EMPIRICAL CONNECTION BETWEEN COVID-19 CASES AND OIL AND GAS STOCK INDEX IN NIGERIA: A VECTOR AUTOGRESSIVE (VAR) APPROACH

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Introduction

The oil and gas industry is an important sector of the economy given its ability to provide gainful employment and contributes to the provision of basic services from security to health and education, and to service foreign debt. Nigeria is an oil-dependent country and the sector has made moderate contributions to the country's economic growth over time. For instance, statistics (Central Bank of Nigeria, 2019) shows that the crude petroleum and natural gas sector in Nigeria contributed to the nominal Gross Domestic product at a rate of 5.92billion Naira in 1981, and at average of N12.17777b in the 80s. In 1990, 58.06 Billion Naira was the sector's contribution to the growth of the nation's economy. The average of the 90s stands at N328.9914b while in year 2000 specifically, the sector contributed 1,266.67Billion Naira to the nation's nominal GDP. In the 20s, the sector has a contribution of N2858.124Billion to Nigeria's GDP. In year 2010, the contribution of oil and gas to the country's GDP stood at N8,402.68b, while between 2010 and 2019, the average contribution

ABSTRACT

The oil and gas sector has found itself amidst the twin crises of COVID-19 and price war and these are perceived to impact sector's stocks as listed on the Nigerian Stock Exchange. In this paper, Vector Autoregression (VAR) technique was applied to determine the nexus between covid-19 (fatal, recovery and positive) cases, and oil and gas stock index in Nigeria using 43 weeks' data sets

of oil and gas sector to Nigeria's GDP was N9820.792b.

Specifically, in 2019, N12,400.43b is the sector's contribution to Nigeria's GDP.

The coronavirus disease 2019 (COVID-19) broke out in Wuhan, Hubei Province, China in late December 2019 and has since then spread to over 200 countries including Nigeria. Nigeria had her first recorded case on 27th February 2020 and from this date, the virus has continued to spread to different parts of Nigeria, including all the 36 states and the Federal Capital Territory (FCT). The World Health Organization (WHO) declared the COVID- 19 as a pandemic on 11th March 2020. The Nigeria Centre for Disease (NCDC) (2020) situation reports has it that, as at 27th December 2020, the number of new confirmed cases of

from March 2 to December 27, 2020. This study found no long-run relationship between covid-19 and oil and gas stock index in Nigeria. Moreover, Covid-19 recovery cases (lag 1) have negative and non-significant effect on oil and gas stock index in Nigeria while its lag 2 coefficient is positive and statistically significant. In the same vein, covid-19 positive cases (lags 1 and 2), have positive but non-significant effects on oil and gas stock index in Nigeria. Moreover, covid-19 fatal cases (lag 1) and oil and gas stock index have negative and non-significant relationship while the lag 2 coefficient is positive but non-significant. This study posits that there is a positive and significant relationship between covid-19 recovery cases and oil and gas stock index in Nigeria. This implies that the rate of recoveries from covid-19 poses a good sign to the oil and gas stock performance in Nigeria. The study recommends that Government should make available to the public, covid-19 vaccine to stimulate resilience to and recovery from the disease (for those infected). Furthermore, there is a need for public confidence building campaigns, enlightenment, programmes, workshops, and other measures to encourage capital market activities by the people.

Keywords: *COVID-19, Nigerian Stock Exchange, Oil and Gas, Stock Index, VAR.*

COVID-19 is 5,908 while the count of discharged cases stands at 2,731. Cumulatively, there have been 1,254 deaths reported with a case fatality rate (CFR) of 1.5% in Nigeria. In Africa, the count for confirmed COVID-19 cases is 2,644,112 with 62,366 deaths resulting in a case fatality rate of 2.4% as at 27th December 2020. On the same date, globally, the number of confirmed COVID-19 cases is 79,232,555 with 1,754,493 deaths resulting in a case fatality rate of 2.2% globally.

The outbreak of COVID–19 has shaken the global financial markets, commodity markets, economic activities, employment and GDP of different countries (Meher et al., 2020). Specifically, COVID-19 causes fear and additional stress on financial markets, where the price volatility is continuously increasing (Albulescu (2020). In Nigeria, no sector of the economy is left unscathed by the effects of the pandemic. A case in point is the oil and gas industry which is hit by double tragedy of the coronavirus pandemic and oil price war. During the pandemic, the oil market is coincidentally weak and prices are under pressure. Furthermore, as the number COVID-19 confirmed cases and its attendant risk to the general public, investors would shape their sentiments towards the disease, which could significantly influence the stock market (Takyi & Bentum-Ennin, 2020). The information-driven nature of the stock market, makes information coronavirus pandemic to be of potential influence on the performance of the market. Camp et al. (2020) observe that the pandemic affected energy prices for products such that the onset of the pandemic led to an initial drop in prices for petroleum-based products, and then, just as abruptly, prices rose sharply as producers limited production and demand increased. Abegunde et al. (2020) note that in addition to the country-wide economic impact of COVID-19 in Nigeria, crude producers are faced with a decline in both price and demand for crude, resulting in an oil glut. Research have shown that activities in the real sector of the economy, especially those that have direct bearing on the sector value and operation do tell on the financial performance as well the stocks of the companies in the said industry.

Empirically, impact of coronavirus has been examined in terms of its effect on capital market performance generally. For instance, Chaouachi

and Chaouachi (2020) investigated covid-19 impact on Saudi stock market. Ngwakwe, (2020) also evaluated the effect of Covid-19 pandemic on global stock market values. In Nigeria, most of the few available studies focused on the nexus between COVID-19 and stock prices (Babarinde (2020a); market capitalization (Alade et al. (2020), Babarinde et al. (2020); Equity turnover (Babarinde (2020b); market performance (Adenomon et al.,2020). Ikwuagwu et al. (2020) focused on the effect of coronavirus on returns for health firms in Nigeria. Research on sectorial analysis of the effects of the pandemic on Nigerian capital market appears relatively scarce in. Hence, the motivation for this current study, considered as one of the pioneer studies on the effects of positive (Confirmed), fatal (death) and recovery (discharged) of coronavirus disease on the oil and gas stock index in Nigeria.

The main aim of this study was to explored the COVID-19 on oil and gas stock index in Nigeria between March 2 to December 27, 2020 using Vector Autoregression(VAR) technique. The specific objectives, however, are to determine whether or not there is a long run relationship between covid-19 and oil and gas stock index in Nigeria; and this study seeks to evaluate the effects of covid-19 (fatal, recovery and positive) cases on oil and gas stock index in Nigeria.

The study sought to answer the following questions:
1. Is there any long run relationship between covid-19 and oil and gas stock index in Nigeria?
2. What is effect of COVID-19 fatal (death) cases on oil and gas stock index in Nigeria?
3. What is effect of COVID-19 recovery (discharged) cases on oil and gas stock index in Nigeria?
4. What is effect of COVID-19 positive (confirmed) cases on oil and gas stock index in Nigeria?

The other parts of this paper contains the following parts in the following order: literature review, methodology, results and discussions, and conclusion and recommendations.

LITERATURE REVIEW

Afaha et al. (2020) examined the impact of COVID-19 on the price of oil and gas products in the international market. The findings revealed that

crude oil prices had reduced to record low of $22 per barrel and this obviously has revenue impacting effects on the Nigeria economic system.

In another study, Aloui et al. (2020) assessed the impact of COVID-19 shocks on the energy futures markets, particularly on crude oil and natural gas S&P GS Indexes. The findings reveal that energy commodities S&P GS indexes respond to COVID-19 shock that varying over time due to fundamentals factors as well as behavioral and psychological factors.

Moreover, Albulescu (2020) investigated the impact of COVID-19 numbers on crude oil prices, while controlling for the impact of financial volatility and the United States economic policy uncertainty. The study shows that the COVID-19 daily new confirmed cases have a marginal negative impact on the crude oil prices in the long run. In the same vein, Aruna and Rajesh (2020) determined the impact of COVID 19 cases and sources of oil price shock on Indian stock returns. The study revealed that COVID-19 has positive and statistically significant on stock returns in the country.

Takyi and Bentum-Ennin (2020) evaluates the short-term impact of the COVID-19 on stock market performance in thirteen African countries, including Nigeria. Stock market performances in Africa have significantly reduced during and after the occurrence of the COVID- 19,

In a study on effect of Covid-19 100thday information on health firms' stock returns in Nigeria, Ikwuagwu et al. (2020) showed an evidence of a positive abnormal return for health firms in Nigeria. Adenomon et al. (2020) examined the effects of the COVID-19 pandemic on Nigerian's stock exchange performance. They found that COVID-19 has negative effects on the stock market returns in Nigeria.

The empirical review exposes the perceived lacuna in empirical literature on the effects of COVID-19 cases on oil and gas stock index in a developing country, such as Nigeria. The oil and gas sector is examined in this study considering the dependency of the Nigerian economy on the sector.

METHODOLOGY

In this paper, the effects of positive, recovery and fatal cases of coronavirus disease on oil and gas stock index were investigated using

Nigeria's weekly data sets covering 43 weeks, from March 2 to December 27, 2020. Data on coronavirus disease were sourced from NCDC (2020) while data on oil and gas stock index were obtained from NSE websites. This study is a based on event study methodology in line with similar previous studies (such as Babarinde (2020), Liu et al. (2020)). In line with Alade et al. (2020) and Babarinde (2020a), this study applied Vector Autoregression (VAR) technique to the analysis of the link between oil and gas stock index and COVID-19 cases in Nigeria.

Drawing from the works of Babarinde (2020a) and Ahmed (2020), this study specified the functional relationship between coronavirus (positive, recovery and fatal) cases and oil and gas stock prices, measured as the weekly Nigerian Stock Exchange (NSE) Oil and Gas index as follows (1).

$$OGI_t = \text{ß}_0 + \text{ß}_1 CNNP_t + \text{ß}_2 CNNF_t + \text{ß}_3 CNNR_t + U_t \qquad (1)$$

This current study employs the multivariate Vector Autoregressive method (VAR). The VAR models for this study are specified in equations (2) to (5) below.

$$OGI_t = \text{ß}_0 + \text{ß}_1 OGI_{t-1} + \text{ß}_2 CNNP_{t-1} + \text{ß}_3 CNNF_{t-1} + \text{ß}_4 CNNR_{t-1} + U_{1t} \qquad (2)$$

$$CNNP_t = \text{ß}_0 + \text{ß}_1 OGI_{t-1} + \text{ß}_2 CNNP_{t-1} + \text{ß}_3 CNNF_{t-1} + \text{ß}_4 CNNR_{t-1} + U_{2t} \qquad (3)$$

$$CNNF_t = \text{ß}_0 + \text{ß}_1 OGI_{t-1} + \text{ß}_2 CNNP_{t-1} + \text{ß}_3 CNNF_{t-1} + \text{ß}_4 CNNR_{t-1} + U_{3t} \qquad (4)$$

$$CNNR_t = \text{ß}_0 + \text{ß}_1 OGI_{t-1} + \text{ß}_2 CNNP_{t-1} + \text{ß}_3 CNNF_{t-1} + \text{ß}_4 CNNR_{t-1} + U_{4t} \qquad (5)$$

Where;

OGI_t indicates the weekly closing prices of oil and gas stocks at the Nigerian Stock Exchange,

$CNNP_t$ denotes the weekly new number of confirmed cases of COVID-19 in Nigeria,

$CNNR_t$ represents the weekly new number of COVID-19 recovery cases in Nigeria,

$CNNF_t$ signifies the new number of weekly COVID-19 fatal cases

$U_{1t}\ to\ U_{4t}$ denote the error terms.

$ß_0 - ß_4$ are the short-run dynamic coefficient of the model adjustment; and

t = March 2 to December 27, 2020.

DATA ANALYSIS AND EMPIRICAL RESULTS

Descriptive Statistics

To have a preliminary understanding of the statistical properties of the variables of study, the descriptive statistics are presented in Table 1. The descriptive Statistics reveal the average oil and gas stock index in the Nigerian Stock Exchange to be 206.1728 points in the 43 weeks of study. The average weekly cases of covid-19 new fatalities, positives and recoveries are around 6, 807 and 639. Based on Jarque-Bera test, the three indicators of covid-19 (CNNF, CNNP and CNNR) are not normally distributed while Oil and Gas Stock Index is passes the normality test. The stock Index is not widely dispersed from its mean value unlike the three indicators of covid-19 which exhibit wide dispersion from the average values. Unlike the oil and gas stock index which is negatively skewed, all the three measures of covid-19 in this study are positively skewed.

Table 1: Descriptive Statistics

	OGI	CNNF	CNNP	CNNR
Mean	206.1728	6.883721	807.1395	639.1395
Median	209.1300	5.000000	404.0000	249.0000
Maximum	235.8800	33.00000	5908.000	4876.000
Minimum	170.3400	0.000000	0.000000	0.000000
Std. Dev.	16.24631	6.908274	1260.857	930.0337
Skewness	-0.427195	1.773334	2.958733	2.653578
Kurtosis	2.416534	6.630317	11.28235	11.50209
Jarque-Bera	1.917828	46.14986	185.6413	179.9756
Probability	0.383309	0.000000	0.000000	0.000000

Source: Author's computation (2021).

Trend Analysis

The trend analysis of the COVID-19 (fatal, positive and recovery) cases are presented in Fig.1.
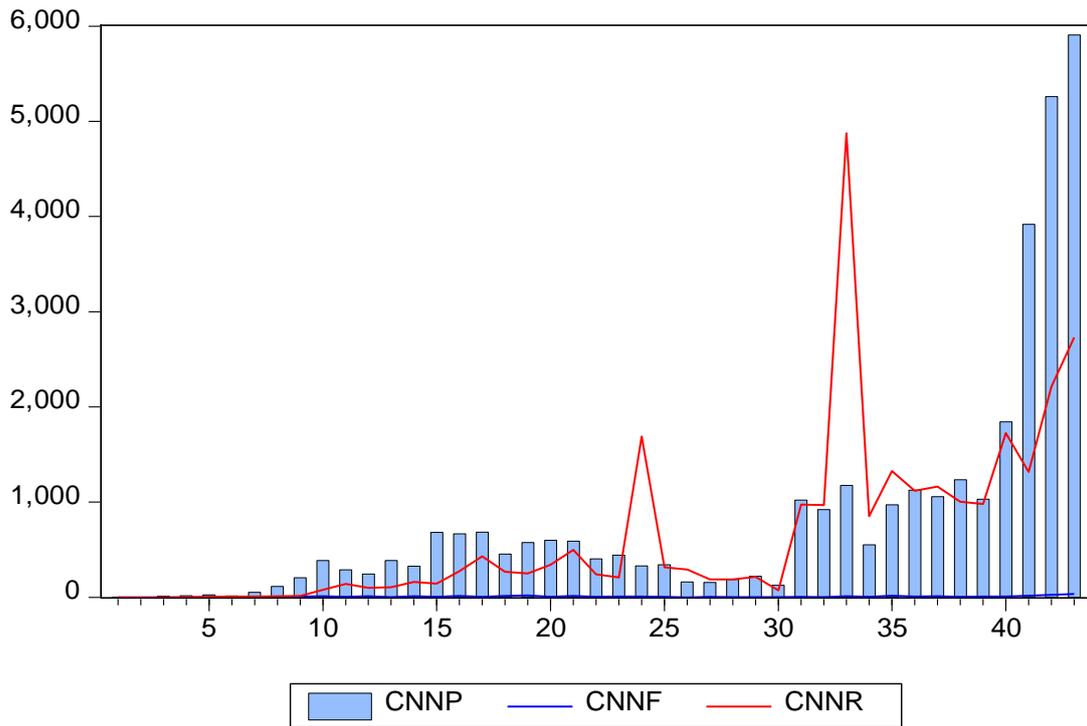
Fig.1: Trend analysis of the COVID-19 (fatal, positive and recovery) cases in Nigeria: 02:03:20-27:12:20

Source: Author's computation (2021).

The trend analysis of the oil and gas stock index in the Nigerian Stock Exchange (NSE) is presented in Fig.2.
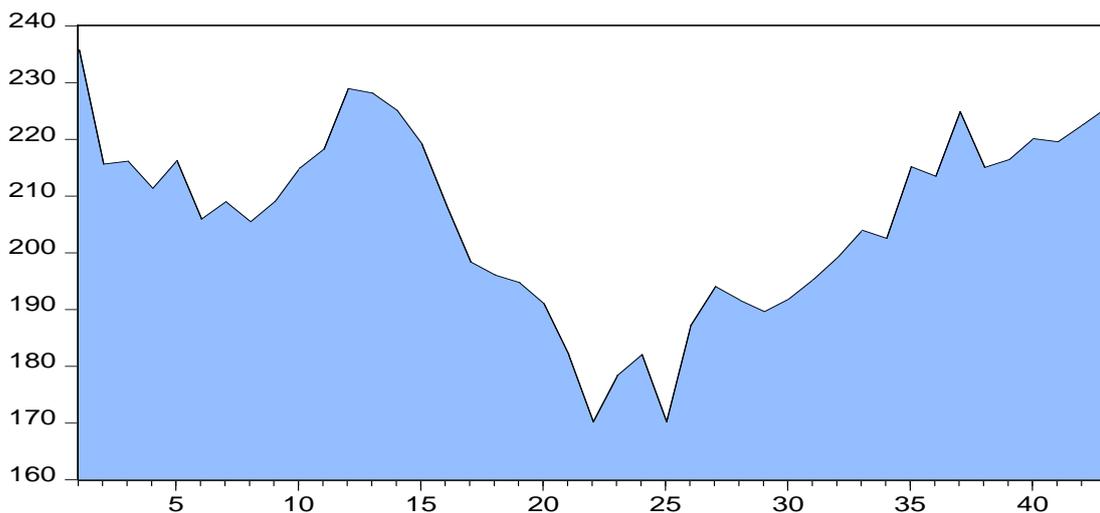

Fig. 2: Trend analysis of oil and gas stock index in the Nigerian Stock Exchange (NSE): 02:03:20-27:12:20

Source: Author's computation (2021).

Unit Roots Tests

The unit root tests by way of augmented Dickey-Fuller (ADF) and Phillips-Perron tests are applied to the variables of study in order to avoid spurious results. Both ADF and PP results as presented in Table 2 show oil and gas stock index (OGI), covid-19 new fatal cases (CNNF), and covid-19 new positive cases (CNNP) to be stationary at first difference while covid-19 new discharged/recovery cases (CNNR) attains stationary in its level form.

Table 2: Unit Roots Tests

	ADF	p-value	I(d)	Remarks
OGI	-7.039057	0.0000	I(1)	Stationary
CNNF	-11.12851	0.0000	I(1)	Stationary
CNNP	-3.697353	0.0078	I(1)	Stationary
CNNR	-3.570170	0.0107	I(0)	Stationary
	PP	p-value	I(d)	Remarks
OGI	-6.955763	0.0000	I(1)	Stationary
CNNF	-10.66482	0.0000	I(1)	Stationary
CNNP	-3.735467	0.0070	I(1)	Stationary
CNNR	-3.617673	0.0095	I(0)	Stationary

Source: Author's computation (2021).

Cointegration Tests

Whether or not a long-run relationship exists between covid-19 and oil and gas stock index in Nigeria was examined via Johansen cointegration test and F-Bounds. The results of the cointegration tests as presented in Table 3, indicate lack of cointegration between oil and gas stock index and covid-19 new positive cases; between oil and gas stock index and covid-19 new recovery cases; and between oil and gas stock index and covid-19 new fatal cases. Similarly, oil and gas stock index and covid-19 new positive cases, fatal cases and recovery cases in Nigeria are not cointegrated. By these results, this study has established that that there is no long-run relationship between covid-19 (fatal, positive and recoveries) and oil and gas stock index in Nigeria. This implies that the connection between COVID-19 and oil and gas stock index seems to

exists in the short-run. Hence, the effects, relationship and implications of the pandemic on oil and gas stock index in Nigeria is for short-run only.

Table 3: Cointegration Tests

[I].Trace Test			Maximum Eigenvalue Test		
Series: O&G INDEX CNNP			Series: O&G INDEX CNNP		
Hypothesized No. of CE(s)	Trace Stat	Prob.	Hypothesized No. of CE(s)	Max-Eigen Stat	Prob.
None	5.4279	0.7618	None	3.237069	0.9297
At most 1	2.1908	0.1388	At most 1	2.190833	0.1388
Trace and Max-eigenvalue tests indicate no cointegration between OGI and CNNP at the 5% level					
[II].Trace Test			Maximum Eigenvalue Test		
Series: O&G INDEX CNNF			Series: O&G INDEX CNNF		
Hypothesized No. of CE(s)	Trace Stat	Prob.	Hypothesized No. of CE(s)	Max-Eigen Stat	Prob.
None	4.221039	0.8849	None	4.212496	0.8363
At most 1	0.008543	0.9260	At most 1	0.008543	0.9260
Trace and Max-eigenvalue tests indicate no cointegration between OGI and CNNF at the 5% level					
[III].F-Bounds Test					
Series: O&G INDEX CNNR					
Test Statistic	Value	Signif.	I(0)	I(1)	
F-statistic	2.189655	10%	3.02	3.51	
K	1	5%	3.62	4.16	
		1%	4.94	5.58	
F-Bounds Test indicates no levels relationship between OGI and CNNR at the all the levels					
[IV].F-Bounds Test					
Series: O&G INDEX CNNC CNNF CNNR					
Test Statistic	Value	Signif.	I(0)	I(1)	
F-statistic	1.052646	10%	2.37	3.2	
K	3	5%	2.79	3.67	
		1%	3.65	4.66	
F-Bounds Test indicates no levels relationship among OGI, CNNC, CNNF and CNNR at all the levels					

Source: Author's computation (2021).

Vector Autoregression Results

Vector Autoregression (VAR) technique was applied to the empirical analysis of the effects of COVID-19 (fatal, recovery and positive) cases on oil and gas stock index in Nigeria. Thus, the VAR results displayed in Table 4 indicate that covid-19 positive cases (lag 1) have negative but non-significant relationship while the its lag 2 coefficient is positive but statistically non-significant effect on oil and gas stock index in Nigeria. Moreover, covid-19 fatal cases (lag 1) have negative and non-significant effect on oil and gas stock index in Nigeria. Furthermore, covid-19 recovery cases (lag 1) have negative and non-significant effect on oil and gas stock index in Nigeria.

Finally, on the relationship between oil and gas stock index and covid-19 positive, fatal and recovery cases, VAR shows that covid-19 recovery cases (lag 1) have negative and non-significant effect on oil and gas stock index in Nigeria while lag 2 coefficient of covid-19 recovery cases have positive and statistically significant effect on oil and gas stock index in Nigeria. In the same vein, covid-19 positive cases (lags 1 and 2), are positively associated with oil and gas stock index in Nigeria but this connection is not statistically significant. This study also established that covid-19 fatal cases (lag 1) have negative and non-significant effect on oil and gas stock index in Nigeria while its lag 2 coefficient is positive but statistically non-significant related with oil and gas stock index in Nigeria in the period of investigation.

Table 4: Vector Autoregression Results

Models	A		B		C		D	
Variables	OGI		OG I		OG I		D(OGI)	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
OGI(-1)	0.903	0.000*	0.870	0.000*				
OGI(-2)	0.002	0.985						

CNNP(-1)	-0.000	0.858						
CNNP(-2)	0.002	0.597						
CNNF(-1)			-0.038	0.853				
D(OGI(-1))					0.042	0.785	0.100	0.539
D(OGI(-2))					0.108	0.443	0.061	0.682
CNNR(-1)					-0.001	0.177	-0.001	0.266
CNNR(-2)					0.003	0.004*	0.003	0.016**
D(CNNP)(-1)							0.000	0.973
D(CNNP)(-2)							0.000	0.958
D(CNNF)(-1)							-0.047	0.861
D(CNNF)(-2)							0.259	0.339
Constant	18.429	0.236	26.638	0.073***	-0.806	0.556	-0.827	0.558
R-squared	0.822		0.792		0.223		0.2767	
Adj. R-squared	0.803		0.782		0.135		0.090	

Serial Correlation	3.129	0.536	11.272	0.023**	0.071	0.99	7.862	0.952
Normality	83.660	0.000*	1.926	0.749	294.437	0.000*	406.533	0.000*
Heteroscedasticity	27.740	0.271	35.612	0.000*	31.707	0.134	154.410	0.609

Source: Author's computation (2021).

Note: *, ** and *** significant at 1%, 5% and 10% respectively.

CONCLUSION AND RECOMMENDATIONS

Vector Autoregression technique was applied to the empirical analysis of the nexus between covid-19 (fatal, recovery and positive) cases and oil and gas stock index in Nigeria using a 43-week data sets beginning from March 2 to December 27, 2020. This has empirically established via cointegration tests, that there is no long-run relationship between covid-19 (fatal, positive and recoveries) and oil and gas stock index in Nigeria in the study period.

The Vector Autoregression results on the relationship between oil and gas stock index and covid-19 positive cases, VAR indicates that covid-19 positive cases (lag 1) have negative and non-significant relationship while the its lag 2 coefficient is positive but statistically non-significant. Moreover, on the relationship between oil and gas stock index and covid-19 fatal cases, VAR indicates that covid-19 fatal cases (lag 1) have negative and non-significant relationship. Furthermore, on the relationship between oil and gas stock index and covid-19 recovery cases, VAR indicates that covid-19 recovery cases (lag 1) have negative and non-significant relationship.

Finally, on the relationship between oil and gas stock index and covid-19 positive, fatal and recovery cases, VAR shows that covid-19 recovery cases (lag 1) have negative and non-significant relationship while its lag 2 coefficient is positive and statistically significant. In the same vein, covid-19 positive cases in both lags 1 and 2, are positively associated with oil and gas stock index in Nigeria but this connection is not statistically significant. VAR indicates that covid-19 fatal cases (lag 1) have negative

and non-significant relationship while its lag 2 coefficient is positive but statistically non-significant.

This study therefore concludes that covid-19 recovery cases (lag 2) have positive and statistically significant relationship. This implies that the rate of discharged/recovery from the covid-19 cases poses a good sign to oil and gas stock performance in the Nigerian Stock Exchange. Covid-19 positive and fatal cases do not have significant relationship with oil and gas stock index in Nigeria.

The study recommends that Government should make available covid-19 vaccine to stimulate resilience to and recovery from the disease (for those infected). Public confidence building campaigns, enlightenment, programmes, workshops, as well as other measures like capital market intervention funds be available to the capital market community and the generality of the public so as to encourage capital market activities by the people.

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