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Assessing the Impact of Oil Revenue and Financial Development on

Economic Growth in Nigeria: Asymmetric Approach

Muhammed Shamwil¹, Yusuf Hamza², Bilyaminu Abdullahi³ and Zakari Ya'u Abba⁴

¹Department of Economics and Development Studies, Federal University of Kashere, Gombe state, Nigeria.
 ²School of Postgraduates, Department of Economics, Modibbo Adama University, Yola, Nigeria
 ³Department of General Studies (Economics Unit) Gombe State Polytechnic, Bajoga, Gombe State, Nigeria.
 ⁴Department of Cooperative Economics and Management, Federal College of Horticulture Dadin Kowa Gombe, Gombe State, Nigeria.

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Corresponding author Muhammed Shamwil mohammedshamwil@fukashere .edu.ng Tel: +2347067560338

Abstract

This study examined the asymmetric impact of oil revenue and financial development on the Nigerian economic growth, covering the period 1980-2021. The study applied nonlinear autoregressive distributed lag (NARDL) model which allows for the incorporation of possibility of asymmetric effects of positive and negative changes in the independent variables on the dependent variable. The results revealed the presence of long run asymmetric relationship among the variables of the study. The results revealed that, oil revenue, financial development and investment contribute positively to economic growth in Nigeria both in the shortrun and longrun, except for their lag values in the shortrun, which are negative and statistically significant. From the findings, the study concludes that a sound financial and energy sectors are major drivers of economic growth in Nigeria and therefore recommend that special attention should be given to promote these sectors through formulation and implementation of supportive policies. These can be achieved by mitigating the level of corruption in the oil sector and revival of the Nigerian refineries to reduce the cost of importing refined petroleum products. In addition, there should be a robust financial sector development that will bring about adequate savings and investment in the economy.

1. Introduction

In most developing oil producing countries, economic growth and development depends mostly on natural resource endowment in the form of crude oil, natural gas coal and other mineral resources, being the most significant source of national income country that contributes greatly to economic development through provision of exports earnings, foreign exchange, raw materials, and serve as source of energy for household and industrial uses & Dunyo, (Adabor, Buabeng, 2021). Adegboyega, Abeeb, and Mathew (2021) posit that, for all the developed and developing economies of the world, energy especially crude oil and natural gas remain the essential factor of production, alongside labor and capital, forming the basic factors that determine the level of economic growth and development. In the same vein, financial sector development plays a pivotal role in channeling the earnings from oil resources of developing nations to achieve growth and development (Alenoghena, 2022). It is well established in both theoretical and empirical studies that. financial sector development is fundamentally good for economic growth. It includes the extensive use of the existing financial instruments as well as the creation and adoption of new ones for intermediating wealth and risk management (Paul, 2017).

The African continent is endowed with rich minerals and fossil fuels, with about 30% of the world's total mineral reserves and new discoveries of oil and gas resources continue to emerge (Paul, 2017). Thus, if the conventional economic reasoning and wisdom were to hold, oil-rich African countries would have been among the strongest economies in the world, but most of these countries have been categorized as low income even with the substantial progress in financial development over the past decade (Afolabi, 2022). The continent has achieved remarkable progress in innovative financial services based on mobile banking which has helped to incorporate a large share of the population into the financial system, especially in East Africa, microfinance has grown rapidly, providing services to customers at the lower end of the income distribution (Afolabi, 2022).

Furthermore, petroleum industry has been significant towards the development of Nigerian economy since the discovery of oil in commercial quantity (Nweze and Edame, 2016). Nigeria has 37.2 billion barrels of estimated oil reserves in 2022, produces an average of 1.93 million barrels per day, and accounts for about 80% of the federal government's revenue 2022). (Akintayo, This suggests the overdependence of the country on the oil revenue expenditure for government and other developmental activities. Rising oil prices volatility and the discovery of oil in other parts of the world, oil imports from Nigeria to major economies such as the United States has considerably reduced, hence the need to diversify the economy through the development of the financial sector of the country (Okoye, 2021). The financial sector has grown steadily in Nigeria recently, with the stock market been very active with high performance ratings, reflecting a steady rise in providing credit to the private sector, money supply and market capitalization have been on annual increase (World Bank, 2020).

In line with the country's over-dependence on oil revenues and the desire to investigate the complementary role of the financial sector in channeling the revenue generated from oil to promote the country's economy, an extensive study on the impact of oil revenue and financial sector development on the Nigerian economy is crucial and timely. Given that empirical studies on the subject matter remain limited in Nigeria, mostly restricted to taking into consideration, only the impact of either oil revenue or financial development on economic growth separately. This study is relevant in bridging this gap by empirically examining the intermediating role of the financial development in transmitting the country's oil revenue to develop the nation's economy. Therefore, this study intends to examine the impact and also to test the validity of nonlinear hypothesis on the nexus between oil revenue, financial development and economic Nigeria, growth in using Nonlinear Autoregressive Distributed Lag (NARDL) model. The use of this technique is suitable for this study because it has the ability to run a regression having variables mix order of integration (Kriskkumar et al. 2022). Furthermore, the NARDL model allows for the decomposition of the positive and negative partial sum of the selected explanatory variable (oil revenue and financial development), which explains how variation in oil revenue and financial development affect economic growth in Nigeria asymmetrically.

2. Literature Review

Brief Conceptual Clarifications

The Concept of Oil revenue

Oil revenue is the money earned from the sales of petroleum products by any company or organization engaged in petroleum operations (Akintayo, 2022). Petroleum products or crude oil is a nonrenewable resource, implying that it can't be substituted naturally at the rate it is consumed, hence, a limited resource obtained typically through drilling, where it is usually found alongside other resources, such as natural gas which is lighter and saline water (which is denser, and sinks below the crude oil). It is then refined and processed into various forms, like gasoline, kerosene and asphalt, and sold to consumers, and is one of the major components of oil and gas revenue in Nigeria (Ebimobowei, 2022). For Nigeria, oil revenue is the money received on behalf of the government by the Nigerian National Petroleum Corporation (NNPC), Central Bank of Nigeria (CBN) or any other agency in form of Petroleum Profits Tax (PPT), royalties, sale of crude oil and gas, licensing fees and other incidentals (Obaretin &

Monye-Emina, 2019). Petroleum Profit Tax (PPT) refers to a levy on the firm's profit from oil activities under the Nigerian Petroleum Income Tax Act (Okoh et al, 2016). It is levied, evaluated and payable on the firms' profits for their engagement in petroleum operations during any accounting period, usually one year (January to December). It is a tax that related to the upstream activities in the oil and gas industry. It is principally related to rents, royalties, margins and profit-sharing elements associated with oil mining, prospecting and exploration leases (Olatunji & Adegbite, 2014). Moreover, Domestic crude oil sales entail the sale of crude to the domestic refineries; whereas, the licensing fees is the fee paid to the government for issuing different types of licenses for crude oil prospecting, exploration and exploitation granted by the government under Section 2(1) (a) of the Nigerian Petroleum Act. (Ebimobowei, 2022).

The concept of financial development

The concept of financial development has been defined based on the World Bank's classification of financial development indicators under the categories of financial depth, access, efficiency and stability as the improvement in the quality of five key financial indices: acquiring and processing data about potential investments and capital allocation based on these assessments; monitoring firms and individuals and exercising corporate governance after capital allocation; facilitating risk trading, diversification, and management; mobilizing and pooling savings; and facilitating the exchange of goods, services, and financial instruments (Ezeibekwe, 2020). The financial system accelerates transactions, ease risk management, mobilizes and allocates savings, and after funding projects, monitor the behavior of managers. These financial services provide a rough definition of financial development, and the financial systems that are better at providing these services are better developed financially (Deidda, 2006).

The Concept of Economic Growth

Economic growth refers to increase in the quantity of goods and services produced by an economy over a given time period, usually a year. It is conventionally measured as the percent rate of increase in Real Gross Domestic Products (RGDP), or Real Gross National Products (Trevor, 1956). Trevor opines that, economic growth is normally calculated in real terms, in order to avoid the misleading effects of inflation on the price of the goods and services produced. Philippe (2002) also defined economic growth as the growth of potential output, i.e. production at full employment, which is caused by growth in aggregate demand or observed output. Economic growth is, in a limited sense, an increase in the national income per capita, and it involves the analysis, especially in quantitative terms, of this process, with a focus on the functional relationship between the endogenous variables; while in a wider sense, it involves the increase of the GDP, GNP and National Income and therefore of the national wealth, including the production capacity, expressed in both absolute and relative terms, per capita, encompassing also the structural modifications of an economy (Haller, 2012). Denison (1962) on the other hand stressed that economic growth is the increase of real GDP or GDP per capita, an increase of national products that is measured in constant prices (adjusted for inflation).

2.2 Empirical Literature

Oil Revenue and Economic Growth in Nigeria

Given the rise in value and importance of oil revenue, many studies have aimed to examine the developmental impacts of oil revenue on receiving countries. Studies focusing on this nexus have somewhat mixed outcomes. Alenoghena et al. (2022) deployed the fully modified ordinary least squares (FMOLS) to estimate the impact of oil revenue and financial development on economic growth in Nigeria between 1981 and 2019. The findings revealed that oil revenue has a positive and significant impact on economic growth, whereas, the financial development has negative and significant effect on economic growth, but the interacted effect of oil revenue and financial development is positive and significant. Sweidan and Elbargathi (2022) examined the impact of globalization and international geopolitical risks on Saudi Arabia's economic development via Saudi Arabia's oil rent channel during the period 1970 to 2018 using time series autoregressive distributed lag (ARDL) model with moderation effects. The results revealed the direct and significant positive short and long run effects of oil rent and globalization on economic growth, while the influence of international geopolitical risk is statistically insignificant in the short and long run. However, adding the moderation effects to the analysis reversed the results.

Adams and Bello (2022) studied the long-run impact of oil revenue, oil price volatility on economic growth in Nigeria from the year 2006 to 2020. The study applied Johansen cointegration, and Autoregressive Distributed Lag (ARDL) co-integration statistical methods. It was indicated from the result that oil revenue promotes Nigeria's economy. Appah (2022) investigated the relationship between oil revenue and economic growth in Nigeria between 1990 and 2022 by applying Pearson Moment Correlation Coefficient and Ordinary Least Square Multiple Regression techniques. The results revealed that there is a significant relationship between oil revenue and economic growth in Nigeria. Kriskkumar et al (2022) using the augmented autoregressive distributed lag model (ARDL) bound test approach and the recent innovative nonlinear autoregressive distributed lag (NARDL) model to investigate the Asymmetric Effect of Oil Price on the Economic Growth in Malaysia. The investigation revealed that adjustments in the price of oil influence Malaysia's economic growth asymmetrically. Akinleye et al. (2021) examined the impact of oil revenue on economic growth in Nigeria from 1981 to 2018 using autoregressive

distributive lag (ARDL) model. The findings showed that oil revenue is positively related with the economic growth in Nigeria; while petroleum profit tax, inflation rate, and exchange rate, were inversely related with the economic growth in both the short and long run.

Adabor, et al (2021) examine the causal relationship between oil resource rent and economic growth for the period of 2011 to 2020 in Ghana. The study used autoregressive distributed lag (ARDL) model, Toda-Yamamoto test, nonlinear autoregressive distributed lags (NARDL) model and nonlinear Granger causality. The findings revealed that in oil resource rent has positive and significant impact on economic growth of Ghana in the long run. The result from the TY test also revealed a unidirectional causality running from oil resource rent to economic growth of Ghana, providing evidence in support of the resource blessing hypothesis in Ghana. Hassan et al. (2019) used a panel of 35 countries for the period of 1984 and 2016 to investigate the Effect of Institutional Quality and Oil Revenue on Economic Growth in Oil-Exporting Developing Countries. The result showed that, institutional quality mitigates the negative effect of oil revenue on economic growth both in the long run and short run. In another study, Brown and Nnamaka (2019) investigate the effects of oil revenue on economic growth in Nigeria between 1980 and 2017 using ARDL model. The findings revealed that in the long run, oil revenue and oil rent impacted on GDP positively but economic insignificant, whereas, retarded growth in the shortrun. Olayungbo (2019) examines the impact of oil revenue on economic growth in Nigeria by applying the Bayesian timevarying parameter (TVP) model using annual data from 1970 to 2015. The results indicated that, oil export revenue positively and significantly contribute to economic growth. It is also found that trade openness and educational quality results do not promote economic growth in Nigeria.

Financial development and Economic Growth Gongwei and Xiaoping (2020) investigated the relationship between financial development, natural resource abundance and economic growth in China. The study uses panel data from 30 provinces and cities in China from 2005 to 2018. The system Generalized Method of Moment (system-GMM) model and Path Analysis through SEM models were employed. The findings reveal that, financial development has reduced the negative correlation between resource endowment and economic growth. Guan et al. (2020) investigated the resource curse hypothesis in the presence of globalization, human capital, and economic growth in China during the period 1971–2017. The study applied the Bayer and Hanck cointegration, the autoregressive distributed lag (ARDL) model. robustness check by fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), canonical cointegration regression (CCR), and Breitung-Candelon spectral Granger causality testing. Findings from the study show that the effect of natural resources on financial development is negative and confirm China's resources curse hypothesis, while globalization, human capital, and economic development lead to improving the financial

development of the country. Sun et al. (2020) assessed natural resource abundance nexus financial development for emerging seven (E-7) economies for the time period 1990-2017. Pesaran Cross-section dependence (CD) test and Augmented mean group (AMG) for long and short-run estimations. The results found an adverse effect of natural resources rent on financial development, which confirms the existence of a resource curse hypothesis for emerging seven (E-7) economies. Dogan, et al. (2020) investigate the relationship between four natural resource rents versus financial development in developed countries during the period 2001 to 2017. The study employs panel quartile regression with fixed

effect. The study finds that oil rents, coal rents, forest rents and natural gas rents have a positive and significant effect on financial development. Li et al. (2020) explored the effect of natural resources on financial development to ascertain the validity of a resource curse or resource blessing hypothesis for N-11 countries for the period 1990 to 2017. Second-generation econometric techniques have been employed to dependency cross-section manage and heterogeneity issues in a panel data. The findings reveal that there is a positive and significant relationship between technological innovation, human capital and financial development.

Hussaini et al.(2020) look at political institutions, energy prices and financial development in BRIC countries during the period 1992 to 2016. The study applies Augmented Autoregressive Distributive lag Model (CS-ARDL) along with a common correlated effect mean group (CCEMG). From the empirical results, the resources are found as a blessing for BRIC economies. Dogan, et al. (2020) investigate the relationship between financial development and natural resource abundance in oil-rich countries during the period 1980 to 2017. The study employs both traditional and secondgeneration econometric techniques. The findings show that financial resource curse hypothesis is confirmed for the panel of resource-rich economies because natural resources have negative effect on financial development indices. Akif and Sinha, (2020) explored whether the shocks to commodity prices can lead to lower financial development using 68 commodity-rich developing countries over the period 1980-2014. The study applies system Generalized Method of Moment (system-GMM) estimator. The results show a strong evidence of the financial development curse due to commodity price shocks.

The foregoing suggests mixed findings on the oil revenue-finance-growth nexus due to methodological and measurement issues, data sources, sample size and the context specification, as well as the empirical studies on the subject matter remain limited in Nigeria, mostly restricted to taking into consideration, only the impact of either oil revenue or financial development on economic growth independently. This study would be relevant because of the following reasons: Firstly, the mix outcome in the existing literature calls for further study to clear this doubt in the literature using strategies. Secondly, different estimation Nigeria's oil industry and financial sector are not yet developed, so this study takes advantage of that to produce scientific evidence against which policies can be formulated to facilitate sustainable economic growth as well as promote the growth of Nigeria's financial sector and oil industry.

3. Methodology

Data

This study examined the impact of oil revenue and financial development on economic growth in Nigeria using annual data from 1981-2021. Specifically, data on real gross domestic products (RGDP) measured in constant 2015 US\$, proxied for economic growth, domestic credit to private sector (% of GDP) proxied for financial development (FD), Gross fixed capital formation measured in constant 2015 US\$ proxied for investment (INVS) government effectiveness as a proxy for institutional quality, are sourced from World Development Indicators, World Governance Indicators, and World Financial Development of the World Bank (WDI, WGI, and WFD, 2022) with the exception of oil revenue obtained from the Central Bank of Nigeria (2022). Following the studies of Okoye (2021), Alenoghena et al. (2022), and Shahbaz et al. (2020), this study adapts the modified model as follows:

$$LRGDP = \beta_0 + \beta_1 LOIR + \beta_2 FD + \beta_3 INSQ + \beta_1 LINVS + \mu_t \qquad 1$$

Where the LRGDP stands logarithm of real GDP of Nigeria; β 's are parameter estimates; LOILR is the logarithm of oil revenue, FD is the financial development; INSQ is the institutional quality; LINVS is the logarithm of investment, and $\mu_{i,t}$ is the error term which is assumed to be distributed independently in all time periods.

The NARDL Approach

This study adopted Non-linear Autoregressive Distribution Lag (NARDL) Model developed by Shin et al. (2014). The superiority of the model is that, it takes into account the possibility of asymmetric effects of positive and negative changes in the explanatory variables on the dependent variable compared with the traditional ARDL in which the expected changes in the explanatory variables remain the same (Sohail et al. 2021). As opined by Galadima and Aminu (2019), in the recent years, most economic relationships are changing from linear to nonlinear both in structure and dynamics, and, it is well known in econometrics that, model misspecification poses potential consequences for both estimation and statistical inference. Thus, this provides more credible justification for using nonlinear techniques in this study. The model is structured into the cumulative sums of positive and negative changes in order to show how the rise and fall in the explanatory variables affect the explained variable under study. The NARDL model represents the asymmetric error correction term as follows:

Where, LOIR⁺t, LOILR⁻t, FD⁺t, FD⁻t, INSQ⁺t, INSQ⁻t, LINVS⁺t and LINVS⁻t are the positive and negative shock components of oil revenue, financial development, institutional quality and investment. Δ is the first difference of the variables of the study in the short-run. The parameter δ_i , indicates short-term coefficients, while long-term coefficients are denoted by β_i with i = 1....n. LRGDPt is the dependent variable with optimal lag q, while LOILR_t, FD_t, INSQt, and LINVSt are the independent variables, with k_i optimal lags.

4. Results and discussion of findings

Descriptive Statistics and Correlation Matrix The summary of the statistical properties such as mean, median, maximum, minimum and standard deviation of all the variables and correlation matrix are presented in Table 1.

Variables	RGDP	OILR	INVS	FD
Mean	26.158	6.275	24.798	2.165
Median	25.943	7.244	24.775	2.104
Maximum	26.956	9.091	25.430	2.977
Minimum	25.464	1.981	24.405	1.601
Std. Dev.	0.524	2.466	0.215	0.352
RGDP	1.000			
OILR	0.850	1.000		
INVS	0.400	0.281	1.000	
FD	0.750	0.685	0.217	1.000

Table 1. Descriptive Statistics and Correlation Matrix

Source: Author's computation using Eviews 10

The results of descriptive statistics indicated that, the standard deviations analysis revealed higher volatility in OILR, followed by RGDP, FD while INVS recorded lowest volatility.

The pair-wise correlation matrix is employed to measure the presence of multicollinearity in the model. The results reveal the strength of correlation between a pair of variables. The higher coefficient of correlation ($r \ge 0.8$) shows severe multicollinearity among the variables. The results of the pair-wise correlation matrix statistics in Table 1 indicates that explanatory variables INVS is weakly correlated with the dependent variable RGDP and OILR. Also, FD is weakly correlated with OILR and INVS.

Stationarity test

This study applied ADF unit root test to examine the stationarity properties of the variables as presented in Table 2.

	Level	First Difference	
Variables	t-stat	Variables	t-stat.
LRGDP	-1.887	LRGDP	-3.888***
LOILR	-0.544	LOILR	-5.564***
LINVS	-2.250	LINVS	-5.373***
LFD	-4.157**	LFD	

Table 2. Unit Root Tests Results

***, ** and * show significance at 1%, 5% and 10% levels respectively. *Source:* Author's Compilation.

From the ADF test results in table 2, LFD is stationary at level I(0) while LRGDP, LOILR and LINVS are stationary at first difference I(1). Therefore all the variables are combination of both I(0) and I(1). Thus, the variables are qualified to run for NARDL approach to co-integration.

	Level			First Difference	
Variables LRGDP	t-Stat	SBa	Variables LRGDP	t- Stat -6.444***	SBb 2001 2011
LOILR			LOILR	-6.820***	2006 2014
LINVS			LINVS	-7.263***	1991 2012
LFD	-7.501**	2005 2012	LFD		

Table 3. Unit Root Tests Results with Structural Breaks

Table 5 Unit root test with structural breaks

***, ** and * show significance at 1%, 5% and 10% levels respectively *Source*: Author's Compilation.

The study employed the Lee Strazicich LM unit root test as presented in Table 3. The test has the capacity to account for two breaks points i.e., innovative and additive outliers, with additive outlier as most preferable because it deals with sudden changes in the mean of the variables as posited by Inuwa et al. (2022). The findings are in conformity with the outcome obtained from the previous test (ADF) that the variables are combination of both I(0) and I(1). 4.3 Lag Length for F- Bound Cointegration Test The result of the optimal lag length is presented in the table below. Table 4 presented the lag order selection by five different criteria. All the lag selection criteria except LR, suggested that a lag length of two (2) is optimal for the F-bound cointegration test. Therefore, this study used a lag length of two for the cointegration test.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	10.522	NA	0.0365	-0.480	-0.233	-0.418
1	54.319	64.743*	0.001	-4.202	-3.905	-4.127
2	56.138	2.531	0.001*	-4.383*	-3.939*	-4.271*
3	56.566	0.558	0.001	-4.223	-3.828	-4.124
4	59.407	3.459	0.001	-4.273	-3.927	-4.186

Table 4. Lag Length for F- Bound Cointegration Test

*Indicates lag order selected by the criterion Source: Author's Compilation

Bound Test for Cointegration

Bounds Test for cointegration was performed to check the presence of longrun relationship among the variables. The null hypothesis is that there is no long-run relationship among the variables of the study. From the result in table 5, the F-bound test of cointegration shows that, F-statistics is 11.73473 which is higher than both the lower and the upper bound critical values at all the levels of significance. Therefore, the null

hypothesis of no cointegration is rejected and concluded that the variables are co-integrated.

Table 5. Dound Test for Connegration					
F-Statistic	Significance	Bound Critica	l Values	Κ	
	Level				
		I(0) Bound	I(1) Bound		
11.73473	1%	3.6	4.9	6	
	2.5%	3.19	4.38		
	5%	2.87	4		
	10%	2.53	3.59		

Table 5. Bound Test for Cointegration

Source: Author's Compilation

Table 6 presents both short-run and long-run asymmetric impact of oil revenue and financial development on economic growth in Nigeria. The asymmetric relationship exists between oil revenue and economic growth. The positive change in oil revenue is positive and statistically significant. The result indicates that, in the long-run, 1% increase in oil revenue raises economic growth by 0.24% while decrease in oil revenue by 1% increases economic growth by 0.39%, confirming the results of Alenoghena et al. (2022) and Sweidan and Elbargathi (2022).

In the case of financial development, the coefficient of positive shock indicates that, 1% increase in financial development increases

economic growth by 0.38%, while decline in financial development by 1% decreases economic growth by 0.18%. The result is in line with the findings of Okoye, (2021), who also reported the environmental deteriorating impact of fossil fuel consumption. The long-run positive of investment is positively shock and insignificantly associated with economic growth, whereas the negative shock which is negative and statistically significant. This means that 1% increase in investment increases economic growth by 0.15%, while decline in investment also increases economic growth by 0.48%, confirming the finding of Hille et al. (2019).

Table 6. Nonlinear autoregressive	distributed lag (NARDL) ResponseLon	g-run Estimates
		/	0

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LOILR_POS	0.240	0.019	12.477	0.0000
LOILR_NEG	-0.388	0.033	-11.881	0.0000
LFD_POS	0.375	0.083	4.497	0.0009
LFD_NEG	-0.176	0.104	-1.700	0.1172
LINVS_POS	0.152	0.115	1.322	0.2131
LINVS_NEG	-0.486	0.085	-5.717	0.0001
Short-run Estimates				
С	22.558	2.007	11.239	0.0000
D(LOILR_POS)	0.085	0.010	8.770	0.0000
$D(LOILR_POS(-1))$	-0.066	0.013	-5.124	0.0003

D(LOILR_POS(-2))	-0.019	0.009	-2.164	0.0533
D(LOILR_NEG)	-0.164	0.017	-9.738	0.0000
$D(LOILR_NEG(-1))$	0.089	0.021	4.312	0.0012
$D(LFD_POS)$	0.068	0.022	3.108	0.0100
$D(LFD_POS(-1))$	-0.157	0.026	-6.161	0.0001
$D(LFD_POS(-2))$	-0.093	0.021	-4.416	0.0010
D(LFD_NEG)	0.172	0.033	5.278	0.0003
$D(LFD_NEG(-1))$	0.268	0.041	6.532	0.0000
$D(LFD_NEG(-2))$	0.165	0.034	4.793	0.0006
D(LINVS_POS)	0.516	0.040	12.800	0.0000
D(LINVS_POS(-1))	0.463	0.048	9.737	0.0000
$D(LINVS_POS(-2))$	0.226	0.054	4.166	0.0016
D(LINVS_NEG)	-0.100	0.036	-2.804	0.0172
$D(LINVS_NEG(-1))$	-0.111	0.037	-3.027	0.0115
D(LINVS_NEG(-2))	0.078	0.034	2.283	0.0433
ECM(-1)	-0.887	0.079	-11.267	0.0000

Source: Author's Compilation

Moreover, the short run results indicate that, positive shocks in oil revenue is positive and statistically significant while negative shocks is negative and significant. 1% rise in oil revenue raises economic growth by 0.09%, whereas, 1% rise in the previous values of oil revenue (lag 1 and 2) reduce economic growth by 0.07% and 0.02% respectively. However, fall in oil revenue by 1% reduces economic growth by 0.16%, and fall in the previous value of oil revenue reduces economic growth by 0.09%. Also in the shortrun, 1% rise in financial development raises economic growth by 0.06%, whereas, 1% rise in the previous values of financial development (lag 1and 2) reduce economic growth by 0.16% and 0.09% respectively, while both the current and the previous values (lag 1 and 2) of negative changes in financial development are positive and statistically significant. A decrease in financial development by 1% reduces economic growth by 0.17%, 0.26% and 0.16% Table 7. Longrun Asymmetry: Wald Test

	U				
Variab	Equati	T-	Chi-	F-	Prob
les	on	stat	Squa	stats	
		S	re		
LNGC	NAR	2.1	4.48	4.48	0.03
	DL	19	8	8	31

respectively. Moreover, the current and the previous values of positive changes in investment (lag 1 and 2) are positive and statistically significant. 1% rise in investment raises economic growth by 0.51%, whereas, 1% rise in the previous values of investment (lag 1and 2) raise economic growth by 0.46% and 0.22% respectively, whereas, the current and the previous values (lag 1) of negative changes in investment are negative and statistically significant. A decrease in investment by 1% increase economic growth by 0.10%, 0.11% respectively. The lag 2 value of investment shows that, 1% rise in investment in the previous period increases economic growth by 0.08%. Finally, the Error Correction Mechanism ECTt(-1) is negative and statistically significant, which implies that for every disequilibrium or divergence, in the longrun there will be convergence or correction toward equilibrium by 0.88% every year.

LPCA	NAR	4.4	20.1	20.1	0.00
Р	DL	89	53	53	02
LLBF	NAR	0.8	0.79	0.79	0.02
	DL	89	0	0	34

Source: Author's computation using Eviews 10

Table 7 shows the result of longrun asymmetric relationship of the Wald test between the dependent variable (RGDP) and the independent variables (OILR, FD and INVS). The null hypothesis states that, H₀: there is no longrun asymmetric relationship between the dependent and the explanatory variables. From the table, if the F-statistics value is statistically significant at 5% level, then reject the null hypothesis and

conclude that there is longrun asymmetric relationship. Therefore, from table 7, there is evidence of longrun asymmetry between the dependent variable (RGDP) and all the explanatory variables. Therefore, the study reject the null hypothesis and conclude that there is evidence of longrun asymmetric relationship among oil revenue, financial development, investment and economic growth.

 Table 8. Shortrun Asymmetry Wald Test

Variables	Equation	T-stats	Chi- Square	F-stats	Prob.
LNGC	NARDL	4.570	20.888	20.888	0.0001
LPCAP	NARDL	1.841	3.389	3.389	0.0686
LLBF	NARDL	2.570	12.867	12.867	0.0001
		=	-=		0.0001

Source: Author's computation using Eviews 10

Table 8 shows the result of the shortrun asymmetric relationship of the Wald test between the dependent variable (RGDP) and the independent variables (OILR, FD and INVS). The null hypothesis is H_0 : there is no shortrun asymmetric relationship. From the table, if the F-statistics value is statistically significant at 5%

level, then reject the null hypothesis and conclude that there is shortrun asymmetric relationship. Therefore, from table 9, there is evidence of shortrun asymmetry between the dependent variable (RGDP) and the explanatory variables (OILR and INVS, except FD which is not statistically significant at 5% level.



Fig. 1 NARDL Multiplier Graph for OILR. *Source:* Author's computation.



Source: Author's computation

Asymmetric Dynamic Multiplier Graphs

Figure 1 presents information on how economic growth responds to positive and negative changes in oil revenue (OILR) in Nigeria. The thick black line shows how RGDP adjusts over the horizon as a result of a positive changes in OILR. The dashed black line shows how RGDP responds over the horizon to negative changes in OILR. The dashed red line is the asymmetry plot that reflects the difference between positive and negative changes in the oil revenue in Nigeria. Also, the asymmetry line that lies within the upper and the lower bands of the 95% confidence interval means, if the asymmetry plot lies on zero line, there is no asymmetry. Therefore, RGDP responds positively to a positive and negative changes in OILR in Nigeria. This means, increase oil revenue leads to a rise in RGDP, and a decrease in OILR decreases RGDP, but, the magnitude of increase in RGDP as a results of negative changes in OILR is greater than of positive changes in OILR in the longrun. Finally, there is asymmetric relationship between OILR and RGDP.



Fig. 3 NARDL Multiplier Graph for INVS *Source:* Author's computation using Eviews 10

Figure 2 and 3 also show the degree of the response of RGDP to the positive and negative changes in financial development (FD) and investment (INVS) in Nigeria. Figure 2 shows that RGDP responds positively to a positive changes in FD in both shortrun and longrun, and responds negatively to negative changes in FD in the shortrun and positively in the longrun, but the magnitude at which RGDP responds to negative

changes in FD in the longrun is greater than of positive changes in FD. Therefore, there is asymmetric relationship between RGDP and FD. Moreover, figure 3 shows that RGDP responds positively to both positive and negative changes in INVS in both shortrun and longrun, but the magnitude at which RGDP responds to negative changes in INVS in the longrun is greater than of positive changes in INVS, indicating the presence of asymmetric relationship between economic growth and investment in Nigeria.

Tests	F- statistics	Obs*R-squared	Prob.
Jaque Bera			0.523
Serial Correlation	2.098	11.766	0.1787
Heteroskedasticity	1.743	29.542	0.1683
RAMSEY RESET	1.769		0.2202

Table 9. Diagnostic Tests

Source: Author's computation using Eviews 10



The results of diagnostics tests are presented in table 9. The results revealed that the error terms are normally distributed, and the model is free from serial correlation and heteroscedasticity. Also, the model is well specified based on the Ramsey rest test. Similarly, Stability of both the short and long run parameters have been checked using CUSUM and CUSUMsq and the results are presented in Figs. 4 and 5, which revealed that the plots are within the 5% critical bounds and justify the stability of the models during the study period.

5. Conclusion and policy implications

The study applied Nonlinear Autoregressive Distributed Lag (NARDL) model to investigate the impact of oil revenue and financial development on the Nigerian economy during the period 1981–2021. The results showed that, oil revenue, financial development and

investment contribute positively to economic growth in Nigeria both in the shortrun and longrun, except for their lag values in the shortrun, which are negative and statistically significant. In terms of policy implications, given the existence of nonlinear relationship between oil revenue and economic growth in Nigeria, using nonlinear techniques would be more statistically appropriate in forecasting the impact of oil revenue and economic growth.

6 Recommendations

Based on the above findings, the study concludes that a sound financial and energy sectors are major drivers of economic growth in Nigeria and therefore recommend that special attention should be given to promote these sectors through formulation and implementation of supportive policies that increase oil production by oil companies and reduce wastes. These can be achieved by mitigating the level of corruption in the oil sector and revival of the Nigerian refineries to reduce the cost of importing refined petroleum products. In addition, there should be a robust financial sector development that will bring about adequate savings and investment in the economy.

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