Journal of Business Management and Economic Development
E-ISSN 2986-9072 P-ISSN 3031-9269
Volume 3 Issue 01, January 2025, Pp. 432-443
DOI: https://doi.org/10.59653/jbmed.v3i01.1422

Fuel Subsidy Imbroglio and Economic Prosperity of Nigeria: A Dynamic Auto Regressive Distributed Lag (DARDL) Approach

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Received: 27-12-2024 *Reviewed: 10-01-2025* *Accepted: 27-01-2025*

Abstract

This study evaluates the impact of fuel subsidy imbroglio on Nigeria's economic prosperity, covering the period from 1986 to 2022. In investigating the effect of oil subsidy on the economic prosperity of Nigeria, it uses RGDP as the regressed while the regressors are Subsidy Payment (SY). Additionally, Oil rent (RO), Exchange Rate (ER) and institutional variables such as Political stability (PS) and Control of Corruption (CO) served as control variables. To mediate the effect of subsidy, the institution of regulation was applied to moderate the nexus between subsidy payment and economic prosperity in Nigeria (SY*RQ). Data were obtained from secondary sources such as The Central Bank of Nigeria (CBN) Statistical Bulletin, the World Bank Development Index (WDI) and United States Energy Information Administration (USEIA). The dynamic autoregressive distributed lag (DARDL) model estimator tool was deployed for data analysis. The short-run result shows the magnitude of change in economic prosperity orchestrated by political stability. Also, corruption control was effective in the short run and encouraged economic prosperity. At the same time, oil subsidies harmed the country's economic prosperity; as the short-run coefficient implied, the effort to control subsidies directly using the institution of regulation (RQ) failed. Further, the normalized ARDL long-run test shows that the payment of oil subsidies has a minimal impact on economic prosperity in Nigeria. Similarly, when oil subsidy payment is subjected to regulations, its impact is still minimal. Notwithstanding, PS and LEX significantly promote economic prosperity in Nigeria. Based on the findings, the study recommends and supports the removal of fuel subsidies and that the proceeds should be re-invested in providing critical amenities and infrastructure to grow the Nigerian economy.

Keywords: Fuel Subsidy Imbroglio, Economic Prosperity, Dynamic Auto Regressive Distributed Lag (DARDL) Approach

Introduction

Although Nigeria is one of the major crude oil producers in the world, the country still pay high cost for subsidy petrol. These costs are costs are associated with crude oil production and the opportunity cost of local consumption (PWC, 2023). Also, it is highly expensive to refine crude oil as it requires huge infrastructural costs, expertise and technology. This rationalizes why crude oil is mostly refined oversea. Hence, two major arguments arise. The first argument is that Nigeria can sell fuel at a market-based price without incurring high subsidy costs. Another argument is that the subsidy costs can be eliminated if Nigeria refined crude oil locally (PWC, 2023).

Uzoho (2023) reported that Nigeria's petrol product volume is about $28 billion annually. This suggests that the price of petrol in Nigeria is not factored by exchange rates and global oil price only but is also factored by handling, insurance and importation charges. If attention is placed on subsidy removal by encouraging local production, subsidy costs such as handling, insurance and importation charges will be eliminated (Okonkwo, 2023). However, Addeh (2023) argued that subsidy costs such as handling, insurance and importation charges does not constitute a major factor which reduces the oil price value chain. The authors further contend that even if local production will reduce the cost of oil production, oil price subsidy removal is still not the best approach of solving economic problems. The rationalization is that except global price fall at a desired level, subsided petrol price will always be above regulated prices. This has been the case of Nigeria.

Within the Nigerian context, fuel subsidy removal has been a matter of intense debate across different climes. Formally, President Bola Ahmed Tinubu, as part of his plan to address the huge budget deficits, removed fuel subsidy on 29th May, 2023 (Sulaimon, 2023). It is with the expectation that the subsided costs will be channeled towards priority sectors such as health care, education, and transportation sectors. Nevertheless, the subsidy removal increased the consumer price index (CPI) by over 100% which by extension increased poverty level, reduced the value of Naira over the US dollar and increased petrol pump price. This prevailing circumstance further reaffirmed the position of Addeh (2023) that even if local production will reduce the cost of oil production, oil price subsidy removal is still not the best approach of solving economic problems.

Arising from the above arguments raised, this novel research aimed to examine the impact of fuel subsidy imbroglio on economic prosperity of Nigeria from 1986 to 2022. 1986 as the base year is strategic given the fact that, 1986 marked the structural adjustment era while 2022 marked the end of subsidy regime. In investigating the effect of oil subsidy on economic prosperity of Nigeria, it uses RGDP as the regressed while the regressors are Subsidy Payment (SY). Additionally, Oil rent (RO), Exchange Rate (ER) and institutional variables such as Political stability (PS), and Control of Corruption (CO) served as control variables. In a bid to mediate the effect of subsidy the institution of regulation was applied to moderate the nexus between subsidy payment and economic prosperity in Nigeria (SY*RQ). Justifiably, sudden gyrations in Oil rent (RO), Exchange Rate (ER) and institutional variables such as political stability (PS), and control of Corruption (CO) cause sudden gyration in price of petrol which

by extension affects the stability of the economy (Adamu, 2023; Obuareghe, Orubu, & Awogbemi, 2025). Hence, the incorporation of Oil rent (RO), Exchange Rate (ER) and institutional variables such as Political stability (PS), and Control of Corruption (CO) into the fuel subsidy and economic prosperity model will give a robust interpretation of the fuel subsidy and economic prosperity dynamics. In the light of this salient issue, the pertinent questions which guide this research are:

1. How has fuel subsidy payments affected the growth of the Nigerian economy from 1986 to 2022 having controlled for Oil rent (RO), Exchange Rate (ER) and institutional variables such as Political stability (PS), and Control of Corruption (CO)?
2. To what extent has regulatory quality moderate between fuel subsidy and economic prosperity?

Literature Review

Over time, various arguments have been advanced regarding whether oil subsidy should be removed. Conceptually, oil subsidy imbroglio is a complex and highly contentious issues which surrounds government petroleum product policies (Husaini, Puah, & Lean, 2019; Ighosewe, Akan & Agbogun, 2021). The argument is that though subsidized petrol reduces the price of petrol, it increases economic burden (van den Bergh, van Beers, & King, 2024; Ighoroje, Ewiwile, Akan, Egugbo, & Agbogun, 2024). Additionally, subsidized fuel prices may also lead to crude oil theft. This further compounds the economic inefficiencies. Also, global oil price gyrations further compound the oil price imbroglio in that the rise in the fiscal costs associated with the encouragement of subsidized oil price pushes the government to reform the oil sector which further increase economic burden (Mohammed, Yusuf, Mele, Yahaya, & Olowo-Oribi 2024; Meludu, Komolafe, & Chilaka, 2024). This further suggests oil price imbroglio can be resolved if effective policy implementation and intervention programme such as cash transfer are highly encouraged (Akinsola, & Odhiambo, 2020).

Yohana, Mary, and Adamu (2024) noted that the intention to subsidize the price of petrol in Nigeria was institutionalized in 1977 consequent upon the price control Act to 19777. They further stressed that the decision to subsidize the price of petrol in Nigeria is not the issue but the mis-management of public funds by those in authority. Figure 1 below presents a ten year trend of the pre-fuel subsidy removal era beginning from 2013 to 2022.

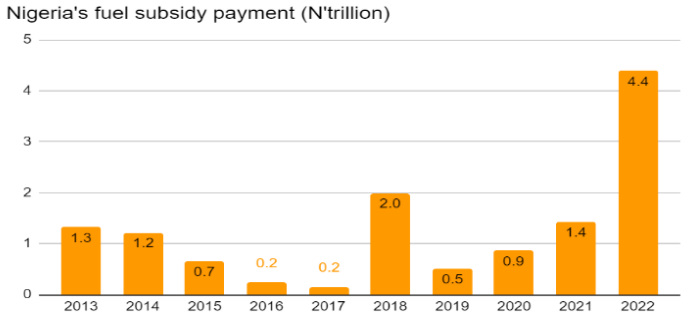

Figure 1: Nigeria's Fuel Subsidy Payment from 2013 to 2022
Source: CBN Statistical Bulletin (2022)

It is obvious from the above scenario that as at 2013, ₦1.3 trillion was designated for subsidy. However, ₦1.2 trillion was designated for subsidy. Meanwhile, in 2015, 2016, and 2017, N7 billion, N2 billion, and N2 billion were designated for subsidy. In 2018, the amount rose to N2 trillion, accounting for about 100% increasing following the amount disbursed for fuel subsidy payment. However, it dropped to ₦5 billion and ₦9 billion in 2019 and 2020, respectively but later increased to ₦1.4 trillion and ₦4.4 trillion in 2021 and 2022, respectively. The chart above clearly suggests that Nigerian economy will save more if the subsidy is removed provided that the public revenue is well managed (Raji, 2018).

Undoubtedly, the high gyration in global oil price and subsidized price poses a heavy economic burden to Nigeria's economy since it can increase debt sustainability issues. Nevertheless, public debt to GDP rate is moderate. The World Bank country director, Chandhurl reported that even when the Brent oil price in relation against the Nigeria's oil price was $118.11 per barrel at 5.06pm as at 18th April, 2022.

The study draws its theoretical framework from the lens of the Welfare economics. The theoretical foundation of the welfare economics is derived from the works of Vilfredo Pareto, Arthur Cecil Pigou, and Amartya Sen. Vilfredo Pareto introduced the Pareto Optimality/Efficiency concept into welfare economics (Drakopoulos, 2024), Cecil Pigou introduced the concepts of externality in welfare economics stressing that the essence of subsided fuel price is to current perceived market inefficiencies (Kumekawa, 2024) while Amartya Sen expanded the Welfare economics domain beyond economic efficiency to include the concept of distributive justice, fairness and individual freedom. Consequently, the contributions made by these three welfare economists is highly key to understanding the implications of subsidized oil price on economic prosperity, resource allocation, distributive justice, fairness and individual freedom (Leßmann, Otto, & Ziegler, 2011).

Accordingly, this theory stressed that though subsidy reduces the crude oil costs, it increases economic burden/costs and may likely hinder economic prosperity if not well managed. By implication government will have to tradeoff between the economic costs of encouraging oil subsidy and the benefits of removing oil subsidy. The justification is that though if oil subsidy is encouraged, it will provides immediate welfare gains as it will increase the standard of living, it may have detrimental impact on the growth of the economy on the long run as it will encourage diversion of public funds, encourage market distortions, unequal distribution of public resources, encourage overconsumption, and also increase economic burden. Also, if oil subsidy is encouraged, it has the high tendency to discourage economic diversification, sustainability, technological advancement and development of alternative source of generating power.

Similarly, extant empirical discourse reported mixed outcomes on the impact of oil price subsidy imbroglio on economic prosperity. First, Zhu, Xu, Chen, and Wu (2024) evidenced that low oil price distortion encourages green economic efficiency of China from 2003 to 2019. Again, Jatuporn (2024) evidenced that global oil prices affect domestic prices and that both affect Thailand's economic prosperity. However, Liu, Salleh, and Nor (2024) reported that oil price subsidy removal has a slight adverse effect on economic prosperity**.** Gamette and Oteng

(2024) reported that the removal of the subsidized fuel price have adverse effect on the Ghana and Nigeria economy. Similarly, Yohana, Mary, and Adamu (2024) reported that subsidies removal have high adverse effect on inflation rate, debt reduction, fiscal sustainability, high poverty and vulnerability rate, social unrest and protest. The authors further stressed that if policy measures are not re-directed towards checking this policy, its effect on the economy will be more adverse.

Research Method

In investigating the effect of oil subsidy on economic prosperity of Nigeria, it uses RGDP as the regressed while the regressors are RO, SY, and ER, Institutional variables such as PS, and CO. In a bid to mediate the effect of subsidy the institution of regulation was applied to moderate the nexus between subsidy payment and economic prosperity in Nigeria (SY*RQ). Data were generated from WDI (2022) and CBN Bulletin (2022).

The data analysis in this study makes use of the ARDL. If the variables of interest have a consistent long-term relationship, then using the ARDL approach makes sense. This method's ability to do away with the need that every variable be stationary at the same level of integration—typically either I(0) or I(1)—makes it very helpful. Additionally, the application of the ARDL technique provides solutions for missing or omitted variable bias that may arise in econometric analyses, as well as the autocorrelation issue that is frequently encountered in many series containing economic variables (Maduka, 2022; Yule, 1926; Engle and Granger, 1987). Lastly, the ARDL approach is used to consider both the short- and long-term dynamics in the current empirical investigations. The study further employs the F-statistic test, proposed by Pesaran et al. (1991) and used by the ARDL technique to ascertain whether co-integration exists among the variables of interest. The generalized form of the ARDL formulation is expressed as follows before the ARDL bounds tests are applied:

$$Y\_t = \varphi\_0I + \sum\_(i = 1)\^P \delta Y\_(t - i) + \sum\_(j = 0)\^q \beta\_1 X\_(t - i) + \epsilon\_t \quad (3)$$

Where;

X_{t-i} represents the lagged terms of the regressors (the distributed lag);

Y_{t-i} is the autoregressive lag (the lag of the regressed);

Y_t is the regressed.

The error component captures all of the model's unexplained changes, ϵ_t. With this unrestricted ARDL model, the X_t can be cointegrated, I(0), or I(1). In conclusion, β and δ represent coefficients, φ denotes the constant, and p and q represent the ideal lag lengths for the distributed and autoregressive lag elements.

To find out if there is co-integration among the variables being studied, the Bounds test is undertaken. According to the null hypothesis, no co-integration exists between the variables in question. Thus, the following is a statement of the alternative and null hypotheses:

$H\_o: \beta = \theta = 0$

$H\_o: \beta \neq \theta \neq 0$

This resulted to the understated functional relationship expressed in Log form:

$$LEP_t = f(PS_t, CO_t, LSY * RQ_t, LSY_t, LER_t, RQ_t, RO_t) \qquad (1)$$

Whereas the econometrics model is stated as follows:

$$〖LEP〗\_t = \alpha\_0 + \alpha\_1\ 〖PS〗\_t + \alpha\_2\ 〖CO〗\_t + \alpha\_3\ 〖LSY * RQ〗\_t + \alpha\_4\ 〖LSY〗\_t + \alpha\_5\ 〖LER〗\_t + \alpha\_6\ 〖RQ〗\_t + \alpha\_7\ 〖RO〗\_t + \mu\_t \qquad (2)$$

Where:

LEP is the log of Economic prosperity,

PS is political stability,

CO is corruption control,

RQ, regulatory quality,

LSY is the log of subsidy,

LER is the log of exchange rate,

RO is oil rent,

μ is the error term of the model while the lower subscript

t is the period (year).

α_0 is the intercept of the model,

$\alpha_1$to α_7 are the parameters of the regressors

Result and Discussion

Table 1 presents the descriptive statistics that are used to identify some salient features of the dataset used for the study. A cursory look at the table shows that the mean, maximum and minimum logged values for the regressed, LEP are 30.4948, 32.8019 and 26.9271 respectively; it shows that LEP has witnessed a continuous increase over the period of the study. LER indicates that the exchange rate has witnessed some volatility over the period as the minimum/lowest, maximum and median values of LER, which are 2.0842, 5.9943 and 4.8593 respectively clearly show. The mean, maximum and minimum values of political stability (PS), and institutional variable are -1.6389, -0.5882, and -2.21112 respectively. Suggesting that political stability fluctuated during the reviewed period but maintaining a negative value.

Table 1. Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
LEP	30.49476	30.90823	32.80193	26.92710	1.771229	32
CO	-1.1912	-1.18489	-0.90095	-1.50207	0.128880	32
PS	-1.63892	-1.77086	-0.58824	-2.21112	0.434290	32
LSY	26.21227	26.59300	27.98870	24.41713	1.160917	32
LER	4.487035	4.859322	5.994340	2.084216	1.111626	32
RQ	-0.93808	-0.94336	-0.68177	-1.29282	0.151474	32
RO	12.61989	13.46242	28.70544	2.684290	6.010368	32

Furthermore, the institutional variables of Regulatory quality (RQ) and Corruption control (CO) remained largely flat and negative for the period under review as indicated by the mean, maximum and minimum value -0.9830, -0.6817 and -1.2928 for Regulatory Quality (RQ) and -1.1912, -0.9009 and -1.5020 for corruption control. This suggests that while the variables weigh negatively on economic prosperity, their relative impacts have neither diminished nor been heightened during the review period. In addition to the above, Logged Subsidy (LSY) increased as the minimum, maximum and mean values of 24,4171, 27.9887 and 26.2122 respectively indicate but the rise in subsidy is less than the rate of increase in economic prosperity witnessed during the period under review. Oil rent has mean, maximum and minimum values of 12.619, 28.705 and 2.6842, indicating variations brought about by both invisible hands of demand and supply and other socioeconomic factors outplaying the international oil market scene and the domestic environment. All the variables of interest with the exception of political stability are right-tailed which suggests how poorly they may be performing. For instance, as earlier noted, the amount of money paid out as subsidy has continued to increase over the period under review and the exchange rate has continued to fall against other major currencies.

Table 2: Unit Root Tests

Variables	ADF		Phillips-Perron (PP)	
	Level	First Diff.	Level	First Diff.
LEP	-2.678*	-2.344	-4.815***	-2.957*
LER	-1.858	-5.159***	-1.947	-5.161***
LSY	-0.537	-6.141***	-0.537	-6.141
PS	-1.141	-9.714***	-1.685	-10.624***
RQ	-2.707*	-8.461***	-2.774*	-8.473***
CO	-2.115	-5.921***	-2.284*	-5.919***
LSY*RQ	-2.986**	-8.741***	-3.086***	-8.789***
RO	-2.652*	-7.379***	-2.533	-14.645***

Table 2 accounts for the unit root tests using ADF and the PP tests. The results show that LEP is stationary at level I(0), while the rest of the variables including LSY, LER and PS,

RQ, CO and RO are integrated of order I(1) at the 5% level. Meanwhile, the interaction of LSY*RQ reported integrated mixed integration. The mixed nature of the order of integration of the variables, where some variables integrated of order I(0) & others of I(1) justifies the use of the ARDL estimator and the bounds test of co-integration for modelling the relationship between the interest variables.

Table 3: ARDL Normalized Long Run Estimates

Specification		**Optimal lag**	**F-statistics**
$LEP = f(LER,$ LSY, PS, CO, RQ, LSY*RQ, RO)		ARDL(2,2,2,2 ,1, 2,1,1)	9.104817***
Critical value bounds	**0.01 (1%)**	**0.05 (5%)**	**0.10 (10%)**
1(0) bound (k=7)	2.73	2.17	1.92
1(1) bound (k=7)	3.9	3.21	2.89

Table 3 evident that, the F-statistics value of 9.104817, clearly outstripping the upper Bound of the critical value at all levels of significance suggesting that long run equilibrium exist. The normalized ARDL test shows that the oil subsidies payment has minimal impact on economic prosperity in Nigeria. Similarly, when oil subsidy payment is subjected to regulations as indicated by LSY*RQ, it still have minimal effect on economic prosperity. This goes to support the position of several policy maker for which the removal of subsidy in Nigeria was put forward, that the huge sum invested on subsidy do not serve the purpose it was meant for but rather the money is believed to be embezzled by few individuals who have access to the money. Notwithstanding, PS and LEX significantly promotes economic prosperity in Nigeria. This shows that a stable political climate is indispensable framework in achieving economic prosperity in any country. While the exchange rate holds something good for the country's economic prosperity in the long run if properly managed. Also, the result shows that RO deteriorates economic prosperity of Nigeria significantly. This goes to reveal the harms caused oil dependence in the country. This incident began with the oil boom of the 70s that enriched the country through foreign earnings from crude oil sales, leading to the abandonment of the other sectors that contributed immensely to the economy- the agricultural and industrial sectors. This translated to the closure of many industries and caused the contribution of the agricultural sector to plummet. Besides, there is high level of embezzlement of revenue from the crude oil sales by those in charge of the sectors. This is indeed the expected long-run effect of the country's overreliance on oil. Moreover, it is been said that the huge expenditure on subsidy comes from crude oil earnings, thus, one shouldn't expect significantly contribution from subsidy in Nigeria.

Table 4: Normalized Long Run ARDL Results

DepVar(LEP)

Regressors	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
PS	1.364294	0.350493	3.892497	0.0037
CO	0.703523	0.510629	1.377758	0.2016

LSY*RQ	0.779930	0.638837	1.220860	0.2532
LSY	0.877314	0.634434	1.382828	0.2001
LER	1.498909	0.173668	8.630904	0.0000
RQ	-17.46253	16.93016	-1.031445	0.3293
RO	-0.036770	0.008828	-4.165328	0.0024
C	7.476331	16.26865	0.459554	0.6567

Note: *,** and *** stands for 10%, 5% and 1% level of significance.

The short run result shows that political stability encouraged economic prosperity in the country as indicated by the coefficient and probability values of 0.184092 and 0.0061. While the probability values indicated significance at 5%, the coefficient value shows the magnitude of change in economic prosperity orchestrated by political stability. Corruption control also was effective in the short run and so encouraged economic prosperity in Nigeria at a magnitude of 0.647634% going by the coefficient value. While oil subsidy harmed the country's economic prosperity as the short run coefficient implied, the effort to control subsidy directly using the institution of regulation (RQ) failed. Thus, the mediation of RQ on the relationship between oil subsidy payment and economic prosperity could not redirect the direction of subsidy's impact on Nigeria's economy. This is clearly shown by the coefficient of -0.518776 for subsidy and -0.675740. Infact, the result shows that in the short run that effort made to control oil subsidy money using regulation had a higher negative impact on the growth of the economy (-0.675740%) compared to the direct impact of subsidy on Nigeria's economic prosperity (-0.518776%). Furthermore, the study's result shows that controlling economic prosperity directly using the institution of regulation is potent and effectively promoted economic prosperity of the country at a magnitude of 18.60512%. Exchange does not have any significant effective on economic prosperity of Nigeria during the short run. But oil rent promoted economic prosperity of Nigeria but at the 10% significant level.

Table 5: ARDL Dynamic Short-run Results

DepVar (LEP)

Variables	Coefficient	Std. Error	t-Statistic	Prob.
ΔPS	0.184092	0.051665	3.563193	0.0061
ΔCO	0.647634	0.123769	5.232609	0.0005
ΔLSY*RQ	-0.675740	0.119706	-5.644994	0.0003
ΔLSY	-0.518776	0.109424	-4.740961	0.0011
ΔLER	0.044858	0.046145	0.972111	0.3564
ΔRQ	18.60512	3.190231	5.831905	0.0002
ΔRO	0.004507	0.002396	1.881264	0.0926
ECM(-1)	-0.735731	0.059137	-12.44114	0.0000

*Note: *,** and *** stands for 10%, 5% and 1% level of significance.* ***Source:*** *Researcher's compilations from Eviews 10.*

The ECM is statistically significant at 5% with a negative value coefficient of -0.735731 indicating that about 75% of the disequilibrium in the short run is corrected in the long run. Since the coefficient is above 50%, it implies that the speed of convergence to long-run equilibrium reasonably represents the absence of any market failure in the economy. The

diagnostic tests' outcome revealed the absence of serial correlation, heteroscedasticity, omitted variable and that the model is normal according to the Breusch-Godfrey, Breusch-Pagan-Godfrey, ARCH, Ramsey and JB test results. The Cusum graph further revealed that the model of the study is stable.

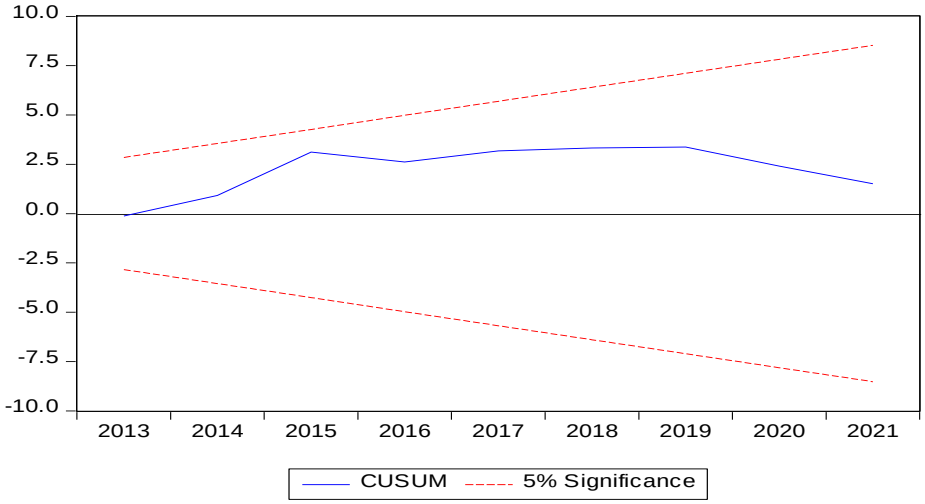

Figure 2: Cusum Graph

Conclusion

While debates are still ongoing among scholars on the appropriateness or otherwise of the recent petroleum subsidy removal, this study assessed the effect of the subsidy on Nigeria's economic prosperity from 1990 to 2021 using the Dynamic ARDL model estimator. The study's findings indicate significant co-integration, as indicated by the Bound test, while the ARDL regression shows that subsidies have no significant long-run effect on the growth of Nigeria's economy. Similarly, when regulatory authority was allowed to mediate the relationship between subsidy and economic prosperity, the effect remained insignificant. However, political stability and exchange rate encouraged the long-run economic prosperity in Nigeria but oil rent retarded the growth of the economy. Pointing to the long-term impact of oil rent which made jobs in the oil sector more attractive and led to the neglect of the other industries and so crippled industrialization in the country. It also unveiled the crucial role of appropriate exchange rate policy in the country and the importance of relative peace (political stability).

Policy Recommendation

Furthermore, the short-run impact shows that subsidies significantly hampered economic prosperity in Nigeria and that efforts to control the same by employing institutions of regulation are ineffective. More so, the institution of regulation, corruption control and political stability effectively promoted economic prosperity in Nigeria during the short run. At the same time, oil rent had an insignificant effect on the economy during the same period. The study, therefore, recommends support for removing subsidies on oil while re-investing the same

industrialization of the economy. This stems from the fact that controlling the subsidy money through regulation could not achieve the desired goal. Moreover, the various control institutions should be employed directly and appropriately to promote the economy's growth. This study is recommended for replication in oil-rich countries with subsidy programs. A further comparison is necessary between many of these countries.

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