



ECONOMIC IMPACT OF COVID-19 OUTBREAK ON CRUDE OIL PRICES IN NIGERIA: A STRUCTURAL BREAK APPROACH

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Abstract

Nigeria is a mono-cultural economy with over 70% of federal government's revenue emanating from the export of crude oil. This paper empirically analysed the impact of covid-19 outbreak on crude oil prices in Nigeria. Data used in the estimation were sourced online and the total number of daily observations was 58days. The models of the structural break analysis was evaluated using Autoregressive Moving Average (ARMA) maximum likelihood approach with the aid of E-views 11.0 software. The results reveal that the structural break model variables (COP and COI) at days 15 and 35 are significant at 5% as the F-stat $0.00 < 0.05$. This implies that Covid-19 pandemic is significant to crude oil prices and negatively influences crude oil prices. Covid-19 (COI) exerts negligible influence on crude oil

prices by 0.00% in the short run but gradually affects oil prices by 6.61% in the long-run. The paper concludes that economic

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understanding of the impact of Covid-19 pandemic on crude oil prices in Nigeria using a structural break model at day 15 break point is most appropriate for prediction. It recommends amongst others that, government and private individuals must invest in funding research on sustainable vaccine and germane solution to the disease in Nigeria.

INTRODUCTION

It is common knowledge that Nigeria is Africa's largest economy and a major exporter of crude oil. Irrespective of the shifting trend to other alternative sources of energy, she is still highly dependent on crude oil export and exposed to the world trade cycle. The emergence of COVID-19 and its increasing incidence in Nigeria and the rest of the world have made different economies implement recommended measures such as social distancing, staying and working from home; tighter boarder controls; reduction in international flights and so on to curtail the spread of the disease. The lockdown of economies worldwide has generally created a low demand for aviation fuel, transport fuels and other oil related products. These have invariably affected crude oil prices negatively.

Nations including Nigeria are still grappling with the pandemic and the challenges posed by the scourge hence there is paucity of empirical studies on the economic impact of covid-19 in countries. It may be too early to estimate empirically the impact of Covid-19 on the Nigerian economy, however, this study adopts a structural break approach to analyse the impact of covid-19 outbreak on crude oil prices in Nigeria. To this end, the paper provides a brief perspective on covid-19, reviews empirical studies relating to the impact of crude oil export and oil price volatility on the Nigerian economy, analyses quantitatively the relationship between Covid-19 outbreak and oil prices; concludes and suggests some recommendations.

Literature Review

Brief Perspective on Covid-19 Outbreak: The Nigerian Experience

What appeared to be an ailment that can be overcome within a short space of time became a pandemic that took the world by storm. Covid-19, a respiratory illness that spreads through human to human contact is described as the unseen enemy in the battle for life that humanity is currently facing. It is a novel Coronavirus disease which was first identified in Wuhan, Hubei province of China in December, 2019. The infection rate of the disease is higher than the normal seasonal flu. The World Health Organisation (W.H.O) on March 11th, 2020 declared the disease a pandemic and the measures to curtail its spread include social distancing, restriction of human movement; use of face masks in public places; tighter boarder controls and so on. Globally, as at 15th May, 2020, the disease had infected millions of persons (4,338,658) and claimed a lot of lives (297,119) (Nigeria Centre for Disease Control (NCDC), 2020). Despite the rate of recoveries recorded, the severity of the ailment and the fast rate of

transmission have led different governments to adhere to the tough measures for more than a month to curtail its spread. These preventive measures implemented by different countries to flatten the curve of infected persons, came with significant economic implications, specifically a decline in economic activities.

A global slowdown of economic activities is seen, as a result of a drastic reduction of activities as well as low patronage in virtually all sectors - Aviation, Hospitality, Tourism, Manufacturing, Service, Oil and gas to name a few. According to the (Congressional Research Service (CRS), 2020), the global pandemic has affected a swathe of international economic and trade activities, from services generally to tourism and hospitality, medical supplies, consumer electronics, financial markets, energy, transportation, food, global value chains, a range of social activities and so on. COVID-19's impact on global health and economic system has been profound and unseen since the Spanish flu of 1918-19 (Einian & Hamid, 2020). The magnitude of the economic impact will depend on how the outbreak evolves, which remains highly uncertain (Asian Development Bsnk (ADB), 2020). There are projections that the virus could trim global economic growth by as much as 2.0% per month if current conditions persist. Global trade could also fall by 13% to 32%, depending on the depth and extent of the global economic downturn (CRS, 2020). Furthermore, the full impact of this disease will not be felt until the post pandemic regime.

Nigeria, Africa's largest economy and a major exporter of crude oil has had her fair share of the pandemic. After the index case was recorded in Lagos on the 27th of February, 2020, the Nigerian government swung into action and implemented the recommended measures to stem the spread of the disease. Despite the measures, as at 15th May, 2020 it had spread to 34 states and the federal capital territory (FCT) with 5,445 confirmed cases, 1,320 recoveries and 171 fatalities (NCDC, 2020). The pandemic has affected the entire fabric of the Nigerian society (businesses, religious organisations, domestic consumption, educational institutions; health facilities to name a few). There is substantial decline in domestic demand, business travel, trade, production; supply of goods; because of the stay home and stay safe directives; travel bans and other restrictions on the movement of people and capital. Apart from the fact that not all persons or businesses can operate from home, the level of infrastructural development is tested during this Covid-19 period. A good number of businesses ranging from micro to large may record significant drop in productivity and output. There is also the likelihood that some new ones will spring up. However the uncertainties surrounding the covid-19 quagmire, suggests a possible spike in unemployment rate because some businesses will lay off workers. Thus, just like in other countries, there are expectations that

economic growth will shrink. The impact of the pandemic has also been felt in the global oil market.

Crude oil and the Nigerian Economy

Crude oil export remains Nigeria's largest source of revenue, energy and foreign exchange for the past three decades (Odularu, 2008). Based on government records, it contributes to more than 90% of aggregate foreign exchange earnings for the country and 80% of federal government revenue (Olurounbi, 2020). In Odularu (2008)'s analysis of the crude oil sector and Nigeria's economic performance using the Ordinary Least Square (OLS) regression method, crude oil consumption and export were seen to have contributed to the improvement of the Nigerian economy. Akinlo (2012) using a multivariate VAR model over the period 1960-2009 to assess the importance of oil in the development of the Nigerian economy showed that the selected five subsectors (oil; agriculture; manufacturing; building and construction and trade and service) are co-integrated and that crude oil can cause other non-oil sectors to grow. Ezekwe et al., (2019) ascertained the impact of crude oil export on economic growth in Nigeria and concluded that there is 32% (thirty two percent) positive impact of crude oil export on economic performance in Nigeria. These empirical studies confirm the general view that crude oil plays an important role in the economy of Nigeria. However, the pricing of this commodity in the international market is not solely the prerogative of Nigeria or other producing countries but also of the buyers of the commodity (advanced and other developing countries) and other factors.

Considering Nigeria's high dependence on crude oil and the need to study the impact of price changes on the economy, (Alley et al., 2014) examined the impact of oil price shocks on the Nigerian economy using general methods of moment (GMM) and data from 1981 to 2012. The study revealed that oil price shocks insignificantly retards economic growth while oil price itself significantly improves it. It was further stated that the significant positive effect of oil price on economic growth confirms the conventional wisdom that oil price increase is beneficial to oil-exporting country like Nigeria. Also (Nwoba et al., 2017) having used simple regression analysis, Pearson Product Moment Correlation and Chi-Square to determine the effect and relationship between oil price and economic growth found that fallen oil price had a significant negative effect on the economy of Nigeria. They recommended among others that diversification of the Nigerian economy was most imperative. Having used the OLS estimation, the study of the impact of oil prices on economic growth in Nigeria from 1980 to 2016 by Onyeiwu and Oladimeji (2018) revealed a significant and positive relationship between oil price changes and economic growth in Nigeria. It was stated that in the short-run, Nigeria was able to have increased growth because of the high global oil prices, but in the long-run, the inconsistency of oil prices and lack of diversification of the productive base did not really help the Nigeria economy. Manasseh et al., (2019) used multiple

regression techniques to investigate the impact of oil price fluctuation and oil revenue on well-being in Nigeria from 1981–2014. Their findings suggested that oil price fluctuations have no significant impact on well-being, while oil revenue was observed to have a significant and positive impact on well-being. The vulnerability of Nigeria to oil price volatility and the current trend towards green or alternative energy has made many experts to clamour for a diversified economy. Despite the agitations for this paradigm shift, crude oil has remained an important facilitator of economic activity.

Covid-19 and Crude oil prices in Nigeria

Covid-19 pandemic has taken its toll on the oil and gas sector. It came at a time when Nigeria was recovering from the 2016 economic recession. The slowdown in the global economy and lockdown due to covid-19 in countries such as Italy, Spain, China and other eurozone economies and beyond have affected the global demand for oil (Akanni & Gabriel, 2020).

According to (Ozili, 2020), oil demand shock (sharp decline in oil price) is one of the five main consequences of Covid-19 outbreak in Nigeria. In March, 2020, the price of crude oil dropped from nearly US\$60 per barrel to as low as US\$30 per barrel. This was attributed to the fact that during the pandemic, people no longer travelled and this led to a sustained fall in the demand for aviation and automobile fuel which invariably affected Nigeria's net oil revenue and foreign reserve (Ozili, 2020). The federal government of Nigeria in reaction to global energy market reviewed and changed the earlier revenue expectations and fiscal projections to reflect the new reality.

Being a novel disease, there is a dearth of empirical studies on the impact of covid-19 on domestic economies. This paper might as well be the first empirical study on the impact of covid-19 outbreak on crude oil prices in Nigeria. However, there are other covid-19 related studies. Einian and Hamid (2020) examined the effectiveness of different policy responses to contain the Coronavirus pandemic. Estimation of the deterministic compartmental model for Iran results showed that in many instances the number of unidentified cases (including asymptomatic individuals) could be much higher than the reported numbers and concluded that in such circumstances, social distancing alone cannot be an effective policy unless a large portion of the population confines themselves for an extended period of time. Farzanegan et al., (2020), used ordinary least squares multivariate regression to examine the relationship between globalization, Covid-19 cases, and associated deaths in more than 100 countries. It was revealed that although countries with higher levels of socio-economic globalization are more exposed to Covid-19 outbreak, globalization cannot explain cross-country differences in Covid-19 confirmed deaths. It was further stated that the fatalities of coronavirus are mostly explained by cross-country variation in health infrastructures and demographic structure. Given the above, we examine the impact of covid-19 outbreak using a structural break approach.

Research methods

This study adopts the structural break model. Hence based on (Perron & Gabriel, 2003; Perron & Xiaokang 2005), three equations are estimated to test unit root for break analysis. The equations take into account the existence of three kinds of structural breaks.

$$x_t = \alpha_o + \alpha_1 DU_t + d(DTB)_t + \beta_t + \rho_{i-1} + \sum_{i=1}^p \phi D x_{i-1} + e_t \quad (1)$$

Model 1 represents crash model that allows for break in the intercept or level of the series

$$x_t = \alpha_o + \gamma DT_t^* + \rho_{i-1} + \sum_{i=1}^p \phi D x_{i-1} + e_t \quad (2)$$

Model 2 allows for a break in the slope or the rate of growth

$$x_t = \alpha_o + \alpha_1 DU_t + d(DTB)_t + \gamma DT_t + \beta_t + \rho_{i-1} + \sum_{i=1}^p \phi D x_{i-1} + e_t \quad (3)$$

In model 3, DU_t is the intercept dummy representing change in level. $DU_t = 1$ if $(t > TB)$ and zero otherwise. $DT_t(DT_t^*)$ is change in the slope of the trend function, $DT_t^* = t - TB$ ($DT_t^* = t$ if $t > TB$) and 0 otherwise (Ben-David et. al., 2003; Lee & Strazicich, 2004). DBT (the crash dummy) = 1 if $t = TB + 1$, otherwise zero, then TB is break date. The break is further tested using Chow test of stability analysis in structural analysis (Perron & Tomoyoshi, 2009).

To achieve the study objectives, data used in the estimation were daily records of covid-19 infection in Nigeria from 8th March 2020 to 14th May, 2020 sourced online from worldometer website of covid-19 infection real time reporting (www.worldometers.info). The daily crude oil prices were obtained from www.ychat.com for 58 days. The sampled days justified the normality theory of time data sufficiency for analysis and estimation.

Model Specification

To investigate the economic impact of covid-19 on crude-oil prices in Nigeria, the model assumes an underlying structural break of covid-19 on crude oil prices on corresponding daily bases (see appendix 1). Data for the crude prices on missing dates assume the previous traded prices to avoid missing values problem, which can affect the estimation procedures. The dynamics of Covid-19 on crude oil prices are captured in the function and model as follows;

$$COP = f(COI) \quad (4)$$

The explicit form of equation 4 is represented as follows:

$$COP_t = a + bCOI_t + \varepsilon_t \quad (5)$$

Where COP is crude oil prices at period t ; COI is the covid-19 infection rate at period t ; b is estimation parameter, a is constant function while ε_t is an error term. In testing for presence or absence of break point, the model for estimation is re-specified in the equations 6 and 7 based on the break point

period. The variables are interacted with dummy break point values to express the desired estimation model for the study.

Specified Structural Break Model

At 15-day structural break, the model to be estimated is expressed as:

$$COP_t = a + b_1COI_t + b_2D(T) + b_3DCOP + b_4DCOI + \varepsilon_t \quad (6)$$

At 35-day structural break, the model to be estimated is expressed as:

$$COP = a + p_1COI_t + p_2D(T) + p_3DCOP + p_4DCOI + u \quad (7)$$

Equations 6 and 7 show the structural break point dummy of the model variables describing the structural change of impact of covid-19 on crude oil

price, where u and ε_t are white noise disturbance terms. The apriori expectations of the model suggests that covid-19 impacts negatively on crude oil prices while structural change impact on crude oil prices performance is positive (i.e $\alpha_1 < 0$). Coefficients of structural break rate at both slope changes and intercept are, a , b and p respectively. The models were evaluated using Autoregressive Moving Average (ARMA) maximum likelihood approach and E-views 11.0 econometrics software.

Results

Test of Stationarity of Variables

In order to obtain a reliable result, the study carried out a stationarity test of the variables using Phillips Perron (PP) test at intercept with and without trend. The results are presented in Table 4.1.

Table 4.1 Unit Root Test Results

Variable	Order	PP-Test	Critical Value at 5%	Prob.<0.05	Decision	Conclusion
D(COP)	I(1)	-7.3156	-2.9145	0.0000	No unit root	Stationary
D(COI)	I(1)	-9.8692	-2.9571	0.0000	No unit root	Stationary
D(DCOP)	I(1)	-5.3267	-2.9145	0.0000	No unit root	Stationary
D(DCOI)	I(1)	-8.8787	-2.9571	0.0000	No unit root	Stationary
D(T)	I(1)	-5.6574	-2.9145	0.0000	No unit root	Stationary

Source: E-views 11.0 results, 2020.

Using Phillips-Peron value greater than critical value at 5% with associated probability values less than 0.05 at 5%, there is evidence that the variables are stationary at first difference, I(1) series (see table 4.1). This implies that all the variables in the estimated specified model have no unit root hence stationary at order I, I(1) and this confirms that the series for the study is integrated at order one indicating possible long run equilibrium relationship.

Trend plot and Break point detection Analysis

The graphs of dependent variable (crude oil prices) and independent variable (Covid-19 pandemic periods) are illustrated in figures 1 and 2 below:

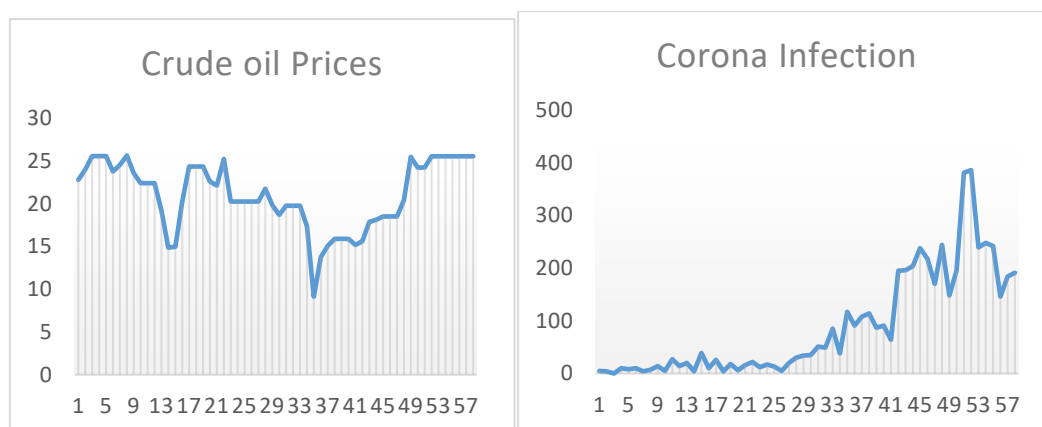


Fig 1: Trend plot for Crude Oil Prices

Source: www.worldometers.info

Fig 2: Trend plot for Covid-19 Pandemic

Source: www.ychat.com

Figures 1 and 2 reveal time plots of crude oil prices and covid-19 pandemic in Nigeria. The trend of crude oil prices in figure 1 indicates cyclical patterns illustrating the price of crude oil instability over the study days. Figure 2 shows the steady increase in the covid-19 pandemic in Nigeria from 8th March to 15th of May, 2020. It shows significant peaks of incidents and reported cases in the last 20 days of the data extractions. These suggest correlation between crude oil prices and Covid-19 pandemic in Nigeria.

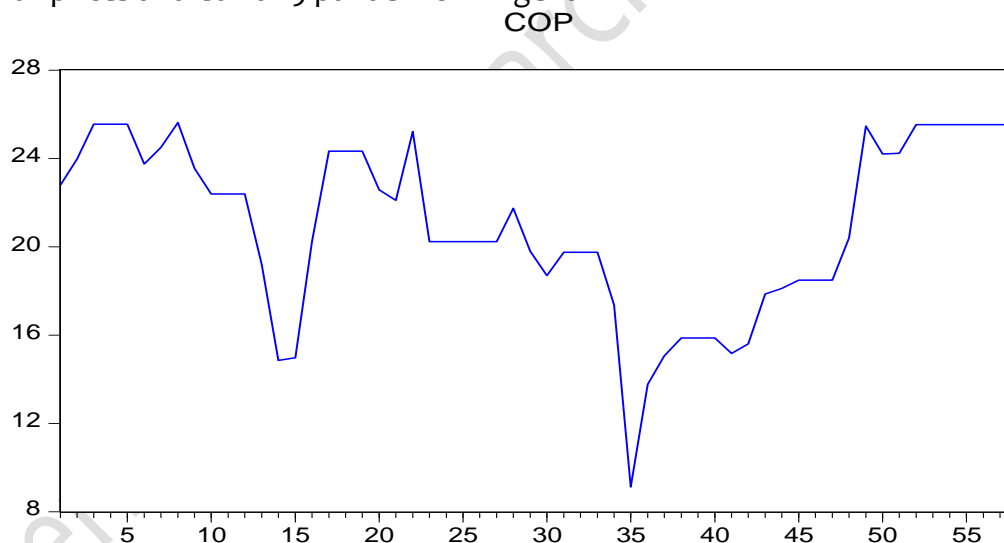


Figure 3: Trend plot for Multiple Break point detections

Source: E-views break point graph, 2020

Based on the chow test, figure 3 shows some indications of break points in days 15 and 35 due to sharp drops downwardly with confirmation of test of presence of a break at 5%. This suggests the introduction of dummy variables (0 for no break period and 1 for break period) and re-specifications of model for analysis

where variables interact with dummy variable to evaluate the impact of covid-19 in Nigeria.

Chow breakpoint tests Representation (Break)

The multiple break point test results of the model are reported in table 4.2

Table 4.2 Chow breakpoint tests Results

Chow Breakpoint Test: 15			
Null Hypothesis: No breaks at specified breakpoints			
Equation Sample: 1 58			
F-statistic	18.87078	Prob. F(6,46)	0.0000
Log likelihood ratio	75.97066	Prob. Chi-Square(6)	0.0000

Chow Breakpoint Test: 35			
Null Hypothesis: No breaks at specified breakpoints			
Equation Sample: 1 58			
F-statistic	7.181292	Prob. F(6,46)	0.0000
Log likelihood ratio	41.96597	Prob. Chi-Square(6)	0.0000

Source: E-views 11.0 results, 2020.

The results above (table 4.2) suggest that break point in the crude oil prices variable of the model is significant at 15* break point, as the scaled F-Statistic (18.87) and (7.18) have p-values less than 0.05 at 5%. The break point of the structural break regression model for the study is at day 15 and 35 for models 1 and 2 respectively. Previous days (1-14) and (1-34) have zero dummy variable and subsequent values have 1 dummy variable. The implication of this is that there is structural instability in crude oil prices caused by covid-19 pandemic.

Structural Break Model (SBM) Representation

Table 4.3a Structural Break Model (SBM) Results at day 15 break

Dependent Variable: COP	
Method: ARMA Maximum Likelihood (OPG - BHHH)	
Date: 05/15/20 Time: 05:38	
Sample: 1 58	
Included observations: 58	

Convergence achieved after 10 iterations				
Coefficient covariance computed using outer product of gradients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
COI	0.137100	0.044417	3.086647	0.0032
DCOP	0.300498	0.041208	7.292288	0.0000
DCOI	-0.142353	0.044425	-3.204340	0.0023
C	17.86229	25.97189	0.687755	0.4947
D(T)	0.490583	0.038894	12.61319	0.0000
SIGMASQ	4.286055	0.719099	5.960310	0.0000
R-squared	0.717879	Mean dependent var		21.01569
Adjusted R-squared	0.690752	S.D. dependent var		3.931766
S.E. of regression	2.186458	Akaike info criterion		4.568304
Sum squared resid	248.5912	Schwarz criterion		4.781454
Log likelihood	-126.4808	Hannan-Quinn criter.		4.651330
F-statistic	26.46360	Durbin-Watson stat		0.952077
Prob(F-statistic)	0.000000			

Source: E-views 11.0 results, 2020.

The results from the structural break analysis at day 15 suggests COVID-19 (COI) has positive impact on crude oil prices by 13.7% within the first few days of the outbreak in Nigeria and it is significant at 5%. In the break point period, crude oil prices (COP) has 30% influenced on itself in the global market and it is significant. However, Covid-19 (COI) at the break point has significant negative impact on crude oil prices (COP) by 14.2%. Dummy break variable D(T) defines the crude oil prices positively by 49% with significant influence. The crude oil prices maintained 178.6% based on constant function of the model although not significant. Crude oil prices (COP) and covid-19 infection (COI) fitted relatively high at 71.7%. Covid-19 explained total variation in the crude oil prices (COP) by 69%. The structural break model variables (COP and COI) at day 15 are significant at 5% as the probability (F-stat $0.00 < 0.05$). This implies that Covid-19 pandemic is highly significant to crude oil prices negatively.

Table 4.3b Structural Break Model (SBM) Results at day 35 break

Dependent Variable: COP		
Method: ARMA Maximum Likelihood (OPG - BHHH)		

Date: 05/15/20	Time: 05:43			
Dependent Variable: COP				
Method: ARMA Maximum Likelihood (OPG - BHHH)				
Date: 05/15/20	Time: 05:44			
Sample: 1 58				
Included observations: 58				
Convergence achieved after 14 iterations				
Coefficient covariance computed using outer product of gradients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
COI	0.047491	0.020534	2.312726	0.0247
DCOP	0.148985	0.100848	1.477313	0.1456
DCOI	-0.053533	0.020690	-2.587406	0.0125
C	20.74897	31.17211	0.665626	0.5086
D(T)	0.487071	0.034408	14.15591	0.0000
SIGMASQ	5.258374	0.991062	5.305799	0.0000
R-squared	0.653878	Mean dependent var		21.01569
Adjusted R-squared	0.620597	S.D. dependent var		3.931766
S.E. of regression	2.421799	Akaike info criterion		4.767166
Sum squared resid	304.9857	Schwarz criterion		4.980315
Log likelihood	-132.2478	Hannan-Quinn criter.		4.850192
F-statistic	19.64720	Durbin-Watson stat		0.998629
Prob(F-statistic)	0.000000			

Source: E-views 11.0 results, 2020.

The results from the structural break analysis at day 35 indicates that COVID-19 (COI) has positive impact on crude oil prices by 4.2% within the first few days of the outbreak in Nigeria and it is significant at 5%. In the break point period, crude oil prices (COP) has 14.8% influenced on itself in the global market but not significant. However, Covid-19 (COI) at the break point has significant negative impact on crude oil prices (COP) by 5%. Dummy break variable D(T) defines the crude oil prices positively by 49% with significant influence. The crude oil prices maintained 207.4% based on constant function of the model value but was not significant. Crude oil prices (COP) and covid-19 infection (COI) fitted relatively high at 65.3%. Covid-19 explained total variation in the crude oil prices (COP) by 62%. The structural break model variables (COP and COI) at day 35 are significant at 5% as the probability (F-stat 0.00<0.05). This

implies that Covid-19 pandemic is highly significant to crude oil prices at 35 days into the pandemic in Nigeria.

Result of Variance Decomposition

Using variance decomposition of shock, the economic impact of covid-19 pandemic on crude oil prices in Nigeria are reported in table 4.4a and b.

Table 4.4a: Variance Decomposition Results

Variance Decomposition of COP:

Period (day)	S.E.	COP	COI
1	2.043554	100.0000	0.000000
2	2.924833	97.15347	2.846525
3	3.246661	97.66999	2.330006
4	3.426859	97.90595	2.094051
5	3.542189	97.32733	2.672669
6	3.617284	96.65277	3.347226
7	3.670616	96.15617	3.843834
8	3.712908	95.34625	4.653750
9	3.745779	94.37352	5.626482
10	3.772634	93.39079	6.609209

Cholesky Ordering: COI

Source: E-views 11.0 results, 2020.

In the short run of period 1, percentage forecast error variance of crude oil prices (COP) of 100% in crude oil prices is explained by itself. In the long run period 10, the percentage of the forecast error variance decreases to 93.39% revealing that the crude oil prices variable tends to dwindle as we further into the future of the pandemic by 6.61%. Crude oil prices (COP) is strongly endogenous. Covid-19 (COI)) gradually impacted on oil prices by 6.61% in the long run.

Table 4.4b: Variance Decomposition Results

Variance Decomposition of COI:

Period	S.E.	COP	COI
1	45.67772	2.270588	97.72941
2	56.86251	3.998345	96.00165

3	61.29034	3.791901	96.20810
4	69.12254	3.746077	96.25392
5	76.51694	4.738270	95.26173
6	82.28084	5.570524	94.42948
7	88.34036	6.218446	93.78155
8	94.35233	6.964462	93.03554
9	99.85105	7.689632	92.31037
10	105.2019	8.336564	91.66344

Cholesky Ordering: COP

Source: E-views 11.0 results, 2020.

Percentage of the forecast error of variance of Covid-19 (COI) reveals that in the short run period 1; about 97.7% percentage of forecast variance in Covid-19 (COI) is explained by itself. In the long run of period 10, the percentage of the forecast error variance of Covid-19 (COI) decreases slightly by 91.6% revealing that Covid-19 (COI) pandemic tends to become gradually stable as we further into the future of the pandemic. Covid-19 (COI) is strongly endogenous and it indicates in the short run pronounced impact of 97% on the Nigeria crude oil prices and in the long run, 91.6% impact.

Findings

The study of the economic impact of COVID-19 outbreak on crude oil prices in Nigeria using structural break analysis revealed that at day 15 COVID-19 (COI) has a significant positive impact on crude oil prices but influences crude oil prices after the break negatively. Covid-19 explained total variation in the crude oil prices (COP) by 69%. The structural break model variables (COP and COI) at day 15 are significant at 5% as the prob. (F-stat $0.00 < 0.05$). This implies that Covid-19 pandemic is highly significant to crude oil prices. At day 35, COVID-19 (COI) has a positive impact on crude oil prices but a negative impact after the break and it is significant at 5%. In the break points period, crude oil prices (COP) influenced on itself in the global market but not significantly. D(T) defines the crude oil prices positively by 49% with significant influence. Covid-19 explained total variation in the crude oil prices (COP). The structural break model variables (COP and COI) at day 15 and 35 are significant at 5% as the prob(F-stat $0.00 < 0.05$). This implies that Covid-19 pandemic is highly significant to crude oil prices at 35 days into the pandemic in Nigeria.

In the short run of period 1, percentage forecast error variance of crude oil prices (COP) of 100% in crude oil prices is explained by itself. In the long run period 10, the percentage of the forecast error variance decreases to 93.39% implying that the crude oil price variable tends to dwindle as we further into the future of the pandemic by 6.61%. Covid-19 (COI)) exerts negligible influence on the Nigeria crude oil prices by 0.00% in short run but gradually affects oil prices by 6.61% in the long-run. In the short run period 1; about 97.7%

percentage of forecast variance in Covid-19 (COI) is explained by itself. In the long run of period 10, the percentage of the forecast error variance of Covid-19 (COI) decreases slightly by 91.6% implying that the Covid-19 (COI) pandemic tends to become gradually stable as we further into the future of the pandemic. Covid-19 (COI)'s impact on Nigerian crude oil prices is 97% percentage in the short run and 91.6% in the long run. To select the best model at the varying breaks, the economic impact of Covid-19 outbreak on crude oil prices in Nigeria has lowest Akaike Information Criteria (AIC) of 4.56 at day 15 compared to day 35 which has AIC value 4.76.

Conclusion

Based on the structural break point analysis of covid-19 outbreak on crude oil prices, the economy of Nigeria has been greatly affected by the outbreak. Being a mono-cultural economy where crude oil accounts for over 70% of federal government's revenue, Nigeria's economy is likely to suffer huge setbacks characterized by losses accruing from structural change points occasioned by lockdown, technological dependency, crash in domestic/international business, physical/social distancing that affected real time trade and others. Finally, to have better economic understanding of the impact of Covid-19 pandemic on crude oil prices in Nigeria, structural break model at day 15 break point is most appropriate for prediction.

Recommendations

Given the above, the paper recommends that:

1. More efforts should be put in place to curtail further spread of Covid-19 in Nigeria and other countries so as to mitigate the adverse impact of the disease on the Nigeria economy in the long run.
2. Considering the significant but negative resultant effect of Covid-19 on crude oil prices, government and private individuals must invest in funding research on sustainable vaccine and germane solution to the disease in Nigeria.
3. Post Covid-19, the government should with all seriousness have a set plan on how the economy will be diversified over a given number of years and this should be strictly followed even when oil prices soar.

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Appendix 1: Data presentation

Days	COP	COI
1	22.79	5
2	23.98	4
3	25.55	0
4	25.55	10
5	25.55	8
6	23.75	10
7	24.5	4
8	25.62	7
9	23.55	14
10	22.39	5
11	22.39	27
12	22.39	14
13	19.19	20
14	14.85	4
15	14.97	39
16	20.24	10
17	24.33	26
18	24.33	4
19	24.33	18
20	22.58	6
21	22.1	16
22	25.22	22
23	20.23	12
24	20.23	17
25	20.23	13
26	20.23	5
27	20.23	20
28	21.74	30
29	19.8	34
30	18.69	35
31	19.75	51
32	19.75	49
33	19.75	85
34	17.36	38
35	9.12	117
36	13.77	91
37	15.06	108
38	15.87	114
39	15.87	87
40	15.87	91
41	15.17	64
42	15.6	195
43	17.86	196
44	18.11	204
45	18.49	238
46	18.49	218
47	18.49	170
48	20.4	244
49	25.46	148
50	24.2	195
51	24.23	381
52	25.53	386
53	25.53	239
54	25.53	248
55	25.53	242
56	25.53	146
57	25.53	184
58	25.53	191