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Exploring the Nexus between Oil Revenue and Public Infrastructure Development in Nigeria

Umar, Usman Abubakar[1*] and Abdullahi, Salihu[2]

[1,2] Department of Economics, Gombe State University, Gombe, Nigeria.

***Corresponding Author**

Umar, Usman Abubakar

Department of Economics, Gombe State University, Gombe, Nigeria.

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Abstract: *This study examines the relationship between oil revenue and public infrastructure development in Nigeria from 1999 to 2023. Stationarity tests using the Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) shows that the variables are stationary at different levels, I(0) and I(1). The ARDL Bounds Co-integration test confirms the presence of a long-run relationship among the variables. In the short run, past oil revenue and non-oil revenue have significant positive effects on infrastructure development, while oil price and GDP have negative impacts. Corruption is not statistically significant. In the long run, oil and non-oil revenues continue to show strong positive effects, while GDP remains negative, and both oil price and corruption are insignificant. The Granger causality test shows that non-oil revenue and GDP help predict infrastructure spending, while oil revenue does not. Corruption is Granger caused by GDP, and it also Granger causes oil revenue. The model explains 94.5% of changes in infrastructure spending. Based on these results, the study recommends linking oil revenue directly to infrastructure through clear fiscal rules and spending oil and non-oil revenues more effectively on infrastructure spending. Nigeria should reduce its heavy dependence on oil by improving domestic revenue generation. Strengthening institutions, promoting transparency in the oil sector, and adopting long-term infrastructure plans that are less affected by economic shocks are also necessary. Finally, stronger accountability systems are needed to reduce the indirect effects of corruption on public investment.*

Keywords: *Oil Revenue, Infrastructure Development, Non-Oil Revenue, ARDL, Granger Causality, Nigeria.*

Introduction

Nigeria, one of the world's largest oil producers, continues to grapple with poor infrastructure, including dilapidated roads, unreliable electricity, under-equipped schools, and overstretched healthcare systems. This paradox, where immense oil wealth coexists with widespread infrastructure deficits, has drawn the attention of development economists, policy analysts, and concerned citizens alike. Given that oil has remained the backbone of Nigeria's economy since the 1970s—contributing over 90% of foreign exchange earnings and more than half of government revenue—it is expected that such wealth should drive substantial investment in public infrastructure. However, the reality has often contradicted these expectations.

Public infrastructure is critical to national development, supporting productivity, service delivery, employment creation, and improved quality of life. It encompasses both economic infrastructure—such as power, transport, and ICT—and social infrastructure, including schools and healthcare facilities. Yet, despite decades of oil wealth, Nigeria's infrastructure remains largely inadequate, poorly maintained, and unevenly distributed. Several scholars have identified persistent governance issues, corruption, weak institutions, and lack of transparency in public finance as major obstacles to infrastructure development. Much of the oil revenue is channeled into recurrent expenditure rather than capital projects, resulting in underfunded and often abandoned infrastructure initiatives.

Empirical studies present mixed findings. Some scholars (e.g., Ewa, Adesola & Essien, 2020; Oyinlola & Akinnibosun, 2013; Umeh & Ezeaku, 2022) have found that oil revenue positively affects infrastructure development, particularly during oil boom periods. Conversely, others (e.g., Akinlo, 2012; Iyoha & Oriakhi, 2020; Adegbite & Ayadi, 2021) argue that despite high oil earnings, Nigeria's infrastructure remains weak due to mismanagement, corruption, and prioritization of recurrent spending over capital investment. These divergent outcomes

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highlight the need for a more comprehensive examination of the oil-infrastructure nexus.

Compounding the challenge is Nigeria's rapidly growing population. Currently the 7th most populous country in the world, Nigeria is projected to become the 3rd largest by 2050, with a population expected to exceed 350 million (United Nations, 2022; National Planning Commission, 2023). This rapid growth exerts additional pressure on already weak infrastructure. The mismatch between infrastructure supply and population demand has resulted in overcrowded schools, traffic congestion, frequent power outages, and overstretched health services. This infrastructure gap contributes to deepening social inequality, worsening poverty, and slowing economic growth.

This study seeks to explore the relationship between oil revenue and public infrastructure development in Nigeria, particularly in the context of rising population demands. It assesses whether oil wealth has been effectively utilized to meet infrastructure needs and examines the extent to which population growth has influenced infrastructure outcomes. The study covers the democratic period from 1999 to 2023—a time marked by significant oil earnings and expanded public spending—offering new insights into how Nigeria can leverage its oil wealth to achieve sustainable development.

To guide the investigation, this study poses two key research questions: What is the impact of oil revenue on public infrastructure development in Nigeria? And what is the causal relationship between oil revenue and public infrastructure development? In line with these questions, the study aims specifically to examine the impact of oil revenue on public infrastructure development and to assess the causal relationship between the two variables. To achieve these objectives, the study tests the following null hypotheses: H_o1—Oil revenue has no significant impact on public infrastructure development in Nigeria, and H_o2—There is no causal relationship between oil revenue and public infrastructure development in Nigeria.

2. Literature Review

2.1 Conceptual Clarification and Literature Review

Oil revenue, in the context of this study, refers to income derived from the exploration, production, refining, marketing, and export of crude oil and its associated products such as natural gas and petroleum derivatives. In Nigeria, oil revenue remains the dominant source of government income, accounting for approximately 80% of government revenues and 90% of exports (Ogbonna & Appah, 2012; NBS, 2020). These earnings are sourced from petroleum profits tax, royalties, crude oil sales, licensing fees, and related charges (CBN, 2002; 2009), and are vital for financing national development. Since the mid-1970s, the Nigerian economy has heavily depended on oil revenues to achieve macroeconomic objectives (Uremadu et al., 2020). However, concerns persist over the effectiveness of utilizing these funds for long-term development, particularly in bridging infrastructure gaps (Tanzi, 2017). Infrastructure development, on the other hand, entails the construction and improvement of physical systems—such as roads, electricity, water supply, schools, hospitals, and communication networks—that underpin economic productivity and societal well-being. Defined as the foundational facilities required for national functioning, infrastructure plays a crucial role in supporting growth and reducing poverty (Boyle, 2024; Buhr, 2000). This study focuses on economic or "hard" infrastructure, particularly capital investments by the government in transport, power, health, and education sectors, which are essential for boosting efficiency, increasing public revenue, and fostering inclusive development (Business Standard, 2022). The strategic link between oil revenue and infrastructure development is thus critical to understanding Nigeria's economic trajectory and the challenges of translating natural resource wealth into tangible improvements in public services.

2.2 Theoretical Review

Peacock and Wiseman's Theory of Public Expenditure (1979) explains the tendency of government spending to rise in response to major social or economic events, such as crises or rapid population growth. These events cause a "displacement effect," where temporary increases in public expenditure and tax tolerance become permanent, leading to an expanded role of government in economic activities. The theory also introduces the concept of a "tolerance level," reflecting citizens' increased acceptance of higher public spending when it supports national progress. This framework is particularly relevant to countries like Nigeria, where oil revenue offers the potential to expand fiscal capacity. As supported by Hong and Nadler (2015) and Asongu and Jella (2016), increased government income from sources such as oil can drive capital investment in infrastructure. In the Nigerian context, oil windfalls should ideally boost spending on public goods like roads, power, and education. Thus, Peacock and Wiseman's theory provides a foundational understanding of how rising oil revenue can influence government decisions to invest in infrastructure and public services.

2.3 Systematic Literature Review

This section systematically reviews existing empirical literature on the relationship between government revenue—especially oil revenue—and infrastructure development, along with associated economic outcomes in Nigeria and other regions.

Studies focused directly on Nigeria offer varying insights. Usman (2024) employed the Kalman filter and found that oil and non-oil revenues significantly contribute to infrastructural development. In contrast, Omodero and Ehikioya (2020), using the ARDL model, observed that oil revenue had a negative and insignificant effect, while non-oil revenue was positively significant. Anewe and Ogbu (2022) further supported the importance of oil tax revenue, revealing its significant role in developing roads, education, and healthcare. These findings highlight divergent perspectives on oil revenue's effectiveness in supporting infrastructure.

Other studies examined broader revenue streams. Etoko and Umbe (2020) found federally collected revenue positively affected infrastructure, albeit insignificantly, urging better transparency. Okon and Umah (2023), and Olayinka and Phebe (2019), using regression analyses in Akwa Ibom and Lagos respectively, emphasized the positive effects of Internally Generated Revenue (IGR) on local infrastructure. Nnanseh and Akpan (2013) echoed similar findings in Akwa Ibom, linking IGR to improved access to water, electricity, and roads.

Linking revenue and infrastructure to growth, Amadi and Odu (2022) showed that social infrastructure positively drives economic growth in Nigeria. Ayeni and Afolabi (2020) emphasized the significance of tax revenue, although they found infrastructure had an insignificant effect on growth. Ogunlana et al. (2016) revealed positive links between infrastructure spending and economic growth, while Ekpung (2014) confirmed a long-term trend of infrastructure investment positively affecting Nigeria's economy.

Revenue composition also matters. Akinola and Akinrinola (2023) found petroleum profit tax and VAT significantly impact GDP, though company income tax did not. Ibrahim et al. (2023) used the VECM approach to show government spending's significant contribution to sectoral development, especially in health, education, and transport. Tanko and Samson (2020) reported similar positive effects of IGR and grants in Taraba State. Ideh (2019), however, found VAT and petroleum profit tax negatively impacted human development and GDP, indicating inefficiencies in revenue allocation.

Non-oil revenue studies such as Okolo et al. (2018) emphasized its positive effect on capital expenditure. Regionally, Kumari and Sharma (2017) found infrastructure crucial for growth and poverty reduction in India, and Mwakalobo (2015) made a similar observation in East Africa. Iyiama et al. (2017) showed that tax components significantly affect infrastructure in Nigeria, suggesting room for improved tax administration.

Regarding oil revenue's macroeconomic implications, Nweze and Edame (2016) found a long-term positive effect on Nigeria's GDP. Olayungbo (2019) used a NARDL model and observed that positive oil shocks enhanced growth more than negative ones. Obaretin and Monye-Emina (2019) found petroleum profit tax positively contributed to economic growth, calling for transparent revenue management. Akinleye et al. (2021) highlighted how macroeconomic instability, like inflation, weakens the oil-growth link.

In comparative perspective, Mohammed et al. (2020) examined oil-funded government spending in other oil-exporting countries and found benefits mainly for banking sectors, not private credit or stock markets. Finally, Obioma and Ozughalu (2012) confirmed a unidirectional causality from revenue to expenditure in Nigeria, reinforcing the idea that revenue drives fiscal planning and infrastructure expansion.

2.4 Literature Gap

Despite a rich body of research, several gaps persist. First, many Nigerian studies (e.g., Usman, 2024; Ayeni et al., 2020) did not isolate oil revenue as the primary variable of interest. Others used mixed-era data—combining military and democratic regimes—which undermines consistency due to differing fiscal policies (e.g., Tanko et al., 2020; Ideh, 2019). Also, several studies narrowed their focus to subnational units like states (e.g., Okon et al., 2023; Nnanseh et al., 2013), limiting generalizability. Moreover, some did not differentiate between oil and non-oil revenues, complicating causal interpretations.

This study addresses these gaps by focusing solely on oil revenue and public infrastructure at the national level, specifically during Nigeria's democratic era (1999–2023). Using the ARDL model, it captures both short-run and long-run dynamics, offering more targeted insights into how oil revenue has shaped infrastructure delivery in Nigeria's Fourth Republic.

3. Methods

3.1 Data Sources and Definition of Variables

The study utilizes annual time-series data for the period under review, sourced from Central Bank of Nigeria(CBN) and the Organisation of Petroleum Exporting Countries (OPEC). Table 1 presents the operational definition and sources of each variable employed in the analysis.

Variable	Description and Measurement	Source
Infrastructure Spending	Total capital expenditure of the Federal Government of Nigeria (proxy for infrastructure)	CBN
Oil Revenue	Federally collected oil-related revenue (crude oil, gas, royalties, taxes, etc.)	CBN
Non-Oil Revenue	Federally collected revenue from non-oil sources (e.g., VAT, CIT, import duties)	CBN
Oil Price	Annual average crude oil price (US$ per barrel)	OPEC
GDP	Nominal Gross Domestic Product of Nigeria	CBN
Corruption	Corruption perception index (higher score implies higher corruption)	Transparency International

Note: CBN = Central Bank of Nigeria; OPEC = Organization of Petroleum Exporting Countries; TI = Transparency International. Source: Compiled by the Author.

3.2 Estimation Methods

This study is guided by two primary objectives: (i) to examine the impact of oil revenue on public infrastructure development in Nigeria, and (ii) to assess the direction of causality between oil revenue and infrastructure investment. To achieve these objectives, the study adopts a three-stage econometric strategy:

Unit Root Testing: The time-series properties of the data are first examined using the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test to determine the order of integration for each variable. This ensures compatibility with the ARDL bounds testing framework, which requires variables to be either I(0), I(1), or a mix of both—but not I(2).

Cointegration Analysis: Upon confirming that none of the series is I(2), the Autoregressive Distributed Lag (ARDL) Bounds Test approach developed by Pesaran, Shin, and Smith (2001) is used to determine the existence of a long-run equilibrium relationship among the variables.

Model Estimation and Causality Testing: If cointegration is established, the long-run and short-run dynamics are estimated using the ARDL model. Additionally, the Engle-Granger causality framework is employed to explore the causal direction between oil revenue and infrastructure development.

3.3 Model Specification

The functional form of the model is expressed as:

$IFR_t = f(OILREV_t, OILPRIC_t, COR_t, NONOILREV_t, GDP_t)$

The econometric representation of the model is:

$IFR_t = \beta_0 + \beta_1 OILREV_t + \beta_2 OILPRIC_t + \beta_3 COR_t + \beta_4 NONOILREV_t + \beta_5 GDP_t + \mu_t$

To stabilize variance and reduce heteroskedasticity, the model is specified in its log-linear form:

$\log IFR_t = \beta_0 + \beta_1 \log OILREV_t + \beta_2 OILPRIC_t + \beta_3 COR_t + \beta_4 \log NONOILREV_t + \beta_5 \log GDP_t + \mu_t$

ARDL Model Estimations

Short-Run ARDL Specification:

$\Delta \log IFR_t = \beta_0 + \Sigma\alpha_i \Delta \log IFR_{t-i} + \Sigma\beta_i \Delta \log OILREV_{t-i} + \Sigma\gamma_i \Delta OILPRIC_{t-i} + \Sigma\delta_i \Delta COR_{t-i} + \Sigma\theta_i \Delta \log NONOILREV_{t-i} + \Sigma\varphi_i \Delta \log GDP_{t-i} + \mu_t$

Long-Run ARDL Specification:

$\log IFR_t = \beta_0 + \beta_1 \log OILREV_{t-1} + \beta_2 OILPRIC_{t-1} + \beta_3 COR_{t-1} + \beta_4 \log NONOILREV_{t-1} + \beta_5 \log GDP_{t-1} + \mu_t$

4.0 Results and Discussions

4.1 Trend Analysis of Infrastructure Spending and Oil Revenue (1999-2023)

Figure 1.

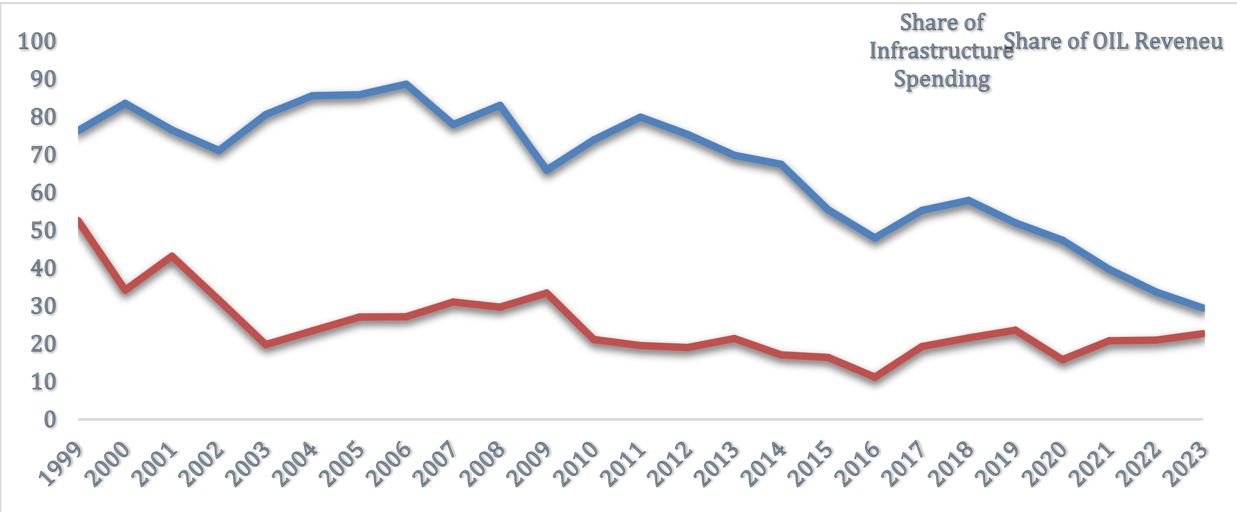


Figure 1. Trend of the Share of oil revenue to total revenue and the share of infrastructure expenditure to total expenditure.

Figure 1 shows that from 1999, the share of infrastructure spending in Nigeria's total government expenditure was high at 52.55% (CBN, 2023), likely due to the country's return to democracy and the need for infrastructure renewal. However, by 2000 it dropped to 34.16%, rose briefly to 43.09% in 2001, and then declined steadily to 19.71% by 2003. Between 2004 and 2006, the share remained moderate, ranging from 23% to 27%. It rose again in 2007 to 30.98% and stayed fairly strong in 2008 and 2009 at 29.65% and 33.39% respectively. From 2010 onward, the figures declined again, with the share falling below 20% in 2011 and 2012. The lowest point was in 2016 at just 11.16%. Although there were modest increases in subsequent years, 19.24% in 2017, 21.53% in 2018, and 23.57% in 2019, it fell again to 15.78% in 2020. From 2021 to 2023, the share slowly recovered to 20.74%, 20.97%, and 22.65% respectively. On average, from 1999 to 2023, infrastructure spending accounted for only 24.91% of total government spending (CBN, 2023), indicating that infrastructure has not consistently received a large share of the budget.

In contrast, oil revenue consistently made up a large portion of total government income during the same period. In 1999, it contributed 76.32%, rising to 83.50% in 2000 and staying high through the mid-2000, peaking at 88.64% in 2006. Between 2007 and 2014, oil still dominated revenue, maintaining shares above 65%. However, from 2015, a clear downward trend began, with oil revenue dropping to 55.41%, then 47.96% in 2016, and continuing to fall in later years. By 2023, it stood at just 29.42% (CBN, 2023). On average, oil accounted for about 66.38% of total revenue from 1999 to 2023. This declining trend suggests reduced reliance on oil in recent years, possibly due to diversification efforts or global oil market shifts.

However, while oil revenue remained a major source of income, the share of infrastructure spending did not follow the same pattern. The gap between high oil earnings and low investment in infrastructure highlights concerns about how oil revenue has been managed. The mismatch also suggests that rising oil income did not automatically lead to increased infrastructure investment, underlining the importance of efficient fund allocation and strong fiscal institutions.

4.2 Unit Root Tests

Table 2. ADF Stationarity Test

Variable	**At Level**		**At First Difference**		**Order of Integration**
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
LIFR	-0.9516	-2.4574	-1.7831	-1.8047	None
LOILREV	-3.1651**	-2.7938	____	___	I(0)
OILPRICE	-2.0780	-2.0462	-4.5475***	-4.2257**	I(1)
LNOILREV	-0.5217	-2.3236	-5.1747***	-5.0045***	I(1)
COR	-1.9434	-1.0138	-2.2093	-3.5371*	I(1)
LGDP	-4.4549***	-2.2274	____	____	I(0)

Note: ***(1%), **(5%) and *(10%)

Optimal lag length are determined by Akaike Information Criterion (AIC)

Source: Author's Computation Using Eviews 10.

The Augmented Dickey-Fuller (ADF) test was used to check the stationarity of each variable, which is important to avoid spurious regression results. At level, only Oil Revenue (OILREV) and Gross Domestic Product (GDP) are stationary, as their ADF statistics are significant at the 5% and 1% levels respectively. This means they are integrated of order zero, I(0), and do not require differencing. Other variables, including Infrastructure spending (IFR), Oil Price (OILPRICE), Non-Oil Revenue (NOILREV), and Corruption (COR), are not stationary at level, as their test values are not statistically significant.

When differenced once, Oil Price, Non-Oil Revenue, and Corruption become stationary. Their ADF test values turn significant at conventional levels 1% , 1% and 10% respectively, showing they are integrated of order one, I(1), and need to be differenced once to become stable. Infrastructure spending (IFR) remains non-stationary even after first differencing, as both intercept and trend values stay insignificant. As a result, the study further applied the Phillips-Perron (PP) test to recheck the stationarity of IFR using a more robust approach.

Phillips-Peron Stationarity Test

Variable	**At Level**		**At First Difference**		**Order of Integration**
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
LIFR	0.2045	-2.9712	-6.7582***	-6.6694***	I(1)
LOILREV	-3.4798**	-2.7830	-5.4186***	-5.8984***	I(0)
OILPRIC	-2.0267	-2.0478	-4.5858***	-4.5297***	I(1)
LNOILREV	-0.5217	-2.5581	-5.1747***	-5.0045***	I(1)
COR	-1.3089	-1.4586	-6.3733***	-7.5232***	I(1)
LGDP	-4.5706***	-2.1050	____	____	I(0)

Note: *(1%), **(5%) and *(10%)**

Optimal lag length are determined by Akaike Information Criterion (AIC)

Source: Author's Computation Using Eviews 10.

The Phillips-Perron (PP) test was used to recheck the stationarity of the variables and to confirm the earlier results from the ADF test. At level, Oil Revenue (OILREV) and Gross Domestic Product (GDP) are stationary, with test statistics significant at the 5% and 1% levels respectively. This confirms that both variables are integrated of order zero, I(0), and do not require differencing. On the other hand, Infrastructure spending (IFR), Oil Price (OILPRICE), Non-Oil Revenue (NOILREV), and Corruption (COR) are not stationary at level, as their PP values are not statistically significant under both intercept and trend conditions. After first differencing, the PP test confirms that IFR becomes stationary, with test statistics highly significant at the 1% level under both intercept and trend and intercept options. This resolves the earlier non-stationarity issue observed under the ADF test. Similarly, Oil Price, Non-Oil Revenue, and Corruption also become stationary at first difference, with all values significant at the 1% level. This shows that these four variables are integrated of order one, I(1), and require first differencing before use in further analysis.

ARDL Bounds Co-integration Test

F-Statistic	Significance Level	Bound Critical Values		K
		I(0) Bound	I(1) Bound	
4.8303	1%	3.06	4.15	5
	2.5%	2.7	3.73	
	5%	2.39	3.38	
	10%	2.08	3	

Source: Author's Computation Using Eviews 10.

The ARDL Bounds Co-integration test was carried out to examine whether a long-run relationship exists among the variables in the model. The ARDL Bounds Co-integration Test shows an F-statistic of 4.8303, which is higher than all the upper bound critical values across the 1%, 2.5%, 5%, and 10% significance levels. This clearly indicates the presence of a significant long-run relationship among the variables. The null hypothesis of no co-integration is rejected, meaning the variables move together over time. In other words, despite short-term fluctuations, the variables tend to move together over time, supporting the existence of long-run equilibrium. The test outcome provides the green light to proceed with estimating the long-run and short-run ARDL models

ARDL Long-run Impact

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LOILREV	1.608673	0.812259	1.980492	0.0692
OILPRIC	-0.030180	0.015886	-1.899839	0.0799
COR	0.078079	0.063390	1.231718	0.2399
LGDP	-2.150670	1.094104	-1.965691	0.0711
LNOILREV	2.622598	0.943940	2.778354	0.0157
C	-3.160601	3.509912	-0.900479	0.3842

Source: Author's Computation Using Eviews 10.

In the long run, oil revenue (LOILREV) has a positive coefficient of 1.6087**,** with a p-value of 0.0692, indicating a statistically significant relationship at the 10% level. Similarly, oil price (OILPRI) has a negative coefficient of -0.0302, and with a p-value of 0.0799, it is also significant at the 10% level. In contrast, corruption (COR) shows a positive coefficient of 0.0781, but its p-value of 0.2399 indicates that the relationship is not statistically significant. Furthermore, Gross Domestic Product (LGDP) has a negative coefficient of -2.1507, and a p-value of 0.0711**,** making it significant at the 10% level. In addition, non-oil revenue (LNOILR) has a positive coefficient of 2.6226 and is statistically significant at the 5% level, with a p-value of 0.0157. Lastly, the constant term is -3.1606, but with a p-value of 0.3842, it is not statistically significant.

ARDL Short-run Impact

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.124251	2.072972	-1.024737	0.3242
LIFR(-1)	-0.672103	0.190670	-3.524956	0.0037
LOILREV(-1)	1.081195	0.381002	2.837765	0.0140
OILPRIC(-1)	-0.020284	0.007819	-2.594271	0.0222
COR(-1)	0.052477	0.041598	1.261533	0.2293
LGDP(-1)	-1.445473	0.591999	-2.441680	0.0297
LNOILREV	1.762657	0.501125	3.517403	0.0038
D(LOILREV)	0.379128	0.305415	1.241352	0.2364
D(OILPRIC)	-0.004597	0.005720	-0.803580	0.4361
D(COR)	-0.001141	0.035616	-0.032040	0.9749
D(LGDP)	0.391271	1.333863	0.293337	0.7739
R-squared	0.945292	Mean dependent var		6.792223
Adjusted R-squared	0.903209	S.D. dependent var		0.770619
S.E. of regression	0.239749	Akaike info criterion		0.285113
Sum squared resid	0.747234	Schwarz criterion		0.825055
Log likelihood	7.578641	Hannan-Quinn criter.		0.428360
F-statistic	22.46257	Durbin-Watson stat		2.025393
Prob(F-statistic)	0.000001			

Source: Author's Computation Using Eviews 10.

In the short run, the lag of Infrastructure spending (LIFR (-1)), which represents infrastructure development, has a negative and significant effect on current IFR, with a coefficient of -0.6721 and a p-value of 0.0037. This means a 1% increase in past IFR leads to about 0.67% drop in the current period. Lagged oil revenue (LOILREV(-1)) shows a strong positive and significant impact with a coefficient value of 1.0812, and p value of 0.0140, meaning higher oil earnings from the previous year lead to more spending on infrastructure in the current year. In contrast, the lagged oil price (OILPRI(-1)) has a negative and significant effect with a coefficient value of -0.0203, and p value of 0.0222, indicating that rising oil prices constrain capital spending.

Furthermore, Lagged corruption (COR(-1)) is positive but not statistically significant, meaning corruption levels from the previous year do not have a clear short-run impact on infrastructure spending. Lagged GDP (LGDP(-1)) is significant and negative with a coefficient value of -1.4455, and p value of 0.0297, indicating that past GDP led to reduced infrastructure spending in the current period. Additionally, Non-oil revenue (LNOILR) has a strong and significant positive influence with a coefficient value of 1.7627**,** and a p value of 0.0038, showing that growth in non-oil revenue supports short-term increases in infrastructure investment. However, the short-run changes in oil revenue, oil price, corruption, and GDP (First differencing terms) are not statistically significant, indicating that their influence on government capital expenditure takes effect gradually rather than immediately.

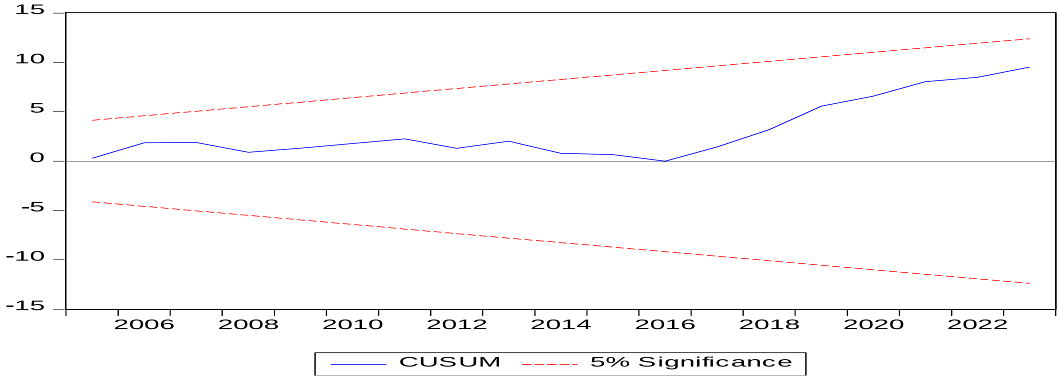
Overall, the model performs well, with an R-squared of 0.9453, meaning about 95% of the variation in infrastructure expenditure is explained by the independent variables. The F-statistic is highly significant with p = 0.000001, confirming the model's strength. The Durbin-Watson value of 2.025 suggests no serious issue of autocorrelation, making the short-run estimates reliable for inference.

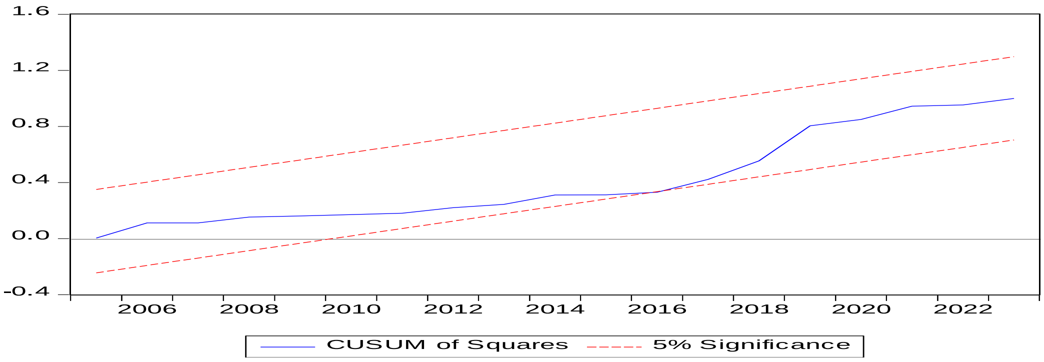
Diagnostics and Stability Tests

Test	**F-statistics**	**Obs*R-squared**	**Prob.**
Serial Correlation	0.0250	0.0498	0.8233
Heteroskedasticity	2.3167	15.3733	0.1190
RAMSEY RESET	4.0386		0.0675
Jarque-Bera		0.7509	0.6869

Source: Author's Computation Using Eviews 10.

Figure 2. Stability Table





Source: Generated Using E-views 10.

The diagnostic tests confirm the adequacy of the model. First, the Breusch-Godfrey test for serial correlation shows an F-statistic of 0.0250 and a p-value of 0.8233, indicating the absence of autocorrelation in the residuals. Next, the Breusch-Pagan-Godfrey test for heteroskedasticity reports an F-statistic of 2.3167 with a p-value of 0.1190, suggesting that the residuals are homoskedastic at the 5% level. In addition, the Ramsey RESET test yields an F-statistic of 4.0386 with a p-value of 0.0675, which is above the 5% threshold but below 10%, implying that the model does not suffer from serious functional form misspecification.

Furthermore, the normality test based on the Jarque-Bera statistic is 0.750933, with an associated probability value of 0.686969. This indicates that the residuals are normally distributed, as the probability is well above the 5% level.

Lastly, the model stability, both the CUSUM and CUSUM of Squares plots fall within the 5% significance boundaries, confirming that the estimated parameters are stable over the sample period.

Granger Causality

Table 4. Granger Causality Test Results

Variable Pair	Direction of Causality	Result
LOILREV → LIFR	Oil Revenue does not Granger Cause Infrastructure Spending	No Causality
LIFR → LOILREV	Infrastructure Spending does not Granger Cause Oil Revenue	No Causality
OILPRIC → LIFR	Oil Price does not Granger Cause Infrastructure Spending	No Causality
LIFR → OILPRIC	Infrastructure Spending does not Granger Cause Oil Price	No Causality
COR → LIFR	Corruption does not Granger Cause Infrastructure Spending	No Causality
LIFR → COR	Infrastructure Spending does not Granger Cause Corruption	No Causality
LNOILREV → LIFR	Non-Oil Revenue Granger Causes Infrastructure Spending	**Unidirectional**
LIFR → LNOILREV	Infrastructure Spending does not Granger Cause Non-Oil Revenue	No Causality
LGDP → LIFR	GDP Granger Causes Infrastructure Spending	**Unidirectional**
LIFR → LGDP	Infrastructure Spending does not Granger Cause GDP	No Causality

OILPRIC → LOILREV	Oil Price does not Granger Cause Oil Revenue	No Causality
LOILREV → OILPRIC	Oil Revenue does not Granger Cause Oil Price	No Causality
COR → LOILREV	Corruption does not Granger Cause Oil Revenue	No Causality
LOILREV → COR	Oil Revenue Granger Causes Corruption	**Unidirectional**
LNOILREV → LOILREV	Non-Oil Revenue does not Granger Cause Oil Revenue	No Causality
LOILREV → LNOILREV	Oil Revenue does not Granger Cause Non-Oil Revenue	No Causality
LGDP → LOILREV	GDP does not Granger Cause Oil Revenue	No Causality
LOILREV → LGDP	Oil Revenue does not Granger Cause GDP	No Causality
COR → OILPRIC	Corruption does not Granger Cause Oil Price	No Causality
OILPRIC → COR	Oil Price does not Granger Cause Corruption	No Causality
LNOILREV → OILPRIC	Non-Oil Revenue does not Granger Cause Oil Price	No Causality
OILPRIC → LNOILREV	Oil Price does not Granger Cause Non-Oil Revenue	No Causality
LGDP → OILPRIC	GDP does not Granger Cause Oil Price	No Causality
OILPRIC → LGDP	Oil Price does not Granger Cause GDP	No Causality
LNOILREV → COR	Non-Oil Revenue Granger Causes Corruption	**Unidirectional**
COR → LNOILREV	Corruption does not Granger Cause Non-Oil Revenue	No Causality
LGDP → COR	GDP Granger Causes Corruption	**Bidirectional**
COR → LGDP	Corruption Granger Causes GDP	**Bidirectional**
LGDP → LNOILREV	GDP does not Granger Cause Non-Oil Revenue	No Causality
LNOILREV → LGDP	Non-Oil Revenue does not Granger Cause GDP	No Causality

Source: Author's computation using Eviews 10

The Granger Causality test reveals that non-oil revenue (LNOILR) Granger causes infrastructure spending (LIFR), with an F-statistic of 6.1346 and a p-value of 0.0218, indicating a statistically significant relationship at the 5% level. This means that past values of non-oil revenue help in predicting changes in capital expenditure. In addition, gross domestic product (LGDP) is found to Granger cause LGCE, with an F-statistic of 8.8799 and a p-value of 0.0071, showing significance at the 1% level. This implies that previous GDP levels contain information useful in forecasting government capital expenditure. Furthermore, oil revenue (LOILREV) is Granger caused by corruption (COR), as indicated by a significant F-statistic of 11.1122 and a p-value of 0.0032. Lastly, corruption (COR) is also Granger caused by GDP (LGDP), with an F-statistic of 6.7547 and a p-value of 0.0168, confirming statistical significance at the 5% level.

On the other hand, the rest of the variables do not show statistically significant causality in either direction. This includes the causal links between LIFR and oil revenue, oil price, and corruption; between LOILREV and oil price, non-oil revenue, and GDP; between oil price (OILPRI) and all other variables; as well as between non-oil revenue and GDP or corruption. The p-values in these cases are above the 5% level, indicating that past values of these variables do not significantly improve the prediction of others within the selected lag period.

Discussion of Findings

Key outcomes emerged from the study titled “Exploring the Nexus between Oil Revenue and Public Infrastructure Development in Nigeria, 1999–2023.

Starting with the ARDL estimates, the short-run results show that oil revenue had a statistically significant positive impact on infrastructure spending (IFR). This means that increases in oil revenue supported infrastructure spending in the short term. This outcome is in line with the findings of Usman (2024), Anewe et al (2022), and Omodero et al (2020), who reported that oil-related income contributed to infrastructure financing in Nigeria. However, the result contradicts Omodero et al (2020), who found the effect to be negative and insignificant.

In the same short-run estimates, non-oil revenue also showed a statistically significant positive effect on infrastructure development. This supports earlier research by Okolo et al. (2018), Okon et al (2023), and Nnanseh et al (2013), which emphasized the role of domestic revenue sources in sustaining capital projects. Oil price and GDP, on the other hand, showed significant negative effects in the short run. They differ from findings by Olayungbo (2019) and Amadi et al (2022), who reported positive impacts from economic activity on government spending. Corruption did not have a statistically significant effect on infrastructure development in the short term, which aligns with the findings of Etoko et al

(2020), who noted that accountability issues limit the efficient use of revenue for infrastructure.

Turning to the long-run ARDL results, oil revenue maintained a positive and statistically significant influence on infrastructure spending, indicating that oil income remains a major source of infrastructure financing over time. This finding is consistent with the results of Anewe and Ogbu (2022), Usman (2024), and Akinleye et al. (2021), who found long-term benefits of oil revenue on capital projects. Likewise, non-oil revenue had a strong and significant long-run effect, confirming the results of Okolo et al. (2018) and Olayinka et al (2019), who emphasized the importance of diversifying revenue sources. Meanwhile, GDP showed a negative long-run effect, significant at the 10% level. This partly supports the argument by Etoko et al (2020) that rising income levels have not always translated into improved infrastructure due to weak institutions and misallocation of resources. Oil price and corruption also showed statistically insignificant effects in the long run, which is consistent with the findings of Omodero et al (2020) and Ibrahim et al. (2023), suggesting that the broader effect of price shocks and corruption on infrastructure is not always direct or immediate.

The Granger Causality test offered further insights. It revealed that non-oil revenue and GDP Granger cause infrastructure spending. This indicates that both revenue sources and the state of the economy are useful in predicting infrastructure spending. These findings support the evidence presented by Okolo et al. (2018), Nnanseh et al (2013), and Ayeni et al (2020), who reported a strong link between economic performance, government income, and infrastructure growth. Furthermore, corruption was found to Granger cause oil revenue, while GDP Granger caused corruption. These directional links suggest that economic conditions influence governance outcomes and that corruption may be connected to fluctuations in oil-based revenue. These results are in line with the findings of Obioma et al (2010), who emphasized the revenue-spending link and the influence of governance on public finance.

On the other hand, no significant causality was found between infrastructure spending and oil price, oil revenue, or corruption in either direction. This means that, based on the data, past movements in these variables did not help predict infrastructure spending. This aligns with studies such as Omodero et al (2020) and Etoko et al (2020), who argued that the effect of these variables on infrastructure may be influenced by weak transmission channels or poor institutional frameworks.

Conclusion

The study examined the relationship between oil revenue and public infrastructure development in Nigeria from 1999 to 2023. The results clearly showed that oil revenue has a strong effect on infrastructure spending, both in the short and long term. This means that when oil revenue increases, the government is more likely to invest in capital projects. However, the study also found that non-oil revenue has an even more consistent and reliable impact on infrastructure development, showing the growing importance of internal revenue sources.

The study also looked at whether oil revenue can predict infrastructure spending. The findings showed that oil revenue does not directly cause changes in infrastructure spending. Instead, non-oil revenue and GDP were found to be better predictors of infrastructure spending. This means the level of economic activity and how well the government generates and manages its revenue play a bigger role than oil alone. The study also found that economic growth influences both oil revenue and corruption, showing that these factors are connected in important ways.

Based on these results, the first hypothesis; oil revenue does not impacts public infrastructure development is rejected, as oil revenue showed a meaningful effect both in the short and long run. However, the second hypothesis; there exist no direct causal relationship between oil revenue and infrastructure development is accepted, since the Granger causality test did not find a significant directional link from oil revenue to infrastructure spending.

Overall, while oil revenue is still important, the findings suggest that relying only on oil is not enough. Nigeria needs to strengthen other sources of income, improve how public funds are managed, and build stronger institutions to ensure steady and effective infrastructure development.

Recommendations

Based on the findings of this study, it is recommended that the Nigerian government strengthen the management and allocation of oil revenue to improve its impact on public expenditure, especially infrastructure. Since the study shows that oil revenue supports infrastructure in both the short and long run, it is important to adopt clear fiscal rules that tie oil income directly to key capital projects. The government should also save during periods of high oil prices and maintain investments during downturns to reduce the effect of oil market swings. This will help promote steady and reliable development outcomes.

However, the study also found that oil revenue does not directly lead to infrastructure development over time, which means there is no automatic link between oil income and capital spending. Based on this, the government should create stronger budget frameworks that connect oil earnings more directly to infrastructure plans.

Beyond oil income, efforts should be made to boost non-oil revenue by expanding the tax base, enhancing collection systems. Reducing the country's heavy reliance on oil will make funding for infrastructure more stable and predictable. Stronger institutions and improved transparency will ensure that public funds, whether from oil or other sources are managed and spent efficiently. To further improve outcomes, long-term infrastructure plans should be developed to reduce vulnerability to economic shocks, and strong accountability systems must be in place to tackle the indirect effects of corruption on public spending.

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