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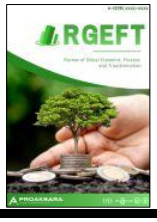

Pre- and Post-Fuel Subsidy Removal and Nigerian Exchange Group Perfomance

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ABSTRACT

This study examined the mean value of measures of instruments of trade in pre-fuel subisidy removal (pre-FSR) (54 weeks: 20th May 2022 – 26th May 2023) and post-FSR (54 weeks: 2nd June 2023 – 7th June 2024) using the paired sample t-test. Also, the study employed Autoregressive Distributed Lag (ARDL) bounds regression to further examined how equity measures and exchange traded products measues influences market capitalization growth in both compared periods.Various preliminary analysis conducted to ensure that the model is well fitted include the Clemente-Montanes-Reyes single additive outliers (AO) test, Spearman rank correlation, Lag-order selection criteria, Auguemtned Dicker Fuller (ADF) and Philip Peron (PP) unit root, autocorrelation, Homoskedasticity, Norrmality and Ramsey Reset, and Parameter Stability test. The paired sample t-test reported that the mean difference of Equity shares total turnover (ESTT), Equity total shares worth (ESW), Equity deals (ED), Exchange traded products volume (ETPV), Exchange traded product worth (ETPW), and Exchange traded product deals (ETPD) were higher during post-FSR than during pre-FSR. Nevertheless, the coefficient of explanatory variables during pre-FSR nor post-FSR were significant to explain Market capitalization: growth (MCG) in both short and long-run. The paper concludes that though FSR is an important element in the larger scheme to accelerate Nigerian Exchange Group (NGX) performance, FSR has not significantly impacted NGX in spite having better mean difference. Consequetly, the Nigerian government should invest freed financial resources into infrastructural facilities that will better the productivities of listed companies. Also, the Nigerian government should revitalize the domestic refineries to refine crude oil.

Keywords: Pre- and Post-Fuel Subsidy Removal, Equity and Exchange Traded Products Measues, NGX Perfomance, Freed Resources, Market Capitalization Growth

1. INTRODUCTION

Perhaps, if freeing resources for investment is one of the arguments put forward by the federal government is correct, fuel subsidy removal (FSR) should likely free some resources that should find their way into the Nigeria Exchange Group Market (NGX). Stock market is the bridge through which the savings of surplus units may be transformed into medium and long-term investments by the deficit units. Stock markets perform critical functions, which promote economic growth and prospects for an economy (Adenuga, 2010). A strong stock exchange market provides greater opportunities for mobilizing funds, better efficiency and allocation of resources (Azeez & Obalade, 2018; Emudainohwo, 2020). It is measured in terms of market capitalization (the value of all companies shares issued and tradable on public markets.) Market capitalization is a function of equity shares, bonds, exchange traded products, and other instruments of trade in the stock market. By implication, a change in the performance of the stock market will have a detrimental effect on the macro-econommic indicators (Ighosewe et al., 2021).

The Nigerian government proposes to remove all fuel subsidies, arguing that savings from FSR can be better invested in refineries, roads and major infrastructural projects which in the long-term will ensure sustainable business development and wealth generation for her citizens (Onyeizugbe & Onwuka, 2012).

Again, thorough investigation into extant empirical documentation reveals clearly that, in spite extensive empirical documentations on FSR, studies on how such removal affect the performance of NGX is under reviewed. Hence, most extant empirical studies could not give a clear cut description on the degree to which the pre- and post- FSR affect the NGX.

Given the argument for and against FSR coupled with the dearth of literature, it is worth examining if FSR will favour NGX or not. Addition, the direction and magnitude of equity shares and exchange traded product measures on market capitalization gowth during pre-FSR and post-FSR on NGX is worth studying.

In the light of the above, this study aim to examine the mean value of measures of instruments of trade in pre-FSR (54 weeks: 20th May 2022 – 26th May 2023) and post-FSR (54 weeks: 2nd June 2023 – 7th June 2024) as well as their direction and magnitudes on NGX market capitalization growth.

This study contributed to the current policy discussions on FSR by evaluating the economic effects of FSR and comparing the pre-FSR with the post-FSR in relation to how fuel subsidies have impacted on the performances of the NGX. Additionally, to developed an economic model that captures the extent to which FSR improves the NGX performance. To the best of my knowledge, this study is the first to compare pre- and post-FSR relative to NGX performance using weekly data.

2. LITERATURE REVIEW

The term "subsidy" is simply any method or approach that maintains the prices consumers pay for goods, in this example, the price at the fuel pump: either at or above market levels for producers is referred to as a subsidy. The fuel subsidy represents the difference between the expected open market price and the government-approved retail price, which is paid to marketers. Meanwhile, FSR simply means removing government financial support for petroleum pump prices by raising the pump prices to market rates (Vadlamannati et al., 2024). Usually, subsidies can typically take two forms: they can have an indirect effect on pricing through rules that bias the market in favor of particular products, R&D, or government-sponsored technologies, or they can have a direct impact on pricing through grants, price restrictions, tax breaks, and exemptions (Gana & Bashar, 2024). Additionally, it includes government frequently use of subsidies to further certain economic objectives or to assist particular businesses. They can be employed to promote innovation, boost growth in developing industries, or shield homegrown firms from outside rivalry. Subsidies may also be directed toward social welfare initiatives, which seek to lower the cost of and provide access to necessities for low-income people and underserved communities. Two primary categories of subsidies that exist are: those found in rich economies, such as production subsidies, and those found in developing nations, such as consumer subsidies (Vadlamannati et al., 2024).

Additionally, there are a wide range of reasons given for adding or removing subsidies. The primary policy drivers in developed countries are international commerce, environmental concerns, and preserving competitiveness. Also, the introduction of subsidies in developing nations is primarily motivated by welfare, poverty alleviation, and election cycle politics.

2.1. Historcial Evidence of Fuel Subsidy Removal in Nigeria

Nigerian government has employed several measures to moderate inflation in the country from the 1970s. Amongst which is the direct regulation of prices, the 'price control decree 1970' which has been amended severally and now replaced with the 'price control decree No. 1 of 1977.' This is the genesis of fuel subsidy, which began in 1970 and became institutionalised in 1977. From then on, the federal government subsidized the domestic consumption of petroleum products. The decree made it illegal for some products (including petrol) to be sold above the regulated price.

Of the two major types of energy subsidy, the consumer subsidies on fuel has being in place in decades in Nigeria rather than production subsidy (Adeoti et al., 2016). On May 29th 2023, the Bola Tinubu government removed fuel subsidy. Mainwhile, experts have argued that the fuel subsidy is expensive, unsustainable and a fodder for corruption, waste, and mismanagement in Nigeria. Further deduced reasons for FSR are huge foreign exchange cost/demand resulting from fuel importation and depreciating exchange rate which undermines macroeconomic stability (Adeoti et al., 2016). The opportunity costs of contracting debts to finance fuel importation are significant because of increasing debt (Adeoti et al., 2016), increasing share of resources

on subsidies for petroleum diverts scarce resources away from projects and programs needed for national development such as interventions in the health sector, education, and infrastructural needs (Adeoti et al., 2016). The fuel subsidy regime gave rise to inefficiency, leakages, waste and widespread corruption which provide overwhelming evidence for support of FSR (Adeoti et al., 2016), and that fuel subsidy has only benefitted the rich at the expense of the poor. The poor rarely obtain fuel at the subsidized rate (Adeoti et al., 2016). Such subsidies come at great cost: spending on other development objectives is lower; the distribution of resources to the state governments is reduced; the vast majority of the subsidy goes to better off only the rich; and cheaper gasoline encourages greater pollution, congestion and climate change.

The FSR is expected to free up resources that would have been spent on the subsidy for investment in other critical sectors such as education, healthcare, security and infrastructure. This will not only improve the standard of living for citizens but also enhance economic growth. Furthermore, with increases in refining capacity, Nigeria could meet its domestic fuel demand with domestic resources, obtained at cost of production below expected open market price (Adeoti et al., 2016), However, critics worry FSR could further squeeze Nigeria's poorest citizens. Instead, corruption, wastges and inefficiencies should be address while leave the subsidy itself in place (Adeoti et al., 2016), and that fuel subsidies removal could escalate transportation costs, prices of food items and other essential commodities, thereby triggering inflation and deepening poverty (Adeoti et al., 2016). While its not a bad idea to import crude oil and refine the product in Nigeria, however, as far as profitability is the motive, the poor will suffer the most in the society. Such moves will be influenced by industrial trends, exchange rate challenges, and world price of crude-oil shocks which is beyond government control (Emudainohwo, 2015; Gort, 1969).

2.2. Nigerian Exchange Group (NGX) Performance

The NGX performance is one of the barometer for judging the efficiency of the exchange or stock market. In other words, stock exchange market performance is a metrics that is used to determine the liquidity, size and vitality of the exchange market. More so, stock market performance is a tool that is used to show the scope, intensity, and general health of the stock market. Meanwhile, the stock markets are a complex network of organizations and systems that aggregate money for longer-term uses and make it accessible to people, businesses, and the government. They also facilitate the transfer of already-issued instruments. The capital markets are widely available on a local, regional, national, and international level and are well-organized. Umar and Nor (2024) defined stock markets as markets that deal with capital on both the short and long term basis.

In determining the performance of the exchange or stock market, investors consider both the market capitalization and all-share index (Eniekezimene & Opuofoni, 2024). Jusifiably, one important measure of the size and health of the stock market is equity total shares worth (market capitalization), which is the total value of all listed businesses' shares in the stock market. According to Ukoh (2024), a healthy stock market with a high equity total shares worth has a beneficial impact on how effectively available funds are allocated. Consequently, th whole value of all outstanding shares of publicly traded firms are represented by Equity total shares worth, being a fundamental statistic in the stock market. Again, Equity total shares worth is a crucial indicator that shows the scope, intensity, and general health of the stock market.

Another measure of stock market performance is market capitalization to GDP ratio. This parameter is used to determine the depth of the stock market (World Bank report, 2022). This parameter measures the value/worth of all traded securities in realtion to GDP of Nigeria. This parameter compares the aggregate values of all traded stock to GDP. By implication, a low market capitalization to GDP ratio suggests that, the market is not deep enough while a high market capitalization to GDP ratio suggests that, to the country's overall output (Ibrahim & Mohammed, 2020).

Another parameter which inform investors' perception on the performance of the stock exchange is share turnover ratio. Conceptually, the share turnover ratio accounts for the ease at which investors are able to turn a share into cash. It also addresses the ease at which a shareholder can easily find either a buyer or seller in the open market. Moreso, its high volume suggests increased trading activity on the floor. By implication, it is expected that, the removal of subsidy will have impact on the liquidity of the stock market (Grbić, 2021; U. A. Ibrahim & Mohammed, 2020).

Another parameter for measuring the performance of the NGX performance is share deal, the shares of a company are transferred to the buyer, while in the case of an asset deal only certain or possibly all assets and liabilities are identified and bought from the target company by the buyer. This is one of the most paramount forms of company acquisition. Here, the buyer becomes the owner of the company (Grbić, 2020).

Exchange traded products, are variety of financial instruments that are traded on national exchanges on any given day and the higher the volume, the better. Its also defined as the broad category of investments that are listed on stock exchanges and trade like stocks. The share price of exchange traded products comes from the underlying investments that track underlying security, index, or financial products. Their value, volume, and deals are measure of stock market.

2.3. Empirical Review

Using the deterministic model, Ibrahim et al. (2023) appraised the dynamics of fuel subsidies with emphasis on the Nigerian commodity markets. The researchers included time delay into the model to illustrate the Nigerian government's control over oil theft in order to shed light on how oil leaks affect the country's oil earnings. The study demonstrates that, the necessary circumstances for the adoption of a subsidy regime that would increase consumer income and prevent oil theft. The study demonstrated that if oil theft can be eradicated, the government oil incomes and the commodity markets will witness normal growth.

Bello (2024) employed data from the NGX to examined the extent stock prices reacted to the unexpected announcement of FSR. The researchers adopted the the standard event study methodology using a sample of 76 firms listed in the NGX. The study shows that the stock prices (cumulative abnormal returns) reacted positively to the unexpected announcement of FSR. However, after the unexpected announcement of FSR, the stock prices (cumulative abnormal returns) fell.

Ozili and Obiora (2023) employed discourse analysis methodology to examining the implications of the 2023 FSR in Nigeria. The study showed tha though would be highly beneficial to the Nigerian economy as it would encourage domestic refineries to produce more petroleum products, reduce the counntry's level of corruption, reduce Nigeria's dependence on imported fuel amongst others, reduce the Nigeria's GDP on the short run, increase inflation, poverty and crime rates, increase fuel smuggling, increase price of petrol and at the same time result to high nemployment rate especially in the informal sector.

Musa, Awaja, Jerry, Okedina, Uduakobong, and Olayinka (2022) investigated the effect of oil price on the stock prices of quoted oil and gas firms in the NGX market. They evidenced that oil price shocks influences stock prices (oil & gas) positively on the long run.

Loo and Harun (2019) examined the impact of eliminating Malaysia's domestic producer subsidies using a computable general equilibrium (CGE) model based on Lofgren. The results indicate that the elimination of fuel subsidies causes a notable decline in production, which in turn reduces the amount of output allocated to both local and export markets. Industries that produce comparatively significant volumes of oil products would probably be more severely affected. In addition to modeling the effects of eliminating fuel subsidies, two additional programs are included to address the slowing growth in domestic production: redistributing the excess savings to the agricultural sector to support the impoverished in rural areas and providing direct financial assistance to those in need. Notably, increasing agricultural investment is associated with greater performance.

Onyeizugbe and Onwuka (2012) examined the nexus between fuel subsidy removal and job creation in Nigeria using descriptive survey design. The data that were obtained were analyzed using statistical summation techniques and Z-test. The study found that the fuel subsidy removal did not influence job creation signfcantly in Nigeria.

2.4. Hypotheses

H1: mean difference of ESTT, ESW, ED, ETPV, ETPW, ETPD and CMG are higher during post-FSR than during pre-FSR.

H2: value of minimum, maximum and volatility (std. dev.) of ESTT, ESW, ED, ETPV, ETPW, ETPD and CMG are higher during post-FSR than during pre-FSR.

H3: ESTT, ESW, ED, ETPV, ETPW, and ETPD influenced on CMG are more statistically significant during post-FSR than during pre-FSR.

3. RESEARCH METHODS

This study used samples of weekly secondary data from the NGX for the period 24th June 2022 to 3rd May 2024. The samples were splitted into two: forty-nine weeks pre-FSR from 24th June 2022 – 26th May 2023, and forty-nine weeks post-FSR from 2nd June 2023 to 3rd May 2024, totaling ninty-eight weeks. It is based on comparison of the means of the pre-FSR and post-FSR, by subtracting the mean of the formal from that of the later. The study employed ARDL bounds regression to further examined how equity measures and exchange traded products measues influences market capitalization growth for the compared periods. The NGX variables employed for the study is presented in table 1.

Table 1. Variable Description and Source(s)

Variable	Measurement	Source(s)
Market capitalization: growth (N' trillion) (MCG)	This is expressed as market capitalization(t) minus market capitalization(t-1): which could be positive or negative.	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
Equity shares total turnover (Billion units): ESTT	It is expressed as the total number of shares traded divided by number of shares outstanding during that period.	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
Equity total shares worth (N' billion): ESW	number of shares outstanding multiplied by the present share price	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
Equity deals (units): ED	This is expressed as the total equity deals	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
Exchange traded products volume: ETPV	ETPV is the number of variety of financial instruments that are traded on national exchanges on any given day. The higher the volume, the better. Its also defined as the broad category of investments that are listed on stock exchanges and trade like stocks.	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
Exchange traded product worth: ETPW	This is the value of broad category of investments that are listed on stock exchanges and trade like stocks.	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
Exchange traded product deals: ETPD	Exchange traded product deals is the number of activity of buying, selling, or exchanging all categories of investments that are listed on stock exchanges between buyers and sellers.	NGX Weekly Report (https://ngxgroup.com/exchange/data/market-report/)
DU	Dummy variable represented by one (1) prior to structural break and zero (0) after structural break.	Emudainohwo and Okolo (2022)

Source: Researchers compilation, 2024

4. RESULTS AND DISCUSSION

4.1. Results Presentation

The study presented first, paired sampled t-test and secondly, the ARDL bounds regression results.

4.1.1. The paired sampled t-test

Panel A in table 2 present the paired sampled t-test, which is based on the subtraction order of mean of pre-fsr period data from post-fsr period data. The results support H1 that shows mean difference of ESTT, ESW, ED, ETPV, ETPW, and ETPD are higher during post-FSR than during pre-FSR, except for MCG. Panel B of table 4.1 shows differences based on subtracting the value of standard deviation (proxy for volatility), minimum and maximum during pre-fsr from post-fsr. The results support H2 except that maximum and volatility value are higher during pre-FSR for ESTT, and minimum value was higher during pre-FSR for MCG.

Table 4.1 shows that the weekly mean of ESTT in post-FSR improves over that of pre-FSR by 1.073078 billion units, and with a strong statistical evidence of t = 3.0004, p = 0.0035. Pre-FSR volatility was higher than

that of post-FSR by 0.514954 billion units. ESTT weekly maximum was 4.198 billion units higher in pre-FSR than in post-FSR. The minimum weekly ESTT was 0.640185 billion units higher in post-FSR than in pre-FSR.

There is strong evidence (t = 7.5199, p = 0.0000) that FSR improves weekly mean of ESW by ₦28.71702 billion. However, the weekly ESW was more volatile by N15.618928 billion in post-FSR than in pre-FSR. Weekly ESW maximum was higher in post-FSR by N86.401 billion over the maximum in pre-FSR, and its weekly minimum in post-FSR was N10.399 billion higher than in pre-FSR. The paired sample t-test showed that weekly, ED post-FSR increased over pre-FSR by mean difference of 22,464.24 units, and it is statistically significant (t = 11.7279, p-value = 0.0000), but more volatile than in pre-FSR by 8,826.769 units. The maximum weekly ED during post-FSR exceeded that of pre-FSR by 49,239 units. The minimum weekly ED during post-FSR was higher than that of pre-FSR by 9,885 units.

The mean of weekly ETPV during pre-FSR was less than that of post-FSR by 1,526,775 units. The weekly mean difference of ETPV was statistically significant (t = 2.2713, p = 0.0275), and its volatility was higher in post-FSR than in pre-FSR by 4,177,739.8 units. ETPV maximum was higher in post-FSR than in pre-FSR by 25,581,000 units. Also, minimum ETPV during post-FSR was higher than that during pre-FSR by 6,575 units. Weekly ETPW in post-FSR improves over that of pre-FSR by N24.55791 million. The statistical evidence of ETPW (t = 3.6779, p = 0.0006) is strong, and post-FSR was more volatility by N37.303095 million over that of pre-FSR. ETPW weekly maximum was higher in post-FSR period than in pre-FSR by N198.446 million. The weekly minimum was smaller during pre-FSR period than during post-FSR by N0.8590138 million).

There is strong evidence (t = 5.9140, p = 0.0000) that FSR betters weekly mean of ETPD by 168.9388 deals. The weekly ETPD volatility was higher during post-FSR over that of pre-FSR by 173.59984 deals. ETPD weekly maximum was higher in post-FSR period over that of pre-FSR period by 978 deals. The weekly minimum was more during pre-FSR period over post-FSR period by 38 deals. The paired sample t-test showed that weekly MCG in post-FSR decreased by mean difference of N0.0353954 trillion, but not statistically significant (t = -0.0557, p-value = 0.9557). Weekly pre-FSR was more volatile during post-FSR period than during pre-FSR by N1.162503 trillion. Weekly MCG maximum for post-FSR was better than that of pre-FSR by N3.95 trillion. However, the weekly minimum MCG was worse-off in post-FSR by N0.1 trillion.

Table 2. Paired Sampled t-Test for Pre- and Post- Fuel Subsidy Removal

Variables	PANEL A: Paired Sampled T-Test Differences and Statistics					PANEL B: Differences in:		
	Paired Differences		t	Welch's df	Sig. value	Min.	Max.	Std. dev. (Volatility)
	Mean	Std Dev.						
Equity shares total turnover (Billion units) (ESTT)	1.073078	0.3576423	3.0004	90.3506	0.0035	0.640185	-4.198	-0.514954
Equity total shares worth (N' billion) (ESW)	28.71702	3.818816	7.5199	61.8475	0.0000	10.399	86.401	15.618928
Equity deals (units) (ED)	22464.24	1915.458	11.7279	57.5616	0.0000	9885	49239	8826.769
Exchange Traded Products Volume (Units) (ETPV)	1526775	672203.9	2.2713	49.1462	0.0275	6575	25581000	4177739.8
Exchange Traded Products worth Million Naira (ETPW)	24.55791	6.677233	3.6779	51.5278	0.0006	0.8590138	198.446	37.303095
Exchange Traded Product Deals (ETPD)	160.9388	27.21325	5.9140	48.7287	0.0000	38	978	173.59984
Market capitalization growth (N' trillion) (MCG)	-0.0353954	0.6350724	-0.0557	86.771	0.9557	-0.1	3.95	1.162503

Source: Compiled by researcher, 2024

4.1.2. ARDL bounds test results

A. Structural Break Test

This section commenced with structural break test. The Clemente-Montanes-Reyes single AO test for unit root was employed to examine structural break. It revealed structural break in 2022w44 during pre-oil subsidy removal and 2024w1 in post-oil subsidy removal (Fig 1 and 2). Weeks before structural breaks in each period were assigned 1 values and after structural breaks assigned value of 0 as dummy variable (DU) in our models.

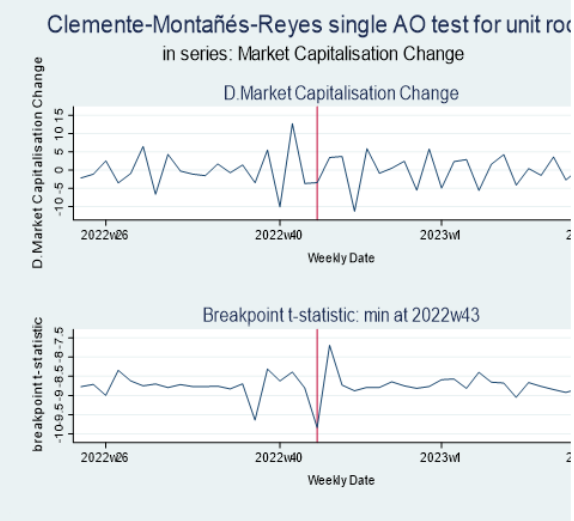

Figure 1. Pre-FSR structural break

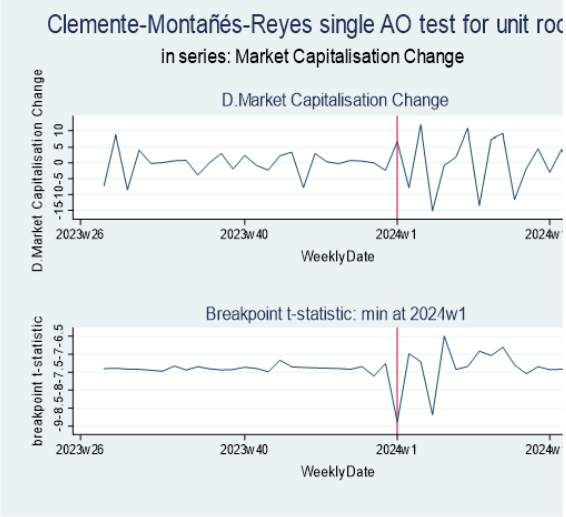

Figure 2. Post-FSR structural break

B. Correlation matrix

Spearman rank correlation was employed (table 3). In both period of oil subsidy, MCG had weak correlation with the independent variables, but with the exception of the correlation between MCG and ETPW in post-FSR (-0.2860*). The correlation with MCG were mainly negative except: for ESTT, it was negative in pre-FSR (-0.0684) and positive in post-FSR (0.0018), for ESW, it was positive in pre-FSR (0.0708) and negative in post-FSR (-0.0823), and for ETPV, it was positive in pre-FSR (0.0713), and negative in post-FSR (-0.2510). Furthermore, the correlation between MCG and the independent variables were higher during post-FSR than in pre-FSR except that between MCG and ESW (0.0018).

There are several statistically significant correlation among the independent variables. The highest is correlation in post-FSR between ETPV and ETPW (0.7953*) and next to it is post-FSR between ESW and ED (0.7413*). The least correlation among the independent variables is post-FSR between ETT and ETPD (0.1613). A negative correlation suggests that an increase in the first variable is likely to cause a decrease in the second variable, and vise-versa. on the other hand, a positive correlation suggests that both variable are likely to increase or decrease together. The decrease or increase depends on their degree of relationship.

Table 3. Spearman rank correlation

Variables	Period	MCG	ESTT	ESW	ED	ETPV	ETPW	ETPD	DU
Market capitalization growth (N′ trillion) (MCG)	Pre	1.0000							
	Post	1.0000							
Equity total turnover of shares (Billion units) (ESTT)	Pre	-0.0684	1.0000						
	Post	0.0018	1.0000						
Equity total shares worth (N′ billion) (ESW)	Pre	0.0708	0.5644*	1.0000					
	Post	-0.0823	0.6565*	1.0000					
Log of Equity deals (units) (ED)	Pre	-0.1028	0.4792*	0.4230*	1.0000				
	Post	-0.1034	0.5895*	0.7413*	1.0000				
Log of Exchange Traded Products Volume (Units) (ETPV)	Pre	0.0713	0.2393	0.4644*	0.3522*	1.0000			
	Post	-0.2510	0.3182*	0.2585	0.2868*	1.0000			
Exchange Traded Products worth Million Naira (ETPW)	Pre	-0.0584	0.3298*	0.3460*	0.2614	0.5443*	1.0000		
	Post	-0.2860*	0.3184*	0.4876*	0.4246*	0.7953*	1.0000		
Exchange Traded Product Deals (ETPD)	Pre	-0.1295	0.4905*	0.5488*	0.2419	0.3364*	0.4127*	1.0000	
	Post	-0.1907	0.1613	0.2977*	0.4052*	0.4382*	0.6739*	1.0000	
DU	Pre	-0.0246	0.3788*	0.4375*	-0.1321	0.1541	0.1174	0.7361*	1.0000
	Post	-0.1132	-0.1440	0.3244*	0.5063*	0.0424	0.1880	0.3563*	1.0000

Source: Authors compilation using data from NGX (see table 1), 2024.

C. Preliminary tests

The study's preliminary tests to ensure well fitted model commenced with structural break test. Other preliminary tests for this study are as follows:

1) Lag-Order Selectıon Crıterıa

Table 4 and 5 present lag-order selection criteria. To obtain and set maximum lag-order necessary to run unit root test, the lag-order selection statistic was executed. Lag 4 was elected and used to test unit root in both pre-FSR and post-FSR. The selected lags is when the criteria values is least, indicated with asterics in tables 4.3a and 4.3b. Thus, lag 4 was employed to examine unit root test for both period.

Table 4. Lag-order selection criteria

Sample: 2022w29 thru 2023w20 (pre-oil subsidy removal) Number of obs. = 44

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-738.473	.	.	.	75180.9	33.9306	34.0509	34.255*
1	-624.34	228.27	64	0.000	8067.89	31.6518	32.7346	34.5714
2	-569.049	110.58	64	0.000	16045.1	32.0477	34.0928	37.5625
3	-466.807	204.49	64	0.000	6855.54	30.3094	33.317	38.4194
4	-305.534	322.55*	64	0.000	855.92*	25.8879*	29.5579*	36.5931

* optimal lag. Endogenous: DMC ESTT ESW ED ETPV ETPW ETPD DU. Exogemous: _cons

Source: Authors compilation using data from NGX (see table 1), 2024.

Table 5. Lag-order selection criteria

Sample: 2023w30 thru 2024w16 (post-oil subsidy removal) Number of obs. = 39

Lag	LL	LR	Df	p	FPE	AIC	HQIC	SBIC
0	-940.565	.	.	.	7.3e+08	43.1166	43.2369	43.441*
1	-830.492	220.15	64	0.000	9.5e+07	41.0224	42.1051	43.9419
2	-762.424	136.14	64	0.000	1.1e+08	40.8375	42.8826	46.3522
3	-669	186.85	64	0.000	6.7e+07	39.5	42.5076	47.61
4	-496.451	345.1*	64	0.000	5.0e+06*	34.566*	38.5359*	45.2711.

* optimal lag. Endogenous: DMC ESTT ESW ED ETPV ETPW ETPD DU. Exogemous: _cons

Source: Authors compilation using data from NGX (see table 1), 2024.

2) Stationarity (Unit Root) test

ADF and PPeron unit root test were adopted for the study (table 6). The test show ED and DU were stationary at first difference [l(1)], while other variables were stationary at level in both subsidy period. The essense of executing stationarity test is to ensure variables stationary at level 2 [l(2)] and above are excluded from the ARDL bounds models.

Table 6. ADF and PPeron unit root test

Variable	PRE-SUBSIDY				Decision	POST-SUBSIDY				Decision
	ADF		PPeron			ADF		PPeron		
	Level	D1.	Level	D1.		Level	D1.	Level	D1.	
MCG	-3.790	-5.118	-14.270	-27.172	L(0)	-4.236	-4.513	-11.258	-21.192	L(0)
	(0.0171)	(0.0001)	(0.000)	(0.0000)		(0.0039)	(0.0014)	(0.0000)	(0.0000)	
ESTT	-1.568	-3.871	-5.630	-13.666	L(0)	-3.464	-6.075	-4.507	-9.807	L(0)
	(0.8046)	(0.0133)	(0.0000)	(0.0000)		(0.0434)	(0.0000)	(0.0015)	(0.0000)	
ESW	-2.887	-3.580	-5.472	-14.240	L(0)	-2.429	-5.177	-5.049	-13.093	L(0)
	(0.1669)	(0.0316)	(0.0000)	(0.0000)		(0.3643)	(0.0001)	(0.0002)	(0.0000)	
ED	-0.776	-3.785	-2.795	9.416	L(1)	-2.660	-4.810	-3.455	-8.751	L(1)
	(0.9677)	(0.0174)	(0.1987)	(0.0000)		(0.2530)	(0.0004)	(0.0445)	(0.0000)	
ETPV	-2.761	-4.826	-4.618	-8.969	L(0)	-3.751	-3.777	-5.631	-13.495	L(0)
	(0.2118)	(0.0004)	(0.0010)	(0.0000)		(0.0192)	(0.0178)	(0.0001)	(0.0000)	
ETPW	-2.734	-3.034	-6.983	-13.291	L(0)	-3.766	-3.923	-6.177	-15.128	L(0)
	(0.2222)	(0.1228)	(0.0000)	(0.0000)		(0.0184)	(0.0113)	(0.0000)	(0.0000)	
ETPD	-3.490	-3.514	-4.479	-9.702	L(0)	-1.986	-4.214	-3.660	-10.562	L(0)
	(0.0405)	(0.0379)	(0.0016)	(0.0000)		(0.6090)	(0.0032)	(0.0252)	(0.0000)	
DU	-1.678	-2.952	-1.903	-6.802	L(1)	-2.033	-2.930	-2.099	-6.823	L(1)
	(0.7604)	(0.1459)	(0.6530)	(0.0000)		(0.5833)	(0.1527)	(0.5466)	(0.0000)	

Source: Authors compilation using data from NGX (see table 1), 2024.

3) ARDL Lag structure

The researcher leveraged on stata command to extract lag content from matrix list in ARDL regression. The lags was what was employed to execute ARDL bounds regression as follows: pre-FSR: ARDL(1,0,0,0,0,0,1,0) regression while post-FSR: ARDL(1,0,0,0,0,0,0,0) regression. In both result, ARDL Bounds test (ec btest) was superceded by estat ectest, hence we run the ectest (table 4.5).

In PANEL A of table 7, farthest critical values for l(0) at 1% are: F = 3.641 and t = -3.583. The calculated F(17.549) and t(-11.422) statistics are farther to zero (0) than the critical values. Thus, we reject Ho. Furthermore, critical values for l(1) at 1% are: F = 5.379 and t = -5.461. The calculated F(17.549) and t(-11.422) statistics are more extreme than the critical values. Thus, we reject Ho.

In PANEL B of table 6, farthest critical values for l(0) at 1% are: F = 3.643 and t = -3.587. The calculated F(14.280) and t(-9.819) statistics are farther to zero (0) than the critical values. Reject Ho in both period suggests level relationship during pre-FSR and post-FSR period. Thus, ARDL bounds test can be employed for the study's analysis.

Table 7. ARDL bounds test

Pesaran, Shin, and Smith (2001) Bounds test																
Ho: no level relationship																
Case 3																
Kripfganz and Schneider (2018) critical values and approximate p-values																
	PANEL A: Pre-Oil Subsidy Removal								PANEL B: Post-Oil Subsidy Removal							
	10%		5%		1%		p-value		10%		5%		1%		p-value	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F	2.240	3.499	2.658	4.063	3.641	5.379	0.000	0.000	2.247	3.489	2.664	4.048	3.643	5.347	0.000	0.000
t	-2.528	-4.176	-2.877	-4.603	-3.583	-5.461	0.000	0.000	-2.538	-4.190	-2.884	-4.613	-3.587	-5.464	0.000	0.000
		F =	17.549							F =	14.280					
		t =	-11.442							t =	-9.819					
	Finite sample (7 variables, 47 observations, 1 short-run coefficients)								Finite sample (7 variables, 47 observations, 0 short-run coefficients)							

Source: Authors compilation using data from NGX, 2024.

4) Auto-correlation (Serial Correlation) test

The Durbin-Watson d-statistics (table 8) revealed 2.289662 in pre-FSR and 2.021091 for post-FSR. The values are near 2 indicating non-autocorrelation.

Table 8. Durbin-Watson d-statistic

Pre: (10,47) = 2.289662	Post: (9,47) = 2.021091

Source: Authors compilation using data from NGX, 2024.

5) Homoskedasticity Test

The test (table 9) for both period reveals prob > chi2 = 0.4313 and 0.3170, indicating homoskedasticity in pre-FSR and post-FSR, since their p-value > 0.05.

Table 9. Homoskedasticity test

White's test. Ho: Homoskedasticity. Ha: Unrestricted heteroskedasticity

Source	Chi2 (46) = 47.00			Chi2 (43) = 46.86		
	Prob > chi2 = 0.4313			Prob > chi2 = 0.3170		
	Chi2	df	P	Chi2	df	p
Heteroskedasticity	47.00	46	0.4313	46.86	43	0.3170
Skewness	6.50	9	0.6782	6.08	8	0.6378
Kurtosis	2.49	1	0.1147	2.99	1	0.0837
Total	56.09	56	0.4714	55.94	52	0.3293

Source: Authors compilation using data from NGX, 2024.

6) Normality test

The Jarque-Bera test for normality (table 10), and skewness and kurtosis test for normality (table 11) shows that the data were not normaly distributed. Their p-value < 0.05 in both pre-FSR and post-FSR period.

Table 10. Jarque-Bera test for Ho: normality

Pre: Jarque-Bera normality test: 20.37 chi(2)	3.8e-05
Post: Jarque-Bera normality test: 6.243 chi(2)	0.0441

Source: Authors compilation using data from NGX, 2024.

Table 11. Skewness and Kurtosis tests for normality

	Variable	Obs.	Pr(skewness)	Pr(kurtosis)	---Joint test---	
					Adj chi2(2)	Prob > chi2
Pre-	Resid	47	0.0413	0.0043	10.19	0.0061
Post-	Resid	47	0.1237	0.0440	6.01	0.0497

Source: Authors compilation using data from NGX, 2024.

7) Model Specification Test

Ramsey RESET test for omitted variable results (table 12) based on omitted powers of fitted values of MCG and null hypothsis that states model has no omitted variables returned p-value > 0.05 for both period. They suggest the models has no omitted variables challenges.

Table 12. Ramsey RESET test for omitted variables.

Pre-	F(3, 37) = 0.08	Prob > F = 0.9729
Post	F(3, 37) = 1.33	Prob > F = 0.2787

Source: Authors compilation using data from NGX, 2024.

8) Parameter Stability test

CUSUMSQ and the roots of the companion matrix (eigenvalue stability condition) are presented in figures 3 and 4 respectively. In the CUSUMSQ, the results can be said to indicate the coefficients are stable since the plots falls inside the critical bands of 95% confidence level except that it veered outside the bands but returned inside the bands within the period. On the other hand, the eigenvalues are in the circle suggesting the model satisfies the condition of stability over time.

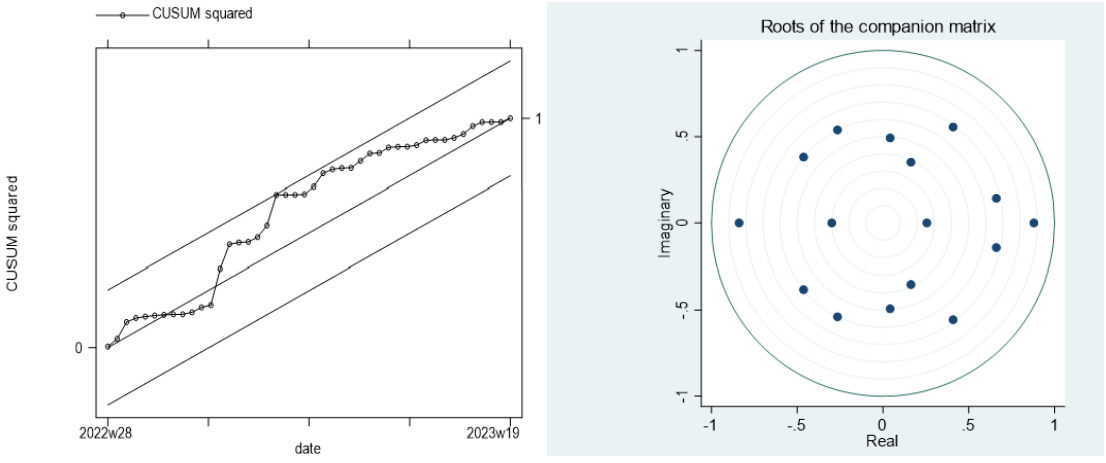

Figure 3. CUSUMSQ and roots of the companion matrix
Source: Authors compilation using data from NGX, 2024

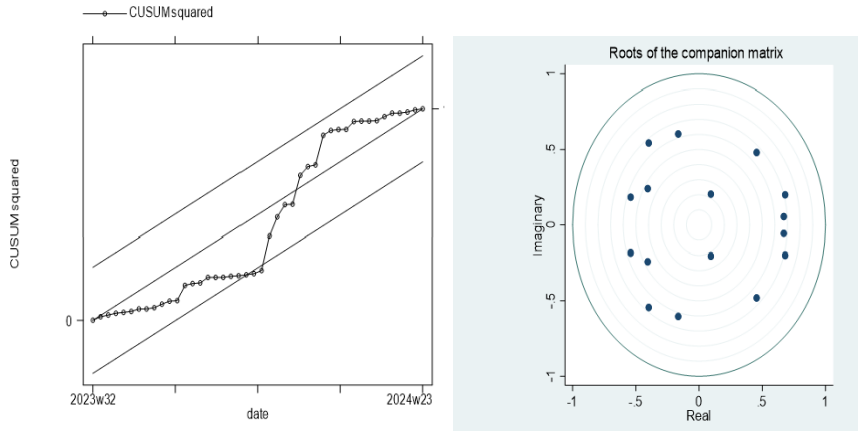

Figure 4. CUSUMSQ and roots of the companion matrix
Source: Authors compilation using data from NGX, 2024

9) ARDL bounds regression results

Table 4.11 present ADRL bounds regression for pre-FSR (PANEL C) and post-FSR (PANEL D). The results adjustment coefficients are negative (-1.555) and (-1.376), respectively at 1% level of significance (p-values = 0.0000). They indicate long-run equilibrium relationship exist among the explanatory variables. By implication, their previous errors will be speedily corrected (155.5% for pre-FSR and 137.6% for post-FSR) in the current period for both ARDL bounds model. The regressors explained 74% and 70% of the MCG in pre-FSR and post-FSR period, respectively. However, the result did not support H3, neither of the coefficient of influence of ESTT, ESW, ED, ETPV, ETPW, and ETPD on CMG is significant in pre-FSR and post-FSR.

a. Long-run:

In spite the fact that neither of the coefficients is statistically significant to explain MCG in pre-FSR and post-FSR, it is petinent to note that ESW, ETPV, ETPW, and EPD have greater evidence against null hypothesis in post-FSR than in pre-FSR, and that ESTT and ED have greater evidence against the null hypothesis in pre-FSR than in post-FSR. Furthermore, ESTT, ESW, and ETPW revealed positive association in both period, ED and ETPD showed negative association, while ETPV impact on MCG was positive in pre-FSR but negative in post-FSR.

b. Short-run:

In pre-FSR, only ETPD had asslociation with MCG in the short-run and it is statistically insignificant (0.050, 0.175). During post-FSR, none of ESTT ESW ED ETPV ETPW ETPD have bearing with DMC.

Table 13. ARDL bounds regression

Sample:		PANEL C: Pre-FSR				PANEL D: Post-FSR			
		2022w26 thru 2023w20				2023w24 thru 2024w18			
		ARDL(1,0,0,0,0,0,1,0) Regression				ARDL(1,0,0,0,0,0,0,0) Regression			
		Number of obs.		= 47		= 47			
		R2		= 0.7919		= 0.7504			
		AdjR2		= 0.7413		= 0.6978			
		Log likelihood		= -98.848528		= -118.02568			
		Root MSE		= 2.2341		= 3.3152			
	D.dmc	Coef.	Std. err.	t	p>|t|	Coef.	Std. err.	t	p>|t|
ADJ									
	MCG								
	LI.	-1.555	0.136	-11.44	0.000	-1.376	0.140	-9.82	0.000

LR									
	ESTT	0.179	0.179	1.00	0.325	0.030	0.510	0.06	0.953
	ESW	0.009	0.046	0.19	0.847	0.035	0.026	1.34	0.190
	ED	-1.102	1.708	-0.65	0.523	-0.952	2.244	-0.42	0.674
	ETPV	0.088	0.144	0.61	0.545	-0.435	0.304	-1.43	0.161
	ETPW	0.010	0.034	0.31	0.759	0.007	0.014	0.49	0.628
	ETPD	-0.018	0.029	-0.63	0.533	-0.0022	0.0020	-1.12	0.271
	DU	0.004	0.771	0.01	0.996	-0.477	1.053	-0.45	0.653
SR									
	ED								
	D1.								
	ETPV								
	D1.								
	ETPW								
	D1								
	ETPD								
	D1	0.050	0.036	1.38	0.175				
	DU								
	D1.								
	_cons	15.757	25.110	0.63	0.534	18.945	31.784	0.60	0.555

Source: Authors compilation using data from NGX, 2024.

4.2. Discussions

The positive inclination of the mean difference is in favour of FSR, the mean difference of ESTT, ESW, ED, ETPV, ETPW, and ETPD were higher during post-FSR than during pre-FSR. The results support H1 that shows mean difference of ESTT, ESW, ED, ETPV, ETPW, and ETPD were significantly higher during post-FSR than during pre-FSR, except for MCG. It indicates that part of funds released from fuel subsidizing activities were invested into the NGX. The results support Ozili and Obiora (2023) which shows FSR would free up financial resources for other priority sectors of the Nigerian economy. In spite the significant higher mean difference in equity share measures and exchange traded product measures, the mean difference of MCG was better off during pre-FSR period though, not significantly. What this mean is that the market capitalisation growth rate was relatively hihger in pre-FSR than during post-FSR. Again, the result corroborated Ozili and Obiora (2023) that showed FSR may decrease economic growth in the short term (MCG in this context).

The variability (standard deviation) of the variables were mainly higher during post-FSR. It suggests that probably, the rate of activity of buying, selling, or exchanging (deals) was higher during post-FSR except for ESTT. The ARDL regression results revealed long-run equilibrium relationship among the explanatory variables in both pre- and post-FSR era. Their respective speed of adjustment to economic shock are 155.5% for pre-FSR and 137.6% for post-FSR in the current period. The explanatory variables explained about 74% and 70% of MCG in pre-FSR and post-FSR, respectively. In the long-run, the results did not support H3, since neither of the coefficient of influence of ESTT, ESW, ED, ETPV, ETPW, and ETPD on CMG is significant. The results failed to corroborate Ibrahim et al. (2023) that demonstrated that if oil theft can be eradicated, the commodity markets will witness normal growth.

In spite the fact that the coefficient of explanatory variables during pre-FSR nor post-FSR were statistically significant to explain MCG in the long-run, it is petinent to note that ESW, ETPV, ETPW, and EPD have greater evidence against null hypothesis in post-FSR than in pre-FSR, and that ESTT and ED have greater evidence against the null hypothesis in pre-FSR than in post-FSR. These results corroborated Onyeizugbe and Onwuka (2012) that revealed fuel subidy removal did not affect job creation significantly (recall that the mean differences and volatility were higher during post-FSR: this may be synonymous with job creation in the NGX) in Nigeria. In the short-run during pre-FSR, only ETPD had association with MCG and it is statistically insignificant (0.050, 0.175). During post-FSR, none of ESTT ESW ED ETPV ETPW ETPD have bearing with DMC.

5. CONCLUSIONS

The paper concludes that though FSR is an important element in the larger scheme to accelerate NGX development, FSR has not significantly impacted NGX in spite having better mean difference. The researchers recommend that the government should invest freed financial resources into infrastructural facilities that will

better the productivities of listed companies. Also, the government should revitalize the domestic refineries to refine crude oil rather. Again, the government should curb corruptions/mismanagement/wastage associate with fuel subsidy payments, accountability and transparency in the management of saved resources from FSR, blockage of crude-oil theft, and so forth. Furthermore, government should deliberately invest the saved fuel subsidy resources in such other services education and providing health services to cushion the adverse effect of the fuel subsidy removal burden from particularly, the poor.

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