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Asymmetric Effect of External Debt and Foreign Capital Flows on Economic Growth: New Evidence from Nigeria[1]

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This research examines the asymmetric nexus between external debt and foreign capital flows on economic growth in Nigeria. The paper employed the non-linear autoregressive distributed lag (NARDL) methodology to investigate the asymmetrical effect of external debt on real Gross Domestic Product (GDP) growth in Nigeria. The estimated long-run parameters for positive and negative shocks of external debt are -1.08 and 3.09, respectively. The outcome indicated that a percentage increase in external debt will result in a 1.08 decrease in real GDP growth and that a one percent decrease in external debt will result in a 3.08 increase in economic growth. This illustrates that the receptiveness of real GDP growth to positive values of external debt is different to that of negative values of external debt. The reaction of real GDP growth to negative values of external debt is larger than to positive value of external debt. This suggests that it is imperative for Nigeria to have manageable external debt and fiscal sustainability as this would bolster its real economic growth as well as urge the fiscal authority to make concerted effort towards curbing corruption and reducing inefficiency to the barest minimum, as these will enhance growth.

Keywords: *Nigeria, external debt, economic growth, asymmetry, foreign capital inflows*

JEL Classification: *C22, E62, F43, O11*

Introduction

Foreign capital flows and external debt will continue to remain a subject of interest and concern among academia, policy makers and fiscal and the monetary authorities. The reasons adduced for this are quite apt especially its contribution to economic growth, volatility and other macroeconomic consequences. Foreign capital inflow is encouraged in developing countries to supplement domestic savings for investment and growth, and to bring in capital and technology. It contributes to filling the resource gaps where domestic savings are inadequate to finance the required investment. Capital flows are classified into debt, private and official flows. Private capital flows comprise mainly FDI, foreign portfolio investment (FPI) in the form of bonds and equity and commercial bank loans, while official capital flows include Overseas Development Assistant (ODA) and grants. In investigating the effect of capital flows on economic growth, FDI and

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portfolio equity are different from each other since FDI involves ownership and control while FPI is not while foreign debt is a liability that must be paid (Lensik and Morrissey 2001, Klein and Olivei 2008, Ekeocha et al. 2012, Coccia 2017).

In 2016, total external inflow to Africa was US$197.33 billion, a 25.4 percent decrease from $264.51 billion in 2015. It thereafter dropped by 16.01 percent to US$165.7 billion in 2017 and maintained a steady increase of 2.93 and 3.42 percent, respectively to US$170.6 billion and US$176.4 billion in 2018 and 2019. Following the outbreak of corona virus disease (COVID-19) pandemic in 2020, resulted in lockdown and travel restriction lead to moderation in total external inflows by 0.34 percent to US$177.0 billion in 2020 and increased by 3.64 to US$183.5 billion in 2021. Foreign Direct Investment has nosedived in Africa over the last decade from a rise of 5.23 percent of the total inflows in in the last decade 2002 - 2011 (US$262.9 billion) and declining to about 34.47 percent in 2021 (US$183.48 billion) (UNCTAD 2019, 2018, World Bank 2021, Chih et al. 2022). Conversely, portfolio inflows fell in 2021 and accounted for only 32.7 percent of total financial inflows compared to 5.23 percent in 2002-2011 occasioned by investor's risk averse to shocks in the global economy (Adeniran and Sidiq 2018, World Bank 2021).

Foreign capital flows have been defined as the movement of financial resources from one country to another. In a broader term it includes different kinds of financial transactions such as investment in equities; lending by governments and international organisations; bank lending; short and long terms; investment in public and private bonds and direct investment in productive capacity. Each of these has different implications for economic growth and development (see, Obadan 2004). International capital flows offer benefits to financially integrated countries and at the same time countries with some degree of financial openness share income risk, smoothen their consumption path and bridge saving-investment and foreign exchange gaps. They also face shocks transmitted through capital flow volatility which induces domestic instability (see also, Reinhart et al. 2016, Fernández et al. 2015, Reinhart and Reinhart 2009, Levine, 2001, Chenery and Strout 1966).

The 2008/9 global financial crises and its aftermath coupled with the recent decline in global commodity prices has necessitated a re-assessment of the effects of the recent developments especially in the context of financial integration and capital flows volatility on economic growth in Nigeria. For several years, Capital flows into the Nigerian economy have been largely in form of FDI. It is more beneficial for growth because it brings in the needed capital, technology and know-how, managerial skills, jobs creation and stimulation of economic growth. However, the sustainability of these flows was affected by the global financial crises and its aftermaths including the recent fall in global commodity prices (Adeniran and Sidiq 2018, Omondiale 2018, Orji et al. 2021).

Nigeria net foreign direct investment (FDI) inflows have oscillated significantly in recent years, as it has the tendency to expand through period 1980-2021. Net foreign direct investment (FDI) flows to Nigeria stood at US$2.4 billion in 2020. This represents a slight increase of 3.5 percent, from the level in 2019 (US$2.3 billion), notwithstanding the global economic catastrophe sparked by the

novel corona virus disease (COVID-19) pandemic (UNCTAD 2018, 2019, World Bank 2021).

In Nigeria, the build-up in portfolio investment, especially during 2005-2007 was largely due to the consolidation of the financial sector and the liberation of the money market which allowed foreign investors to invest in treasury bills with a tenor of at least one year. This notwithstanding, portfolio inflows which stood at US$360.2 million in 2006 but declined to US$319.4 million in 2020, due to capital reversal in the Nigerian Capital Market (Obayagbona and Igbinovia 2021).

Since the external debt relief from Paris club, the Nigeria's external debt component had remained relatively stable from US$3.5 million in 2006 to US$3.9 million in 2009. It however increased from US$4.5 million in 2010 to US$9.7 million in 2014, and further increased to US$10.7 million in 2015. The stock of external debt as at end-December 2017, increased by 65.8 percent, 33.9 percent and 9.5 percent, respectively, above the US$11.4 million, US$18.9 million and US$25.3 million in 2016, 2017 and 2018. The country stock of external debt stood at US$38.4 million in 2021. This represents a marginal increase of 38.6 percent, from the level in 2019 (US$27.7 million), occasioned the advent of the global economic devastation created by the novel corona virus disease (COVID-19) pandemic and the need to fund health and other critical infrastructure in Nigeria (UNCTAD 2018, 2019, Adekunle et al. 2021, World Bank 2021).

In the light of above and given the heterogeneous nature of external debt and capital flows, financial integration and the volatility in crude oil prices during the 2008/9 global financial crisis and its aftermath, the benefits of external debt need a re-assessment especially in developing countries. Several studies have attempted an empirical investigation on the effects of external debt on macroeconomic variables, especially, its effect on economic growth yet no consensus has been reached. The results in the literature on effects of debt on economic growth have been found to be both positive and negative and some studies had recorded no significant effect on growth of the receiving country (See Boltho and Carlin 2013, Coccia 2017, Lau et al. 2019, Edo et al. 2020, Alexandre et al. 2021, Mosikari and Eita 2021, Sharaf 2021). There have been other studies on the effect of capital flows on output growth without unanimity in conclusions, due to the differences in the methodologies and samples used (see: Klein and Olivei 2008, Kohlscheen, 2010; Reinhart and Rogoff 2011, Murshid and Mody 2011, Driffield and Jones 2013, Reinhart and Reinhart 2015, Levine, 2001).

In Nigeria, several studies including Obiechina and Ukeje (2013), Adeniyi et al. (2012), Olusanya (2013), Umoh et al. (2012), Ekeocha et al. (2012), investigated on the effects of capital flows and external debt on economic growth but the results had no consensus as they were mixed. Our study, therefore, set out to investigate the asymmetric effects of external debt and capital flows (FDI, FPI) on economic growth in Nigeria considering the aftermath of the global financial crisis and the decline in commodity prices that led to economic recession in Nigeria.

Despite the explosion of theoretical and empirical literature, studies that clarifies our understanding of the effect of the threesome- external debt, FDI and FPI - after the global 2007/8 global financial crises is lacking. Filling this research

gap is extremely important given the policy conundrum that confronted countries during the crises, due to portfolio reversal and external debt overhang. In Nigeria currently, FDI is contracting, while FDI and increasing external debt stock are increasing. What is the effect of increasing external debt stock and FPI, and decreasing FDI on economic growth? What are the possible new theoretical lens that are influencing economic managers decision to accumulate external debt stock, increase inflow FPI, during decline in FDI? To provide answers to these questions, the rest of the paper is structured as follows: next section presents the theoretical framework and review of related literature and then some stylized facts on the Nigerian macro-economy are presented. Methodology and data sources are following, then the analysis of the results, and finally come the conclusions that proffer policy recommendations.

Theoretical and Empirical Review

Theoretical Literature

Numerous theories have been publicized by academics and researchers attempting to describe the subject of debt and capital flows on growth. An eclectic synopsis of some of these theories will be discussed here. The theory of capital flows is anchored on the concept of capital markets. The theory assumes that the capital market is efficient. The modern portfolio theory provided explanations for risk-averse financiers to allocate their properties in an efficient capital market. Here, risk-averse stakeholders have identical expectations concerning the mean, variance, and covariance of their returns to assets, as such, they make the most of their expected satisfaction when creating investment choices. The concept of risk aversion is an upshot from the expected utility theory (EUT). The EUT describes the decision creating procedure of financiers in the existence of risk while depending on the stakeholder wisdom. Export–led growth theory (EGT), stresses the significance of trade on economic growth; focusing on different variables like openness, foreign exchange rate, capital flows, tariffs, terms of trade and export performance to justify the proposition that open economies grow faster than closed economy (Udah 2008). Trade offers a poor country the opportunity of recovering domestic shortages to overcome the diseconomies of the small size of its domestic market (Nyong 2005). The proponents of the export–led growth theory, therefore, argue that trade is one of the major determinants of the growth of the Asian Tigers (Taiwan, Korea Republic, Hong Kong and Singapore). The importance of this theory to our study is that opening our economy to foreign competition would lead to faster growth as well as provide an opportunity to overcome the diseconomies in its domestic market (see: Shan and Sun 1998, Shirazi and Abdul Manap 2005, Malhotra and Kumari 2016).

Empirical Literature

An earlier study by Metwally and Tamaschke (1994) developed and tested a simultaneous equation model (two-stage least square) to examine the relationship between debt servicing, inflow of foreign capital and economic growth using three heavily indebted North African countries – Algeria, Egypt and Morocco. The result suggests that servicing and capital reversals in these countries worsens their debt problem. This finding is consistence with Odhiambo (2011).

Çifligu (2018) in a survey investigated the relationship between public debt and economic growth in Albania in the post dictatorship periods and concluded that external debt has a negative effect on economic growth for debt /GDP over 35-40 percent. Laina (2011) studied the relationship between public debt and economic growth in the United States for the period 1959-2010using a SVAR time series model. According to the impulse response function and forecast error variance decomposition analysis, the effect of government debt on economic growth is positive in the short term and negative in the long term.

Balassone et al. (2011) analyzed the relationship between public debt and economic growth, looking at the effects of both domestic and external debt on the economy over a long period of 1861 to 2010 in Italy. The study applied both the endogenous growth model and heteroskedasticity. The result showed a negative correlation but bigger influence on external debt. Baharumshah and Thanoon (2006) employed a dynamic panel analysis to quantitatively evaluate the weight of several forms of capital flow on the growth process of the East Asian countries. Their result showed that domestic savings had positive effect on economic growth. They also observed that FDI is growth enhancing, thus, its effect is felt both in the short- and long- run and held that the effect of FDI on growth is much higher than home savings and concluded that countries that are effective in enticing FDI can finance more investments and grow faster than those that dissuade FDI.

While Obadan (2004), observed that capital flows have played critical roles in the economies of both developed and developing countries. But opined that it has brought about some undesired effects and difficulties in the developing countries, thus, posing severe challenges for policy makers. This notwithstanding, he held that if foreign capital is channeled into the productive sectors of the economies, contrary to consumption, can be highly desirable, as it will bring about the much needed economic growth and development. Calvo et al. (1996), in analyzing the principal causes, facts, and policies that have described capital inflows into Asia and Latin America, perceived that foreign investment are inclined to repeated booms and busts. They concluded that the aim of policy in Asia and Latin America countries was to reduce the vulnerability of capital inflows as such polies have proved useful in protecting these economies from the vagaries of international capital flows.

To Malik et al. (2010) external debt is a significant source of income for developing countries and this was accountable for the heavy reliance of Pakistan on external resources for development that was uncontrollable in late 1980s. Their study found that external debt and debt servicing negatively and significantly affected on economic growth and led to its decline. Therefore, the concluded that

as debt servicing grew, there will be less prospects for economic growth. Adelegan (2000), surveyed the effect of foreign direct investment inflows on economic growth in Nigeria from 1970 to 1995 by adopting seemingly unrelated model. He also observed negative and significant linkage foreign direct investment inflows - growth in Nigeria. He therefore, attributed this to the none channeling of FDI to productive use but rather for consumption, substitute for saving and devoted to the importation of consumer goods and services at the expense of investments that will aid exports.

Using panel of forty-five countries, Bordo et al. (2010) evaluated the effect of foreign currency debt on currency and debt crisis and its indirect short- and long-run effect. They discovered that financial crises, driven by acquaintance to foreign currency were responsible for significant and permanent output losses. They arrived at this, by looking at the risk posed by high levels of foreign currency liabilities in Eastern Europe in late 2008. They concluded that foreign currency debt increased the risks of financial crisis and was responsible for the East Asian crisis in the late 1990s.

Hermes and Lensink (2010) evaluated the nexus between financial system, FDI and economic growth, using panel data for sixty-seven countries. Narayan (2013) using the pair-wise Granger causality test, examined the casual relationship between foreign capital inflows and economic growth in India. The pair-wise Granger causality test shows that long-run equilibrium relationships exist between the following variables economic growth and Foreign Direct Investment (FDI) and economic growth and Foreign Portfolio Investment (FPI).

Aurangzeb and Haq (2012) investigated the effect of foreign capital inflows on economic growth of Pakistan for the period of 1981 to 2010. The study employed a multiple regression analysis and the results indicated that the all the variables were positive and significant in their relationship with economic growth (GDP). The Granger-Causality test confirms the bidirectional relationship between remittances and external debt, gross domestic product and external debt, foreign direct investment and external debt, and foreign direct investment and remittances. The Study concluded that the foreign capital inflows are very significant to the growth of any economy.

Obiechina and Ukeje (2013), using time series data from 1970-2010 investigated the effect of capital flows (foreign direct investment), exchange rate, export and trade openness on economic growth of Nigeria as well as the causal long-run relationship among the variables. Using Engle-Granger 2-Step procedure, it was observed that all the variables, except the FDI are statistically significant and influence economic growth in the short-run dynamic equilibrium model. Exogeneity test confirmed that FDI has weak exogeneity with economic growth. In addition, the Pairwise Granger causality revealed the existence of uni-directional causality between economic growth and FDI, and uni-directional and bi-directional causality among some of the variables.

In 2011, Adeniyi et al. (2012) examined the causal relationship between foreign direct investment (FDI) and economic growth - in Cote' d'Ivoire, Gambia, Ghana, Nigeria and Sierra Leone - with the financial development accounted for over the period 1970-2005 within a trivariate framework that applies Granger

causality tests in a vector error correction (VEC) model. Three alternative measures of financial sector development - total liquid liabilities, total banking sector credit and credit to the private sector - were employed to capture different aspects of financial intermediation. The results supported the view that the extent of financial sophistication matters for the benefits of foreign direct investment to have influence on economic growth in Ghana, Gambia and Sierra Leone depending on the financial indicator used. Nigeria, on the other hand, displays no evidence of any short- or long-run causal flow from FDI to growth with financial deepening accompanying.

Olusanya (2013) examined the effect of foreign direct investment inflow and economic growth in a pre-and post-deregulated Nigerian economy, using a Granger causality test between 1970 and 2010. The analysis also dis-aggregated the data into three periods; 1970 to 1986, 1986 to 2010 and 1970 to 2010, to test the causality between foreign direct investment inflow (FDI) and economic growth (GDP). The result indicated that there is causality relationship in the pre-deregulation era that is (1970-1986) from economic growth (GDP) to foreign direct investment inflow (FDI). This implies that GDP causes FDI, however, but there is no causality in the post-deregulation era of (1986-2010) between economic growth (GDP) and foreign direct investment inflow (FDI). This implies that GDP causes FDI. The result showed that from 1970 to 2010 there is a causal relationship between economic growth (GDP) and foreign direct investment inflow (FDI) and vice versa.

Umoh et al. (2012) opined that there is endogeneity relationship between FDI and economic growth in Nigeria. Using a single and simultaneous equation system, the study examined the relationship between FDI and economic growth in Nigeria. The results indicated that FDI and economic growth are jointly determined in Nigeria and there is positive feedback from FDI to growth and from growth to FDI. Fambon (2013) investigated the effect of foreign capital inflows (foreign aid and foreign direct investment) on economic growth in Cameroon. The study employed an autoregressive distributive lag approach to the co-integration and time-series data for the period 1980-2008. The study revealed that the domestic capital stock and foreign direct investment have positive and significant effects on economic growth in the short and long terms, as that of labour force on growth was significantly negative in both terms. This was attributed to the fact that there is unlimited supply of labour in Cameroon as is in most developing country with its detrimental effect on economic growth.

Ekeocha et al. (2012) investigated the long run determinants of foreign portfolio investment (FPI) in Nigeria and suggested that appropriate policies should be pursued to attract same in the long run. FPI has grown recently in proportion relative to other types of capital inflows to Nigeria before the wake of global financial crisis. The study tried to add to the existing literature by modelling the long-run determinants of FPI in Nigeria using quarterly data for the period of 1981-2010. The study employed variables such as market capitalization, real exchange rate, real interest rate, real gross domestic product and trade openness. The result revealed that FPI has a positive long-run relationship with market capitalization, and trade openness in Nigeria.

Ezeabasili et al. (2011) examined the effect of Nigeria's external debt and economic growth, from 1975 to 2006. The study revealed that external debt has negative effect on economic growth in Nigeria. Also, from the pairwise Granger Causality test it was found that uni-directional causality exists between external debt service payment and economic growth at the 10 percent significance level. More importantly, external debt granger caused external debt service payment at the 1 percent significance level, as there exists statistical interdependence between external debt and economic growth.

Chigbu et al. (2015) examined the effect of capital inflows on economic growth of developing economies using Nigeria, Ghana and India as case studies from 1986-2012. The study employed Augmented Dickey Fuller unit root test to evaluate the stationarity of the data, while Johansen Co-integration was used to estimate the long-run equilibrium relationship among the variables. The casual relationship was tested using Granger Causality, and the Ordinary Least Square method was used in the model estimation. The findings from the study revealed that capital inflows have significant effect on the economic growth of the three countries. In Nigeria and Ghana, foreign direct and portfolio investment as well as foreign borrowings have significant and positive effect on economic growth. Workers' remittances significantly and positively related to the economic growth of the three countries. The study recommended an enabling environment to encourage more inflow of foreign investments and workers remittances as it will help in bridging the savings-investment gap and encourage economic growth.

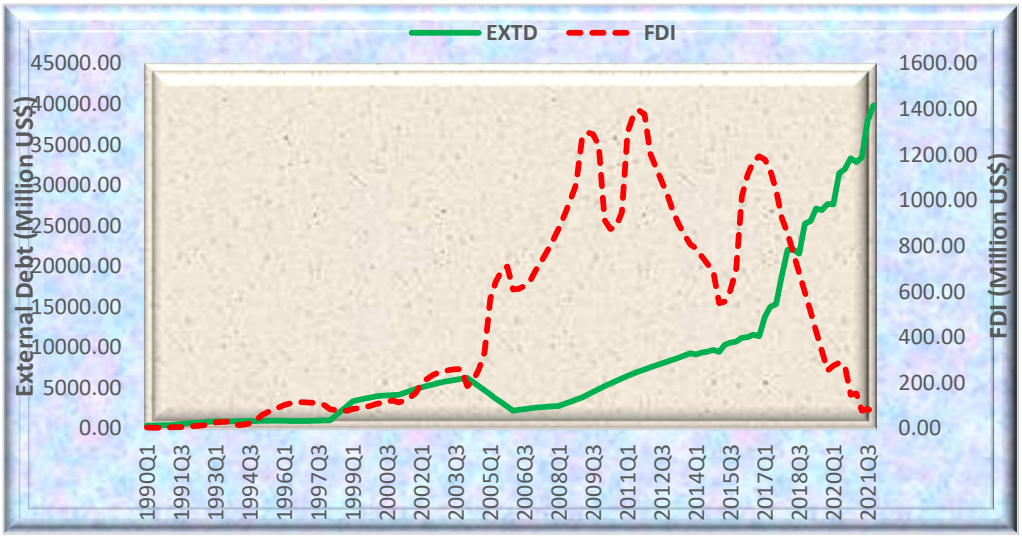
Several scholars have employed the non-linear autoregressive distributed lag (NARDL) methodology to evaluate the asymmetrical effects of debt on economic growth in other clime and concluded that the responsiveness real GDP growth to positive and negative shocks of debt is significantly different (see: Boltho and Carlin 2013, Suliková et al. 2015, Coccia 2017, Lau et al. 2019, Alexandre et al. 2021, Mosikari and Eita 2021, Sharaf 2021). To the best of our knowledge, this is the first time it is applied in this area in Nigeria.

Stylized Facts on Capital Flows, Public Debt and Economic Growth in Nigeria

The movement between external debt (EXTD) and foreign direct investment (FDI) is presented in Figure 1. Figure 1 revealed that between 1990Q1 and 2006Q1, EXTD was higher than the FDI with the later been relatively volatile. Conversely, between 2006Q2 and 2012Q3, FDI was higher than EXTD with the latter continued to be more volatile. From 2012Q4 to 2018Q4, EXTD was higher than the FDI. The country's total debt profile has continued to shower by about 90 per cent the value in 2015 quarter 4 (US$2,467.44) to US$9,608.90 in 2018Q4 according to data from Debt Management Office (DMO). Within the same period, the FDI have remained volatile while debt is rising and FDI is declining. Provisional data from the Debt Management Office (DMO) indicated that Nigeria's total external debt profile has continued to experience an upsurge of about 57.7 percent US$39,856.43 million, when compared to the level in 2018Q4 (US$25,274.36) while within the same period, the FDI have continued to show a

steady downward trend as it decreased by 88.0 percent to US$0.72 million in 2021Q4, from US$0.598 million in Q4 2018. The analysis shows that while 200debt is total external debt has been rising since 2006Q2, that of FDI indicates a volatile declining trend (CBN 2019, 2020, 2021, DMO 2018, 2020, 2021).

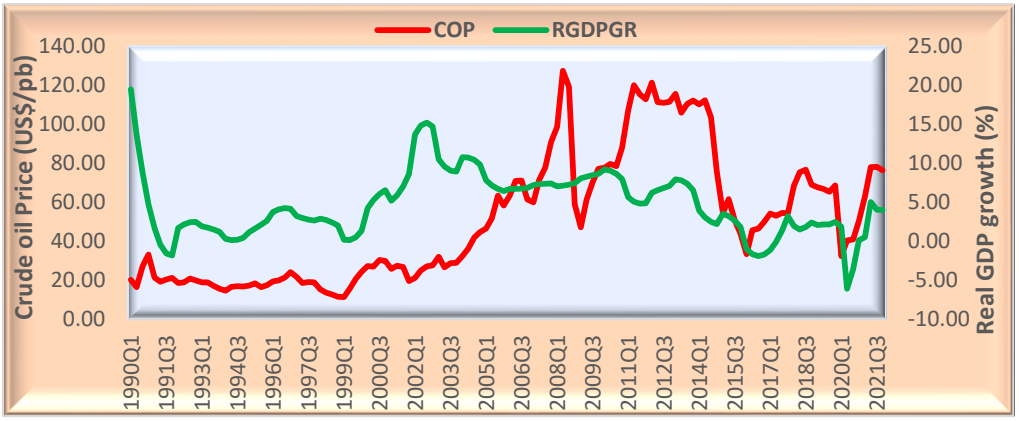
Figure 1. *The Nexus between External Debt (EXTD) and Foreign Direct Investment (FDI)*



Source: Authors compilation.

The relationship between crude oil price (COP) and real GDP growth rate (RGDPGR) is presented in Figure 2. The Figure showed that the movement in COP and RGDPGR was in the same direction throughout the period 1990Q1 and 2018Q2. The global oil price in 2011Q2 stood at US$119.89 per barrel, though it plunged relatively, it was stable at US$103.41 per barrel in 2014Q2. Thereafter, it declined sharply to US$33.37 per barrel in 2016Q1 before increasing marginally to US$76.61 per barrel in 2018Q3 and then decreased to US$68.90 in 2018Q4. The positive Real GDP growth rate between 1992Q2 – 2002Q4 was attributable to high oil price in the world market, while the period 2003Q1 to 2018Q4 witnessed a sharp and continued decrease in RGDPGR as due to a decline in oil output in Nigeria as result of youth restiveness and militancy activities in the Niger thus its revenue. The mixed performance of Real GDP growth rate between 2019Q1 – 2020Q3 was attributable to the period of low oil price in the world market, and advent of COVID-19 pandemic that effected negatively on the Nigerian economy while the period 2020Q4 to 2021Q4 witnessed a marginal and continued improvement in RGDPGR as due to an increase in oil price in the international market and the opening of the economy to normalcy following the relaxation of COVID-19 restriction (DMO 2018, 2020, 2021, NBS 2019, 2020, 2021).

Figure 2. *Relationship Between Crude Oil Price and Real GDP Growth*

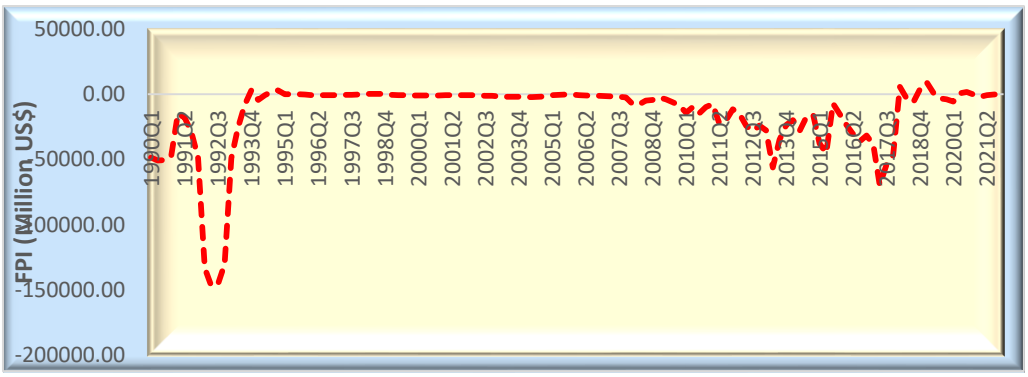


Source: Authors compilation.

A trend analysis of quarterly Nigeria's foreign portfolio investment for the period 1990Q1 – 2018Q4 is presented in Figure 3. The foreign portfolio investment that stood at US$-48,484.31 million in 1990Q1 improved marginally to US$-14,857.07 million in 1991Q1 before contracting sharply to US$-146,435.96. Thereafter, the FPI maintained a stead positive improvement and stood at US$3,169.27 million in 1993Q4. From 1994Q1 to 2007Q4, it remained relatively stabled as it hovered between US$-4,331.31 and US$-2,293.72 and from 2008Q1 it maintained an undulating negative downward trend and peaked at US$-56,079.90 million in 2013Q2, before improving marginally to US$-15,239.62 million in 2015Q4 then decreased sharply to US$69,614.35 million in 2017Q2, it then improved sharply to US$5,700.40 million in 2018Q1 and US$9,111.15 million in 2019Q1 (CBN 2019, 2020, 2021, NBS 2019, 2020, 2021).

Thereafter, it decreased marginally to US$-3,788.36 million and US$-5,529.51 million, respectively, in 2019Q4 and 2020Q1. FPI experienced a steady increased in quarters' 2 and 3 of 2020 to US$0.68 million and US$1,742.40 million, respectively and since then it has continued to maintain a steady decline and stood at US$-0.60 million as at 2021Q4. This abysmal trend is attributable to the adverse effect of COVID-19 on the economy (CBN 2019, 2020, 2021, NBS 2019, 2020, 2021).

Figure 3. *Trend Analysis of Foreign Portfolio Investment*



Source: Authors compilation.

Data, Models and Methods of Non-linear ARDL

Data

The paper employs quarterly data spanning the period of 1990 to 2021. This study utilizes quarterly data on real economic growth (RGDPGR), external debt (EXTD), crude oil price (COP), foreign direct investment (FDI) and foreign portfolio investment. The data for this study were sourced from the Nigerian National Bureau of Statistics, Debt Management Office and Central Bank of Nigeria Statistical Data base. Except RGDPGR and FPI, all other variables are expressed in natural logarithmic form.

Models and Methods of Non-linear ARDL

This paper attempts to capture the effects of selected macroeconomic variables on the Nigerian real gross domestic product growth rate (RGDP). The study employs semi log-linear model with the dependent parameter as the RGDP growth rate while external debt (EXTD), crude oil price, foreign portfolio inflow (FPI) and foreign direct investment (FDI) are the independent variables. For the initial examination, equation (1) will follow a semi-log linear long-run model specification of Bahmani-Oskooee and Fariditavana (2016, 2015) and Bahmani-Oskooee et al. (2016) thus:

$$RGDPgr_t = \beta_t + \gamma LEXTD_t + \omega FPI_t + \eta LCOP_t + \emptyset LFDI + \mu_t \quad (1)$$

Here, $RGDPgr_t$is real GDP growth rate. FDI_t is foreign direct investment. FPI_t Implies foreign portfolio inflow, $EXTD_t$ represents external debt and L is natural logarithms. An increased inflow in these variables reflects increase in Nigeria's real GDP growth rate in real terms and vice versa. The coefficient of FDI and FPI is expected to have a positive effect as an increase is expected to have favorable effect on $RGDPgr_t$ in long run. EXTD is expected to have either a positive or negative influence on real GDP growth rate. This is in consonant with the views of Okonjo-Iwela et al. (2013), Obadan (2004) and Pattilo et al. (2001), who opined that at a small debt level, debt exert positive effects but when it is above the desired threshold, it begins to have a negative effect on growth. Therefore, an increment in debt is expected to decease Nigeria's GDP and thus real GDP growth rate will worsen and vice versa. In addition, a situation where the price of crude oil in the international market declines, the Nigerian GDP is likely to have negative effect as it is likely to increase capital flight outflows and consequently $RGDPgr_t$ will be worsened.

The foregoing discussion of equation (1) is symmetrical in nature as foreign direct investment is a solitary variable, but it can be decomposed into two variables (positive and negative). The positive variable is the fractional sum of the positive changes in external debt, while the negative variable emanates as a result

of a negative movements. These two positive and negative variables of EXTD are algebraically represented in equation (2) thus:

$$\left.\begin{aligned} P = LEXTD_t^+ &= \sum_{j=1}^{t} \Delta LEXTD_j^+ = \sum_{j=1}^{t} \max(\Delta LEXTD_j, 0), \\ &\quad and \\ N = LEXTD_t^- &= \sum_{j=1}^{t} \Delta LEXTD_j^- = \sum_{j=1}^{t} \min(\Delta LEXTD_j, 0) \end{aligned}\right\} \quad (2)$$

These parameters as represented in equations (2), defines a linear ARDL model, but Shin et al. (2014) converted this linear ARDL to a non-linear or asymmetrical ARDL model. Thus, the non-linear ARDL model for equation (1) can be econometrically written as follows:

$$\begin{aligned} \Delta RGDPgr_t = {} & \beta_t + \pi RGDPgr_{t-1} + \varphi^{+} EXTD_{t-1}^{+} + \varphi^{-} EXTD_{t-1}^{-} + \sigma LCOP_{t-1} \\ & + \tau FPI_{t-1} + \rho LFDI_{t-1} \\ & + \sum_{i=1}^{p} \delta_i \Delta RGDPgr_{t-1} \\ & + \sum_{i=0}^{r} (\partial_i^{+} \Delta EXTD_{t-1}^{+} + \partial_i^{-} \Delta EXTD_{t-1}^{-}) + \sum_{i=0}^{q} \emptyset_i \Delta LCOP_{t-1} \\ & + \sum_{i=0}^{q} \vartheta_i \Delta FPI_{t-1} + \sum_{i=0}^{q} \gamma_i \Delta LFDI_{t-1} \\ & + \alpha_t \end{aligned} \quad (3)$$

Equation (3) will be used to test for a cointegration. $where: \pi = \sigma^{+} = \sigma^{-} = 0$. This indicates the absence of cointegration, as such it can be tested for bound test. In bound test, if the expected $F_{\text{-statistics}}$ value is found to be greater than the upper critical bound value then the null hypothesis is rejected. Preceding the cointegration, the long run effects is estimated by standardizing the coefficients of $EXTD_{t-1}^{+}$, $EXTD_{t-1}^{-}, FPI_{t-1}$ and FDI_{t-1}, standardized by coefficient of $RGDPgr_{t-1}$. Therefore, the positive and negative effects of $EXTD_{t-1}^{+}$ and $EXTD_{t-1}^{-}$ are estimated like a symmetrical model. The effect of real GDP growth rate will be measured as symmetrical, if the predictable coefficients of $EXTD_{t-1}^{+}$ and $EXTD_{t-1}^{-}$ conveys the same signs and degrees but a change in sign or size of the coefficients can be seen as evidence for asymmetrical effects. From the foregoing, we can also test for short run asymmetry by employing an error correction model [ECM(-1)] of the non-linear ARDL. The ECM(-1) model is shown in equation (4):

$$\Delta RGDPgr_t = \sum_{i=1}^{p} \delta_i \Delta RGDPgr_{t-1} + \sum_{i=0}^{r} (\partial_i^{+} \Delta EXTD_{t-1}^{+} + \partial_i^{-} \Delta EXTD_{t-1}^{-}) + \sum_{i=0}^{q} \vartheta_i \Delta LCOP_{t-1} + \sum_{i=0}^{q} \omega_i \Delta FPI_{t-1} + \sum_{i=0}^{q} \varphi_i \Delta LFDI_{t-1} + \pi ECM(-1)_{t-1} + \varepsilon_t \quad (4)$$

We introduced positive (+) and negative (-) in Equation (2, 3 and 4) to create non–linearity. Using Pesaran et al. (2001) methodology, Shin et al. (2014) was able to institute a corresponding process to assess a non-linear ARDL model. The proposition to asymmetric effect of foreign portfolio investment (FPI) will maintain the same consequence. Equation (4) provided proof of short-run adjustment asymmetry, if Δ^{+} and Δ^{-} parameter establishes different lag orders. Also, the short–run asymmetric effects would be determined from the sign and magnitude of $\partial_{\mathrm{i}}^{+}$ is different than the magnitude of $\partial_{\mathrm{i}}^{-}$ at each lag i. This will be ascertained through the Wald test if $\partial_{\mathrm{i}}^{+} \neq \partial_{\mathrm{i}}^{-}$. However, the long–run, asymmetric is approved if $\frac{\partial_{\mathrm{i}}^{+}}{\tau} \neq \frac{\partial_{\mathrm{i}}^{-}}{\tau}$; this also requires Wald test.

The coefficients of variables of the lagged differences parameters, captures the short run effects in (4). However, if measurements of $PEXTD_{t-1}$ and $NEXTD_{t-1}$ are evaluated to be different in signs or degree then we accept that short run asymmetry. Econometrically, the short run correlation and a speed of adjustment must be a negative parameter of electroconvulsive treatment and this situation is expected to hold in the long run as well if it is not found with bound test.

Analysis of Results

All macroeconomic time series are prone to the problem of a unit root, hence, the need to test for the stationarity of such series. The stationarity test result determines the appropriate procedure to ascertain the long-run association. Nonetheless, ARDL has the benefit to adopt combination of decision except stationarity at second difference. We have confirmed that none of our macroeconomic series was tested for second difference since all our variables were either stationary at levels or at first difference. In the light of the foregoing discussion, we preceded with our analyses without the presentation of the stationarity tests. However, we conducted the bound test on real GDP growth rate as well as the application of the needed diagnostic tests to validate our results.

Therefore, we examine the unit root test properties for the variables at level by including constant and time trend, as well as including only constant at first difference using ADF, KPSS and Ng-Perron tests. The outcome is presented in Table 1. The result of ADF test confirms that the RGDPgr, COP and FDI were stationary after they converted to first difference, indicating that the variables are I(1), whereas it reveals that the series EXTD and FPI contains unit root at level. Most importantly, the findings of KPSS test, which have more power compared to

ADF test, appears to support the stationarity of the three variables (RGDPgr, EXTD and COP) at first difference, while Ng-Perron supports stationarity of FPI at levels and thus we conclude that the variables in our model are I(0) and I(1).

Table 1. *Augmented Dickey-Fuller (ADF), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Ng-Perron Tests Results for Unit Roots*

Variable	ADF		KPSS		Ng-Perron	
	Level	1st Difference	Level	1st Difference	Level	1st Difference
RGDPgr	–1.8958	–4.1747**	0.1055	0.2377**	–1.8005	–3.1177**
EXTD	–4.7430**	–2.3725	0.1717	0.2370**	–2.4308	–6.9134**
COP	–2.2931	–8.6645**	0.1740	2.0586**	–2.3275	–4.2689**
FPI	–3.0938**	–6.4110**	0.1750**	0.1142	–3.3796**	–1.9298
FDI	–0.5367	–4.4308**	3.2101**	0.1127	–1.0319	–3.5375**

Notes a. ***; ** and * implies significance at the 1%, 5% and 10% level, respectively.

b. ADF statistic is obtained by $\Delta y_t = \gamma_0 + \delta_0 x_{t-1} + \sum_{i-1}^{k} \sigma_0 \Delta x_{t-1} + \varphi$ where Δ is the difference operator, γ_0, δ_0 *and* σ_0 are coefficients to be estimated, x is the variable whose time series properties are examined and φ is the white-noise error term.

c. KPSS statistic is obtained by $y_t = x_t'\delta + \varphi$ where δ_0 is coefficients to be estimated, x is the variable whose time series properties are examined and φ is the white-noise error term.

d. Ng-Perron statistic is obtained by $k = \sum_{t-2}^{T} (y_{t-1}^{d})^2 / T^2$ where $y\ is$ coefficient to be estimated and k is the variable whose time series properties are examined.

e. The lags of the dependent variable used to obtain white-noise residuals are determined using Akaike Information Criterion (AIC) for ADF, Bartlett Kernel for KPSS and AR-GLS Detrended for Ng-Perron.

f. The null and the alternative hypotheses are respectively $\delta = 0$ (series is non-stationary) and $\delta < 0$ (series is stationary).

g. As the coefficient δ_0 has a non-standard distribution, it is compared with critical values tabulated by MacKinnon (1996) ADF, Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1) KPSS and Ng-Perron (2001, Table 1).

The results of the bounds test as shown in Table 2, revealed that there is no cointegration in the linear form specification because the calculated F-statistics of 3.04 is less than the lower critical bound. Conversely, in the long-run non-linear form model, the calculated F-statistics of 7.07 exceed both the lower and upper critical bound at 5%, thus, indicating a cointegration. These results reveal that any incorrect model specification would lead to a deceptive conclusion vis-à-vis whether the selected macroeconomic variables co-move in the same direction in the long run or not.

Table 2. *Bounds Test for Linear/Nonlinear Cointegration*

Model Specification	F-statistics	Bound		Cointegration
		Lower bound	Upper bound	
Linear	3.04	3.23	4.35	No
Non-linear	7.07	2.86	4.01	Yes

Note: 5% significance level. The optimal lag order based on AIC.
Source: Authors' own computation using EViews 10.

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The study adopted the general-to-specific methodology to evaluate the non-linear model in equation (3) and the results are presented in Tables 3, 4 and 5. The model permits us to measure dynamics in real GDP growth rate and its reaction to the selected macroeconomic variables, positive and negative changes in oil price. To make valid conclusion from our long-run equation, we conducted various diagnostic tests to gauge the efficacy of the adjusted R-square in the dynamic model and result is presented in Table 3. Given the adjusted R-squared value of about 0.91, indicates the high explanatory power of the regressors in explaining changes of the regressand.

In addition, the serial correlation LM test and the heteroskedasticity ARCH test indicate the absence of autocorrelation in the residuals and that the residuals have constant variance overtime. Furthermore, the Jarque-Bera test and Ramsey RESET tests, respectively reveals that the error of variables are normally normal distributed and the model is properly specified while the CUSUM and CUSUM of squares tests shows that the model is stable since the estimated model lies within the 5 per cent significance bound.

Table 3. *Diagnostics*

Test	**Statistics**
Serial correlation LM tests	2.876104 (0.3273)
Heteroskedasticity ARCH test	2.688891 (0.1820)
Normality test: Jarque-Bera	6.369742 (0.2228)
Ramsey RESET test	2.332799 (0.1216)
CUSUM	Stable
CUSUM sum of squares	Stable
R-squared	0.913663
Adjusted R-squared	0.907795

Probability values of the respective tests in brackets.
Source: Authors' own computation using EViews 10.

Haven ascertained evidence of asymmetric cointegration in the EXTD model (see Table 2), the next step is present the long–run and short–run factors of NARDL outcomes as shown in Tables 4 and 5. The asymmetric ARDL specification with 2, 0, 0, 2, 2 were selected based on AIC. The result from Tables 4 and 5, indicates that all the parameters conform to a priori expectation in both the long–run and short–run. The long–run and short–run asymmetric decomposition of the effects of positive external debt ($LEXTD^{+}$) and negative external debt ($LEXTD^{-}$) were significant (see 0.8037[0.0000] and 0.5198[0.0015], respectively, in Tables 4 and 5).

We presented the long-run asymmetric dynamics in Table 4. The result in Table 4 shows that all the factors employed in our analysis were statistically significant at the 5 percent level of significance. The analysis of the effect of individual parameter of the regressand indicated the coefficients of the positive (+) and negative (-) components of the solitary regressor variable adversely influenced the behaviour of the real GDP growth variable in the long-run.

A cursory look at Table 4, reveals that one percent increase in (positive or +) EXTD results in a decrease of 1.08 percent in RGDPG while a percentage decline

in (negative or -) EXTD translates to a significant real GDP growth decrease of 3.08 percent. This could be explained by ineffectiveness in debt management and the level corruption in the clime. Specifically, external debt promotes economic growth when invested optimally in projects that are value creating such as intervention on roads, electricity, housing, and other tangible infrastructure. Where the fund is diverted for personal purpose, it would rather hurt growth. This explains the negative relationship between increasing debt stock and economic growth.

Table 4. *NARDL Long-run Results*

RGDPgr	Coefficient	Std. Error	t-Statistic	Prob.
$LEXTD^{+}$	-1.0801	0.4396	-2.4569	0.0068
$LEXTD^{-}$	3.0852	1.2276	2.5131	0.0035
$W_{LR,\ LEXTD}$	0.5198	0.1294	4.0170	0.0014
FPI	-0.0453	0.0039	-11.6154	0.0000
LCOP	-2.6827	0.2918	-9.1936	0.0000
LFDI	0.5094	0.1388	3.6703	0.0019

Table 5. *NARDL Short-run Results*

RGDPgr	Coefficient	Std. Error	t-Statistic	Prob.
Trend	0.6342	0.2754	2.3028	0.0097
$\Delta LEXTD^{+}$	-0.6218	0.1519	-4.0949	0.0000
$\Delta LEXTD^{-}$	0.5364	0.1772	3.0265	0.0009
$W_{SR,\ LEXTD}$	0.8037	0.1076	7.4695	0.0000
ΔFPI	0.0023	0.0008	-2.8750	0.0079
ΔLCOP	-0.9656	0.3020	-3.1975	0.0006
ΔLFDI	0.9207	0.2046	4.4998	0.0000
ECM(-1)	-0.1414	0.0324	-4.3697	0.0000

Note: The superscripts "+" and "–" denote positive and negative partial sums, respectively. L^{+} and L^{-} are the estimated long-run coefficients associated with positive and negative changes, respectively, defined by $\hat{\beta} = -\hat{\theta}/\hat{\rho}$.

$W_{LR,\ LEXTD}$ refer to the Wald test for the null of long-run symmetry defined by $-\hat{\theta}_1^{+}/\hat{\rho} = -\hat{\theta}_1^{-}/\hat{\rho}$. $W_{SR,\ LEXTD}$ refer to the Wald test for the null of the additive short-run symmetry condition defined by $\sum_{i=0}^{q} \gamma_{1,i}^{+} = \sum_{i=0}^{q} \gamma_{1,i}^{-}$. ** Implies 5 percent significance level

Source: Authors' own computation using EViews 10.

The result is in consonance with the findings of Alexandre et al. (2021), Mosikari and Eita (2021) and Sharaf (2021) who observed that in the long-run, external debt is inimical to growth as it crowds out private investment, this is in tandem with the crowding-out effect hypothesis but disagree with Heimberger (2021) and Oyegoke and Aras (2021) assertation that there is no evidence of a consistently negative growth effect of higher external debt. In terms of the control factors, foreign portfolio investment (FPI) and crude oil price (COP) significantly contracted real economic growth by 0.05 and 2.68 percent, respectively, while if foreign direct investment increases by a percentage change, real GDP will grow by 0.51 percent. Given the Wald LR test for asymmetry of positive and negative EXTD coefficient of 0.52 (0.0014) indicates that positive (+) and negative (–) external debt shocks on real economic growth in Nigeria are significantly distinct.

The short–run result in Table 5, shows that external debt stock has a significant effect in both the positive ($EXTD^{+}$) and negative ($EXTD^{-}$). It can therefore be inferred that the short-run coefficient of $EXTD^{+}$ is 0.62 indicating that a one percent rise in $EXTD^{+}$ results in a decrease in real economic growth by 10.62 percent. Similarly, the coefficient of $EXTD^{-}$ is 0.54 accounting for a positive change in external debt as a one percent increase in $EXTD^{-}$, results in a decline in real growth rate by 0.54 percent. This result implies that the larger effect of EXTD is emanating from the positive changes. Our outcome is in consonance with the findings of Alexandre et al. (2021), Mosikari and Eita (2021) Oyegoke and Aras (2021), and Sharaf (2021) who opined that in both the long-run and short-run, external debt is inimical to growth as it crowds out private investment, this is in tandem with the crowding-out effect hypothesis but disagree with Heimberger (2021) assertation that there is no evidence of a consistently negative growth effect of higher external debt. We also considered the effect of the individual control variables (LCOP, FPI and LFDI) on economic growth in the short-run asymmetric form. The outcome of our analysis reveals that LCOP did not conform with our a priori expectation while FPI and LFDI conforms to our a priori expectation.

From a theoretical and empirical standpoint, large portfolio inflows promote macroeconomic vulnerabilities and stymie financial stability. Foreign portfolio investment is short-term in nature and will only remain in an economy only if the returns are consistent with expectations, or at least at a tolerable level; otherwise, the funds will be moved to a more profitable jurisdiction without prior notice. Its short-term nature seems to be blamed for instability in the financial system as witnessed in Asia, Latin America, and Russia (Henry 2003). The global shocks such as quantitative easing, tapering, US-China trade war, that confronted the small open economies during the study people would have induced the short-termism of FPI inflow and reversal, hence hurting the Nigerian economy.

However, all control parameters were significant at 5 percent level. An assessment of the short-run relationship between RGDPgr and selected variables indicates there is a significant short-run effect. In addition, Table 5 shows the outcome of Wald test with their corresponding p–values for short runs statistics are ($WSR = 0.0000 < 0.01$), thus, supporting the rejection of the null hypothesis in favour of the alternative. This suggests that in the short run, the positive and negative partial sum of square effects and degrees of external debt on real economic growth are different. This is correct given the widespread corruption and elevated level of inefficiency in the country.

Table 6. *NARDL Causality*

RGDPGR	Short- Run	p-value	Long- Run	p-value	Strong	p-value
PLEXTD	10.1677	0.0000	19.0942	0.0000	9.2587	0.0031
NLEXTD	9.9606	0.0018	19.0942	0.0000	9.2492	0.0024
FPI	20.2481	0.0000	19.0942	0.0000	19.0867	0.0000
LCOP	20.0577	0.0000	19.0942	0.0000	20.0115	0.0000
LFDI	2.3305	0.5068	19.0942	0.0000	26.0005	0.0000

Source: Authors' own computation using EViews 10.

Conclusively, the result of the Wald test offers substantial support to reject the null and support the asymmetric behaviour of the indicators. The error correction term [ECM(-1)] is properly signed as expected and the speed of adjustment is 14.1 percent. This meaning that economic growth adjusts to 14.1 percent of the changes in EXTD in the previous period. Hence, the period of complete adjustment to a given change in EXTD takes place almost within a year.

The Granger Causality test in Table 6, was implemented under the NARDL model. First, the variables were assessed at level and first difference in the ARDL framework. The lag length was automatically selected. The non-linear autoregressive distributed lag model was applied with four lag and found an absence of serial correlation. Three types of Granger causalities were applied to find the causality, namely Short-run, long-run and strong NARL causality test. The result reveals that all the variables were significant in the three tests except LFDI that was insignificant in the short run. This implies that their convergence of the system back to equilibrium position, which satisfies equations (2 and 3). Moreover, a joint (short-run, long-run and strong) causality also exists between the selected macroeconomic variables and real GDP growth which confirms the existence of bi-directional causality between the variables. Also, the null hypothesis of Wald test for all variables to zero was rejected and the alternative accepted because the F–calculated value was statistically significant as shown in Table 7.

Table 7. *Wald Test*

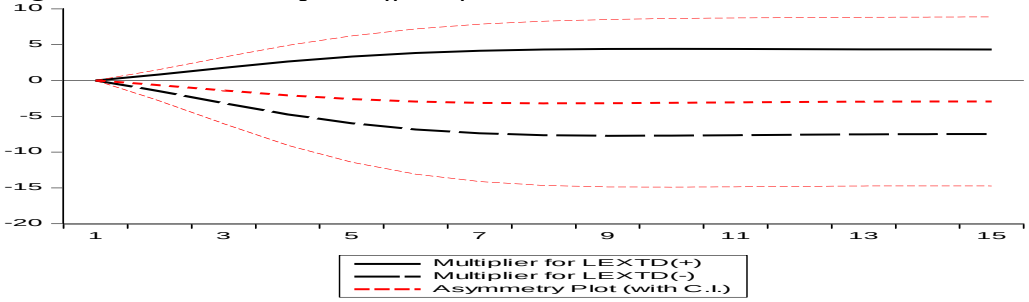
Test	Statistics	Probability
F-statistic	155.7139	0.0000

Source: Authors' own computation using EViews 10.

The NARDL multiplier for the asymmetrical model is presented in Figure 4. The upper solid black line represents the cumulative dynamics of real GDP growth with respect to a per cent rise (positive shock) in EXTD while the lower dashed black solid line denotes the influence of a per cent negative shock (decrease) of EXTD hitting real GDP growth. The red thick dashed line between the 95 percent confidence intervals provides the difference between positive and negative shocks while the tiny red lines represent the bound. Figure 4 demonstrates that the negative component of EXTD is main driver of the asymmetry shocks to growth. Accordingly, the reaction of real GDP growth during periods, when EXTD expands surpasses the periods when external debt shrinks. This is shown in Figure

4 that from 1990Q1 to 2021Q4, the asymmetric response of real GDP growth was driven largely by the negative component.

Figure 4. *NARDL Multiplier Effect of External Debt Shock to Economic Growth*



Source: Authors' own computation using EViews 10.

Conclusion

The paper was able to provide the corroboration that a positive and significant bond of external debt, eventually exert a negative effects on real GDP growth in the country, while a slump in crude oil price has a negative effect on real GDP growth because Nigeria is a mono-economy which is heavily import demand, therefore, a decline in COP will have adverse effect on real GDP growth. Conversely, a rise in FPI and FDI would significantly influence RGDP growth. The long-run and short–run result reveals that reduction in external debt will improve RGDP growth. Short-run results show that FPI and FDI exerts a positive influence on growth in RGDP while COP had negative effect on RGDP growth. However, all the parameters had significant effect on economic growth. The negative PEXTD variable approves the presence of J-curve in the country's real GDP growth rate. Generally, increased borrowing confirms the presence of J-curve after some lag and asymmetrical influences exist in both the long– and short– runs. Consequently, we conclude that reducing external borrowing may improve the real GDP growth Nigeria and recommend that it is imperative for the country to have manageable external debt and fiscal sustainability, as this will bolster its real economic growth. Also, fiscal authority should make concerted to curb corruption and reduce inefficiency to the barest minimum, as these will enhance growth.

The findings of the study have serious implication on policy formulation. First, the effect of external debt on economic growth, do not suggest that debt financial is undesirable. The result rather reveals that the benefit of external debt is dependent on financing critical infrastructure or self-liquidating projects. More importantly, declining inflow of FDI during increase external debt stock and FPI is a pointer to the fact that the resources are not used for developmental purposes. Where the debt is used to promote political stability, reduce conflict intensity, improve processes that reduce corruption, quality of infrastructure, trade facilitation, government effectiveness, promote macroeconomic stability and the ease of doing business, FDI inflow would naturally increase. This study contributes

to extant literature in using the direction of FDI and FPI to establish the anecdotal effect of external debt on economic growth. The study also represents in part, a noble effort to re-assess the external debt and economic growth nexus after the 2007/9 financial crises. This is important, given recent findings that crises alter the relationship of macroeconomic variables.

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