0.000123	1.243139	0.2139
β_{t+3}^{MPCM}	0.000035	0.000123	0.285122	0.7756
β_{t-3}^{STAB}	-0.000050	0.000065	-0.758901	0.4480
β_{t-2}^{STAB}	-0.000002	0.000068	-0.033235	0.9735
β_{t-1}^{STAB}	0.000059	0.000058	1.018648	0.3084
β_{t}^{STAB}	0.000047	0.000060	0.791323	0.4288
β_{t+1}^{STAB}	-0.000066	0.000058	-1.121856	0.2620
β_{t+2}^{STAB}	-0.000056	0.000068	-0.832500	0.4052
β_{t+3}^{STAB}	-0.000055	0.000065	-0.840483	0.4007
β_{t-3}^{INTR}	-0.000039	0.000179	-0.220108	0.8258
β_{t-2}^{INTR}	-0.000032	0.000179	-0.180388	0.8569
β_{t-1}^{INTR}	-0.000052	0.000179	-0.291086	0.7710
β_{t}^{INTR}	0.000000	0.000179	-0.000400	0.9997
β_{t+1}^{INTR}	0.000021	0.000179	0.115523	0.9080
β_{t+2}^{INTR}	-0.000060	0.000179	-0.334676	0.7379
β_{t+3}^{INTR}	-0.000048	0.000179	-0.266256	0.7901
β_{t-3}^{BofT}	-0.000086	0.000100	-0.858956	0.3904
β_{t-2}^{BofT}	0.000399	0.000100	4.002995	0.0001
β_{t-1}^{BofT}	0.000406	0.000100	4.076629	0.0000
β_{t}^{BofT}	0.000179	0.000100	1.793510	0.0730

β_{t+1}^{BofT}	-0.000051	0.000100	-0.513958	0.6073
β_{t+2}^{BofT}	-0.000036	0.000099	-0.361784	0.7175
β_{t+3}^{BofT}	-0.000054	0.000100	-0.542486	0.5875
ω_0	-0.000003	0.000001	-0.718925	0.4722
ω_1	11.376510	0.477246	23.837840	0.0000
Ω	0.186635	0.003942	47.346850	0.0000
$\bar{R}^2$		0.011079		
F-statistic		1.018844		
p(F-statistic)		0.085441		

The statistics – σ_α, $t_\alpha$and $p(t_\alpha)$ are the standard error, the t - value and probability of t-value for α, respectively. Same apply for each β parameter estimates

4.3. Diagnostic Tests

Unlike the MPC meetings, the announcements affects the exchange rate behaviours but not its return. These results has implications for forex market dynamics and monetary policy direction in future. Hence, we conduct some robustness test for the exchange rate models to validate the adequacy of the estimations. The results, presented in Table 11, show that the Breusch-Pagan-Godfrey test with the null of No ARCH effect is not significant. The *p* values of approximately 47% and 32% for the model with and without MPC meetings, respectively, suggest evidence on the absence of heteroscedasticity in the models' residuals. The Breusch-Godfrey test is also insignificant. With *p* values of 0.25 and 0.17 for the model with and without the MPC meetings, respectively, the result provides no basis to reject the null of no serially correlation. The Jarque-Bera statistics indicate that the residuals are not significant, hence, we could not reject the normality null. The Theil inequality coefficients [0.0274] for both models (with and without) log of exchange rate forecasts is not very close to 1, suggesting the model is capable of generating better forecasts.

Table 11: Diagnostic Tests

Statistics	Heteroskedasticity[a]	Autocorrelation[b]	Heteroskedasticity	Autocorrelation
R^2	16.534	15.442	**18.195**	**14.694**
F-statistic	0.8622	1.3861	**0.9255**	**1.0531**
Prob.(F)	0.4706	0.2501	**0.3225**	**0.1726**
Prob.(X^2)	0.1251	0.0817	**0.1051**	**0.0551**
	Normality[c]		Normality[c]	
Prob.(JB)	0.0999		**0.1201**	
Theil	0.0274		**0.0274**	

The **BOLD** figures indicate result of robustness diagnosis for the LEXRT model with the MPCM in included in the estimation. [a] Breusch-Pagan-Godfrey homoskedastic test; [b] Breusch-Godfrey no serial correlation test. [c] Jarque-Bera (JB) normality test.

4.4. Evaluation of Working Hypothesis

As presented in Table 7 and Table 9, the results show that the announcements related direct intervention via the WDAS\RDAS\Special intervention for Bureaux de Change, BDCs (STAB) is significant suggesting that for all the days before, on and after, we have every reason not to accept the null. In other words, the result suggest that forex intervention and the direct exchange rate stabilization program news does affect the exchange rates for both models of announcements without the meetings and announcements with the meetings. Hence the first null hypothesis is wholly rejected at 1 percent significant level. Contrary to hypothesis 1, for the exchange rate returns models presented in Table 8 and 10, we found no enough evidence to reject the null. In other words, there is evidence that the exchange rate stabilization program news does not affect the exchange rates returns in Nigeria. This is even more so with or without the involvement of the MPC meeting announcement in the model.

Table 7 indicates that the response of exchange rates to all the announcements related to the major macroeconomic variables as inflation and interest rates information (INTR) shocks for the event model without MPC meeting announcements are highly significant at 1 percent level and as well as significant at 10 percent level for the event driven model with the meeting variables. These provide enough evidence to reject the third null hypothesis in favour of the alternative hypothesis. Turning to the fourth hypothesis that there is no significance relationship between interest rate announcement and the exchange rates returns, we do not have supportive evidence to refute the null, as all the coefficients of all the dummies for the day before, the announcements day and the days after the announcements are all not significant for both model types with and without involvement of the MPC announcements dummies.

For the announcements related to the incorporation of the MPC meeting in the exchange rates and returns event driven model, we observe that the coefficients of the MPC meetings in the exchange rate model is significant. We do not have enough evidence to accept the null that MPC has no effect on exchange rate dynamics, rather our findings favours the alternatives. For the returns model, we observe a contrary position that the MPC announcement has no impact on the exchange rate returns in Nigeria. The dummies for the MPC announcement was not significant, hence showing supportive evidence to accept the null.

4.5. Discussion of Findings

The study has shown that macroeconomic announcements and MPC meetings affect the exchange rates but not the exchange rata returns in the Nigerian forex markets. This finding is in line with Indriawana *et al.* (2021) for long-term US and German bond futures who show that after expansionary shocks, there is large investment trading strategy in government bond market with substantial yields up to four times the ratio of buy-and-hold assets.

First is that news impinges immediate shock on the value of the exchange rates but may not be the cause of sporadic intraday and a latent volatility pattern volatility exhibit by the returns. This finding is in line with conclusion of Evans and Speight (2010) who studied study simultaneously controls for the distinct calendar effects, latent volatility and establish that news emanating from the US observed to cause statistically significant influences on exchange rate.

Second, foreign exchange stability and intervention announcements could be used to curb excessive fluctuation in the markets. That is the periodic discretionary trading of foreign exchange by intervening in the forex market on order to influence the exchange rate is effective and could as well be sterilised in order not to significantly affect money based. The CBN can sterilize this action by selling the appropriate number of naira dominated assets or bonds in the open market operations.

Third is that market participant is mindful and strategic about information occasioned by announcement of schedule periodic monetary policy committee meetings. The increase in exchange rate fluctuation is substantial when the market is forewarned of an announcement and surprise news cause longer short-term volatility. Hence, participants observe the markets and prepare for next government policy decisions to regular the exchange rate, which helps them arbitrate, as well as hedge any possible loss.

The fluctuation in the returns series may be explain by other factors not considered in our study. In other words, other factors such as influence of banks, relative prices, nature of the economy, fiscal policy influences, capital and stock market operations activities, which are not capture in the events driven models but are well known to influence the exchange rate, its returns and its differentials could possibly be checked in considering sporadic factors that influences the exchange rate returns.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

This study explores the link between exchange rates and announcements related to its basic fundamentals. We work with conventional class of monetary theory of exchange rate determination in which focus on the roles of macroeconomic fundamentals in the forecast of the nominal rate of exchange under the hypothetical construct goods prices are perfectly flexible, stability in monetary conditions and instantaneously existence of PPP at all times. The implication of the announcements for the behaviour of exchange rate remains an incessant debate for emerging countries where the exchange rate affects macroeconomic stability. The summary of our discoveries are presented.

That macroeconomic factors and their announcements could cause sporadic swings in the exchange rate and its returns, similar to stocks, bonds and other financial assets. That macroeconomic announcements and MPC meetings affect the exchange rates but not the exchange rata returns in the Nigerian forex markets. Also, that the macroeconomic announcements related to sterilised intervention through the WDAS\RDAS\intervention for BDCs has effect on exchange rate fluctuations.

That announcements related to exchange rate stabilization program news does not affect the daily exchange rates returns. That the exchange rates respond to all the announcements related to the major macroeconomic variables as inflation and interest rates information shocks. The exchange rate returns does not respond to conventional fluctuation occasioned by the shock impinges by announcements. That the monetary policy committee meeting announcement does have much impacts on the exchange rate dynamics.

That the monetary policy committee meeting announcement does not have much impacts on the exchange rate returns.

5.2 Conclusions

The relationship between macroeconomic announcements and the exchange rates is important for financial stability and provides a basis for the overall monetary policy framework. Such regular or periodic macroeconomic announcements from the central banks convey information that may cause a drift on the value behaviour of the exchange rate expected from fundamentals. Some previous studies Indriawana *et al.* (2021) examines a post-FOMC announcement drift on long-term US and German bonds, some others (Ben Omrane *et al*., 2019) analyse the 'stable' effects of central bank announcements on the exchange rate, (Cheung *et al.,* 2019) and Ben Omrane *enmbvİzt al.* (2019) investigate the announcement effects on exchange rate returns, and Ben Omrane and Savaser (2017) on the exchange rate volatility. We confirm the effect of announcements and MPC announcements under a unified framework for both the exchange rate and the exchange rate returns.

The basic thrust of this study is to verify that macroeconomic announcements published regularly in form of circulars affect the behaviours of the exchange rate in the Nigeria. We focus on the announcements that convey news on stabilising the exchange rate, and apply event driven analysis to confirm the impact of both MPC meetings' and CBN's announcements on the log of exchange rate and its returns. Since the Nigerian exchange rate is sensitive to forex reserves, financial assets, and official interventions (Dayyabu *et al.,* 2016; Bala-Sani and Hassan, 2018; Kalu, *et al.* 2019), we considered announcements that involve direct intervention via the WDAS\RDAS\BDCs (STAB); long-term interest rate and inflation rate (INTR); and balance of trade (BofT) positions. We found that although the MPC meeting is insignificantly, the exchange rate responds significantly to announcements. Contrary, we observe that both the MPC meetings and the CBN's announcement do not have impact on the exchange rate return. This study therefore concluded that the announcements convey information that have impact on the exchange rate but not its return.

5.3. Recommendations

In general, this studies has shown that macroeconomic announcements could cause sporadic swings in the exchange rates beyond fundamentals. Market participants and monetary authorities would consider this finding invaluable. In order for government to ensure that the exchange rate does not fluctuate beyond fundamental needed to attain objective of macroeconomic policies, authorities should embark on policies that would influence the exchange rate in order to adjust it in the desired direction and to stabilise it.

Hence, this study makes the following recommendations to ensure exchange rate stabilisation.

i. Monetary authorities should invest in overseas assets altogether. This will help increase in reserve and also provide foreign exchange to mitigate undue fluctuation in the exchange rates. This nature of exchange rate stabilization may help build the reserves both in short-term or long-run and ensure naira arrive at an acceptable rate of exchange with other foreign currencies.

ii. The CBN can reduced exchange rate fluctuations by ensuring intervention is guided and properly monitored to avoid divergence of the funds. Since intervention influence the monetary funds transfer rate of the national currency, usually with its own reserves, the central bank may engage the commercial bank to take active and participatory in the forex direct intervention, rather than committing such to BDC which are known to divert (launders) the funds.

iii. For central bank to exert any influence and turn the tide in favour of the naira attaining a favourable exchange rate, the apex bank should be more stable with policies. Stability helps announcement to have consistent effect on the exchange rate through the

monetary channel, otherwise the exchange rate is likely to move in favour of more stable, developed countries.

iv. Both fiscal and monetary authorities must have strong economic base- in terms of capacity to produce for exports, in addition to having a robust and diversified source of revenue, driven by functional infrastructure, among other. The naira exchange rate cannot be done in isolation of other considerations, for example, the stock of the reserves and the country's capacity to earn sufficient foreign exchange revenue from exports of goods and services.

v. The monetary should unified all forex windows of exchange rates. A uniform exchange rate, as against the multiple regime currently in place should be implemented. A multiple regime causes wide band and fluctuations which may be detrimental to the real sector.

vi. There should be special support for export-oriented companies. Foreign and Indigenous conglomerates that are willing to locate their factories in Nigeria and engage in producing for exports should be given special consideration in terms of tax holiday and policy relief.

vii. The central bank should ensure measures for more stable environment for international economic flows. A basic effect of the exchange rates stabilisation is a higher level of certainty in international flows. A low degree of national currency's value fluctuations causes that entities maintaining economic relations with foreign countries may take long-term decisions less burdened with the exchange rate risk.

viii. Adoption of common currencies, for instance the proposed "Eco" may also help stabilized the regional exchange rate as with the euro in the European Union. Judging

from the length of stay in the system of countries that have already adopted the common currency, by signals coming from the authorities of the member states only aspiring to join the euro area, and also referring to the experience of the early nineties' currency crisis, this policy may help stabilising the exchange rate.

5.4. Limitation and Delimitation of the Study

The implication of the central bank announcements for the behaviour of exchange rate and macroeconomic stability has remains an incessant debate over the years. Most empirical studies on this issue has been faced with which exchange rates measure to consider as well as the categorisation of announcement components. This research efforts are limited in its analysis in the following capacities

i. First, we only cover only the periods in which 88 MPC meetings were held and published. All issues regarding the period where MPC meetings were not published are completely obliterated from our study.
ii. Second, our definition of exchange rate is limited to simple average of the daily bid-ask price quotes. Although this is in line with some authors, for instance Bauwens and Giot (2000), but other studies have suggested that the closing price may be considered to avoid heteroskedasticity.
iii. Third, our study is did not separate positive or negative announcement to explain how exchange rates respond to this news surprises, unlike similar studies as Boudt *et al*. (2019) and Tamgac (2021).
iv. Fourth, we only considered the exchange rates of naira to dollars, and neglect the influence of this announcements on exchange rate with other national currencies.
v. Lastly, we focus on the effect of domestic announcements emanating from the central bank, we do not consider announcement from fiscal authorities or even from the financial markets, and also completely neglects the foreign countries announcements

5.5. Contribution to Knowledge

This study provides a quantitative response to the effect of macroeconomic announcement on the exchange rate behaviours.

The study has contributed to knowledge in the following three capacities:

i. First, this study bridges the gap for the relationship between macroeconomic announcement and exchange rates for a developing country, Nigeria, which is scarcely studied.
ii. Second, the study considers the relationships alongside interconnectedness with MPC meeting announcements, unlike similar studies which focus on either macroeconomic announcement or MPC/FOMC separately for assets pricing considered.
iii. Third, the study also contributed to knowledge by verifying whether announcements affect exchange rates returns unlike existing studies that focus on their effects on exchange rates volatilities.
iv. Fourth, unlike available study (Pyo & Lee, 2020) which apply applied event models to analyse the cryptocurrency markets, our study used same methodology to analysed the forex exchange markets dynamics.
v. Lastly, we provide numerous policy recommendations that could help monetary authorities and central banks to ensure appropriate exchange rates stabilization in the foreign exchange markets.

5.6. Suggestion for Further Studies

Literature on the impact on information shocks on announcements on exchange rates is broad, particularly for developed countries. Indeed, this study has shown that news from fundamental variables as interventions, interest rate and balance of trade which convey information shocks could predict future changes in exchange rates. However, the study limits its focus on the behaviour of the exchange rates and the exchange rate returns. We therefore suggest that further

and future research may be extended to the impact of announcements on exchange rate in the following uncovered areas:

i. Such impact should be based on the volatility of exchange rate in the Nigerian forex market, rather than the actual and returns series as done in this work.

ii. Unlike this study that applied daily data, future studies could consider high-frequencies data that involves very minutes or seconds report of exchange rate values reported on the routers, if available. Some studies may apply multiple frequencies options such as yearly, quarterly, bi-annual, monthly and infra-monthly (weekly) in order to be able to verify the sensitivity of data frequency on expected outcomes.

iii. In addition, this research is incumbent foundation for studies that intend to consider the efficacy of the channel – the monetary transmission mechanism – via which the central banks announcements affect the behaviour of the exchange rate.

iv. Future studies may also wish to consider the effect of international macroeconomic announcements on the naira-dollar exchange rates dynamics.

v. This study did not separate the effect of positive or negative announcement to explain how exchange rates respond to this news surprises, future studies for Nigeria may focus on this.

vi. Lastly, although we use event driven models with dummies variables, we do not considered interaction between dummies, hence future studies may centre on this.

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Appendix

Table 2.1: 36 Selected MPCM Meetings and CBN Circulars with Memo No., Title, Published Date and Empirical Categorisation

	Memo	Title	Published Date	Category
1	MPC - 132 - 2020 - 1	Central Bank of Nigeria Communique No. 132 of the Monetary Policy Committee Meeting Held September 21 and 22 2020	09/22/2020	MPCM
2	FMD	Nigerian Treasury Bills Issue Programme 4th Quarter 2020	09/01/2020	INTR
3	TED/FEM/FPC/GEN/01/006	Resumption Of Sales To BDCs	08/27/2020	STAB
4	MPD/DIR/GEN/MPC/09/016	Central bank of Nigeria MPC Communique No. 131 with Personal Statements of Members	08/12/2020	MPCM
5	FMD	Nigerian Treasury Bills Issue Programme 3rd Quarter 2020	06/04/2020	INTR
6	TED/FEM/FPC/GEN/01/003	Clarification on Operations of Ordinary Domiciliary Accounts	02/24/2020	BofT
7	ED/FEM/FPC/GEN/01/002	Milk and Dairy Products Importation	02/11/2020	BofT
8	FMD	Nigerian Treasury Bills Issue Programme 1st Quarter 2020	12/04/2019	INTR
9	FMD	NTBs Issue Programme 4th Quarter 2019	09/04/2019	INTR
10	MPC - 125 - 2019 - 1	Central bank of Nigeria Communique no. 125 of the Monetary Policy Committee Meeting of Monday 22nd and Tuesday 23rd July, 2019	07/23/2019	MPCM
11	FMD	3rd Quarter 2019 NTB Issue Programme	06/07/2019	INTR
12	FPR/DIR/GEN/CIR/07/019	Foreign Exchange Restriction on the Importation of 42 Items	12/10/2018	INTR
13	TED/FEM/FPC/GEN/01/005	Introduction of Special Intervention of Foreign Exchange Cash Sales to Bureau de Change Operators	11/29/2018	STAB
14	TED/FEM/FPC/GEN/01/001	Charges on The Sale of Foreign Exchange for Invisible Transactions (BTA, PTA, School Fees and Medicals)	02/12/2018	BofT
15	BPS/FPO/DIR/GEN/CIR/01/099	Unutilized FX Returned To The CBN For The SMIS Wholesale and Retail Interventions	07/03/2017	STAB
16	FMD/DIR/CIR/GEN/08/008	Further Liberalization of the Inter-Bank Foreign Exchange (FX) Market	06/05/2017	BofT
17	FMD/DIR/CIR/GEN/08/007	Establishment of Investors and Exporters FX Window	04/21/2017	STAB
18	TED/FEM/FPC/GEN/01/007	Foreign Exchange Sales To End Users	08/22/2016	STAB
19	TED/FEM/FPC/GEN/01/006	Sales of Forex To BDCs By IMTSO	08/09/2016	BofT
20	TED/FEM/FPC/GEN/01/005	2016 Hajj Pilgrimage	08/05/2016	BofT
21	TED/FEM/FPC/GEN/01/004	Sales of Foreign Currency Proceeds of International Money Transfers to Bureaux De Change Operators	07/22/2016	STAB
22	TED/FEM/FPC/GEN/01/016	2015 Hajj Operations: Purchase of Pilgrims Travelling Allowance (PTA)	08/13/2015	BofT
23	TED/FEM/FPC/GEN/01/015	Developments in the Foreign Exchange Market, Re: Cash Deposit into Domiciliary Accounts	08/05/2015	STAB
24	TED/FEM/FPC/GEN/01/010	Inclusion of Some Imported Goods and Services on the List of Items Not Valid for Foreign Exchange in the Nigerian Forex Market	06/26/2015	BofT
25	BSD/DIR/GEN/LAB/08/013	Currency Substitution and Dollarisation of the Nigerian Economy	04/17/2015	BofT
26	MPC-100-2015-1	CBN Communique No. 100 of the Monetary Policy Committee Meeting of Monday 23rd and Tuesday 24th March, 2015	03/24/2015	MPCM
27	MPC-99-2015-2	CBN Communique No. 99 of the Monetary Policy Committee Meeting with Personal Statements of members January 19 and 20, 2015	03/18/2015	MPCM
28	TED/FEM/FPC/GEN/01/005	Repatriation of Export Proceeds (Oil and non-Oil)	02/19/2015	BofT
29	FMD/FDO/GEN/CIR/02/05/15	Foreign Exchange Market Auction- RDAS No.05/2015	01/19/2015	STAB
30	FMD/FDO/GEN/CIR/01/94/14	Foreign Exchange Market Auction- RDAS No.94/2014 and FX Forward Auction No. 14/2014	12/10/2014	STAB
31	FMD/FDO/GEN/CIR/01/61/14	Foreign Exchange Market Auction- RDAS No.61/2014	08/11/2014	STAB
32	TED/FEM/FPC/GEN/01/015	Year 2014 Christian Pilgrimage; Purchase of Pilgrims Travelling Allowance	08/11/2014	BofT
33	FPR/DIR/GEN/CIR/01/009	Circular to All Bureau De Change: New Requirements for the Operation of Bureau De Change in Nigeria	06/24/2014	STAB
34	FMD/FDO/GEN/CIR/01/072/13	Foreign Exchange Market (WDAS) Auction No. 072/2013	09/23/2013	STAB
35	FMD/FDO/GEN/CIR/01/71/13	Foreign Exchange Market (WDAS) Auction No. 71/2013 and FX Forward Auction No 12/2013	09/18/2013	STAB
36	MPC-05-04	Document of the Monetary Policy Committee: Communique No. 35	05/31/2004	MPCM

Table 12: Volatility of Selected 24 African Countries' Exchange Rates (Against the US Dollar)

Countries	Jan. 00 Dec. 05	Jan. 06 Dec. 10	Jan. 11 Dec. 15	Jan. 16 Dec. 20
Algeria	0.65	0.75	0.30	0.70
Egypt	0.08	0.17	0.13	0.42
Morocco	0.38	0.89	0.53	0.13
South Africa	1.07	3.28	1.17	0.95
Tunisia	0.35	0.84	0.53	0.21
Frontier Market				
Botswana	0.48	0.64	0.36	1.04
Cape Verde	0.50	1.23	0.60	0.98
Kenya	0.38	0.65	0.34	0.38
Mauritius	0.32	1.24	0.92	2.69
Mozambique	0.99	0.83	1.06	0.54
Namibia	1.07	3.28	1.17	0.56
Ghana	0.33	0.45	0.39	0.59
Nigeria	0.18	0.55	0.33	0.18
Seychelles	0.69	3.86	1.80	1.02
Tanzania	0.58	1.07	0.54	0.55
Uganda	0.37	0.86	0.59	3.16
Zambia	0.78	1.54	0.75	1.07
Financially Developing				
Angola	0.08	0.12	0.16	0.33
Congo, Dem Rep of	0.56	1.55	0.77	0.88
Ethiopia	0.10	0.22	0.30	0.34
Lesotho	1.07	3.28	1.17	0.62
Madagascar	0.27	0.00	0.21	1.06
Malawi	0.27	0.00	0.21	0.31
Swaziland	1.07	3.28	1.17	2.67

Table 13: External Debt Indicators

Country	Total Debt (Million USD) 2020	Multilateral (as % of total) 2020	Bilateral (as % of total) 2020	Private (as % of total) 2020	Total Debt Outstanding (as % of GDP) 2016	2017	2018	2019	Debt Service (as % of Exports) 2016	2017	2018	2019
Algeria	3783	0.1	41.1	58.8	1.9	1.6	1.2	1.0	1.6	2.7	2.6	2.6
Angola	22211	2.2	35.7	62.1	19.3	21.1	22.9	23.7	6.2	8.3	9.7	10.9
Benin	1285	53.4	46.6	0.0	17.0	16.2	15.9	15.4	6.0	6.1	6.2	6.6
Botswana	3369	54.3	0.0	45.7	23.2	22.6	21.9	20.7	7.2	6.7	7.3	7.1
Burkina Faso	2626	75.7	24.3	0.0	23.8	22.5	23.4	25.1	2.5	3.0	3.6	4.3
Burundi	487	50.8	49.2	0.0	21.9	20.5	19.1	16.9	8.9	12.4	15.3	16.7
Cabo Verde	1560	50.5	21.9	27.6	87.4	91.8	92.5	91.2	8.5	8.8	9.0	9.1
Cameroon	2268	30.7	69.2	0.1	8.6	9.3	10.3	11.2	2.5	2.9	2.8	3.2
Central African Rep.	528	7.7	92.3	0.0	24.3	34.7	32.3	31.1	9.7	11.8	13.6	16.5
Chad	2757	80.7	19.3	0.0	21.9	20.6	18.8	17.9	3.3	5.2	4.3	3.8
Comoros	243	68.6	30.6	0.8	42.5	17.5	15.2	13.4	10.9	0.6	2.6	2.0
Congo	3534	5.8	67.4	26.8	25.3	21.4	20.7	19.9	1.2	3.0	2.9	2.8
Congo, Dem. Rep.	6156	41.6	14.0	44.4	22.4	20.3	22.4	23.3	1.7	2.4	2.2	2.4
Côte d'Ivoire	12022	5.2	38.0	56.8	48.7	45.6	41.1	38.1	12.3	10.4	10.7	10.6
Djibouti	666	52.0	48.0	0.0	50.3	48.4	48.4	48.9	8.5	9.5	9.3	8.2
Egypt	34385	26.1	64.3	9.5	13.2	17.3	19.1	19.9	11.3	12.7	29.0	29.4
Equatorial Guinea	1387	99.0	99.0	1.0	7.9	5.5	2.9	0.7	1.0	3.5	3.7	3.9
Eritrea	900	65.8	34.2	0.0	29.1	25.7	23.2	23.1	8.3	8.4	6.8	6.9
Ethiopia	7630	39.3	60.7	0.0	18.4	18.3	18.9	20.9	6.6	8.1	8.6	10.3
Gabon	3391	16.6	32.6	50.8	19.2	20.7	22.3	23.2	6.8	6.3	7.4	8.4
Gambia	415	54.2	45.8	0.0	44.1	42.2	37.0	34.2	33.0	32.8	30.6	30.1
Ghana	10612	29.7	53.5	16.7	26.9	29.3	33.0	33.6	3.3	7.9	4.1	4.9
Guinea	1306	55.7	44.3	0.0	23.2	23.7	23.2	21.1	23.6	3.5	3.9	4.2
Guinea-Bissau	232	39.6	60.4	0.0	25.3	22.7	22.1	22.0	1.2	1.7	5.2	4.8
Kenya	11991	42.6	45.5	11.9	29.4	30.5	29.8	28.5	5.9	5.5	11.2	6.3
Lesotho	758	75.8	24.2	0.0	32.6	49.1	56.0	52.1	3.6	4.3	3.3	3.0
Liberia	214	16.6	83.4	0.0	12.0	10.8	14.6	17.9	0.9	0.9	1.2	1.1
Libya	5574	50.3	57.4	42.6	5.9	6.8	6.1	4.8	0.0	0.0	0.0	0.0
Madagascar	4951	52.8	0.0	47.2	49.8	46.2	41.6	37.1	8.9	7.7	7.6	7.2
Malawi	961	53.7	46.3	0.0	18.5	25.5	18.0	15.9	2.4	2.8	4.2	4.4
Mali	2713	70.0	30.0	0.0	26.4	26.8	28.1	29.7	4.8	5.6	4.5	3.9
Mauritania	4225	48.0	50.4	1.6	107.5	101.9	78.1	74.4	6.0	7.5	12.1	12.0
Mauritius	2677	14.1	24.2	61.7	23.4	22.5	23.3	24.8	3.5	3.4	4.1	5.0
Morocco	28632	35.6	43.3	21.1	30.2	30.4	30.2	30.4	6.9	7.8	8.0	8.0
Mozambique	7900	54.4	5.8	39.7	54.7	53.4	58.4	66.8	11.9	13.6	13.5	12.3
Namibia	4905	33.6	20.0	80.0	37.5	41.9	40.3	38.6	31.0	19.4	19.6	18.8
Niger	3487	33.4	0.0	66.6	51.7	55.3	56.8	61.7	2.7	51.9	3.8	3.8
Nigeria	6522	53.1	46.9	0.0	2.5	3.2	3.3	3.4	0.4	0.7	0.7	0.7
Rwanda	1027	69.1	30.9	0.0	14.5	17.6	20.1	24.7	9.4	23.0	6.8	5.9
São Tomé and Príncipe	203	18.7	81.3	0.0	77.3	65.0	59.5	60.5	14.3	18.6	19.7	1.1
Senegal	8224	47.6	0.0	52.4	58.5	68.5	67.2	65.8	7.7	8.2	7.6	7.6
Seychelles	512	4.4	49.1	46.5	45.5	38.7	39.3	38.3	2.1	3.1	2.7	3.4
Sierra Leone	981	42.9	57.1	0.0	26.2	21.3	19.9	21.5	2.7	2.6	2.1	2.0
Somalia	3055	26.1	0.0	73.9	15.3	19.6	35.3	38.3	14.3	19.6	10.1	9.3
South Africa	137508	2.0	3.9	94.1	36.0	36.9	41.2	37.4	33.8	37.1	39.7	36.4
Sudan	43189	15.9	67.4	16.7	62.8	63.9	62.8	58.0	4.7	8.8	8.0	6.5
Swaziland	521	46.4	32.5	21.1	12.9	13.5	13.7	12.8	3.5	3.7	3.7	4.0
Tanzania	9733	47.0	24.7	28.3	34.5	36.4	36.6	35.7	3.4	5.2	6.1	6.7
Togo	554	27.2	72.8	0.0	14.3	17.4	19.4	20.2	3.0	3.6	3.3	3.0
Tunisia	23358	34.4	22.5	43.1	51.7	55.9	59.4	59.1	11.9	9.1	8.3	5.5
Uganda	5186	66.1	0.0	33.9	24.4	26.7	29.3	30.5	11.9	12.3	12.8	13.6
Zambia	8435	20.0	13.7	66.3	40.9	34.4	34.7	34.5	5.6	3.7	3.7	3.7
Zimbabwe	8 767	21.1	57.4	21.5	70.3	87.5	80.6	73.6	17.9	17.3	21.7	25.9
Africa	**457 463**	**21.2**	**30.0**	**48.8**	**22.5**	**23.2**	**23.7**	**23.2**	**9.6**	**10.7**	**12.1**	**11.8**