

The Effects of Selected Macroeconomic Variables on Currency Substitution in Nigeria

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Abstract

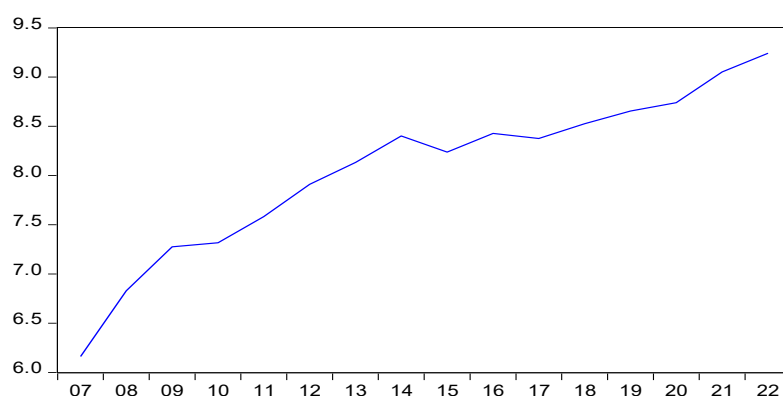
Currency substitution still remains a phenomena in many economies. It is the choice of local residents to desire foreign currency deposits above their national legal tenders. This is possible where the national currency fails to perform optimally to a great extent the traditional functions of medium of exchange, units of account and store of value. The increase in the choice by the local economic agents is attributed to suspected underlying economic factors arising from macroeconomic imbalances. The study set out to examine the effects of selected macroeconomic variables on currency substitution in Nigeria with the recognition of structural breaks within the study period of 1994 – 2022 (29 years). The researchers adopted the autoregressive distributed lag (ARDL) model to execute the study interest with the addition of the pre and post estimation techniques to fine tune the distributional properties. The study found that inflation rate and official exchange rate volatility had inverse relationship with the currency substitution behaviour in the country within the reviewed period. Domestic interest rate and public external debt exerted positive but non-significant influence on currency substitution in the country. Personal (Diaspora) remittances exerted positive and significant influence on the behaviours of foreign currency deposits. Among others, the study recommended strong need for government to establish the Naira Monetary Unit or Currency Board in the economy to arm exchange rate management. Also, rebuild the trust and confidence in the political system and create an economy that works, in order to address the Jappa Syndrome.

Keywords: Currency Substitution, Macroeconomic Variables, ARDL Model, Naira Monetary Unit, Structural Breaks.

1.0 Introduction

Currency substitution (CS) is a phenomenon and still remains a phenomena in many economies. It is the preference or choice of local residents to desire foreign currency deposits and portfolios above their national currency deposits and portfolios. In a world where national currencies are expected to be held at highest regards because of their attributes (otherwise perceptions) to happiness, stability, and development on economic agents, instead are held with mixed feelings. National currencies are legal tenders approved by the various monetary authorities to function primarily as (a) medium of exchange (b) store of value and (c) units of account. These currencies are either in fiat or recently crypto/ digital or jointly used in the economy. Therefore, where some national currencies of economies fail to function optimally on the mentioned functions, would result to change of choice (switching currency preferences) of national currency holdings by economic agents, hence the term “*currency substitution*”.

Currency substitution is therefore the use of different currencies as media of exchange (Cuddington, 1989); the situation in which foreign money substitutes for domestic money in its three traditional roles, as medium of exchange, store of value, or unit of account (Calvo&Vegh, 1992); as the demand for foreign fiat currency by domestic residents (Ramirez-Rojas, 1985); as the ability of domestic residents to switch between domestic and foreign fiat currency (Khan & Ramirez-Rojas, 1986); the replacement of domestic currencies with foreign currencies (Neanidis&Savva, 2006); the complete replacement of a domestic currency by another currency (Giovanini&Turtelboom, 1992); the use of foreign currency (direct currency substitution-two or more currencies) and foreign currency denominated bonds (indirect currency substitution) by domestic residents (McKinnon, 1982 in Viseth, 2001). Currency substitution can be thought of as *symmetrical*(where domestic and foreign residents hold both domestic and foreign currencies)and*asymmetrical*(where domestic residents hold domestic and foreign currencies but foreigners do not have a demand for domestic currency). In Nigeria, asymmetrical currency substitution is the case. The existence of currency substitution and preference by the economic agents of a country, is an indication that the national (local) currency have failed to effectively perform the traditional functions to a greater extent, due to some underlying macroeconomic imbalances caused by inflation, continued expectations of depreciation or volatility of values of local currency, weak policy-making institutions, political uncertainties (bad government), tendency to hold wealth in foreign currencies, deployment of financial innovation products in the payment system, etc. (Ujunwa, Ujunwa, Onah, Nwonye, &Chukwuwike, 2021; Ajibola, Udoette, Muhammad, &Anigwe, 2020; Doguwa, 2014; Mendoza, 2002; Viseth, 2001; El-Khafif, 2002). And these practicehave been on the increase in Nigeria despite strategic plans from the central bank (CBN) to stabilize the local currency-Naira, and the financial system. For example, the structural adjustment plan (SAP) of 1986, the bank recapitalization policy of 2004/2005, the banking system bailout of 2009/2010, the microfinance policy of 2006, the millennium development goals (MDGs) programme of 2000, the sustainable development goals (SDGs) of 2015, the re-classification of bank licensing of 2015, the adoption of various exchange rate regimes, the introduction of e-Naira-central bank digital currency (CBDC) of 2021, Naira 4 Dollar Scheme, 2021, etc, (www.cbn.gov.ng/documents/circulars), the growth of interest in foreign currency deposits have intensified amongst economic agents, that in 2021, it recorded N8,541.17 Billion and N10,329.95 Billion in 2022, an increase of 20.94% and thus posed a problem (see graph 1).



GRAPH 1: FOREIGN CURRENCY DEPOSIT

Source: CBN Statistical Bulletin, 2022

On April 17th, 2015, the central bank of Nigeria (CBN) through its circular to all banks *referenced BSD/DIR/GEN/LAB/08/013* titled “currency substitution and dollarization of the Nigerian economy”, reiterated its stand on the Naira currency, remaining as the only legal tender in Nigeria citing section 15 of the CBN Act 2017. Also, section 20 (1) which made the naira to be used only in the payment of any amount in Nigeria. In addition, section 20 (5) that defined the sanctions on conviction, if found guilty of the offence, up to a maximum of 6 months imprisonment (including confiscation and its related costs). This is why it is illegal to use foreign currencies to pay for any products/services or conduct a business offer or acceptance in Nigeria other than Naira. The question still remains as, why has currency substitution (foreign currency deposits) continued despite all the stabilization plans and market-oriented reforms introduced by the central governments and the central bank of Nigeria? Are there other influencers that researchers have not examined that could contribute to the growing choice for foreign deposit over national currency deposits? Your thought is as good as ours.

The aim of this study is to examine the effects of selected macroeconomic variables on currency substitution in Nigeria, and to measure the degree of response of currency substitution to the dynamics of the investigated macroeconomic variables. The selected variables are ratchet variables (inflation rate, domestic interest rate, and official exchange rate volatility), public external debt, personal (diaspora) remittances, and trade openness. The ratchet variables are independent variables that exert their maximum value over n th periods, and if found significant in a regression are described to have ratchet effect on the study. The rising external debt profile, the persistent migration of young professionals to other economies, and the activities of trade openness are to be investigated. The study is motivated by the inquisition to know the extent to which these selected macroeconomic variables influence currency substitution in Nigeria using the autoregressive distributed lag model (ARDL), accommodating the existence of structural breaks from 1994 to 2022, hence the gap for knowledge addition. This study's significance is therefore not only justified by the literature gap that it aims to fill, but also by the projection that its findings would be useful to the respective policy-makers in Nigeria. The paper is further structured into sections apart from the introduction, this include literature review, research methodology, data results and analysis, and the conclusion and recommendations.

2.0 Literature Review

Theoretically, *the transaction cost theory* first developed by Schwartz (1974) and later by Williamson in 1991 for a Nobel Prize award, theorized that whether activities would be internalized within a firm (here, in a country) depends on their transaction costs. Transaction cost theory is built on assumptions of bounded rationality and opportunism, defined as self-interest with guile/dishonesty due to advantage of information held. The researcher argued that when transaction costs are high (cost of buying dollar with local currency), internalizing the transaction within a hierarchy seemed appropriate decision (local currency deposits are preferred). Conversely, when transaction costs are low, buying the good or service on the market becomes the preferred option, characterized in three dimensions of uncertainty, frequency, and asset specificity, or the degree to which transaction-specific expenses were incurred. This affects international capital flows and influence currency substitution.

The portfolio theory and portfolio balance model were developed by Markowitz (1952) and Tobin [1969]. The modern portfolio theory by Markowitz exposed portfolio management as a method of reducing risk. The portfolio theory pointed that, given a desired level of risk exposures, an investor can optimize the expected returns of a portfolio (investment) through diversification. This is evident by investing in

less correlated assets, and grouping correlated assets together with those that move in opposite directions to each other, to reduce the risk for a given return. In technical terms, diversification reduces risk if returns are not perfectly positively correlated. Meanwhile, the portfolio-balance model by Tobin provided a monetary theory of the interest rate. For simplicity, there are only two financial assets—money and bonds. The portfolio balance model revolves around the choice of whether to hold wealth as money or as bonds, domestically or internationally, when interest rate adjusts, in order to achieve equilibrium (supply and demand) in the financial market. These arguments propel economic agents to keep their wealth in a basket of convertible currencies, thus influencing currency substitution.

The substitution effect theory developed by Vilfredo Pareto (1890), brought into the research world by Eugen Slutsky (1915), and further developed by John Hicks and RGD Allen (1934) referred to a product or services' decrease in demand or sales when consumers switch to alternative but comparable products. In consumer choice theory, substitution effect is paramount. It is the effect due only to the relative price change, controlling for the change in real income (expected income). Substitution effect in currency substitution, doesn't affect currencies with no substitutes that is, where economic agents can't switch to alternative currencies. The substitution effect of higher returns in currency substitution means investors and depositors would seek for or give up local currencies, in the face of consistent devaluation or hyper-inflation with no hope of stabilizing, for other basket of currencies that would give higher yields for more incomes (income effect).

The real business cycle (rational expectation) theory is based on the classical conception regarding the equilibration of markets. Lucas (1973), real business cycle included both the notion of compromise between the inflation and the real GDP level, while maintaining the short-run non-neutrality of money (Snowdon & Vane, 2005), and the one linking to the surprise element of the monetary policies, which influence the supply of goods and services if their effect on prices is incorrectly surprised, given the incomplete information held, influenced by technological changes. The dynamics of the production, employment and real interest rate equilibrium is independent of the monetary policy, the real variables differing only in reaction to technological changes. Lucas stated the three (3) important elements that are at the basis of the new classical model: (a) the negligible significance of money in influencing the business cycles, (b) the rationality of the economic agents who react in an optimum way to the real shocks, mainly related to the swings occurred at the level of productivity, governmental acquisitions or preferences, and (c) the orientation towards the dynamic analysis of the economy, based on rational expectations. Economic agents in Nigeria experience these economic shocks that change their business cycles.

The theory of pure altruism as developed by Piliavin & Charng (1990), is about the concept of benefiting others. A unique behavior which must benefit another person(s), must be performed voluntarily, must be performed intentionally, the benefit must be the goal by itself and must be performed without expecting any external reward. This could be applied on the migrants (local experts who have moved to other economies for greener pastures), in a sense that the migrants care not only for their own utility but also for the utility of the households in the country of origin. In addition, Van Wey (2004) supported that the "altruism" motive shows that having an emotional attachment to the household in the country of origin is so crucial so that remittances reflect a kind of commitment that the migrants have towards their families. That's why we can align based on the theory that the level of diaspora remittances increase with the migrants' incomes and to a great extent increase the recipients' incomes, hence influencing currency substitution.

The Purchasing Power Parity (PPP) originated by John Wheatley (1803) and developed by Gustav Cassel (1920) focused on the inflation and exchange rate relationship. It is a theory that ascertains the relative & comparative exchange value of foreign currencies to home currency. It compares the average costs of goods and services among countries as international trade (trade openness) is persuaded by cross country price differentials prompting changes in the spot exchange rate. The relative form of purchasing power parity (RPPP) addressed the problems of market imperfections and consumption patterns between different countries using different currencies.

The debt overhang hypothesis/theory developed by Myers (1977) and further inspired by Krugman (1988) and Sachs (1989), argued that high levels of debt represent a rise in the expected future tax burden for the private sector since sovereign governments finance their debt by taxing businesses and households, especially when the projected present value of future transfers is less than the current face value of a country's debt. Matandare & Tito (2018) further supported that debt overhang has detrimental effect on capital formation, consumption, and liquidity. This is justified as a greater portion of national cash flows or revenues are used to service existing debt, which further increase the debt burden, trap businesses (disrupt real business cycles) and nations in a vicious downward spiral. Mendoza (2002) added up that sudden stops occur when the country's external debt is "sufficiently large" and "sufficiently adverse". This combination of shocks/ stops shifts the economy from a situation in which the liquidity requirement which was not binding to a situation in which it binds. These debts are repaid in the currencies of the lending economies or adopted global currency, hence influence currency substitution.

Empirically, Ujunwa, Ujunwa, Onah, Nwonye & Chukwubuike (2021) conducted a study on extending the determinant of currency substitution in Nigeria: any role for financial innovation? The study augmented the traditional money demand model of the determinants of currency substitution to introduce and include financial innovation. The study adopted the autoregressive distributed lag (ARDL) model and bound test to co-integrate to estimate the models. The results showed that there is the presence of short-run and long-run relationships between financial technology and currency substitution in Nigeria. In effect, the deployment of financial technology in developing payment infrastructure created additional incentives for economic agents to hold foreign currency deposit. The study advised that economic managers must mainstream credible monetary and fiscal policies to moderate the effect of financial innovation on currency substitution.

Ajibola, Udoette, Muhammad & Anigwe (2020) researched on the currency substitution and exchange rate volatility in Nigeria: an autoregressive distributed lag (ARDL) approach. The study investigated the relationship between exchange rate volatility and currency substitution in Nigeria. The researchers adopted the autoregressive distributed lag (ARDL) model having accounted for the presence of structural breaks. They found that domestic interest and expected changes in exchange rate are important determinants of currency substitution. Also, there existed a positive relationship between exchange rate volatility and currency substitution in Nigeria both in the short and long run. The researchers advised that sustained efforts by the monetary authority, in containing exchange rate volatility and inflation was the way of curbing the spate of currency substitution in the country.

Bawa, Omotosho & Doguwa (2015) investigated on the ratchet effects in currency substitution: an application to Nigeria. The study examined the persistence of currency substitution in Nigeria by

applying the bounds testing approach to cointegration and including a ratchet variable in the estimated autoregressive distributed lag (ARDL) model. The study found that factors such as exchange rate risks, expected exchange rate depreciation, exchange rate spread, inflation expectations as well as the ratchet variables are significant determinants of currency substitution in Nigeria, with the ratchet variables having overarching influence in the long run. The study recommended a strong and sustained monetary policy intervention towards encouraging deposit holders and other economic agents to switch their currency portfolio back to naira.

Doguwa (2014) conducted a research on currency substitution: evidence from Nigeria. The researcher examined the existence, causes and effects of currency substitution in Nigeria. The study estimated conventional money demand equations based on a partial adjustment and adopted the autoregressive distributed lag (ARDL) model to execute the research using three definitions of monetary aggregates. The study found that the behavior of the foreign currency/ naira deposit rates had been influenced by devaluation expectations, exchange rate risks, and political uncertainties. Also that short-term foreign interest rates significantly affect the demand for the naira. In the end, the study revealed a strong evidence of the existence of currency substitution and the possibilities of importing considerable instability in the economy.

Neanidis&Savva (2006) researched on the effects of uncertainty on currency substitution and inflation: evidence from emerging economies. The research focused on the examination of the effects of inflation and currency substitution volatility on the average rates of inflation and currency substitution for twelve emerging market economies. The study adopted the bivariate GARCH-in-mean model. The model accommodated for asymmetric and spillover effects of inflation and currency substitution innovations on their volatilities. They found that for the majority of the countries in the sample, the variability of inflation exerts a positive influence on both the average rates of inflation and currency substitution. Also, higher uncertainty in currency substitution displayed enhancing effects on inflation and currency substitution. The study recommended that implementation of inflation targeting been the appropriate policy for those countries studied as long as they take necessary steps to strengthen their policy institutions.

Mendoza (2002) conducted a research on why should emerging economies give up national currencies: a case for institutional substitution. The study focused on the effects of financial contagion and sudden stops of capital inflows experienced in emerging markets with major stress on policy credibility and world capital market imperfections. The study exposed the understanding that for countries to give up completely their national currencies, would not fix many fundamental economic and institutional problems plaguing emerging economies or eliminate forever all forms of financial crises. The act rather tied as tightly as possible the government's hands, preventing them from exercising their confiscatory powers via monetary policy, and simplified greatly the task of assessing domestic financial policies so critical for driving global capital inflows into emerging economies.

Viseth (2001) conducted a study on currency substitution and financial sector developments in Cambodia. The study focused on measuring the extent and the process of currency substitution and the examination of its impact on macroeconomic policies in Cambodia. The researcher used monthly data to analyze the phenomenon of currency substitution in Cambodia during the recent economic and financial reform process between 1993 – 2001. The study found that there was a significant long run

relationship between the expected rate of depreciation in market exchange rates and holdings of US dollars. Hence, the strong presence of currency substitution in Cambodia.

From the reviewed literatures, there exist a clear path for knowledge addition. The study focused on Nigeria, which is one of the largest economies in Africa, which essentially makes findings arising from the study representative enough for not just African countries but also other developing economies

3.0 Research Methodology

A survey design was adopted for data gathering mainly from the Central Bank Statistical Bulletin and World Bank Development Indicators (annualized series). The research adopted the two widely used indices of currency substitution measurement. The first measure, denoted as CS_1 , defined currency substitution (CS) as per proportion of foreign currency deposits (FCD) to local currency demand deposits (DD). The second measure, denoted as CS_2 , considers the proportion of foreign currency deposit (FCD) to the sum of Naira demand deposit (DD), term deposit (TD), and savings deposits (SD) in the finance structure. These definitions are in line with the specifications of Doguwa (2014), Bawa et al. (2015) and Ajibola et al. (2020). They described CS_{1t} as a narrow definition of currency substitution and CS_{2t} as a broad measure of currency substitution. Based on these two definitions, and following the standard money demand function as in Yinusa&Akinlo (2008) in Ajibola et al. (2020), and Ujunwa et al. (2021), the researchers specified the currency substitution index models for Nigeria as:

$$CS_t = f(INFR_t, MPR_t, OEXRVol_t, EXDT_t, REM_t, TOP_t) \quad (1)$$

$$CS_t = \beta_0 + \beta_1 INFR_t + \beta_2 MPR_t + \beta_3 OEXRVol_t + \beta_4 EXDT_t + \beta_5 REM_t + \beta_6 TOP_t + \varepsilon_t \quad (2)$$

The estimated equation is represented for CS_1 and CS_2 , where:

$$CS1_t = \frac{ECD_t}{DD_t} \quad \text{and} \quad CS2_t = \frac{ECD_t}{DD_t + SD_t + TD_t}$$

The notation $INFR_t$ is consumer price inflation, MPR_t represents monetary policy rate (proxied for domestic interest rate), $OEXRVol_t$ represents official exchange rate volatility, $EXDT_t$ represents public external debt, REM_t represents diaspora (personal) remittances, and TOP_t represents trade openness, all respectively at time t . ε_t is the random error term. The signs of $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5,$ & β_6 are expected to be positive. The above model is modified and adopted to suit the nature of this study in order to measure the effect of selected macroeconomic variables on currency substitution in Nigeria within the period under study, recognizing the existence of structural break analysis and using the extracted volatility series as a proxy for exchange rate fluctuation.

The variables in equation 2 were included in the model in their logarithmic form, except for inflation rate, monetary policy rates and trade openness. The official exchange rate volatility variable, $OEXRVol_t$, was derived using a standard GARCH model (1, 1) in the spirit of Yinusa&Akinlo (2008) in Ajibola et al. (2020). The GARCH model (1, 1) is of the form of:

$$\ln OEXRVol_t = c + \ln OEXRVol_{t-1} + \varepsilon_t \quad (3)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 \quad (4)$$

where equation 3 was a mean equation for the official exchange rate written as a function of exogenous variables with an error term, and equation 4 expressed the fitted variance for the official exchange rate as a weighted average of a long-term average value (α_0), information about volatility in the previous period measured as the lag of the squared residual from the mean equation-the ARCH term (ε_{t-1}^2) and the estimated (forecasted) variance from the previous period-the GARCH term (σ_{t-1}^2). The (1, 1) in GARCH (1, 1) describes the presence of a first-order autoregressive GARCH term and a first-order moving average ARCH term (first and second term in parenthesis respectively).

The representation of the ARDL model (Equation 5) for the two variants of the currency substitution index are specified as follows:

$$\begin{aligned} \Delta \ln CS_t = & \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta \ln CS1_{t-i} + \sum_{i=0}^q \beta_{2i} \Delta INFR_{t-i} + \sum_{i=0}^r \beta_{3i} \Delta MPR_{t-i} + \sum_{i=0}^s \beta_{4i} \Delta LEXRVol_{t-i} + \\ & \sum_{i=0}^u \beta_{5i} \Delta LNEXDT_{t-i} + \sum_{i=0}^v \beta_{6i} \Delta LNREM_{t-i} + \sum_{i=0}^w \beta_{7i} \Delta TOP_{t-i} + \delta_1 \ln CS1_{t-1} + \\ & \delta_2 INFR_{t-1} + \delta_3 MPR_{t-1} + \delta_4 LEXRVol_{t-1} + \delta_5 LNEXDT_{t-1} + \delta_6 LNREM_{t-1} + \delta_7 TOP_{t-1} \end{aligned} \quad (5)$$

where β_s and δ_s ($s = 1, 2, \dots, 7$) represent the short-run and the long-run framework of the model respectively, Δ is a differenced operative and p, q, r, s, u, v, w , are the respective lag lengths assigned to the variables in the model. The variables will be tested for the occurrence of co-integration using standard Fischer test, and the expected outcome of a null hypothesis would be:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0 \quad vs \quad H_1: \delta_i \neq 0 \quad \forall i = 1, 2, \dots, 7.$$

Where in the end, the existence of cointegration is recognized, a suitable autoregressive lag error correction representation of the model will be:

$$\begin{aligned} \Delta \ln CS_t = & \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta \ln CS1_{t-i} + \sum_{i=0}^q \beta_{2i} \Delta INFR_{t-i} + \sum_{i=0}^r \beta_{3i} \Delta MPR_{t-i} + \sum_{i=0}^s \beta_{4i} \Delta LEXRVol_{t-i} + \\ & \sum_{i=0}^u \beta_{5i} \Delta \ln EXDT_{t-i} + \sum_{i=0}^v \beta_{6i} \Delta \ln REM_{t-i} + \sum_{i=0}^w \beta_{7i} \Delta TOP_{t-i} + \lambda ec_t + e_t \end{aligned} \quad (6)$$

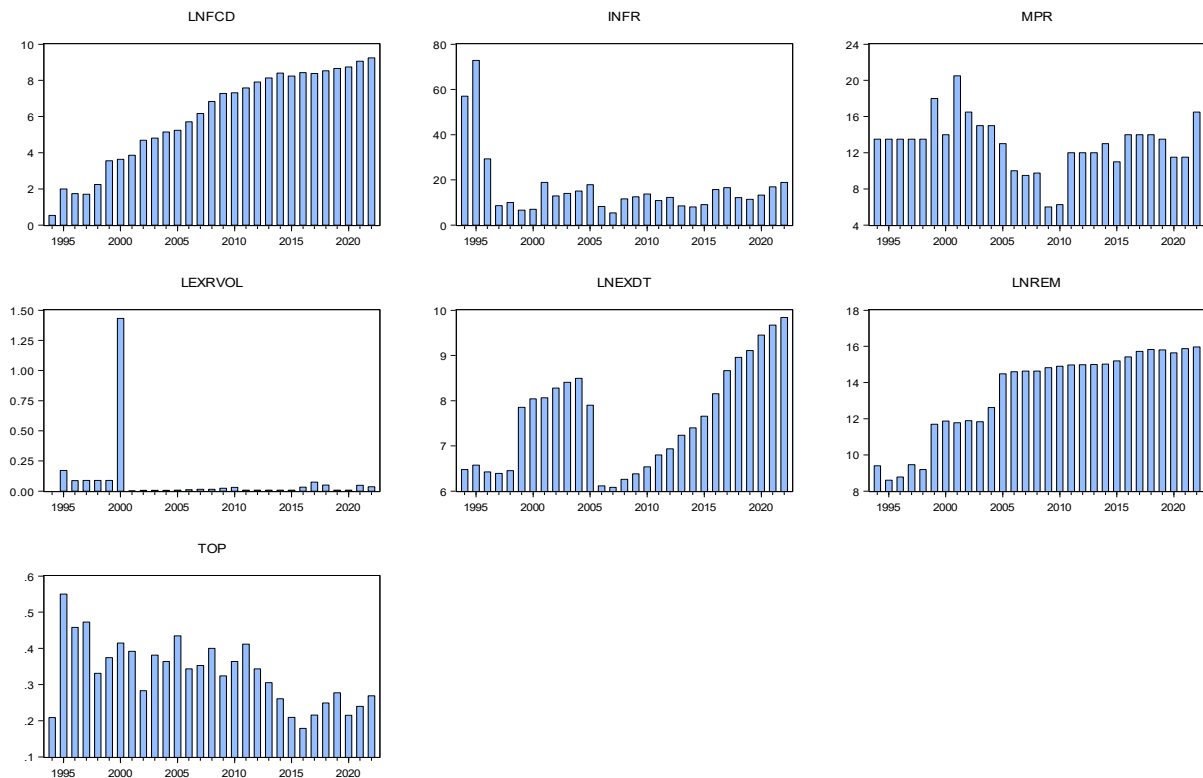
The λ represents the adjustment parameter that signified the speed of adjustment at which stability is re-established given a shock. This is also applied to measure the speed of adjustment in-time (degree of responsiveness) to achieve full equilibrium/ steady state.

4.0 Results and Analysis

In this section, we present the results of graphical movement of variables, descriptive statistics, unit roots, the bounds test for cointegration, ARDL model result, error correction model result, response to dynamics result, as well as post estimation diagnostics relevant in evaluating the validity of the estimated model.

4.1 Graphical Movement of Individual Variables

Graph 2: Movement of Individual Variables



Source: Researchers Computation, 2022

We begin by looking at the graphical representation of movement of individual variables. We would observe that movement of foreign currency deposits and diaspora remittances maintained a steady increase overtime. So long as more people clamour for emigration, the graph would continue to slope upward. Inflation rate reached its highest peak in 1995 and afterwards dropped and had since maintained a moderate average at 20% during the reviewed period. Domestic interest rate and trade openness had similar movements with their transient pattern of close range. The MPR attained its lowest at $\pm 5\%$ between 2008 and 2010, evident from the global financial crisis that rocked the entire financial markets. Also, trade openness attained its lowest in 2016 at 2%, evident from the introduction of Buharinomics which affected the business cycle. The public external debt portrayed a unique shape. It maintained a moderate status between 1994 and 1998, then rose till 2005. It then dropped to its lowest between 2006 and 2007, evident from the debt forgiveness received from the group of creditors (London and Paris Club of Creditors) in 2005. The nation has since been on borrowing streak till date. The exchange rate volatility attained its highest point in 2000 and has since been on the lower trend within the reviewed period.

4.2 Descriptive Statistics

Evidence from the table shows that the strength of dispersion of the variables from mean (*coefficient of variation*) is generally stable at less than one except for the exchange rate volatility that has a higher dispersion from the mean at 3.14. This is evident on the high volatility of exchange rate in the country's currency. The degree of skewness of the variables are mostly positive and above zero, except for LNFCD, MPR, and LNREM that are negatively skewed. The degree of kurtosis of the variables are majorly platykurtic and below three (3) point of normality, except for INFR, MPR, and LEXRVOL that are leptokurtic. In general, the variables fell slightly outside normal distribution and it is consistent with the behaviours of economic and financial time series.

Table 1: Summary of Descriptive Outcomes

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	CV	Obsv
LNFCD	5.991122	6.828831	9.242803	0.530628	2.640228	-0.5497	1.994287	0.44069	29
INFR	16.36788	12.53783	72.8355	5.388008	14.45059	2.926028	11.01512	0.882863	29
MPR	12.96552	13.5	20.5	6	3.030149	-0.12088	3.931131	0.233708	29
LEXRVOL	0.084924	0.014656	1.432275	2.97E-07	0.267046	4.830524	24.89383	3.144529	28
LNEXDT	7.606381	7.655159	9.836399	6.084251	1.155758	0.336406	1.908521	0.151946	29
LNREM	13.46933	14.63814	15.96424	8.607485	2.455442	-0.8282	2.228142	0.182299	29
TOP	0.33174	0.343058	0.550213	0.178561	0.091396	0.261818	2.50272	0.275505	29

Source: Researchers Computation, 2022

4.3 Unit Root Test Results

The Traditional and the Breakpoint consistent test were obtained using Augmented Dickey Fuller (ADF) test to attain the presence of unit root. The Traditional unit root shows stationarity at no-time $I(0)$ and first difference $I(1)$, but with a little twist on the log of external debts that failed to obtain stationarity at both $I(0)$ or $I(1)$ after continuous lagging, rather at none. Furthermore, the break point consistent tests of innovational and additional outliers were stationary at both no-time $I(0)$ and first difference $I(1)$ respectively. Which became the preferred because it has superior expression. This provides the prima facie justification for the choice of the Autoregressive Distributed Lag Model, given that the model tolerates such a combination and still gives robust estimates. The results further showed the break dates as endogenously selected by the estimation methods.

Table 2: Stationarity test with structural breaks

Variables	Traditional ADF			Break with Innovational Outlier (Trend and Intercept)			Break with Additional Outlier (Trend and Intercept)		
	ADF Stats.	Critical Value @ 5%	Order of Integr.	ADF Stats.	Break Date	Order of Integr.	ADF Stats.	Break Date	Order of Integr.
LNFCF	-7.07	-3.59	I(1)	-7.88	1999	I(1)	-7.90	1999	I(1)
INFR	-6.06	-3.59	I(1)	-12.33	2016	I(0)	-7.53	2008	I(0)
MPR	-6.68	-3.59	I(1)	-7.99	2011	I(1)	-8.75	2011	I(1)
LEXRVOL	-5.32	-3.59	I(0)	-82.22	2000	I(0)	-12.33	2000	I(0)
LNEXDT	-3.50	-1.95	None	-9.24	2012	I(0)	-6.26	2008	I(0)
LNREM	-5.88	-3.59	I(1)	-8.17	2008	I(0)	-18.74	2006	I(1)
TOP	-6.72	-3.58	I(0)	-7.81	2013	I(0)	-8.30	2014	I(0)

Critical Value @ 0.05 for Breakpoint Unit Root Tests with Additive and Innovation Outliers = 5.18.

The table shows the break dates that were spread between two decades of intensive economic and political visibilities from 1999 to 2018. A look at the Nigerian economy within the period shows that these were periods of government transition from the military rule to the civilian rule in 1999, fiscal risks and indiscipline marked by continuous conducts of elections and change of government personnel and ruling political party, introduction of new denominations of Naira notes (N100, N200, N500, N1,000) and massive emigration of citizens to foreign economies because of continuous naira devaluations and the search for better living and working conditions, restructuring of banking industry (recapitalization of banks, reclassification of licensing, fintech disruptions, remodeling the corporate governance, bailouts, global financial crisis contagion, etc), insecurities which resulted into rising IDP camps and re-settlements, natural disasters, business cycles marked by periods of economic recessions and expansions, expectations of finance bill, budgetary inadequacies and padding, weak records of growth and development, endemic public sector misappropriation and corruption, external debt forgiveness by the Paris/London club of creditors, etc. These outliers (events) exerted high leverage on the economy, as they distorted the slope or normal flow of economic activities with immense influential pointers.

4.4 Bounds Test for Cointegration

Table 3: Evidence of Cointegration

Test Statistics	Value	K	Decision
F-Statistics	35.15722	6	

Critical Value Bounds			
Significance	I(0) Lower	I(1) Upper	Decision
10%	2.53	3.59	Cointegration
5%	2.87	4.00	Cointegration
2.5%	3.19	4.38	Cointegration
1%	3.60	4.49	Cointegration

Source: Researchers Computation, 2022

Evidence from the bounds test shows that the variables are co-integrated with the determined F-Statistic at 35.15722, is higher than the upper bound critical values of 4.49 at 1% and 4 at 5%, and lower bound critical values of 3.60 at 1% and 2.87 at 5% level of significance respectively. This signifies that there exists a long-run relationship between the independent variables.

4.5 Long Run ARDL Results

The ARDL estimation result shows that the variables are best fit at 99.98% R² and Adjusted R², using the Schwarz information criterion (SIC) and optimum lag length selection of 2, 0, 1, 2, 2, 2 to model our selection. The SIC was chosen because it imposes a harsher penalty than the Akaike Criterion (AIC) for adding more regressors, and the lower it becomes the more significant the outcome. The independent variables are overall statistically significant at p-value of 0.00000. The independent variables were corrected from observed heteroskedasticity through White-Hinkley (HC1) heteroskedasticity consistent standard errors and Covariance.

Variable	Coefficient	Std. Error	t-Statistic	P-Value
INFR**	-0.019702	0.006082	-3.239279	0.0143
MPR	0.018783	0.015390	1.220465	0.2618
LEXRVOL	-0.921149	0.254200	-3.623713	0.0085
LNEXDT	0.087335	0.079759	1.094995	0.3098
LNREM	0.848614	0.044763	18.95806	0.0000
TOP	-1.363083	0.884012	-1.541929	0.1670
R-Squared	0.999827			
Adjusted R ²	0.999384			
F-Stats	2252.518		Prob	(0.000000)
SIC	-1.882535			
DW-Stats	2.532749			

Source: Researchers Computation, 2022

From the estimates, INFR exerted a long-run negative and statistically significant influence on LNFCDD in the country. LNFCDD (proxy for currency substitution) is a negative and significant function of inflation. Meaning that, if inflation rate is increased by 1%, foreign currency deposits by the economic agents will reduce by 2% in the long-run. MPR (proxy for domestic interest rate) exerted a long-run positive and non-statistically significant influence on LNFCDD in the country. By interpretation, currency substitution is a positive and non-significant function of domestic interest rate. This means that if the domestic interest rate is increased by 1% by the central bank of Nigeria, the foreign currency deposits would also increase by 2%. LNXRVOL exerted a long-run negative and statistically significant influence on LNFCDD in the country. Signified that currency substitution is a negative and significant function of exchange rate volatility. This means that if the exchange rate becomes volatile at 1% increase, the foreign currency deposits would reduce by 92% in the long run. LNEXDT exerted a long-run positive and non-statistically significant influence on LNFCDD in the country. So, currency substitution is a positive and non-significant function of public external debt. This means that if the public external debt increase by 1%, the foreign currency deposits would also increase by 9%. LNREM exerted a long-run positive and statistically significant influence on LNFCDD in the country. So, currency substitution is a positive and significant function of personal (diaspora) remittances. This means that if the personal (diaspora) remittances is increased by 1%, the foreign currency deposits would also

increase by 85%. While TOP exerted a long-run negative and non-statistically significant influence on LNFCO. Currency substitution is a negative and non-significant function of trade openness which means that trade openness negatively and non-significantly impact/ influence currency substitution in the country. In the long-run, inflation rate is shown to have double asterisks (INFR**) which indicated that inflation rate is a dynamic regressor with an optimal lag of zero, hence to be discussed contemporaneously. It means that by effects of the existent structural breaks/shocks, there is a zero conditional expectation in the future (it can take any value within a given range).

4.6 Error Correction Model Results

Table 5: Short Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	P-Value
C	-4.935996	0.241609	-20.42967	0.0000
@TREND	0.022435	0.001943	11.54531	0.0000
D(LNFCO(-1))	0.359040	0.038186	9.402389	0.0000
D(MPR)	0.095685	0.005587	17.12615	0.0000
D(LEXRVOL)	0.241999	0.054767	4.418731	0.0031
D(LEXRVOL(-1))	0.173315	0.045192	3.835096	0.0064
D(LNEXDT)	-0.274559	0.043784	-6.270754	0.0004
D(LNEXDT(-1))	0.543221	0.042721	12.71545	0.0000
D(LNREM)	0.283930	0.016789	16.91131	0.0000
D(LNREM(-1))	-0.738945	0.051963	-14.22070	0.0000
D(TOP)	-4.269673	0.227669	-18.75388	0.0000
D(TOP(-1))	-1.281629	0.214369	-5.978599	0.0006
ECM(-1)	-0.869145	0.040655	-21.37858	0.0000
R-Squared	0.990924			-
Adj. R-Squared	0.982546			-
SIC	-2.634404			-
DW-Stats	2.532749			-
F-Stats	118.2780		Prob.	0.000000
F Wald Test				0.000000

Source: Researchers Computation, 2022

The short-run results of the estimation shows that the variables are all statistically significant. The p-values show statistical significance at less than 0.05 level of significance. The error correction regression is negative and statistically significant and implies that in case of structural breaks or shocks in the economy, the speed of adjustment to equilibrium in every period for all variables from the short-run to long-run is at 86.91% and are statistically significant. All the variables are jointly significant as proven by the F-Wald test result.

4.7 Degree of Response to Shocks

$$\begin{aligned}
 Model &= \frac{1}{\text{Economic Shocks or } ECM(-1)} * 100 \\
 &= \frac{1}{86.91} * 100 \\
 &= 0.011506156 * 100 \\
 &= \underline{\underline{1.15}}
 \end{aligned}$$

The degree of response (behaviour) of currency substitution to the dynamics of investigated macroeconomic variables in the event of structural breaks induced by the influential activities in the economy is 1.15. This signifies that the speed of adjustment/response in-time for the variable simultaneously is one year plus approximately two months to attain full equilibrium (a steady state) or full equilibrium is assured.

4.8 Diagnostic Test Results

Table 6: Evidence of Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test			
F-Statistics	5.326539	Prob. F(5,2)	0.1656
Obs*R-Squared	24.18389	Prob. Chi-Square(5)	0.0002

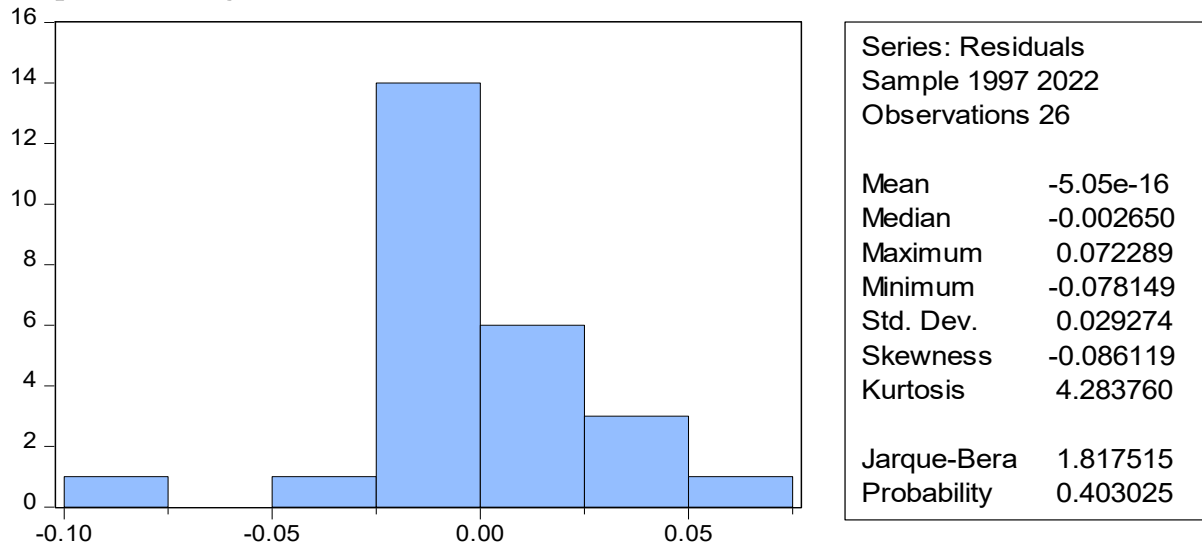
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.163660	Prob. F(18,7)	0.4446
Obs*R-Squared	19.48741	Prob. Chi-Square(18)	0.3624

Source: Researchers Computation, 2022

The diagnostic evidence obtained from the ARDL estimation, there exists no presence of autocorrelation as proven by the Breusch-Godfrey (BG) serial correlation LM test. The F-statistic of 5.326539 with a p-value of 0.1656 greater than 0.05 level of significance shows non-significance. In the same vein, the test for the presence of heteroskedasticity was conducted to determine the difference of variance amongst the variables using the Breusch-Pagan-Godfrey test. The result shows that F-statistic of 1.163660 with the p-value at 0.4446 greater than 0.05 level of significance indicates non-significance. This evidence indicates no presence of heteroskedasticity, all the variables are homoscedastic.

4.11 Histogram Normality Test Results

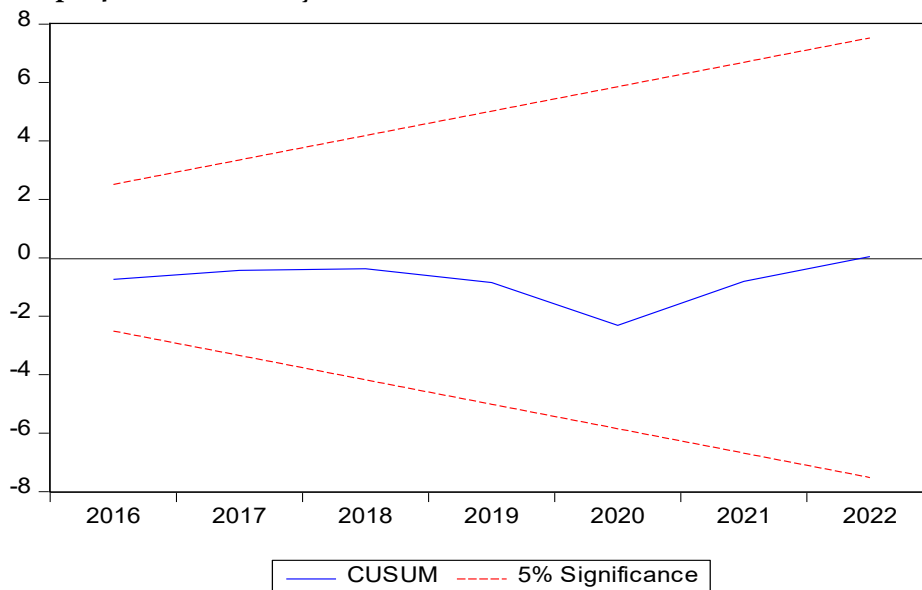
Graph 3: Normality Test



The histogram confirms that the variables are normally and symmetrically distributed. Justified by the p-value of 0.40 greater than 0.05 or 5% level of significance.

4.12 Stability Diagnostic Result (CUSUM TEST)

Graph 4: Test for Stability of Variables



A stability test which was conducted to ascertain if the models were stable and devoid of specification bias. The CUSUM test result shows that there is stability of models as the variable line did not cross the two line-boundaries at 5% level of significance.

5.0 Conclusion and Policy Recommendations

The main aim of this study was to examine the effects of selected macroeconomic variables on currency substitution in Nigeria for the period of 1994 to 2022. We selected macroeconomic variables like inflation rate, domestic interest rate, official exchange rate volatility, public external debt, personal (diaspora) remittances, and trade openness using the ARDL model to estimate the functionality of the variables, ascertain the existence of long-run and short-run relationships, measure shocks from structural breaks.

In the long-run, inflation rate and official exchange rate volatility had inverse relationship with the currency substitution behaviour in the country within the reviewed period. They exerted negative but statistically significant influence on the change of choice of economic agents toward switching their local currency deposits to foreign currency deposits (evidence of ratchet effect). Inflationary trends have negative impact on aggregate demand, consumption, savings and investments on economic agents, and the official exchange rate changes, due to continuous depreciation of naira, collapse domestic consumption and production as cost of raw materials/resources become unbearable for economic agents who bear the tax/ levy impacts, tax shifts and tax burden of the final products. The effect of these are increased consumption expenditures, reduced deposits (local and foreign currencies) and lower standard of living of economic agents in the country. This position does not support the views of Bawa et al. 2020, Doguwa 2015, Ujunwa et al. 2021, Yunusa&Akinlo 2008, and Ajibola et al. 2020, who expressed that risk averse economic agents would increase their holdings of foreign currency as a way of hedging against exchange rate volatility and inflation rates irrespective of the negative relationship.

Domestic interest rate and public external debt exerted positive relationships but at statistically non-significant influence on currency substitution in the country. Domestic interest rate (determined from time to time by the monetary authority) does not have a direct impact, rather relies on another variable (anchor-variable like inflation) to function/ influence currency substitution. The domestic interest rate control only part of total broad money, and if currency substitution is intensified in the economy, the monetary authority faces the loss of seigniorage (income made from producing more local currency) and its ability to maintain a stable financial and pricing system. Therefore, the domestic interest rate impacts more heavily on inflation than on foreign currency deposits. Public external debts, in addition, promote currency substitution through its positive influence but non-significantly because it is usually at secondary level. That is, an economy that is generating substantial public revenues from its economic activities would have no thoughts of borrowing externally, and external debts are usually obtained when there exist economic projects to be achieved. These borrowings promote currency substitution in the sense that, they are obtained using foreign currencies, and their repayments are made using foreign currencies, therefore, if currency devaluation becomes continuous, the debt burden would also increase.

Personal (Diaspora) remittances exerted positive significant influence on the behaviours of foreign currency deposits. This is evident from the increased number of economic agents migrating into another economies for perceived greener pastures, and afterwards sending funds/ supports back home for their families and loved ones' upkeep and personal projects. This no doubt, benefits the nation immensely, as the country has also found additional avenue to pool unsecured capital (diaspora bond). This no doubt increase foreign currency deposits.

Trade openness had inverse and non-significant influence on currency substitution in the country within the period. This empirical finding requires a more investigation or rather a disintegration of the elements of trade openness to obtain results. Anyway, it supports the suspicion that the exchange of

visible products by the country and its trading partners/ economies are done using **netting**, and so foreign currencies are used as units of account and not as deposits.

From the model results, the researchers therefore recommend that (a) the monetary authority should pursue intensively inflation targeting as a way to control inflation and maintain price and financial stability and monitor other radical variables to minimize interference or interplay. (b) The government, through the monetary authority should adopt exchange rate targeting or pegging by setting a fixed level or band of values for the exchange rate against convertible foreign currencies. (c) The CBN should consider the establishment of Naira Monetary Unit (NMU) or Currency Board (CB). These arms would be in charge of exchange rate management. The NMU or CB would fix the naira exchange rate against or the value of the naira would be tied to a basket of specified amounts of convertible currencies by creating a narrow limit around the fixed exchange rate, say $\pm 3\%$. It would serve as a standard for all exchange players in the market, hence entrench orderliness and discipline in the market. (d) The Government should rebuild the trust and confidence needed in the political system and create an economy that works and guarantees good future for her teeming workforce and professionals, hence reduce the spate in which Nigerians are emigrating (Jappa meaning "Run Away" in Yoruba language) into other countries for perceived greener pastures. (e) The Government should consider the possibility of establishing support schemes for the prices of products/assets in the markets. For example, The Nigeria Price Control and Review Commission (NPCRC) to promote price fairness and stability across the nation. And lastly, the Government should ensure to invest foreign loans on self-liquidating economic projects capable of repaying its capital plus accrued interests both in the short-run and long-run basis. This would reduce the external debt burden currently suppressing the sovereignty of this economy.

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