Private Sector Credit Provision in Periods of Fluctuating Capital Inflows in Nigeria: Does each Regime Change Influence Credit Provision Differently?

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Abstract: **Our study aims to find the link between capital inflows and credit to private sector over a period of 2010M01-2021M08 and to identify if the behavior of banks' credit in each regime differ. Under the framework of ARDL, in the first sub-sample, findings show that capital inflows negatively impacts on credit to private sector in the short-run, while in the long-run, the impact is positive though not significant. The study also finds that the interaction of capital inflows with the dummy variable leads to a positivesignificant impact of capital inflows on credit to private sectorin the short-run. In the second sub-sample, findings show that the impact of capital inflows on credit to private sector is positive but not significant both in the short-run and in the long-run. However, when capital inflows interact with the dummy variable, the impact on credit to private sector is negative and significant in both the short and long-run. Consequently, we recommend that different policy measures should be adopted to suit different shocks to the macroeconomic environment.**

Keywords: **ARDL, Capital inflows, Private sector credit, Inflation rate, oil price**

JEL Classification: C22, O24

I. INTRODUCTION

The stability of an econometric model is necessary as it enables the model's coefficients to be valid. Lucas (1976) contended that if regime changes are not accounted for during analysis, econometric estimates are rendered invalid. Several factors can engender structural breaks in a model which may affect the model's parameter stability. It has been noted that the occurrence of structural break in many time series can be traced to so many factors such as crises in the economy, institutional adjustments, changes in policy and shifts in regime. It is proper therefore to test the null hypothesis of structural stability which is compared against the alternative of a one-time structural break. In their separate studies, Perron (1997) and Leybourne and Newbold (2003) observed that should structural changes occur in the data generating process and these changes are not accommodated in the specification of an econometric model, whatever results obtained may be biased.

Exogenous shock to the main source of a country's income can introduce a regime shift.Capital flows has become a major source of revenue to many countries as it assists in cushioning the shortfall in projected revenue. However, there is a tendency for shocks to hit capital inflows in a way that it affects the macroeconomic environment since cyclical fluctuations is a major phenomenon in capitalist economies. Steffen (2011) observed that the integration of financial markets across countries has encouraged huge capital flows to emerging markets over the years. According to the study, evidence show that net capital inflows penetrating emerging market economies are pro-cyclical and highly volatile and capable of causing aggregate output volatility and financial instability. It is further contended that bank intermediated capital inflows within an expansionary phase in the run-up to a financial crisis fuels domestic credit expansion and GDP growth.Barbosa and Celerier (2020) noted that the mechanism through which huge inflows of capital create instability in recipient countries is anissue that is highly debated. Accordingly, in economies where banks are pivotal in channeling international funds, the penetration oflarge capital inflows results in financial crises.

Capital inflows are meant to transmit to the domestic economy through increase in domestic money supply. The central bank intervenes when there is rise in capital inflows through the purchase of foreign exchange. Such intervention measure raises the domestic money supply; increasing liquidity in the banking sector and thus giving deposit money banks the leverage to extend credit facilities to the private sector.In Nigeria, private sector credit is very low owing to certain factors. As noted by the BGL Banking Report (2010) cited in Kolapo*et.al* (2012), the Nigerian banking industry is beset with deteriorating quality of credit assets as a result of fall in stock market indices, global oil prices and the depreciating value of the naira. The report observes that this development has been responsible for the non-extension of credit to the domestic economy as banks are afraid of non-performing loans. To guard against the problem of non-performing loans which peaked during the global financial

crisis of 2008, the Asset Management Corporation of Nigeria (AMCON) was established in July, 2010 to provide a vehicle to tackle the recurring problems of non-performing loans confronting the Nigerian banks. During the global financial crisis, banks experienced liquidity problem owing mainly to the exit of foreign investors.

Since the global financial crisis, episodes of shocks to the economy have occurred from time to time and the worst is the COVID-19 pandemic which affected the macroeconomic environments of different countries in many ways. It affected cross border capital flows as it led to declining economic activities across countries. Nigeria is not left out in this as the country depends largely on inflows to run her budget, especially inflows from the sale of crude oil which is her economic mainstay. Among the sectorsusually affected by shocks to inflows is the banking sector as such affects the intermediation role of the banks.In Nigeria, the low development of the capital market has placed the financial intermediation role on the banking sector. However, the sector does not play this role adequately as the small- and medium-sized enterprises (SMEs) are hardly adequately funded. The high interest rate charged by the banks and the rigid demand on collateral securities, among other factors; put a huge constraint on the private sector to raise credit from the banks. A key concern therefore is to fashion out ways to improve financial intermediation process in a way that financial constraints faced by producers, marketers and artisans can be alleviated.Since capital inflows is among the main sources of liquidity to the banking sector, investigating the behaviour of bank credits in periods of shocks to capital inflows will go a long way in fashioning out policies to address the financial instability resulting from the shocks.

1.1 Some Stylized Facts

In this sub-section, we show the trend of some variables used in our study. Starting with the net foreign assets (NFA), figure1 below shows that the NFA was low from 2010 up till March 2013 when it barely rose and thereafter it declined until February 2017 when it began to rise. It got to peaks in October 2018 and May 2019 respectively after which it decelerated. The descending trend continued until December 2019 and from January 2020, a mild rise occurred which was flat up till July 2021. Evidence of the impact of COVID-19 pandemic on capital inflows is visible from 2019 up till the last period of the sample size in 2021 as capital inflows experienced continuous fall within the period under review.

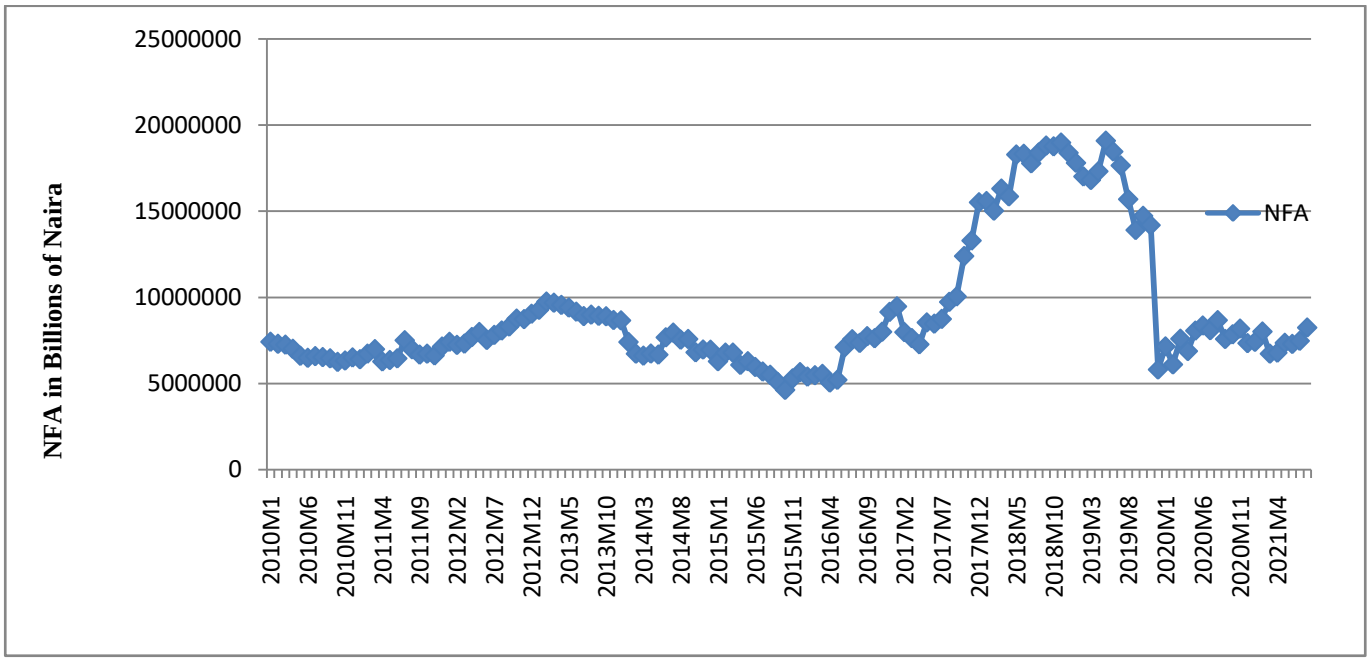

Figure 1: Trend in Net Foreign Assets

Evidence from figure 2 shows that prior to April 2010, oil price was low but after this period it experienced an increasing trend though with fluctuations in some periods. In June 2014, a huge decline occurred which lingered till May 2017 when it began to rise. The rise got to a peak in September 2018 and from December 2019, a sharp decline occurred which got to a trough in April 2020. In June 2020, oil price rose and got to a zenith in February 2021. There is something revealing in the trend of NFA and oil price. It should be noted that inflows from oil contributes to a larger chunk of capital inflows in Nigeria. On grounds of this, one should expect the trend of NFA and oil to go in similar direction in most of the months. However, this is not so as can be seen that between 2010 and 2013 when NFA was low, oil price was relatively high. The period when their trend coincides is in 2019 and afterwards which covers the period of COVID-19 pandemic. What this reveals is that within the period of decline in NFA when oil price was already high,

other sources of capital inflows were responsible for the decline in NFA. Such sources include foreign direct investment (FDI), portfolio investment (FPI), Diaspora remittances, *etc.*

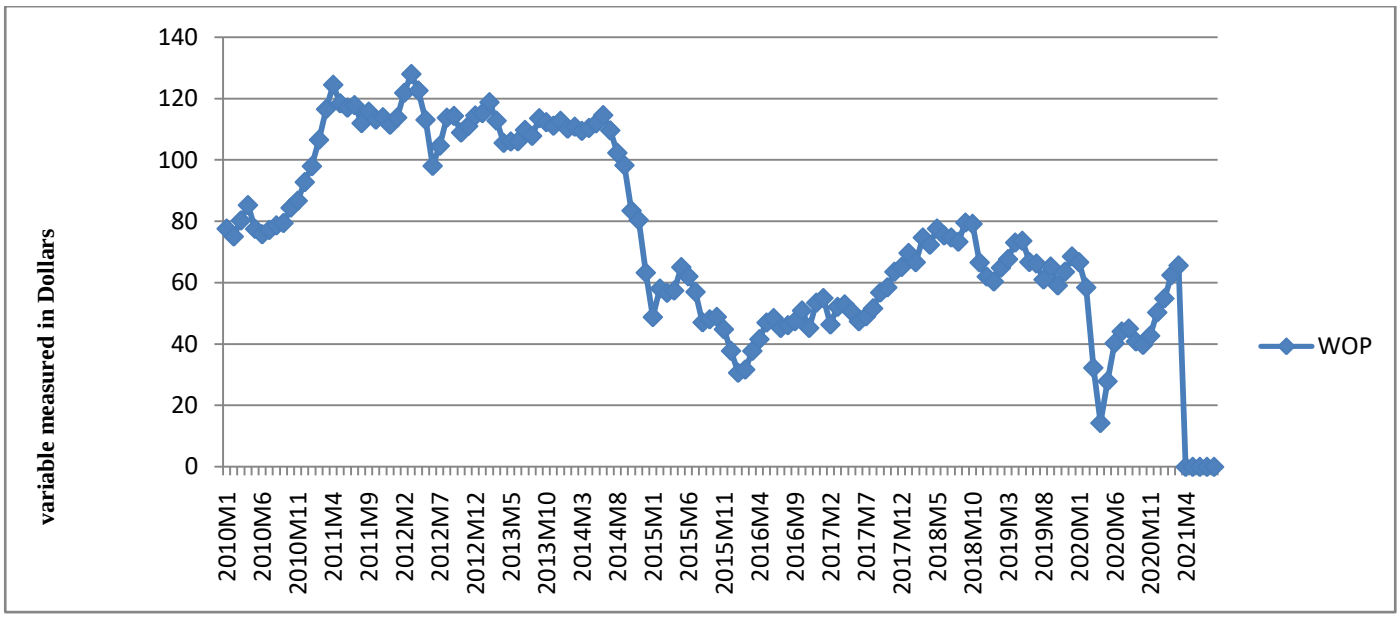

Figure 2: Trend in Oil Price

Figure 3 below shows the trend in bank reserves over the sample period. Evidence from the figure shows that bank reserves was flat up to March 2012 when it sluggishly rose. The mild rise ended in May 2015 and the trend became flat up till December 2019. There was a rise in the trend after 2019 that only lasted till October 2020 when a decline ensued.The rising trend of bank reserves in 2019 could be due to the rise in NFA around early 2019 which demands that monetary authorities should put measures on ground to insulate the domestic economy from the inflationary impact of the increased inflows. Measures to achieve that such as increase in cash reserve ratio is capable of increasing the reserves of banks.

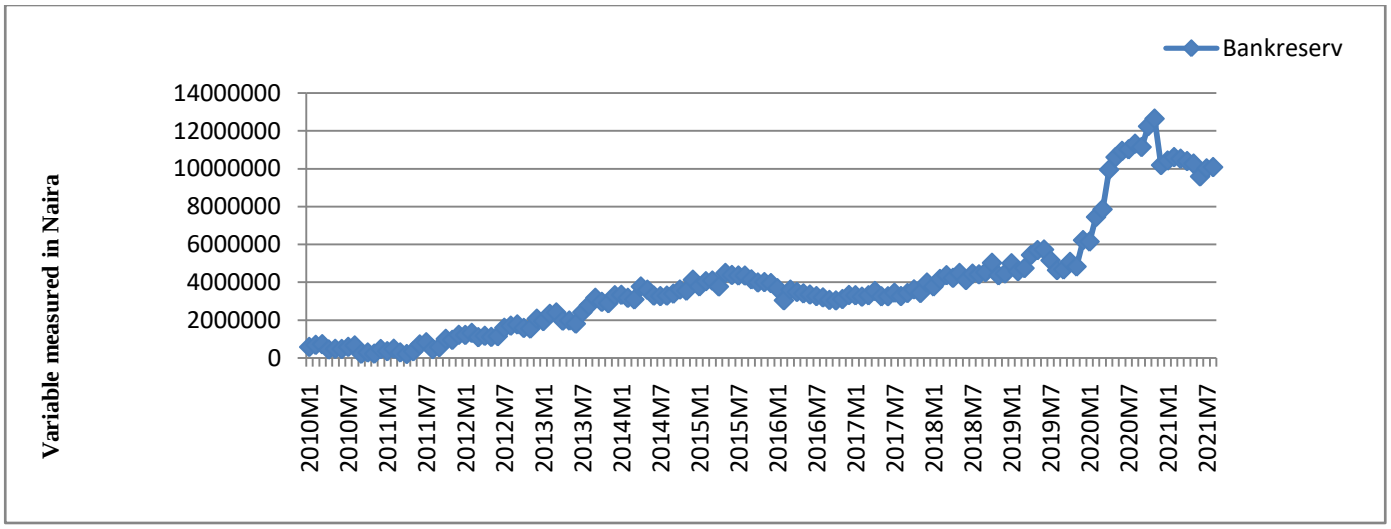

Figure 3: Trend in Bank Reserves

The trend in credit to private sector has been very sluggish over the sample period as can be seen in figure4 below. From 2010 through 2018, the trend was near flat until in 2020 when it began to experience a marginal rise. In Nigeria, private sector credit provision is usually beset with obstacles and among these constrains are the high interest rate charged by the financial institutions as well as the penchant for the banks to extend loans on short-term basis. More so, government

sourcing of loans through the banks is another factor that impedes the extension of credit to private sector as this practice crowds-out the private sector.

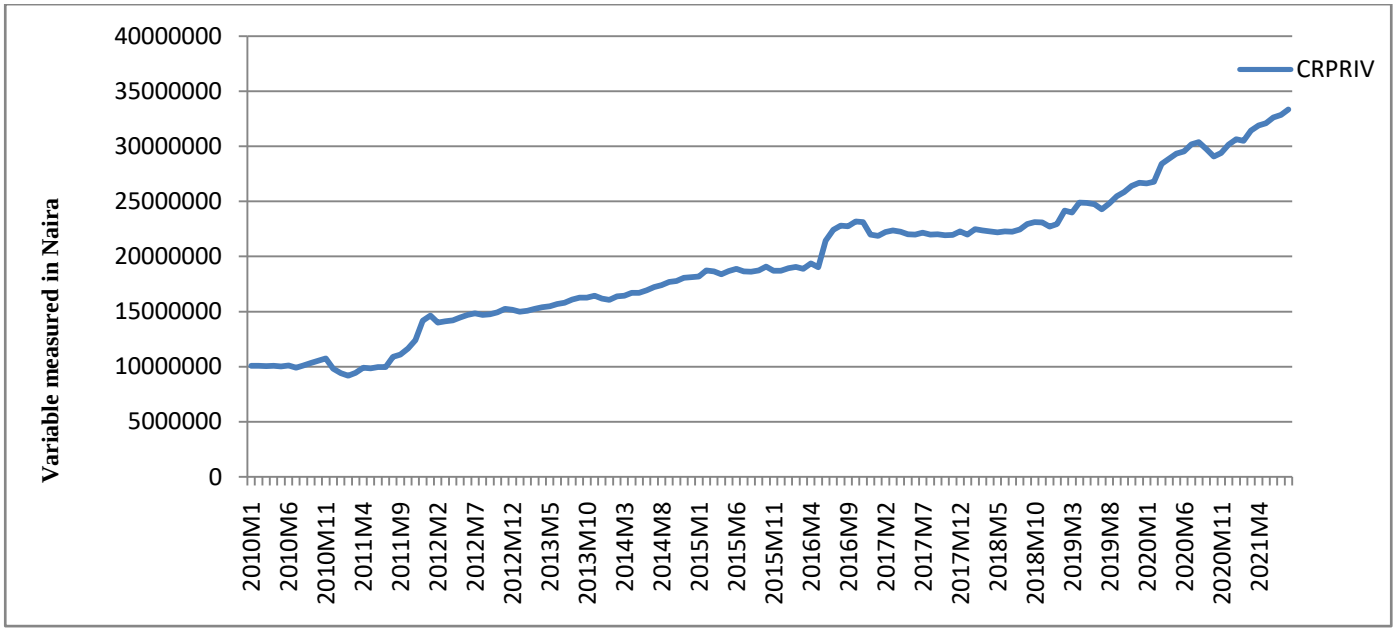

Figure 4: Trend in Credit to Private Sector

Theoretical Background

The theoretical foundation for this paper is based on the endogenous growth model which we adapted from the work of Bailliu (2000). Even though the framework is associated with the economic growth effect of capital inflows, we contend that it can also serve the interest of our paper since capital flows can promote growth by increasing domestic financial intermediation. The framework examined the nexus between capital inflows and growth using a simple endogenous-growth model called the AK model. In this study, the AK framework is enhanced by factoring in the role of international capital flows. In the AK model version of a closed economy, it is assumed that output is a linear function of the aggregate capital stock. The aggregate production function of an economy is specified as follows:

$$Q_t = AK_t \quad \ldots\ldots(1)$$

where

Q_t = output at time t

K_t = capital stock at time t

According to Bailliu (2000), there is an absence of population growth in this model and only a single commodity is produced in the economy, which can be consumed or invested. There is also the assumption that capital stock depreciates at a rate of φ per period and if that is the case, then gross investment equals:

$$I_t = K_{t+1} - (1-\phi)K_t \quad \ldots\ldots(2)$$

where

I_t = gross investment at time t

It is further assumed in the above model that financial intermediaries play the role of transforming savings into investment. This they do by absorbing resources in a way that if households save a dollar, such savings will generate less than a dollar's worth of investment. If we assume that a fraction, ψ of each dollar saved by households is made available for investment, while 1-ψ is kept by the financial intermediaries to represent the reward for theirservices. Bailliu (2000) noted that such transaction cost can be viewed as the spread between lending and borrowing rates which banks charge. The study also contended that in the closed-economy version of the model, equilibrium in the capital market suggests that the fraction of savingsleft bydomestic residents after banks have taken their share must equal gross investment. Capital market equilibrium is thus represented as follows:

$$\psi S_t = I_t \quad \ldots\ldots(3)$$

where

S_t = savings at time t

By combining equations (1), (2) and (3), the growth rate ofoutput, g, can be written as follows

$$g = A(\frac{I}{Q}) - \phi = A\psi S - \phi \quad (4)$$

Where

S = gross savings rate.

Equation (4) thus represents the steady-state growth rate of a closed-economy AK model with financial intermediation.

The AK framework above can be extended to incorporate the role of international capital flows and this is made possible by assuming that foreign residents can now invest in the domestic economy as the borders are open. It is assumed that savings will grow to enhance investment if capital flows through the financial intermediaries and that such growth in savings will not be possible in the absence of capital flows. Thus, in the presence of international capital flows, the capital market equilibrium becomes

$$\psi^*(S_t + NFA_t) = I_t^*,,,,,,,,,, \quad (5)$$

where

NFA = net foreign assets which represents capital inflow

The steady-state growth rate is now given by

$$g^* = A\frac{I^*}{Q} - \phi = A^*\psi^*\frac{S + NFA}{Q} - \phi = A^*\psi^* S^* - \phi \quad (6)$$

Equation 6 above has highlighted the role of capital inflows to economic growth through the channel of credit provision and that is where this framework connects our study. Bailliu (2000) noted that among the conclusions of the model is that capital must flow in on net $(\text{i.e.}, \text{NFA} \succ 0)$ in order for the savings rate to increase in the presence of international capital mobility. Also investment must be financed with capital flows in a way that it must not crowd out domestically financed investment.

II. LITERATURE REVIEW

The link between capital inflows and domestic credit provision is an area that has not been given much attention in literature both at country-specific and cross-country. Most of the few papers in relation to this topic centre on the nexus between capital inflows and economic growth, using credit provision or financial intermediation as a vehicle through which capital inflows leads to economic growth. Focusing their study on 24 emerging countries, Tong and Wei (2011) investigated whether the volume and composition of capital flows affect the degree of credit crunch during the 2007-2009 crisis. Using data on 3,823 firms in these countries, the study found out that, on average, the decline in stock prices was more severe for firms that are intrinsically more dependent on external financing. Akinci and Queralto (2014) adopteda macroeconomic model with financial intermediaries to show that a period of capital inflows and rapid credit expansion, occasioned by low domestic interest rates encourages banks to endogenously decrease the rate at which they issue equity, thus contributing to a higher likelihood of future crises. The paper observed that Macroprudential policies such as capital requirements lower the probability of financial crises and improves welfare.

Ghilardi and Peiris(2014) developed an open-economy Dynamic Stochastic General Equilibrium model with an optimizing banking sector to investigate the role of capital flows, macro-financial linkages, and macro prudential policies in emerging Asia. The results showed the importance of capital flows and financial stability for business cycle fluctuations as well as the role of supply side financial accelerator effects in the amplification and propagation of shocks. Gabriel (2016) examined the contribution of financial system and capital inflows to the development of the Nigerian economy over a period of 1981 to 2014. By employing linear and non-linear multiple regression, the finding revealed that all the variables used as indicators of financial system has no significant impact on development. However, foreign direct investment and remittance significantly contribute to economic development in the long and short run.

Kaat (2017) used a novel dataset covering about 20,000 firm-year observations to study the effects of the exogenous fluctuations in European capital flows on the allocation of credit across firms during the period of 1995-2014. The study found out that large capital inflows have link with more loans to the least profitable firms within an industry and this helps to reduce economic dynamics in the long-run. In a study for Turkey, Baskaya *et al*. (2017) examined the role of the international credit channel over a period of 2005–2013. The study decomposed capital inflows into bank and non-bank flows and it aimed to show the importance of external borrowing of domestic banks in enhancing domestic credit growth. The results showed that highly capitalized banks with higher non-core liabilities increase credit supply during period of rising capital inflows. It was noted by the study that this result is stronger for domestic banks in relation to foreign banks.

Using a panel data on 23 Sub-Saharan African countries spanning a period of 2000-2013, Acheampong (2019) examined the interaction effects of foreign capital inflows and financial development on economic welfare in these countries. The study found that the interaction between foreign capital inflows and financial development have a positive effects on economic welfare in SSA. The study observed that financial development assists in transmitting foreign capital to economic welfare. Barbosa *et al.* (2020) investigated the effect of credit market frictions on channeling of capital inflows to firms and thus their effects on the allocation of human capital in Portugal over the 2002-2007. By exploiting exogenous variations in banks' equity capital, the finding revealed that capital inflows lead to a reallocation of not only capital, but also labor and skills. Using a sample of 71 countries over a period of 1975Q1 to 2010Q4, Cesar and Megumi (2021) investigated if surges in private capital inflows lead to credit booms. The approach the study followed was to build a quarterly database on gross capital inflows,

credit to the private sector and other macro-financial indicators. The results of findings indicated that rises in gross private capital inflows influence credit booms and credit booms is higher if the rise in foreign flows are driven by private investment inflows and, to a lesser extent, portfolio investment inflows.

III. METHODOLOGY

Our interest in this study was to ascertain the response of private sector credit provision of deposit money banks to fluctuations in capital inflows over our sample period. We also sought to know if regime changes occur in the model and how credit to private sector responds to capital inflows in each regime. In achieving this, we first plotted the graph of NFA which we used to proxy capital inflows to see if breaks occurred in the trend. We sought to find out if the historical behaviour of this variable hada way of introducing structural breaks in the model. As shown in figure1above, the NFA exhibited declining trend in some years within the sample period; notably in October 2013, December 2016, March 2017 and a huge decline occurred in March 2019. With this, we surmised that possibly, structural breaks may occur in the model that links capital inflows with credit to private sector. Formerly, we confirmed this possibility by plotting the CUMSUM of Squares of the model. The decision rule was to reject the null hypothesis of no structural break if the plot showed that the CUSUM of Square statistic falloutside the critical bands of the 5% confidence interval which is an indication that the model is not stable; thus indicating that there is structural break in the model.

To further test for the existence of structural breaks, we conducted the Bai-Perron multiple breakpoint tests in order to ascertain the breakpoint periods since the plots of NFA indicated that volatility occurred at different points. We thus used the breakpoint periods indicated by the Bai-Perron multiple breakpoint tests as basis for constructing the series for dummy variables. We also confirmed the Bai-Perron breakpoint dates by running the Chow Breakpoint test within the indicated breakpoint periods. This was to determine if the dates indicated by Bai-Perron test was significant. The number of breakpoints in Bai-Perron test thus guided us on how to split the model based on sub-samples. In each sub-sample model, we included two dummy variables. One of the dummy variables captured the intercept and the other which is an interactive dummy captures the slope of the main independent variable (ie, the NFA)

3.1 Pre-Model Specification Test

As a guide to our model specification, we first run some preliminary tests to confirm how stable our model is. We first plotted the CUMSUM of Squares test to check the existence of possible outliers in the model. Figure5 below shows that the CUSUM of Squares statistic falls outside the critical bands of the 5% confidence interval. This implies that the model is not stable.

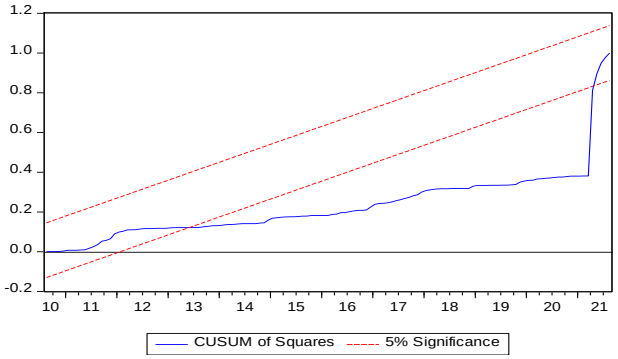

Figure 5: CUMSUM of Squares test of stability of the model

We supported the above test with the Bai-Perron multiple breakpoint tests in order to identify the breakpoint dates. Table 1 below shows that two dates are significant, namely: 2011M10 and 2019M02. This means that structural breaks occurred within these periods in our sample.

Table 1: Result of Bai-Perron Multiple breakpoint tests

Bai-Perron Multiple breakpoint tests Sample: 2010M01 2021M08 Included observations: 140 Breaking variables: C LnNFA LnBRESERVE INFLR TBR WOP Break test options: Trimming 0.15, Max. breaks 5, Sig. level 0.05			
Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	31.02837	186.1702	20.08
1 vs. 2 *	23.78700	142.7220	22.11
2 vs. 3	3.720352	22.32211	23.04
Break dates:			
Sequential		Repartition	
1	2011M10	2011M11	
2	2019M02	2019M02	

Having shown that structural breaks occurred in two periods under the Bai-Perron multiple breakpoint tests, we further confirm this using the Chow Breakpoint test within the breakpoints. As displayed in table 2 below, at the 5% level of significance, we have every reason to reject the null hypothesis of no structural break, thus indicating that there is structural break in the model. This by implication means that the model should have a dummy variable to take care of the structural break. The two break periods indicate that we are going to split our sample into two sub-samples reflecting the two periods.

Table 2: Result of Chow Breakpoint Test

Chow Breakpoint Test: 2011M10 2019M02 Null Hypothesis: No breaks at specified breakpoints Equation Sample: 2010M01 2021M08			
F-statistic	40.12598	Prob. F(14,119)	0.0000
Log likelihood ratio	244.1729	Prob. Chi-Square(14)	0.0000
Wald Statistic	561.7637	Prob. Chi-Square(14)	0.0000

3.2 Model Specification

Having laid down the above foundation, we now formally provide the functional relationship of the link between credit to private sector and capital inflows. It should be noted that the stability tests we earlier carried out were based on the model we are going to specify. Our empirical model is derived from the theoretical framework we stated above which indicates that capital inflows raises domestic credit intermediation. Consequently, we model credit to private sector as a function of capital inflows and other variables that influence it. Our model is thus specified as follows:

$$LnCRPRIV_t = f(LnNFA_t, LnBRESERVE_t, TBR_t, WOP_t, INFLR_t) \ldots (7)$$

where

$LnCRPRIV$ = natural log of credit to private sector at time t

$LnNFA_t$ = natural log of net foreign assets at time t (a proxy for capital inflows)

$LnBRESERVE$ = natural log of bank reserves at time t

TBR_t = Treasury bills rate at time t

WOP_t = world oil price at time t

$INFLR_t$ = inflation rate at time t

Based on the information of the structural break dates, we split equation 7 into two sub-samples. The model for sub-sample one for the first period is specified as follows:

$$LnCRPRIV_t = \alpha_0 + \alpha_1 LnNFA_t + \alpha_2 LnBRESERVE_t + \alpha_3 TBR_t + \alpha_4 WOP_t + \alpha_5 INFLR_t + \alpha_6 Dum1LnNFA_t. + Dum1 + \varepsilon_t \ldots\ldots\ldots (8)$$

where

$Dum1$ = Dummy variable in period one which takes the value 0 prior to 2011M10 and value 1 afterwards up to 2019M01. The first dummy which interacts with the NFA captures the slope, while the second dummy captures the intercept.

The model for sub-sample two for the second period is specified as follows:

$$LnCRPRIV_t = \beta_0 + \beta_1 LnNFA_t + \beta_2 LnBRESERVE_t + \beta_3 TBR_t + \beta_4 WOP_t + \beta_5 INFLR_t + \beta_6 Dum2LnNFA_t. + Dum2 + \varepsilon_t \ldots\ldots\ldots (9)$$

where

$Dum2$ = Dummy variable for the second period which takes the value 0 prior to 2019M02 and value 1 afterwards up to 2021M08. The first dummy which interacts with the NFA captures the slope, while the second dummy captures the intercept.

We employed the framework of the autoregressive distributed lag (ARDL) bounds model by Pesaran., Shin, and Smith (2001) and Pesaran and Shin (1999) in estimating the two equations. The choice of ARDL is informed by the fact that it is more suitable in small samples, while large data samples are necessary under the Johansen co-integration techniques for the sake of validity. Also, the ARDL can be applied whether the series are integrated of order one, ie I(1) or order zero, ie I(0) or an admixture of I(1) and I(0). The ARDL for the estimation of sub-sample one can be expressed in equation 10as follows:

$$\Delta LnCRPRIV_t = \gamma_0 + \sum_{i=1}^{t} \pi_i \Delta LnCRPRIV_{t-1} + \sum_{i=1}^{t} \tau_i \Delta LnNFA_{t-1} + \sum_{i=1}^{t} \vartheta_i \Delta LnBRESERVE_{t-1} + \sum_{i=1}^{t} \nu_i \Delta TBR_{t-1} + \sum_{i=1}^{t} \xi_t \Delta WOP_{t-1} + \sum_{i=1}^{t} \sigma_t \Delta INFRL_{t-1} + \sum_{i=1}^{t} \rho_t \Delta DUM1LnNFA_{t-1} + \psi_1 LnCRPRIV_{t-1} + \psi_2 LnNFA_{t-1} + \psi_3 LnBRESERVE_{t-1} + \psi_4 TBR_{t-1} + \psi_5 WOP_{t-1} + \psi_6 INFLR_{t-1} + \psi_7 DUM1LNFA_{t-1} + DUM1 + \mu_t \ldots\ldots\ldots (10)$$

The ARDL for the estimation of sub-sample two can be expressed in equation 11 as follows:

$$\Delta LnCRPRIV_t = \Gamma_0 + \sum_{i=1}^{t} \Omega_i \Delta LnCRPRIV_{t-1} + \sum_{i=1}^{t} \Phi_i \Delta LnNFA_{t-1} + \sum_{i=1}^{t} \Xi_i \Delta LnBRESERVE_{t-1} + \sum_{i=1}^{t} \Re_i \Delta TBR_{t-1} + \sum_{i=1}^{t} \omega_t \Delta WOP_{t-1} + \sum_{i=1}^{t} \forall_t \Delta INFRL_{t-1} + \sum_{i=1}^{t} \hat{\lambda}_i \Delta DUM1LnNFA_{t-1} + \delta_1 LnCRPRIV_{t-1} + \delta_2 LnNFA_{t-1} + \delta_3 LnBRESERVE_{t-1} + \delta_4 TBR_{t-1} + \delta_{54} WOP_{t-1} + \delta_6 INFLR_{t-1} + \delta_7 DUM2LNFA_{t-1} + DUM2 + \mu_t \ldots\ldots\ldots (11)$$

In the model for sub-sample one, γ_0 is the drift component. The short run parameters are π, τ, ϑ, ν, ξ, σ and ρ while the long-run parameters are ψ_1, ψ_2, ψ_3, ψ_4, ψ_5, ψ_6 and ψ_7

In the model for sub-sample two, Γ_0 represents the drift component. The short run parameters are Ω, Φ, Ξ, $\Re$, ω, $\forall$ and $\hat{\lambda}$. The long-run parameters are δ_1, δ_2, δ_3, δ_4, δ_5, δ_6 and δ_7

The long-run hypothesis for the model for sub-sample one is stated as follows

$H_0 = \psi_1 = \psi_2 = \psi_3 = \psi_4 = \psi_5 = \psi_6 = \psi_7 = 0$ (No co-integration)

$H_1 = \psi_1 \neq \psi_2 \neq \psi_3 \neq \psi_4 \neq \psi_5 \neq \psi_6 \neq \psi_7 \neq 0$ (Existence of co-integration)

The long-run hypothesis for the model for sub-sample two is stated as follows:

$H_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$ (No co-integration)

$H_1 = \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq \delta_6 \neq \delta_7 \neq 0$ (Existence of co-integration)

In determining the long-run relationship, the value of the estimated F-statistic is compared with the lower bounds

critical values *I*(0) and the upper bounds critical values *I*(1). The decision rule is that if the calculated F-statistics exceeds the upper bound critical value, there is an evidence of the existence of a long-run relationship. However, if the calculated F-statistics falls below the lower critical values *I*(0), the variables are not co-integrated. Having ascertained that the variables are co-integrated, an error correction representation of the model (ECM) is estimated. The coefficient of the ECM is expected to be negative and significant which indicates the speed of adjustment of the short-run shocks toward the long-run equilibrium in the case of any disturbance.

The ECM for the model for sub-sample one is specified in equation 12 below as follows:

$$\Delta LnCRPRIV_t = \gamma_0 + \sum_{i=1}^{t} \pi_i \Delta LnCRPRIV_{t-1} + \sum_{i=1}^{t} \tau_i \Delta LnNFA_{t-1} + \sum_{i=1}^{t} \vartheta_i \Delta LnBRESERVE_{t-1} + \sum_{i=1}^{t} \nu_i \Delta TBR_{t-1}$$
$$+ \sum_{i=1}^{t} \xi_t \Delta WOP_{t-1} + \sum_{i=1}^{t} \sigma_t \Delta INFRL_{t-1} + \sum_{i=1}^{t} \rho_t \Delta DUM1LnNFA_{t-1} + \Im ECM_{t-1} \ldots\ldots(12)$$

Where

ECM_{t-1} = Error correction model

$\Im$ = Coefficient of error correction model of the model for sub-sample one

The ECM for the model for sub-sample two is specified in equation 13 below as follows

$$\Delta LnCRPRIV_t = \Gamma_0 + \sum_{i=1}^{t} \Omega_i \Delta LnCRPRIV_{t-1} + \sum_{i=1}^{t} \Phi_i \Delta LnNFA_{t-1} + \sum_{i=1}^{t} \Xi_i \Delta LnBRESERVE_{t-1} + \sum_{i=1}^{t} \Re_i \Delta TBR_{t-1}$$
$$+ \sum_{i=1}^{t} \omega_i \Delta WOP_{t-1} + \sum_{i=1}^{t} \forall_i \Delta INFRL_{t-1} + \sum_{i=1}^{t} \lambda_t \Delta DUM1LnNFA_{t-1} + \Pi ECM_{t-1} \ldots\ldots(13)$$

Where

Π = Coefficient of error correction model for the model for sub-sample two

3.3 Data Sources and Variables justification

The dataset used in the study covers a period of 2010M01 2021M08. All the data were sourced from the Central Bank of Nigeria Statistical Bulletin. The international price of Brent crude was used as a proxy for world oil price. With the exception of world oil price that is measured in foreign currency, other variables are measured in domestic currency. The link between NFA and credit to private sector is that an increase in NFA leads to an intervention in the foreign exchange market by the monetary authorities through the buying of foreign currency which ends up raising money supply. The rising money supply triggers into the vaults of deposit money banks, thus giving them the leverage to extend credit. The reverse is the case if NFA declines. Bank reserves are the portion of depositors' fund that the deposit money banks are required by law to keep in order to prevent them from experiencing liquidity constraint. It can also be used by the central banks to control the ability of deposit money banks to extend loans A rise in bank reserves means that a bank's ability to extend credit is curtailed and vice versa. The link between treasury bills rate and credit to the private sector is that a rise in treasury bills represents an investment opportunity to deposit money banks as such provides them with liquidity to boost their lending. This is mostly common when the monetary authorities float bonds to sterilize inflows. Such exercise raises domestic bond rates which ultimately provide future liquidity for banks that invested in them as they retire the bonds. Oil price plays similar role with NFA as it is a source of capital inflows in Nigeria. However, as noted by Vinayagathasan (2013), world oil price can be used as s proxy for expected inflation, especially for oil-dependent countries**.** This implies that the monetary authorities should anticipate a rise in inflation if world oil price rises and thus put measures on ground to insulate the domestic economy from the inflationary impact of such rising prices. Such monetary policy measures such as increase in cash reserve requirement or sale of bonds through the open market operation usually leads to a reduction in the reserves of deposit money banks which affect their credit provision ability. The link between inflation rate and credit provision can be viewed from the link between interest rate and inflation rate. During period of rising inflation, interest rate usually rise and as such banks take advantage of such rise to extend more credit.

IV. RESULTS AND INTERPRETATION

We deemed it necessary to conduct some preliminary tests regarding the suitability of the series we adopted in our model. This is proper so that the series conform to conventional expectations.

4.1 Descriptive Statistics

The results of descriptive statistics of the variables used in the study are shown in Table 3 below. Results of findings indicate that the variable with the highest mean value is world oil price with a mean value of 74.22507 and a standard deviation of 31.09025, while the variable that exhibited the least mean value is bank reserves with a mean value of 6.441389 and a standard deviation of 0.416392. We also find that world oil price has the highest range within the study period, implying that the variable experiences high volatility within the period. At the 5% level, all the series, except world oil price are normally distributed as the Jarque Bera statistics show that their probability values are less than 5%.

Table 3: Results of descriptive statistics

	LnCRPRIV	LnNFA	LnBRESERVE	INFLR	TBR	WOP
Mean	7.266809	6.927905	6.441389	12.26007	8.834786	74.22507
Median	7.274573	6.879607	6.533969	11.87500	10.03000	69.12000
Maximum	7.523216	7.281033	7.102085	18.72000	15.00000	128.0000
Minimum	6.962762	6.664844	5.309540	7.700000	0.000000	0.000000
Std. Dev.	0.149165	0.155408	0.416392	3.109051	4.350094	31.09025
Skewness	-0.390861	1.057680	-0.862270	0.395848	-0.632883	-0.173349
Kurtosis	2.331918	3.105805	3.265076	2.165833	2.167691	2.387928
Probability	0.045769	0.000002	0.000139	0.021118	0.001239	0.236157
Sum	1017.353	969.9067	901.7945	1716.410	1236.870	10391.51
Sum Sq. Dev.	3.092786	3.357094	24.10011	1343.601	2630.341	134357.9

4.2 Stationarity Test

To avoid the problem of running a spurious regression, we first conducted a test of stationarity so as to confirm the order of integration of the series. We utilized the techniques of Augmented Dickey Fuller (ADF) and Phillip Perron (PP) in order to achieve this objective. Under the null hypothesis of no stationarity, we tested for the existence of stationarity at the 5% critical value. If the t-statistics is less than the critical value at the 5% level, the null is accepted otherwise it is rejected. The results of stationarity tests evaluated at levels and at first difference respectively are shown in tables 4 and 5 below. At levels, the p-values of the series in table 4 indicate that they exhibited non stationarity. By implication, our analysis cannot be based on the outcome of unit root test at level.

Table 4: Results of Unit Root Tests at Level

Variables	ADF t-stat.	PP t-stat.	ADF Critical value at 5%	PP Critical value at 5%	Order of integration
LnCRPRIV	-2.421146	-2.257058	0.3671	0.4541	Not stationary
LnNFA	-1.896010	-1.952907	0.6513	0.6213	-
TBR	-2.711249	-3.090628	0.2338	0.1127	-
LnBRESERVE	-2.528885	-2.507493	0.3139	0.3242	-
WOP	-2.306281	-2.308980	0.4274	0.4260	-
INFLR	-2.460121	-2.024180	0.3474	0.5827	-

As the level results show that the series are non-stationary, we proceeded to conduct another test of stationarity at first difference. As shown in table 5 below, all the series achieved stationarity after conducting the test at first difference. That is, after first differencing all the series become integrated of order one I(1). After achieving stationarity in the series, the parameters of the models can be estimated.

Table 5: Results of stationarity at first difference

Variables	ADF t-stat.	PP t-stat.	ADF Critical value at 5%	PP Critical value at 5%	Order of integration
ΔLnCRPRIV	-9.227994*	-9.233005*	0.0000	0.0000	I(1)
ΔLnNFA	-13.19668*	-13.13163*	0.0000	0.0000	I(1)
ΔTBR	-16.56839*	-18.26902*	0.0000	0.0000	I(1)
ΔLnBRESERVE	-10.01990*	-15.51657*	0.0000	0.0000	I(1)
ΔWOP	-10.28575*	-10.25500*	0.0000	0.0000	I(1)
ΔINFLR	-5.405909*	-12.41717*	0.0001	0.0000	I(1)

Note: Figures with asterisks (*) indicate the rejection of the null hypothesis at the 5% level

4.3 Results of Sub-sample One

Arbitrary selection of lag length is not proper in auto-regressive model; therefore we first conducted the lag order selection test under a Vector Autoregressive (VAR) window. The optimal lag length will then be determined by the selected lag length.

4.3.1Lag Selection Test for Sub-Sample One

Before proceeding to estimate the ARDL, it is necessary to conduct a test of lag length selection. The selection of a particular lag length implies the minimization of the information criteria. Our study employs monthly observations and as such, we use the Hannan-Quinn (HQ) information criterion to guide in the lag selection. The choice of HQ finds support in Rummel (2015) who contended that HQ is most appropriate for quarterly and monthly series. In the unrestricted VAR model we chose lags 4 and from this the optimal lag is selected. From Table 6 below, the optimal lag selected by HQ is lag 1 Thus in the ARDL window, lag 1 will be used to estimate the parameters of the model in sub-sample one.

Table 6: Result of lag order selection for sub-sample one

VAR Lag Order Selection Criteria Endogenous variables: LnCRPRIV LnNFA LnBRESERVE INFLR TBR WOP DUM1 DUM1_NFA Sample: 2010M01-2019M01						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-262.7338	NA	2.40e-08	5.156835	5.359042	5.238773
1	542.2847	1472.034	1.78e-14	-8.957803	-7.137944*	-8.220360*
2	593.0257	85.05159	2.34e-14	-8.705251	-5.267740	-7.312304
3	700.7499	164.1513	1.07e-14	-9.538094	-4.482931	-7.489642
4	781.9041	111.2971*	8.56e-15*	-9.864840*	-3.192025	-7.160883

Note: * indicates lag order selected by the criterion

The stability of the VAR model used to obtain the optimal lag is necessary. We used the inverse roots of the autoregressive characteristic polynomial to test the stability of the VAR model. Using the inverse roots, a VAR model is stable if the roots of the autoregressive (AR) model equation are located inside the circle. As shown in figure 6 below, there is stationarity in the AR process because the roots of the equation are clustered inside the unit circle.

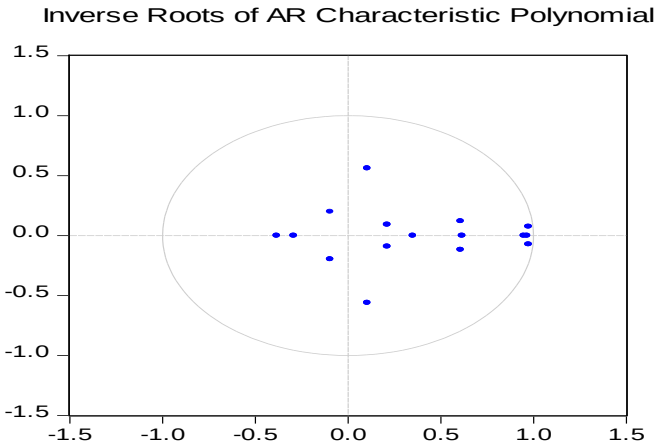

Figure 6: Test of the stability of the VAR in sub-sample one

4.3.2ARDL Test of Co-integration for Sub-Sample One

Since the series are purelyI(1), it is proper to use the ARDLto conduct the test of co-integration. The test is conducted by comparing the F-statistic with both the upperand lower critical values at the 5% level. A co-integration existsif the value of the F-stat. is greater than the upper critical bound I(1), However, there is an absence of a co-integration, if the value of the F-stat. falls below the lower critical bound I(0). From Table 7 below, the F-stat. is 4.696143 and at the 5% level this is higher than the upper critical bound (3.83). Thus, a long-run relationship exists among the variables

Table 7: Result of ARDL Co-integration Test of sub-sample one

Test Statistic	Value	K
F-statistic	4.696143	7
Critical Value Bounds		
Significance	Lower Bound I(0)	Upper Bound I(1)
10%	2.38	3.45
5%	2.69	3.83
2.5%	2.98	4.16
1%	3.31	4.63

4.3.3 ARDL Short and Long-run Results for Sub-Sample One

The results of the parameters of the ARDL for sub-sample one is displayed in table 8 below. The short-run results show that a significant and negative link exists between capital inflows and credit to private sector. Ideally, capital inflows ought to spur credit to private sector as it is expected to increase the reserves of credit money banks. However, its negative impact on credit to private sector within the short-run could be that deposit money banks are careful not to extend facilities in period of declining inflows which depletes their liquidity. During period of falling inflows, banks are more risk averse

because such phenomenon could lead to non-performing loan. Fig. I above shows that between 2013-2017, capital inflows represented by NFA has been very low and consequently within the same period credit to private sector has been almost flat as shown in fig. 4 above. The result of bank reserves exhibited a negative link with credit to private sector even though the result is not significant.

Finding in the short-run also shows that inflation significantly impacts on credit to private sector. During period of rising inflation, interest rate also rises. We should therefore expect this development to give more impetus for banks to extend more credit in order to avail themselves the opportunity to generate more income. Expectedly, treasury bills rate significantly impacts positively on credit to private sector. As capital inflows are sterilized, this exercise raises the treasury bills rate which should serve as an investment opportunity for banks to grow their reserves. Finding shows that world oil price has a negative and significant impact on credit to private sector. As a proxy for expected inflation especially in an oil dominated economy like Nigeria, a rise in world oil price pushes the monetary authorities to anticipate an incipient inflationary trend and as such uses certain contractionary measures to neutralize the inflationary threat. The announcement of such measures during the Monetary Policy Committee (MPC) meeting of the Central Bank is enough for banks to avoid credit extension. The result of the interactive dummy used in the model shows that when NFA interacts with the dummy variable, capital inflows impact positively on credit to the private sector and the result is significant. The result indicates that after the break, banks are willing to extend credit to the private sector.There is a negative and significant link between the dummy that captures the coefficient in the model and credit to private sector. We contend that other factors not related to capital inflows negatively influence credit extension of banks within the period. The result of the error correction modelshows that the coefficient of ECM is negative and significant which supports the long-run relationship that exists among the variables. The coefficient of ECM term is -0.380373 which suggests thatabout 38 per cent of the previous quarter's shock to equilibrium reverts back to the long run equilibrium in the current quarter.

The long-run results show that capital inflows impact positively on credit to private sector but the result is not significant. The result indicates that in the long-run capital inflows gradually improves and as such banks can have more leverage to lend. Finding also shows that bank reserves impact positively on credit to private sector but the result is not significant. In the long-run also, both inflation and treasury bills rate significantly and positively impact on credit to private sector. Again world oil price displayed a negative link with credit to private sector even though the result is not significant. Though the interactive dummy and the ordinary dummy are positively linked with credit to private sector, the result is not significant.

Table 8: Result of short and long-run ARDL coefficient for sub-sample one

Dependent Variable: D(LnCRPRIV) Selected Model: ARDL(1, 1, 1, 0, 0, 1, 1, 1) Sample: 2010M01-2019M01				
Short-run Results				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LnNFA)	-0.252418	0.134388	-1.878272	0.0635
D(LnBRESERVE)	-0.002655	0.013400	-0.198139	0.8434
D(INFLR)	0.001113	0.000660	1.686879	0.0950
D(TBR)	0.000957	0.000449	2.130337	0.0358
D(WOP)	-0.000455	0.000181	-2.513980	0.0137
D(DUM1*NFA)	0.325213	0.139035	2.339081	0.0215
D(DUM1)	-2.201036	0.950415	-2.315868	0.0228
ECM(-1)	-0.380373	0.069459	-5.476255	0.0000
Long-run Results				
C	4.899487	2.439388	2.008490	0.0475
@TREND	0.002195	0.000354	6.196201	0.0000
LnNFA	0.257606	0.378305	0.680949	0.4976
LnBRESERVE	0.051722	0.037576	1.376449	0.1720
INFLR	0.002925	0.001507	1.940826	0.0553
TBR	0.002517	0.001130	2.227792	0.0283
WOP	-0.000180	0.000235	-0.765247	0.4461
DUM1*NFA	0.280743	0.386855	-0.725704	0.4698
DUM1(-1)	2.007033	2.650724	0.757164	0.4509

4.4 Result of Sub-sample Two

In sub-sample two, we also conducted a test on lag order selection before estimating the ARDL model.

4.4.1 Lag Selection Test for Sub-Sample Two

The result of lag order selection in table 9 below shows that the optimal lag selected by Hannan-Quinn (HQ) information criterion is lag 1. Thus in the ARDL window, lag 1 was used to estimate the parameters of the model in sub-sample two.

Table 9: Result of lag order selection for sub-sample two

VAR Lag Order Selection Criteria Endogenous variables: LnCRPRIV LnNFA LnBRESERVE INFLR TBR WOP DUM1 DUM1*NFA Sample: 2011M11-2021M08						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2398.438	NA	2.99e+08	42.21822	42.41023	42.29615
1	-1361.948	1909.324	11.66509*	25.15698*	26.88511*	25.85833*
2	-1304.157	98.34544*	13.20808	25.26592	28.53016	26.59069
3	-1263.935	62.80310	20.86317	25.68307	30.48342	27.63127
4	-1215.240	69.19826	29.51365	25.95158	32.28804	28.52319

Note: * indicates lag order selected by the criterion

Also, as shown in figure 7 below, the test for the stability of the VAR model indicates that there is stationarity in the AR process because the roots of the equation can be located inside the unit circle.

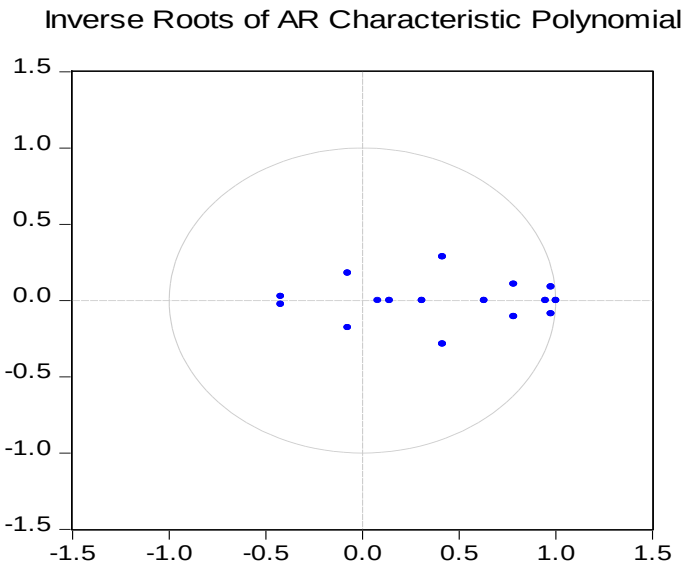

Figure 7: Test of the stability of the VAR in sub-model two

4.4.2ARDL Test of Co-integration for Sub-Sample Two

We also use the ARDL to conduct the test of co-integration in the model for sub-sample two since the series are purely I(1). The test is conducted by comparing the F-statistic with both the upper and lower critical values at the 5% level. From Table 10 below, the F-stat. is 4.693288 and at the 5% level this is higher than the upper critical bound (3.83). Thus, a long-run relationship exists among the variables

Table 10: Result of ARDL Co-integration Test of sub-sample two

Test Statistic	Value	K
F-statistic	4.693288	7
Critical Value Bounds		
Significance	Lower Bound I(0)	Upper Bound I(1)
10%	2.38	3.45
5%	2.69	3.83
2.5%	2.98	4.16
1%	3.31	4.63

4.4.3ARDL Short and Long-run Results for Sub-Sample Two

Findings displayed in table 11 below shows that in the short-run, capital inflows have a positive impact on credit to private sector but the result is not significant. However, bank reserves has a significant and positive impact on credit to private sector. The implication of the result is that banks can engage in credit extension when their reserves increases. While the results of inflation and treasury bills showed that they significantly impacted positively on credit to private sector, world oil price negatively and significantly impacted on credit to private sector. The result of the interactive dummy showed that when capital inflows interacts with the dummy, it significantly has a negative impact on credit to private sector. Unlike the first regime of structural break in our study, in this second regime, banks were more averse to lend even after the break. Indeed one can appreciate the effect of COVID-19 pandemic on many countries' economy as the second regime

in our study happens to be within this period. The real impact of the pandemic began to show long after the lockdown in different countries as the macroeconomic environments of many countries began to witness crisis. The coefficient of the ECM is negative and significant which lends support to the co-integration of the variables. The coefficient of ECM term is -0.491818 which suggests that about 49 per cent of the previous quarter's shock to equilibrium reverts back to the long run equilibrium in the current quarter.

In the long-run, we also noticed that capital inflows have a positive impact on credit to private sector even though the result is not significant. Bank reserves also have positive and significant impact on credit to private sector in the long-run. Again inflation and treasury bills rate also have a significant positive impact on credit to private sector. World oil price and the interactive dummy both have significant negative impact on credit to private sector. The result of the interactive dummy in the sub-sample one is different from the result of the sub-sample two. In the first regime, the result of the interactive dummy is positive and non-significant, indicating that banks are still willing to lend after the shock, however; in the second regime, result of the interactive dummy indicates that banks are less willing to lend even soon after the shock.

Table 11: Result of short and long-run ARDL coefficient for sub-sample two

Dependent Variable: D(LnCRPRIV) Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0, 0) Sample: 2011M11-2021M08				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Short-run Results				
D(LnNFA)	0.026727	0.017513	1.526089	0.1300
D(LnBRESERVE)	0.034924	0.015112	2.310945	0.0228
D(INFLR)	0.001770	0.000567	3.119453	0.0023
D(TBR)	0.000939	0.000390	2.406030	0.0179
D(WOP)	-0.000150	0.000067	-2.236247	0.0274
D(DUM2*NFA)	-0.034721	0.015546	-2.233429	0.0276
D(DUM2)	0.262167	0.111028	2.361269	0.0200
ECM(-1)	-0.491818	0.073882	-6.656775	0.0000
Long-run Results				
LnNFA	0.003282	0.023678	0.138621	0.8900
LnBRESERV	0.071010	0.025780	2.754452	0.0069
INFLR	0.003599	0.000917	3.926466	0.0002
TBR	0.001909	0.000746	2.559692	0.0119
WOP	-0.000306	0.000132	-2.320626	0.0222
DUM2*NFA	-0.070597	0.031069	-2.272261	0.0251
DUM2	0.533057	0.221561	2.405920	0.0179
C	6.668091	0.274784	24.266686	0.0000
@TREND	0.001883	0.000289	6.508339	0.0000

4.5 Results of Diagnostic Tests

The results in appendix 1 for sub-sample one below show that the model is well specified as under the Ramsey reset test, we cannot reject the null hypothesis that the model does not have specification error. Under Breusch-Godfrey test for serial correlation, we cannot reject the null hypothesis that the model does not have serial correlation. However, the model suffers from heteroskedasticity because under the Breusch-Pagan-Godfrey test, we reject the null hypothesis that there is no heteroskedasticity in the model. The plots of cumulative sum (CUSUM) and the cumulative sum of squares (CUMSUM of Squares) reveal that the model for sub-sample one exhibits an absence of instability of the coefficients because the plot of the CUSUM and CUSUMSQ statistic fall inside the critical bands of the 5% confidence interval of parameter stability. In appendix 2, the diagnostic tests for sub-sample two show that the model passes all the tests except the test for heteroskedasticity. Also, the plot of cumulative sum (CUSUM) and the cumulative sum of squares (CUMSUM of Squares) indicate that the model for sub-sample two is stable

V. CONCLUSION AND POLICY IMPLICATIONS

In this study, we sought to find out the impact of capital inflows on credit to private sector under two different regimes and to identify if the behavior of banks' credit in each regime differ. Our finding shows that in regime one spanning a period of 2010M01-2019M01, capital inflows negatively impacts on credit to private sector in the short-run, while in the long-run, the impact is positive though not significant. We also find that when capital inflows interacts with the dummy variable, the impact on credit to private sector is significant and positive in the short-run but not significant in the long-run. In the second regime that spans a period of 2011M11-2021M08, the impact of capital inflows on credit to private sector is positive but not significant in both time horizons. When capital inflows interacts with the dummy variable, the impact on credit to private sector is negative and significant in both short and long-run. In the first regime, banks are willing to extend credit after the shock, but in the second regime, the impact of the shock lingers as banks are not willing to extend credit after the shock.

Our findings show that different regime influences banks' beaviour differently and this suggests that policy makers are not supposed to adopt a one-size-fits-all measures when responding to shocks in the economy. This implies that the underlying causes of the shocks have to be studied and there is also need to insulate the domestic economy from the adverse effect of foreign shocks. This means building a resilient economy that cannot be easily destabilized by exogenous shocks. We noticed that interest rate has been among the factors that spur bank lending in Nigeria as banks see it as an investment opportunity. This penchant to benefit from rising interest rate is among the reasons why lending rate is very high in the country which retards investment. It is our contention that interest rate should be influenced more by productivity than fixing it by fiat.

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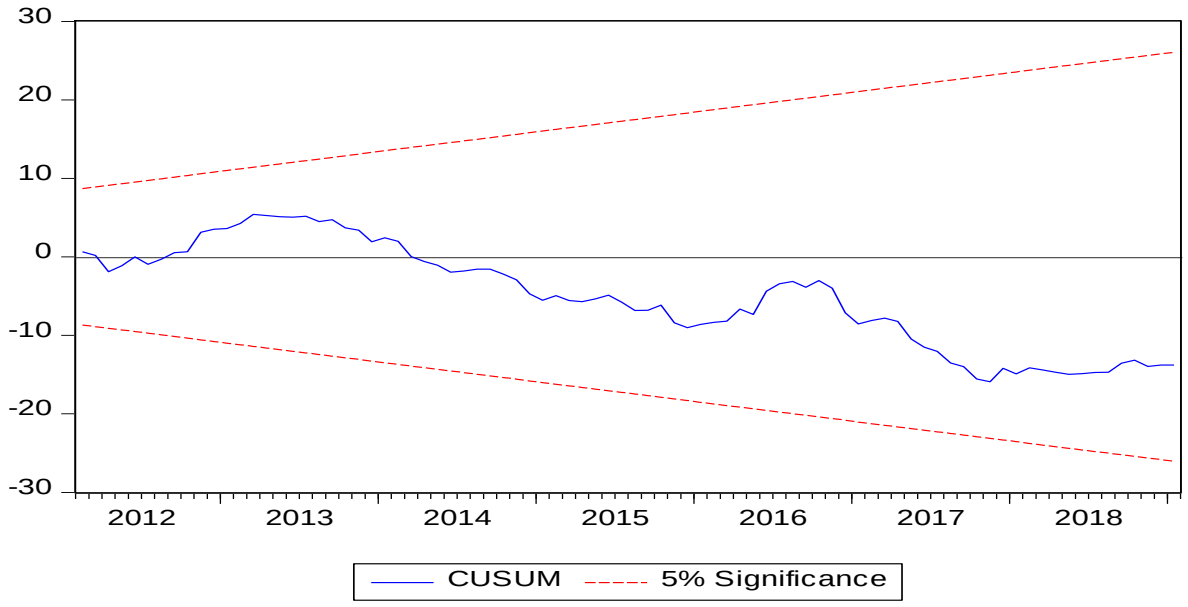
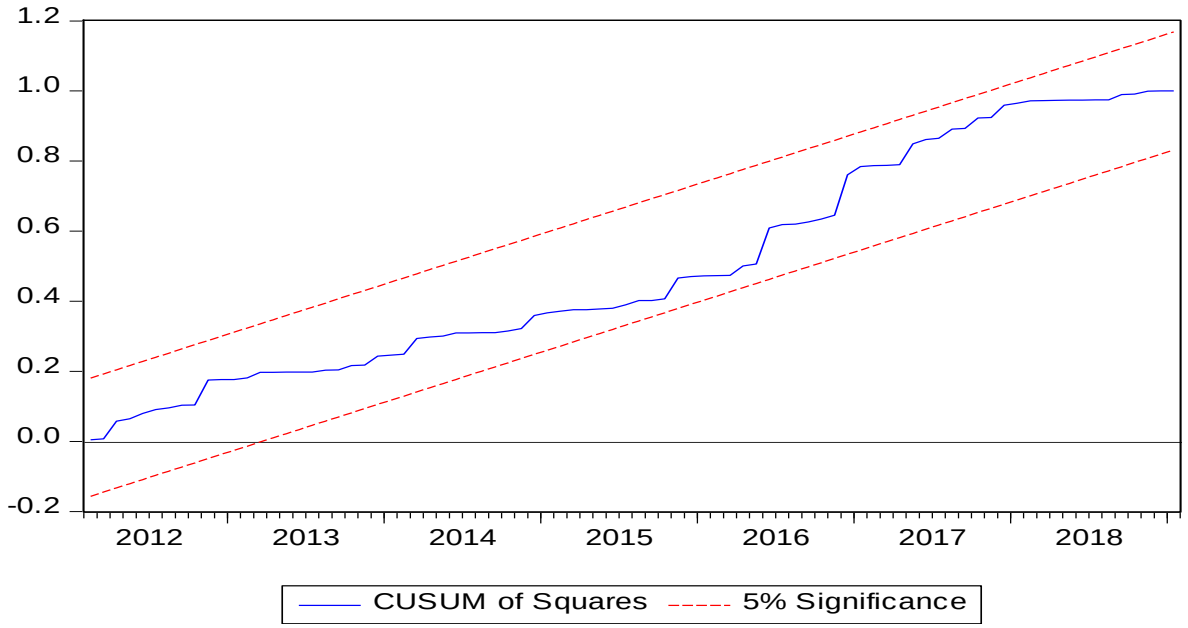
Appendix 1 Diagnostic Test for Sub-Sample One

Ramsey RESET Test			
	Value	df	Probability
t-statistic	1.657077	92	0.1009
F-statistic	2.745903	(1, 92)	0.1009
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.685032	Prob. F(4,89)	0.1605
Obs*R-squared	7.603224	Prob. Chi-Square(4)	0.1072
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	2.852329	Prob. F(14,93)	0.0013
Obs*R-squared	32.44292	Prob. Chi-Square(14)	0.0035





Appendix 2 Diagnostic Test for Sub-Sample Two

Ramsey RESET Test			
	Value	df	Probability
t-statistic	0.124559	105	0.9011
F-statistic	0.015515	(1, 105)	0.9011
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.971548	Prob. F(4,102)	0.1044
Obs*R-squared	8.396728	Prob. Chi-Square(4)	0.0781
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	4.074359	Prob. F(10,106)	0.0001
Obs*R-squared	32.48524	Prob. Chi-Square(10)	0.0003