How have COVID-19 Confirmed Cases and Deaths Affected Stock Markets? Evidence from Nigeria

Nurudeen Abu1, Awadh Ahmed Mohammed Gamal2, Musa Abdullahi Sakanko3, Ana Mateen4, David Joseph5, and Ben-Obi Onyewuchi Amaechi6

ABSTRACT

This study assesses the effect of COVID-19 proxied by the number of confirmed cases of the infection and deaths on Nigeria’s stock market over the 23rd March to 11th September 2020 period using the autoregressive distributed lag (ARDL), canonical cointegrating regression (CCR), dynamic ordinary least squares (DOLS) and fully modified ordinary least squares (FMOLS) techniques. The bounds test to cointegration result reveals that a long-run relationship exists between COVID-19 and Nigeria’s stock market (along with oil prices and exchange rate). The results of the various estimations demonstrate that COVID-19 (proxied by the number of confirmed cases of infection) has a negative and significant impact on stock market performance, while the number deaths has a positive and significant impact on the market in the long-run. In addition, oil prices and exchange rate have a significant and positive effect on stock market performance in the long-run. Similar results were found for sub-sectors including consumer goods and healthcare sub-sectors of the stock market. The study recommends policies to curb the spread of the virus.

KEY WORDS: COVID-19, confirmed cases, deaths, stock market, Nigeria.

JEL Classification: D53, E44, G14, I15.

1. Introduction

Health disasters, like the coronavirus disease (COVID-19) that is ravaging countries across the world, do not only have an undesirable effect on individuals’ health conditions - it can also leave negative social and economic impacts that last for years. COVID-19 which started in the city of Wuhan in China in December 2019, later declared as a pandemic on the 11th March 2020 (Williams & Kayaoglu, 2020), has continued to pose major threats to the global community with increasing number of infections and deaths both in developed and developing countries. Till date around 60 million persons have been infected by (or tested positive to) the virus with over 1,400,000 deaths reported. Although more than 40 million infected persons have been treated and recovered, the lack of a potent vaccine for the virus implies that the worst days of the pandemic might not be over.

Following the outbreak of the disease, international organizations and scholars predicted/projected job losses, reductions in trade, exports and foreign direct investment (FDI), shrinking GDP or economic contraction, decline in stock market activity and increase in the number of poor, among other things (see Hanspal et al., 2020; ILO, 2020; Maliszewska et
al., 2020; McKibbin & Fernando, 2020; OECD, 2020; Ozili & Arun, 2020; UNCTAD, 2020). The absence of known vaccine(s) to permanently treat the disease has forced countries to take different measures to limit the spread of the virus. These measures include lockdown, social distancing, closure of institutions of learning and non-essential businesses or services, cancellation or postponement of events, elections, sporting activities, Summer Olympics, and ban on social gatherings of persons above certain numbers (see Gössling et al., 2020). Most nations have also announced fiscal stimulus to mitigate the adverse effects of COVID-19 on their respective economies, and wealthy countries and organizations are sending aid, health equipments and related items to poorer countries to assist them in combating the spread of the virus including alleviating harsh economic conditions they are currently facing.

Nigeria reported her first index case of COVID-19 (an Italian) on 27th February 2020. Initially, it appeared that the country was able to contain the spread of the virus, but spikes in the number of infected persons and rising number of deaths in the weeks that followed coupled with the precarious state of the healthcare system leaves much to be desired. Available statistics from the Nigeria Centre for Disease Control (NCDC) indicate that single-digit daily infection cases were reported during the first month (27th February to 23rd March 2020) except for two days when the figures were 10 and 14 cases, respectively. The total number of confirmed cases during that period was 70. However, between 24th March and 23rd April, two-digit cases were reported and the total number of confirmed cases rose to 981. But since 28th April 2020, Nigeria has reported mostly daily confirmed infection cases of over 100 (see Figure 1). In addition, the number of deaths (or fatalities) caused by COVID-19 increased over the period (see Figure 2).

In an attempt to contain the spread of the virus, the Nigerian government took certain measures including lockdown, closing down of schools, places of worship, and non-essential businesses, restriction of movements and travel ban, social distancing, among others. Moreover, governments at both federal and state levels have introduced palliatives to ease the burden of the compulsory stay-at-home order particularly on the poor majority of who earn their living on a day-to-day basis. Also, the federal government announced plans to give stimulus to strategic sectors of the economy. These include the sum of N3.5 trillion in direct spending and US$6.9 billion in fiscal support (Ozili & Arun, 2020).

Other measures were contingency funds of N984 million to the NCDC with plan to release extra N6.5 billion; creation of N500 billion COVID-19 Crisis Intervention Fund (CCIF) to upgrade healthcare facilities across the country and intervention funds for states; Presidential approval for the employment of 774,000 persons with each Local Government Area (LGA) to be allotted 1,000 slots; a three-month repayment moratorium for all FarmerMoni, Market-Moni, and TraderMoni loans with an immediate effect; N15 billion federal government’s grant to Lagos state government; conditional cash transfers to be paid to the most vulnerable at Internally Displaced Persons (IDPs) for the next two months; a reduction of petrol pump price from N145.0 to N123.50 per litre; suspension of proposed increase in electricity tariffs by distribution companies; and import duty waivers on medicines, medical equipments, protection equipments for COVID-19 treatment (PwC, 2020).

Although the number of total confirmed cases and fatality rate remain low, it is believed that these figures do not reflect the true situation in Nigeria. In addition, the low testing capacity occasioned by the country’s weak healthcare system has been blamed for the low number of infections and deaths reported.

On the economic front, the Nigeria’s stock market (Nigerian Stock Exchange) appeared to be one of the victims of the COVID-19 pandemic. In fact, the press/media had reported an association between large daily (stock) market movements and the COVID-19 outbreak (Baker et al., 2020a). The lockdown that was introduced by authorities in Nigeria resulted in total or partial shutdown of most firms/businesses’ activity and operations. With many economic activities halted Nigeria’s stock market indicators (i.e. market turnover and market capitalization) showed an unimpressive performance. These indicators which have been used to measure stock market performance or development in Nigeria (see
Figure 1. Plots of total confirmed cases based on the data collected from the Nigeria Centre for Disease Control.

Figure 2. Plots of total fatalities based on the data collected from the Nigeria Centre for Disease Control.
Nurudeen, 2009) exhibited an unstable trend as they increased in certain days and declined in others (see Figure 3 and Figure 4). Although stock market indicators fluctuated since March 2020 it is not clear whether the COVID-19 pandemic is responsible for this behavior. Therefore, the primary objective of this study is to investigate if the performance of Nigeria’s stock market can be attributed to the virus outbreak. The remainder of this study is organized as follows. Section two is the review of relevant literature, while the third section is the theoretical framework and model specification. The fourth section is for data and methodology, and results and discussion are taken up in the fifth section. Section six concludes the study.

2. Review of Relevant Studies on COVID-19 and Stock Market Relationship

The COVID-19 pandemic was announced some months ago and research on its impact on the economy (and certain economic variables) is still emerging. Researchers have been making concerted efforts to investigate the effects of the virus on financial sector variables like stock markets.

For example, Alam et al. (2020) assessed the reaction of stocks of 31 listed firms on the Indian Bombay Stock Exchange following the COVID-19 outbreak from 24th February to 17th April, 2020. The authors discovered that the market reacted positively to the lockdown, while the reaction was negative in the pre-lockdown period. In addition, Al-Awadhi et al. (2020) examined the effect of COVID-19 deaths and confirmed cases on the stock market in China over the 10th January - 16th March 2020 period using panel data analysis. The results demonstrate that daily growth in total deaths and confirmed cases have a negative and significant effect on stock market returns, and the virus has a positive and significant impact on market returns volatility. On his part, Ashraf (2020) used pooled regression analysis to evaluate the impact of COVID-19 confirmed cases and deaths on stock market returns in 64 countries from 22nd January to 17th April, 2020. The empirical evidence show that growth in the number of confirmed cases has a negative impact on stock markets. Also, the results suggest that the growth in the number of confirmed cases was more than the growth in the number of deaths. Moreover, Bash (2020) used the mean-adjusted returns and market model to study the impact of the first registered COVID-19 case on stock returns in 30 countries. The results demonstrate that stock market returns significantly declined in reaction to the pandemic.

Cao et al. (2020) assessed the response of 14 daily stock indices to the COVID-19 during the 21st January to 30th June 2020 period. The authors submitted that stock market indices responded negatively and significantly to the pandemic. Also, Cepoi (2020) used a panel quantile regression estimator to examine COVID-19 related news and stock returns relationship in six most affected countries by the virus from 3rd February to 17th April 2020. The results reveal that stock markets in this group of countries presented asymmetric dependencies with COVID-19. Furthermore, Chia et al. (2020) investigated the stock market returns and COVID-19 pandemic relationship in Malaysia using time series data from 2nd January to 30th
Figure 3. Plots of market turnover based on the data collected from the Nigerian Stock Exchange.

Figure 4. Plots of market capitalization based on the data collected from the Nigerian Stock Exchange.
April, 2020. Employing the ordinary least squares estimator, the authors found that new daily confirmed cases and deaths have an insignificant negative impact on stock returns. On the other hand, movement control order (MCO) was found to have a positive and significant effect on stock returns. Corbet et al. (2020) discovered that COVID-19 pandemic has a significant and positive effect on the volatility of Shanghai and Shenzhen stock markets.

Moreover, Erdem (2020) investigated the response of stock markets and freedom of countries to COVID-19 announcements across 75 nations during the January-April 2020 period. The results indicate a negative response of stock markets to the pandemic. On their part, He et al. (2020) examined the impact of COVID-19 outbreak on stock prices on the Chinese stock market from 3rd June, 2019 to 13th March, 2020 using the event study approach. The authors concluded that certain stocks have been affected negatively by the virus outbreak. In the same vein, Huo and Qiu (2020) evaluated how Chinese stock market reacted to the COVID-19 lockdown announcement. The evidence suggest poor performance of stocks in China. Similarly, Liu et al. (2020a) examined the short-term impact of the COVID-19 outbreak on Chinese stock markets using the event study technique after 20th January, 2020. The authors observed a decline in stock indices during the pandemic. In addition, Liu et al. (2020b) established that indicators of major stock markets of countries have declined sharply in response to COVID-19 outbreak. Moreover, Mazur et al. (2020) investigated the performance of the US stock market during the market crash of March 2020 caused by the COVID-19 outbreak. The authors confirmed that some stock indices declined considerably as a result of the disease outbreak.

In addition, Mishra et al. (2020) employed the Markov switching vector autoregression method to examine the effect of COVID-19 pandemic on Indian stock market returns. The authors compared the findings with implementation of the goods and services tax and demonetization policy outcomes using daily data from 3rd January, 2003 to 20th April, 2020. The results demonstrate that stock indices responded negatively during the COVID-19 outbreak unlike the goods and services tax and post-demonetization era. Furthermore, Naidenova et al. (2020) illustrated that stock markets (or market indices) have reacted negatively to COVID-19 (measured by number of confirmed cases and deaths, lockdown and movement restrictions, and social distancing). Elsewhere, Narayan et al. (2020) investigated the impacts of government responses to COVID-19 (i.e. stimulus packages, lockdowns and travel bans) on G7 stock market returns from 1st July, 2019 to 16th April, 2020. The results of the ordinary least squares estimation corrected for autocorrelation and heteroscedasticity indicate that stimulus packages, travel bans and lockdowns have a positive impact on stock markets in G7 countries. Salisu et al. (2020) evaluated the oil-stock linkage under the COVID-19 pandemic era in worse hit countries using panel VAR and panel logit models. The results reveal negative stocks and oil returns which might have been caused by panic or uncertainty in respective markets.

Moreover, Salisu and Vo (2020) examined the role of health news in predicting stock market returns during COVID-19 outbreak among top 20 worse hit or most affected economies using heterogeneous panel estimator. The authors’ findings suggest that regardless of movement of health news, COVID-19 pandemic affected stock market returns negatively. In addition, Şenol and Zeren (2020) confirmed a long-run relationship between global stock markets and the pandemic between January and April 2020. Also, Topcu and Gulal (2020) examined the effect of COVID-19 on emerging stock markets over the 10th March-30th April, 2020 period by employing the pooled OLS estimator with robust standard errors. The results illustrate that the impact which has been negative has started to decline and gradually tapping off since the middle of April. In addition, emerging markets in Asia appeared to have been most affected with their counterparts in Europe least impacted. Moreover, Zhang et al. (2020) employed correlation analysis, graph theory and minimum spanning tree (MST) to evaluate the performance of financial (stock) markets across the world during the COVID-19 pandemic from February to March 2020. The authors concluded that global stocks have become more risky and highly volatile as a result of the pandemic. Furthermore, Zeren and Hizarci (2020) established that stock markets and COVID-19 (measured as total deaths) have a long run-relationship.
Looking at the literature, it is glaring that there is scarcity of empirical studies which focus on the COVID-19 outbreak and stock market relationship in Nigeria. Therefore, this study contributes to the literature by examining the relationship between the COVID-19 pandemic and Nigeria’s stock market behavior.

3. Theoretical Framework and Model Specification

Although there is no theory that explains the direct relationship between a disease and financial variables such as the stock market, this study relies on the cost of illness (COI) approach to establish the link between COVID-19 and stock market performance. The approach looks at the opportunity cost of resources which are either consumed or lost due to the existence of a disease. These costs can be direct or indirect (Costa et al., 2012). The first type of cost is the direct costs, and it consist of resources used to treat or check a disease from escalating. Examples of such costs are expenditure on physicians/doctor and nurses who treat patients, procurement of drugs, and so on. The second costs consist of not only the present but also future costs arising from disability, morbidity and premature death to the economy (Brahmbhatt & Dutta, 2008). Thus, the existence of a disease can lead to a decline in labor productivity and/or death of workers, and consequently result to output losses.

In addition, economic theory suggests that pandemics such as the COVID-19 are likely to increase labor scarcity, reduce investment demand and impact on financial or stock markets (see Baker et al., 2020a; Jordà et al., 2020; Mandel & Veetil, 2020). As a disease/virus spread from one country to another, labor supply is constrained with an increased risk in operations of businesses including restrictions on movement/travel amongst other things (Mohan, 2006). The high uncertainty that accompany a pandemic/disease outbreak impacts on the survival of existing businesses, establishment of new businesses, investment in human capital and research and development, as well as factors which affect productivity in the medium-term and the long-term (Baker et al., 2020b). As production declines, firms’ sales and profits reduce too. The poor performance of firms is reflected in the value of their stocks/shares as holders of these stocks/shares embark on sell-off to avoid further losses on their investment.

Also, poor health (which results from a disease/virus) reduces individuals’ productivity and efficiency, and as a result lower their ability to earn substantial income. As people’s incomes decline, aggregate demand for goods and services also reduce, which further lessens the need for future investment spending. The increased uncertainty in the business environment hurts the functioning of financial markets/institutions (stock markets inclusive) because it raises investors’ pessimism about future returns on their investment (Liu et al. 2020a). In the same vein, high uncertainty forces stockholders to sell-off their stocks, leading to the flow of funds from capital (stock) markets to safe haven assets (AlAli, 2020; Zeren & Hizarci, 2020). Persistent stock sell-off puts downward pressure on the value/prices of stocks, leading to a decline in market indices (or performance).

The discussion above suggests that the COVID-19 pandemic (COVID) might have affected the performance of Nigeria’s stock market (STMKT). Thus, we specify a model in which STMKT is dependent on COVID as follows:

$$STMKT_t = a_0 + a_1 COVID_t + \epsilon_t$$  \hspace{1cm} (1)

Recent studies have proxied COVID by the number of confirmed cases of the infection (CASE) and number of deaths or fatalities (FAT) (see Liu et al., 2020b; Naidenova et al., 2020; Şenol & Zeren, 2020; Zeren & Hizarci, 2020). Thus, the model above is re-specified as:

$$STMKT_t = a_0 + a_1 CASE_t + a_2 FAT_t + \epsilon_t$$  \hspace{1cm} (2)

Besides the variables of interest (CASE and FAT), oil prices (OILP) can also influence stock market performance or stock prices. Authors have claimed that since oil is a very important input used by most firms during production process, changes in oil prices are expected to affect firms’ expected cash flows. This in turn influences firms’ production costs and earnings, their dividends and as a result stock prices (see Narayan & Narayan, 2010; Rafaillidis & Katrakilidis, 2014; Salisu et al., 2020; Salisu & Isah, 2017).

Also, changes in exchange rate (appreciation or depreciation) can affect stock prices or stock market performance. The traditional approach or goods market theory argues that exchange rate (EXR) depreciation
raises a country’s (domestic firms’) competitiveness and therefore, lead to increases in export of goods and services (see Dornbusch & Fischer, 1980; Tian & Ma, 2010). In essence, local currency depreciation facilitates output expansion and exports, raising earnings of exporting firms, thus, leading to high prices of their stocks (see Abdalla & Murinde, 1997; Alagidede et al., 2011; Ashraf, 2020; Bahmani-Oskooee & Sohrabian, 1992; Megaravalli & Sampagnaro, 2018; Tian & Ma, 2010; Zarei et al., 2019). Conversely, exchange rate appreciation reduces an economy’s competitiveness, exports and trade balance, leading to lower earnings of firms and stock prices.

Taking the possible impacts of OILP and EXR into cognizance, the econometric model is re-specified to include both variables as follows:

\[ L \text{STMARK}_t = \alpha_0 + \alpha_1 \text{CASE}_t + \alpha_2 \text{LAFAT}_t + \alpha_3 \text{OILP}_t + \alpha_4 \text{LEXR}_t + \epsilon_t \]  

(3)

where L denotes logarithm. Taking the logarithm of variables reduces their skewness.

### 4. Methodology and Data

This study uses daily data from 23rd March to 11th September 2020. COVID-19 is proxied by the number of confirmed cases of the infection (CASE) and number of deaths (FAT) as used in recent research (see Ashraf, 2020; Liu et al., 2020b; Naidenova et al., 2020; Şenol & Zeren, 2020). Following Nurudeen (2009) stock market behavior/performance is captured by stock market capitalization, and the data were collected from the Nigerian Stock Exchange. The stock exchange operates five days a week (i.e. Monday to Friday), except on weekends (i.e. Saturday and Sunday) and public holidays. In all, we have 117 days (i.e observations or series). The data on the number of cases of infection and the number of deaths were gathered from the Nigeria Centre for Disease Control. The data on oil prices were collected from the Organization of Petroleum Exporting Countries and the International Energy Association, and exchange rate data were gathered from the Central Bank of Nigeria.

#### 4.1. Unit Root Tests

Time series are required not to have a unit root or be stationary before they are used in regression analysis (İskenderoglu & Akdağ, 2020). Stationarity of data is very important to guide against obtaining spurious results. The Augmented Dicker– Fuller (ADF) test by Dickey and Fuller (1979) and Philips–Perron (PP) test by Phillips and Perron (1988) were employed in ascertaining the unit root status of the series. The ADF test equation is specified as:

\[ \Delta y_t = \rho \Delta y_{t-1} + \theta_1 \Delta y_{t-2} + \cdots + \theta_k \Delta y_{t-k} + \epsilon_t \]

\[ y_t \] is the series and \( \epsilon_t \) the error term.

The hypotheses which are to be tested include:

- \( H_0 : \rho = 0 \) (unit root)
- \( H_1 : \rho < 0 \) (series has no unit root)

The PP test is used as a complement to the ADF test. If the ADF or PP test statistic is less than the critical values at 1%, 5% or 10%, \( H_0 \) is not be rejected. But if the test statistic is higher than the critical values the \( H_1 \) is accepted.

#### 4.2. ARDL Bounds Test to Cointegration

If it is confirmed that the series are all stationary at I(1) or a mixture I(1) and I(0), the ARDL-bounds test to cointegration (Pesaran & Shin, 1999; Pesaran et al., 2001) will be used to check the existence of cointegration (long-run relationship) among the variables. The justification for using the ARDL approach and its preference over the conventional cointegration methods such as the residual-based technique (Engle & Granger, 1987) and the maximum likelihood method (Johansen, 1988; 1991; Johansen & Juselius, 1990) has been explained by several authors (see Abu & Staniewski, 2019; Abu & Gamal, 2020). The ARDL model \( (p,k_1,k_2,k_3,k_4) \) to be estimated is specified as follows:

\[ \Delta \text{STMARK}_t = \sum_{i=1}^{p} \alpha_i \Delta \text{STMARK}_{t-i} + \sum_{i=1}^{k_1} \alpha_{2i} \Delta \text{CASE}_{t-i} + \sum_{i=1}^{k_2} \sigma_{3i} \Delta \text{LAFAT}_{t-i} + \sum_{i=1}^{k_3} \alpha_{4i} \Delta \text{OILP}_{t-i} + \sum_{i=1}^{k_4} \delta_{5i} \Delta \text{LEXR}_{t-i} + \varepsilon_t \]

(4)

The procedure of the ARDL begins with the conduct of the bounds test for the null hypothesis of no cointegration (H0) against the alternative hypothesis (H1) for individual equation stated as follows:

- \( H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0 \)
- \( H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0 \)
Next, is to decide if cointegration exists among the variables by comparing the computed F-statistic with upper and lower critical bounds values. If the computed F-statistic is higher than the upper bound, it is concluded that cointegration exists between the variables. But if the F-statistic is smaller than the lower bound, it is concluded that cointegration does not exist among them. Furthermore, if the computed F-statistic lies between the lower and upper bounds, our decision will be inconclusive. If cointegration is established among the variables, we will proceed to estimate both long-run and short-run parameters using equation 5 and equation 6 which are specified as:

\[
LSTMKT_t = \beta_0 + \sum_{i=1}^{k_1} \beta_{i1} LSTMK_{T-i} + \sum_{i=0}^{k_2} \beta_{i2} LCASE_{T-i} + \sum_{i=0}^{k_3} \beta_{i3} LFAT_{T-i} + \sum_{i=0}^{k_4} \beta_{i4} LOILP_{T-i} + \sum_{i=0}^{k_5} \beta_{i5} LEXR_{T-i} + \theta ECT_{T-1} + \epsilon_t
\]  

(5)

and

\[
\Delta LSTMKT_t = \beta_0 + \sum_{i=1}^{k_1} \beta_{i1} \Delta LSTMKT_{T-i} + \sum_{i=0}^{k_2} \beta_{i2} \Delta LCASE_{T-i} + \sum_{i=0}^{k_3} \beta_{i3} \Delta LFAT_{T-i} + \sum_{i=0}^{k_4} \beta_{i4} \Delta LOILP_{T-i} + \sum_{i=0}^{k_5} \beta_{i5} \Delta LEXR_{T-i} + \theta_1 ECT_{T-1} + \epsilon_t
\]  

(6)

ECT is the error correction variable lagged by one period, and its coefficient, \( \theta \), denotes the speed of adjustment back to equilibrium in the event of any deviation from the equilibrium.

4.3. Diagnostic Tests

After the model estimation conventional diagnostic tests are performed to ascertain the reliability of the results obtained. These tests include the Breusch-Godfrey serial-correlation LM test to check for the existence of serial-correlation, and the Breusch-Pagan-Godfrey heteroscedasticity test to check if the residuals are homoscedastic or not.

4.4. Stability Tests

Stability tests are conducted to evaluate the stability status of the estimated coefficients of the regressors and model. To achieve this object, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) would be employed. If the plots of CUSUMSQ break in the lower or upper bound, the model and the parameters will be adjudged not to be stable (see Greene, 2003; Tang & Lean, 2007).

4.5. Alternative Estimation Techniques

Alternative cointegration estimation techniques including the canonical cointegrating regressions (CCR) by Park (1992), dynamic ordinary least squares (DOLS) by Saikkonen (1992) and Stock and Watson (1993), and fully modified ordinary least squares (FMOLS) by Hansen and Phillips (1990) are used to estimate the relationship between COVID-19 and stock market performance. These methods have advantages such as solving problems of endogeneity bias between/among regressors as well as providing results which are more efficient or robust in finite samples (see Abu & Gamal, 2020; Abu & Staniewski, 2019; Alhassan & Fiaodor, 2014; Montalvo, 1995; Narayan & Narayan, 2004; Singh, 2015).

The CCR technique executes the ordinary least squares estimation via transforming the variables using long-run covariance matrix of the residuals terms, and therefore, ensures that the ordinary least squares estimator is asymptotically efficient (Beard et al., 2010). On the other hand, the FMOLS procedure starts with the ordinary least squares estimation, and then makes a non-parametric correction which may emanate from the ordinary least squares residuals including endogeneity bias (Singh, 2015). The DOLS approach involves the regression of a I(1) variables on other I(1) and I(0) variables, and the leads and lags of (first difference) of I(1) variables. This corrects any simultaneity bias between the regressors. Employing these alternative estimation methods helps to ascertain the consistency and/or robustness of the results.

5. Discussion of Results

5.1. Results of Unit Root Tests

The unit root tests results reported in Table 1 demonstrate that two series namely - LCASE and LFAT have no unit root (i.e. they are stationary at level) at 1% level. However, LSTMKT, LOILP and LEXR have a unit root (i.e. non-stationary) at level. But the series turned out stationary after their first difference has been taken at 1% level.
5.2. Result of Bounds Test to Cointegration
The bounds test to cointegration result in Table 2 reveals that the computed F-statistic (4.3702) is larger than the upper critical bound value (i.e. 4.37) at 1% level.

Therefore, the null hypothesis of no cointegration is rejected. This implies that a long-run relationship exists among the variables. This finding provides justification for using an ARDL technique to estimate the relationship between the variables.

5.3. Results of Selected ARDL Model
The results of estimation of the selected ARDL model are shown in Table 3. The optimal lag length selected by the AIC is: 2,0,1,0,0. The results demonstrate that COVID-19 proxied by the number of confirmed cases of infection (LCASE) has a negative and significant effect on stock market performance (LSTMKT) proxied by stock market capitalization in the long-run. A 1% increase in LCASE leads to a reduction in LSTMKT by a 0.11% at 1% level in the long-run. On the other hand, the number of deaths (LFAT) is positively and significantly related to LSTMKT in the long-run. A 1% increase in LFAT raises LSTMKT by a 0.12% at 1% level in the long-run.

Moreover, oil prices (LOILP) has a positive and significant impact on LSTMKT in the long-run. A 1% increase in LOILP causes LSTMKT to rise by a 0.05% at 10% level in the long-run. Furthermore, exchange rate (LEXR) has a positive and significant effect on stock market in the long-run. A 1% increase in LEXR (exchange rate depreciation) leads to a 0.68% increase in LSTMKT at 5% level in the long-run. In the short-run, COVID-19 appears not to have a significant effect on the stock market. The coefficient of the error correction term lagged by one period is correctly signed and statistically significant at 1% level.

5.4. Results of Diagnostic Tests
The diagnostic tests results are presented in Table 4. The Breusch-Godfrey serial-correlation test result demonstrates that the test statistic is 1.0579 and its probability is 0.5892. In addition, the Breusch-Pagan-Godfrey heteroscedasticity test result shows that the test statistic is 9.4072 and its probability is 0.2247. These findings suggest that the estimates are free from serial-correlation and heteroscedasticity problems.

5.5. Results of Stability Tests
The stability tests results in Figure 5 and Figure 6 indicate that the plots of CUSUM and CUSUMSQ fall within the lower and upper boundaries. These findings indicate that the coefficients of the regressors and the model are stable in the long-run.

| Variable | ADF | PP |
|----------|-----|----|
| LSTMKT   | Level | 1st diff. | Level | 1st diff. |
|          | -1.6450 | -14.8173*** | -1.7256 | -15.0676*** |
| LCASE    | -8.9241*** | -11.8332*** | - | - |
| LFAT     | -7.1369*** | -7.6452*** | - | - |
| LOILP    | -1.2430 | -10.7073*** | -1.2971 | -10.7074*** |
| LEXR     | -0.5358 | -10.7238*** | -0.5358 | -10.7238*** |

Note:*** denotes statistical significance at 1%.

Table 1. Results of Unit Root Tests

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How have COVID-19 Confirmed Cases and Deaths Affected Stock Markets? Evidence from Nigeria

Table 2. Result of Bounds Test to Cointegration

| Critical values bounds |
|------------------------|
| F-stat. =4.3702***     |
|                        |
| 10%                    |
| 2.2                    |
| 3.09                   |
| 5%                     |
| 2.56                   |
| 3.49                   |
| 2.50%                  |
| 2.88                   |
| 3.87                   |
| 1%                     |
| 3.29                   |
| 4.37                   |

Note: *** denotes statistical significance at 1%. L denotes logarithm.

Table 3. Results of ARDL model

| Long-run model | Short-run model |
|----------------|-----------------|
| Regressor      | Coefficient     | Regressor     | Coefficient     |
|                | ( )             |              | ( )             |
| C              | 11.4509***      | ΔLSTMKT-1     | -0.2256***      |
|                | (0.8199)        |              | (0.0825)        |
|                | [13.9646]       | [-2.7339]     |
| LCASE          | -0.1119***      | ΔLFAT         | 0.0117          |
|                | (0.0364)        |              | (0.0105)        |
|                | [-3.0664]       | [1.1141]      |
| LFAT           | 0.1223***       | ECT-1         | -0.2757***      |
|                | (0.0326)        |              | (0.0526)        |
|                | [3.7436]        | [-5.2389]     |
| LOILP          | 0.4547*         |               |                 |
|                | (0.0240)        |              |                 |
|                | [1.8879]        |               |                 |
| LEXR           | 0.6800**        |               |                 |
|                | (0.3327)        |              |                 |
|                | [2.0439]        |               |                 |
| R²             | 0.9324          |               |                 |

Note: ***, **, and * denotes statistical significance at 1%, 5% and 10%, respectively. L denotes logarithm. Values in ( ) and [ ] are standard errors and t-statistics, respectively.
5.6. Results of Alternative Estimation Methods (FMOLS, DOLS and CCR Models)

The results of FMOLS, DOLS and CCR estimations (Table 5) reveal that COVID-19 proxied by the number of cases of infection (LCASE) has a negative and significant effect on stock market performance (LSTMKT). A 1% increase in LCASE reduces LSTMKT by 0.071%, 0.077% and 0.070% at 1% level in FMOLS, DOLS and CCR models, respectively. The results also indicate that a 1% increase in COVID-19 proxied by the number deaths (LFAT) raises LSTMKT by 0.087%, 0.094% and 0.085% at 1% level in FMOLS, DOLS and CCR models, respectively. Also, an increase in oil prices (LOILP) by a 1% raises LSTMKT by 0.040%, 0.052% and 0.039%, at 1% level in FMOLS, DOLS and CCR models, respectively. In addition, a 1% increase in the exchange rate (exchange rate depreciation) raises stock market performance by a 0.507%, 0.552% and 0.495% at 1% level in FMOLS, DOLS and CCR models, respectively.

5.7. Results of Estimation of Stock Market Sub-sectors (Consumer Goods and Healthcare)

We extended our analysis to see how individual sub-sector of the stock market has responded to the COVID-19 pandemic. The sub-sectors are consumer goods, oil and gas, financial services, healthcare, industry, and information and communication technology. However, only the results of consumer goods and healthcare sub-sectors are reported here. Other sub-sectors (results) were left out because the coefficients were mostly insignificant and many of them showed absence of cointegration between the variables including failing diagnostic tests.

5.8. Results of Bounds Test to Cointegration (Consumers Goods and Healthcare Sub-sectors)

The bounds test to cointegration results in Table 6 reveal that the individual computed F-statistic (6.1719 for consumer goods sub-sector) and (4.6885 for healthcare sub-sector) is larger than the upper critical bound value (i.e. 4.37) at 1% level.

These indicate a rejection of the null hypothesis of no cointegration, and implies the existence of a long-run relationship between the variables both in the consumer goods sub-sector and healthcare sub-sector.

5.9. Results of ARDL Models (Consumer Goods and Healthcare Sub-sectors)

The results of estimation of the selected ARDL model (consumer goods sub-sector) are shown in Table 7. The optimal lag length selected by the AIC is: 4, 2, 0, 0, 0. The results illustrate that LCASE is negatively and significantly related to LSTMKT in the long-run. An increase in LCASE by 1% lowers LSTMKT by 0.22% at 1% level in the long-run. On the other hand, LFAT has a positive and significant impact on LSTMKT in the long-run. An increase in LFAT by 1% raises LSTMKT by 0.23% at 1% level in the long-run.

In addition, LOILP is positively and significantly related to LSTMKT in the long-run. A 1% increase in LOILP leads to a 0.14% increase in LSTMKT at 5% level in the long-run. Also, LEXR has positive and significant relationship with LSTMKT in the long-run. An increase in LEXR by 1% raises LSTMKT by 1.14% at 10% level in the long-run. The short-run results demonstrate that LCASE has a negative and significant effect on LSTMKT in the short-run. A 1% increase in LCASE leads to a reduction in LSTMKT by a 0.04% at 1% level in the short-run.

| Test Statistic       | Results                  |
|----------------------|--------------------------|
| Serial Correlation: χ² | 1.0579[0.5892]           |
| Heteroscedasticity: χ² | 9.4072[0.2247]          |

Note: Probability values are in parenthesis.
Figure 5. Plots of cumulative sum of recursive residuals.

Figure 6. Plots of cumulative sum of squares of recursive residuals.
### Table 5. Results of Diagnostic Tests

| Regressor | FMOLS       | DOLS       | CCR       |
|-----------|-------------|------------|-----------|
|           | Coefficient | Coefficient| Coefficient |
| C         | 11.8195***  | 11.6866*** | 11.8485*** |
|           | (0.4705)    | (0.5097)   | (0.4616)   |
|           | [25.1165]   | [22.9273]  | [25.6674]  |
| LCASE     | -0.0714***  | -0.0765*** | -0.0691*** |
|           | (0.0184)    | (0.0207)   | (0.0167)   |
|           | [-3.8765]   | [-3.6922]  | [-4.1362]  |
| LFAT      | 0.0873***   | 0.0937***  | 0.0853***  |
|           | (0.0167)    | (0.0185)   | (0.0154)   |
|           | [5.2162]    | [5.0518]   | [5.5081]   |
| LOILP     | 0.0397***   | 0.0520***  | 0.0385***  |
|           | (0.0135)    | (0.0172)   | (0.0125)   |
|           | [2.9236]    | [2.7117]   | [3.0684]   |
| LEXR      | 0.5070***   | 0.5521***  | 0.4945***  |
|           | (0.1893)    | (0.2036)   | (0.1850)   |
|           | [2.6777]    | [2.7117]   | [2.6718]   |
| R2        | 0.8467      | 0.8912     | 0.8471     |

Note: *** denotes statistical significance at 1%. L denotes logarithm. Values in ( ) and [ ] are standard errors and t-statistics, respectively.

### Table 6. Result of Bounds Test to Cointegration (Consumer Goods and Healthcare Sub-sectors)

|                         | Consumer goods sub-sector | Healthcare sub-sector |
|-------------------------|---------------------------|-----------------------|
|                         | Critical values bounds    | Critical values bounds |
|                         | F-stat. = 6.1719***       | F-stat. = 4.6885***   |
|                         | I(0)  | I(1)  | I(0)  | I(1)  |
| 10%                     | 2.2   | 3.09  | 2.2   | 3.09  |
| 5%                      | 2.56  | 3.49  | 2.56  | 3.49  |
| 2.50%                   | 2.88  | 3.87  | 2.88  | 3.87  |
| 1%                      | 3.29  | 4.37  | 3.29  | 4.37  |

Note: *** denotes statistical significance at 1%. L denotes logarithm.
Table 7. Results of ARDL Models (Consumer Goods and Healthcare Sub-sectors)

| Regressor | Consumer goods sub-sector | Healthcare sub-sector |
|-----------|---------------------------|-----------------------|
|           | Long-run model            | Long-run model        |
| C         | 9.4281*** (1.5372)        | C                     | 3.1983 (3.6521) |
|           | [6.1331]                  |                       | [0.8757]       |
| LCASE     | -0.2230*** (0.0704)      | LCASE                 | -0.5067*** (0.1807) |
|           | [-3.1667]                 |                       | [-2.8031]      |
| LFAT      | 0.2333*** (0.0608)       | LFAT                  | 0.3871*** (0.1406) |
|           | [3.8362]                  |                       | [2.7516]       |
| LOILP     | 0.1362** (0.0531)        | LOILP                 | 0.1826 (0.1161) |
|           | [2.5649]                  |                       | [1.5722]       |
| LEXR      | 1.1403* (0.6237)         | LEXR                  | 3.1767** (1.5090) |
|           | [1.8281]                  |                       | [2.1051]       |

Note: ***, **, and * denotes statistical significance at 1%, 5% and 10%, respectively. L denotes logarithm. Values in ( ) and [ ] are standard errors and t-statistics, respectively.

The results of estimation of the selected model (healthcare sub-sector in Table 7) show that the optimal lag length selected is: 1,0,4,0,0. The results reveal that a 1% increase in LCASE leads to a 0.51% decrease in LSTMKT at 1% level in the long-run. However, LFAT is positively and significantly related to LSTMKT in the long-run. A 1% increase in LFAT leads to a 0.39% increase in LSTMKT at 1% level in the long-run. In addition, LEXR has a positive and significant effect on LSTMKT in the long-run. An increase in LEXR by a 1% raises LSTMKT by a 3.18% at 5% level in the long-run. Furthermore, the short-run results illustrate that LFAT has a negative and significant effect on LSTMKT. A 1% increase in LFAT reduces LSTMKT by a 0.04% at 5% level in the short-run. The coefficient of ECT-1 is correctly signed and statistically significant at 1% level in all the results.

5.10. Results of Diagnostic Tests (Consumer Goods and Healthcare Sub-sectors)

The results of diagnostic tests (for consumer goods and healthcare sub-sectors) are reported in Table 8. In the case of consumer goods sub-sector, the Breusch-Godfrey serial-correlation test result illustrates that the test statistic is 2.0488 with a probability of 0.3590. Also, the Breusch-Pagan-Godfrey heteroscedasticity test result shows that the test statistic is 9.4099 with a probability of 0.4937. For the healthcare sub-sector, the Breusch-Godfrey serial-correlation test result illustrates that the test statistic is 0.1382 with a probability of 0.9332. Also, the Breusch-Pagan-Godfrey heteroscedasticity test result shows that the test statistic is 10.6188 with a probability of 0.3027. Thus, these findings reveal that the estimates do not have serial-correlation and heteroscedasticity problems.
Table 7. Results of ARDL Models (Consumer Goods and Healthcare Sub-sectors) (Continued)

| Consumer goods sub-sector | Healthcare sub-sector |
|---------------------------|-----------------------|
| **Regressor**             | **Coefficient**       | **Regressor** | **Coefficient** |
| ΔLSTMKT<sub>1</sub>       | 0.0679                | ΔLFAT        | -0.0364**       |
| (0.0799)                  |                        | (0.0166)     | [-2.1844]       |
| [0.8499]                  |                        | [-2.1844]    |                   |
| ΔLSTMKT<sub>2</sub>       | 0.1615**              | ΔLFAT<sub>2</sub> | -0.0499**       |
| (0.0787)                  |                        | (0.0191)     | [-2.6068]       |
| [2.0506]                  |                        | [-2.6068]    |                   |
| ΔLSTMKT<sub>3</sub>       | 0.1851**              | ΔLFAT<sub>3</sub> | -0.0506***      |
| (0.0786)                  |                        | (0.0179)     | [-2.8254]       |
| [2.3558]                  |                        | [-2.8254]    |                   |
| ΔCASE                    | -0.0388***            | ΔLFAT<sub>3</sub> | -0.0506***      |
| (0.0145)                  |                        | (0.0183)     | [-2.7698]       |
| [-2.6641]                 |                        | [-2.7698]    |                   |
| ΔCASE<sub>1</sub>         | 0.0423***             | ECT<sub>1</sub> | -0.0835***      |
| (0.0136)                  |                        | (0.0153)     | [-5.4311]       |
| [3.1065]                  |                        | [-5.4311]    |                   |
| ECT<sub>1</sub>           | -0.1572***            |               |                   |
| (0.0252)                  |                        |               |                   |
| [-6.2327]                 |                        |               |                   |
| R<sup>2</sup>            | 0.9790                | R<sup>2</sup> | 0.9738          |

Note: ***, **, and * denotes statistical significance at 1%, 5% and 10%, respectively. L denotes logarithm. Values in ( ) and [ ] are standard errors and t-statistics, respectively.

Table 8. Results of Diagnostic Tests (Consumer Goods and Healthcare Sub-sectors)

| Consumer goods sub-sector | Healthcare sub-sector |
|---------------------------|-----------------------|
| **Test statistic**        | **Results**           | **Test statistic** | **Results** |
| Serial Correlation: χ<sup>2</sup> | 2.0488[0.3590] | Serial Correlation: χ<sup>2</sup> | 0.1382[0.9332] |
| Heteroscedasticity: χ<sup>2</sup> | 9.4099[0.4937] | Heteroscedasticity: χ<sup>2</sup> | 10.6188[0.3027] |

Note: Probability values are in parenthesis.
Figure 7. Plots of cumulative sum of recursive residuals (consumer goods sub-sector).

Figure 8. Plots of cumulative sum of squares of recursive residuals (consumer goods sub-sector).
Figure 9. Plots of cumulative sum of recursive residuals (healthcare sub-sector).

Figure 10. Plots of cumulative sum of squares of recursive residuals (healthcare sub-sector).
Table 9. Results of FMOLS, DOLS and CCR Models (Consumer Goods and Healthcare Sub-sectors)

| Regressor | Consumer goods sub-sector | Healthcare sub-sector |
|-----------|---------------------------|-----------------------|
|           | FMOLS | DOLS | CCR | FMOLS | DOLS | CCR |
| C         | 11.4180*** | 11.4098*** | 11.4582*** | 7.2524*** | 6.6408*** | 7.4331*** |
|           | (0.8001) | (0.9129) | (0.7778) | (2.0086) | (2.2398) | (1.9849) |
|           | [14.2700] | [12.4979] | [14.7314] | [3.6106] | [2.9649] | [3.7447] |
| LCASE     | -0.1285*** | -0.1342*** | -0.1251*** | -0.1916** | -0.2093** | -0.1787** |
|           | (0.0315) | (0.0375) | (0.0280) | (0.0792) | (0.0921) | (0.0737) |
|           | [-4.0709] | [-3.5760] | [-4.4625] | [-2.4184] | [-2.2723] | [-2.4247] |
| LFAT      | 0.1615*** | 0.1689*** | 0.1586*** | 0.2154*** | 0.2296*** | 0.2058*** |
|           | (0.0286) | (0.0335) | (0.0260) | (0.0718) | (0.0823) | (0.0684) |
|           | [5.6421] | [5.0317] | [6.0808] | [2.9973] | [2.7876] | [3.0086] |
| LOILP     | 0.0382  | 0.0384  | 0.0366*  | 0.1150*  | 0.1457*  | 0.1049*  |
|           | (0.0233) | (0.0314) | (0.0212) | (0.0585) | (0.0771) | (0.0538) |
|           | [1.6411] | [1.2227] | [1.7249] | [1.9649] | [1.8893] | [1.9493] |
| LEXR      | 0.3417  | 0.3464  | 0.3244  | 1.2662  | 1.4995* | 1.1902  |
|           | (0.3219) | (0.3648) | (0.3117) | (0.8083) | (0.8950) | (0.7968) |
|           | [1.0612] | [0.9495] | [1.0407] | [1.5664] | [1.6752] | [1.4936] |
| R2        | 0.8375  | 0.9015  | 0.8381  | 0.6910  | 0.7188  | 0.6926  |

Note: ***, **, and * denotes statistical significance at 1%, 5% and 10%, respectively. L denotes logarithm. Values in ( ) and [ ] are standard errors and t-statistics, respectively.

5.11. Results of Stability Tests
The stability tests results (Figures 7 and 9) indicate that the plots of CUSUM fall within the lower and upper boundaries. Although, the plots of the CUSUMSQ (Figures 8 and 10) breaks outside the boundaries briefly, it soon fall back within it.

5.12. Results of Alternative Estimation Methods (Consumer Goods and Healthcare Sub-sectors)
The results of FMOLS, DOLS and CCR for consumer goods and healthcare sub-sectors are reported in Table 9. For the consumer goods sub-sector, the results indicate that LCASE has a negative and significant impact on LSTMKT. A 1% increase in LCASE reduces LST-
The negative impact of the pandemic on stock market suggests that rising number of confirmed cases in Nigeria creates high uncertainty in the economy with its consequences on business survival, investment spending, productivity and efficiency of labor, demand for goods and services, as well as overall economic activity. All of these lowered business sales, revenue and profits, and so on. The poor performance of firms is reflected in declining values of stocks/shares which forces holders to sell-off their stocks/shares to avoid further loss of their investments, leading a decline in stock market indices or performance. However, the positive relationship between COVID-19 deaths and stock market may not be unconnected with the low number of deaths relative to the number of confirmed cases. The low fatality rate might have lowered the uncertainty/risk associated with investment, leading to higher stock market performance.

The positive impact of oil prices on stock market is consistent with previous studies (see Narayan & Narayan, 2010; Narayan et al., 2020; Rafailidis & Karakilidis, 2014; Salisu et al., 2020; Salisu & Isah, 2017; Topcu & Gulal, 2020). For example, the study by Narayan et al. (2020) suggests that oil prices do have a positive relationship with stock market. This finding implies that higher oil prices raise the earnings of oil producing and exporting firms including dividends payments, leading to higher stock prices and market performance.

Also, the positive relationship between exchange rate and stock market lends support to the outcome of prior studies (see Abdalla & Murinde, 1997; Alagidede et al., 2011; Ashraf, 2020; Bahmani-Oskooee & Sohrabian, 1992; Megaravalli & Sampagnaro, 2018; Tian & Ma, 2010; Zarei et al., 2019). Thus, exchange rate depreciation increases the competitiveness of Nigeria’s firms, and raises their exports and earnings. Consequently, the prices of their stocks rise, leading to an improvement in stock market performance.

6. Conclusion
This study investigates the impact of the COVID-19 pandemic on Nigeria’s stock market using daily data from 23rd March to 11th September 2020. The bounds test to cointegration results reveal that a long-run relationship exists between COVID-19 and stock market in Nigeria. The results of estimation using the ARDL, FMOLS, DOLS and CCR estimators indicate that COVID-19 (proxied by the number of confirmed cases of infection) has a negative relationship with stock market. This finding implies that higher oil prices raise the earnings of oil producing and exporting firms including dividends payments, leading to higher stock prices and market performance.

The negative impact of the pandemic on stock market suggests that rising number of confirmed cases in Nigeria creates high uncertainty in the economy with its consequences on business survival, investment spending, productivity and efficiency of labor, demand for goods and services, as well as overall economic activity. All of these lowered business sales, revenue and profits, and so on. The poor performance of firms is reflected in declining values of stocks/shares which forces holders to sell-off their stocks/shares to avoid further loss of their investments, leading a decline in stock market indices or performance. However, the positive relationship between COVID-19 deaths and stock market may not be unconnected with the low number of deaths relative to the number of confirmed cases. The low fatality rate might have lowered the uncertainty/risk associated with investment, leading to higher stock market performance.

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Based on these empirical findings, this study recommends policies to combat the spread of the virus to reduce its adverse impact on the Nigeria’s stock market in the long-run. To this end, government is advised to invest more in the health sector via upgrading the healthcare facilities which are currently in poor shape. In addition, more testing kits and personal protection equipments and related items should be procured to increase the capacity of the NCDC and health workers in discharging their duties as well as containing the spread of the virus. Furthermore, salaries and allowances of frontline workers should be paid as at when due to boost their morale/confidence in fighting this deadly virus, while on the job training should be emphasized to prepare them for future disease outbreak. Moreover, government should encourage Nigeria’s researchers/scientists to develop vaccine(s) so as to curb the spread of the virus via increased funding of research institutions and universities. Lastly, there should be an enlightenment or awareness campaign to educate Nigerians on the need to adhere strictly to preventive measures such as social distancing, partial lockdown or restrictions on travelling where necessary, cancellation or postponement of certain events and ban on social gatherings of persons above certain numbers.

References
Abdalla, I. S. A., & Murinde, V. (1997). Exchange rate and stock price interactions in emerging financial markets: evidence on India, Korea, Pakistan and the Philippines. Applied Financial Economics, 7(1), 25-35. https://doi.org/10.1080/0960310973338286
Abu, N., & Gamal, A. A. M. (2020). An empirical investigation of the twin deficits hypothesis in Nigeria: Evidence from cointegration techniques. Contemporary Economics, 14(3), 285-305. https://doi.org/10.5709/ce.1897-9254.405
Abu, N., & Staniewski, M. W. (2019). Determinants of corruption in Nigeria: Evidence from various estimation techniques. Economic Research-Ekonomska Istraživanja, 32(1), 3052-3076. https://doi.org/10.1080/1331677X.2019.1655467
AlAli, M. S. (2020). Safe haven assets: Are they still safe during COVID-19 pandemic period? European Journal of Economic and Financial Research, 4(1), 91-98. https://doi.org/10.46827/ejefr.v0i0.795
Alam, M. N., Alam, M. S., & Chavaliki, K. (2020). Stock market response during COVID-19 lockdown period in India: An event study. Journal of Asian Finance, Economics and Business, 7(7), 131-137. https://doi.org/10.13106/jafeb.2020.vol7.no7.131
Alagidede, P., Panagiotidis, P., & Zhang, X. (2011). Causal relationship between stock prices and exchange rates. Journal of International Trade & Economic Development, 20(1), 67-86. https://doi.org/10.1080/09638199.2011.538186
Al-Awadhi, A. M., Al-Saifi, K., Al-Awadhi, A., & Alhamadi, S. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. Journal of Behavioral and Experimental Finance, 100326. https://doi.org/10.1016/j.jbef.2020.100326
Alfaro, L., Charī, A., Greenland, A., Schott, & P. K. (2020). Aggregate and firm-level stock returns during pandemics, in real time (Working Paper No. 26950). National Bureau of Economic Research. https://doi.org/10.3386/w26950
Alhassan, A. L., & Fiador, V. (2014). Insurance-growth nexus in Ghana: An autoregressive distributed lag bounds cointegration approach. Review of Development Finance, 4(2), 83-96. https://doi.org/10.1016/j.rdf.2014.05.003
Anh, D. L. T., & Gan, C. (2020). The impact of the COVID-19 lockdown on stock market performance: Evidence from Vietnam. Journal of Economic Studies. https://doi.org/10.1108/JES-06-2020-0312
Apergis, N., & Apergis, E. (2020). The role of Covid-19 for Chinese stock returns: evidence from a GARCHX model. Asia-Pacific Journal of Accounting & Economics, 1-9. https://doi.org/10.1080/160818625.2020.1816185
Ashraf, B. N. (2020). Stock markets’ reaction to COVID-19: cases or fatalities? Research in International Business and Finance, 54, 101249. https://doi.org/10.1016/j.ribaf.2020.101249
Bahmani-Oskooee, M., & Sohrabian, A. (1992). Stock prices and the effective exchange rate of the dollar. Applied Economics, 24(4), 459-464. https://doi.org/10.1080/00036849200000020
Baker, S. R., Bloom, N., Davis, S. J., Kost, K. J., Sammon, M. C., & Viratyosin, T. (2020a). The unprecedented stock market impact of COVID-19 (Working Paper No. 26945). National Bureau of Economic Research. https://doi.org/10.3386/w26945
Baker, S., Bloom, N., Davis, S., & Terry, S. J. (2020b). Covid-induced economic uncertainty (Working Paper No. 26983). National Bureau of Economic Research. https://doi.org/10.3386/w26983
Bash, A. (2020). International evidence of COVID-19 and stock market returns: An event study analysis. International Journal of Economics and Financial Issues, 10(4), 34-38. https://doi.org/10.32479/
Brahimbhatt, M., & Dutta, A. (2008). On SARS type economic effects during infectious disease outbreaks (World Bank Policy Research Working Paper No. 4466). The World Bank. https://doi.org/10.1596/1813-9450-4466

Cao, K. H., Li, Q., Liu, Y., & Woo, C. K. (2020). Covid-19’s adverse effects on a stock market index. Applied Economics Letters, 1-5. https://doi.org/10.1080/13504851.2020.1803481

Cepoi, C. O. (2020). Asymmetric dependence between stock market returns and news during COVID19 financial turmoil. Finance Research Letters. https://doi.org/10.1016/j.frl.2020.101658

Chia, R. C. J., Liew, V. K. S., & Rowland, R. (2020). Daily new Covid-19 cases, the movement control order, and Malaysian stock market returns. International Journal of Business and Society, 21(2), 553-568.

Corbet, S., Larkin, C., & Lucey, B. (2020). The contagion effects of the COVID-19 pandemic: Evidence from gold and cryptocurrencies. Finance Research Letters, 35. https://doi.org/10.1016/j.frl.2020.101554

Costa, N., Derumeaux, H., Rapp, T., Garnault, V., Ferlicot, L., Gillette, S., ... & Molinier, L. (2012). Methodological considerations in cost of illness studies on Alzheimer disease. Health Economics Review, 2(18), 1-12. https://doi.org/10.1186/2191-1991-2-18

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74(366a), 427-431. https://doi.org/10.1080/01621459.1979.10482531

Dornbusch, R., & Fischer, S. (1980). Exchange rates and the current account. American Economic Review, 70(5), 960-971.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation and testing. Econometrica, 55(2), 251-276.

Erdem, O. (2020). Freedom and stock market performance during Covid-19 outbreak. Finance Research Letters. https://doi.org/10.1016/j.frl.2020.101671

Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: a rapid assessment of COVID-19. Journal of Sustainable Tourism. https://doi.org/full/10.1080/09669582.2020.1758708

Greene, W. (2003). Econometric analysis. 5th ed. Prentice Hall.

Hansen, B. E., & Phillips, P. C. (1990). Estimation and inference in models of cointegration: A simulation study. Advances in Econometrics, 8, 225-248.

Hanspal, T., Weber, A., & Wohlfart, J. (2020). Income and wealth shocks and expectations during the COVID-19 pandemic (CESifo Working Paper No. 8244). CESifo.

He, P., Sun, Y., Zhang, Y., & Li, T. (2020). COVID-19’s Impact on stock prices across different sectors-An event study based on the Chinese stock market. Emerging Markets Finance and Trade, 56(10), 2198-2212. https://doi.org/10.1080/1540496X.2020.1785865

Huo, X., & Qiu, Z. (2020). How does China’s stock market react to the announcement of the COVID-19 pandemic lockdown?. Economic and Political Studies, 8(4), 436-461. https://doi.org/10.1080/20954816.2020.1780695

International Labour Organization (2020). Covid-19 and the world of work: Impact and policy responses. International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcom/documents/briefingnote/wcms_738753.pdf

İskenderoğlu, O., & Akdağ, S. (2020). Comparison of the effect of VIX fear index on stock exchange indices of developed and developing countries: The G20 case. South East European Journal of Economics and Business, 15(1), 105-121. https://doi.org/10.2478/jeb-2020-0009

Johansen, S. (1988). Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12(23), 231-254. https://doi.org/10.1016/0165-1889(88)90041-3

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. Econometrica, 59(6), 1551-1580. https://doi.org/10.2307/2938278

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration- With applications to the demand for money. Oxford Bulletin of Economics and Statistics, 52(2), 169-210.

Jorda, Ō., Singh, S. R., & Taylor, A. M. (2020). Longer-run economic consequences of pandemics (Working paper No. 26934). National Bureau of Economic Studies.
Research
J. P. Morgan (2020, March 27). Fallout from COVID-19: Global recession, zero interest rates and emergency policy actions. https://www.jpmorgan.com/global/research/fallout-from-covid19
Liu, H., Wang, Y., He, D., & Wang, C. (2020a). Short term response of Chinese stock markets to the outbreak of COVID-19. *Applied Economics*, 1-14, 5859-5872. https://doi.org/10.1080/00036846.2020.1776837
Liu, H-Y., Manzoor, A., Wang, C-Y., Zhang, L., & Manzoor, Z. (2020b). The COVID-19 outbreak and affected countries stock markets response. *International Journal of Environmental Research and Public Health*, 17(2800), 1-19. https://doi.org/10.3390/ijerph17082800
Maliszewska, M., Mattoo, A., & van der Mensbrugghe, D. (2020). The potential impact of COVID-19 on GDP and trade: A preliminary assessment (World Bank Policy Research Working Paper No. 9211). SSRN Electronic Journal. https://ssrn.com/abstract=3572311
Mandel, A., & Veetil, V. (2020). The economic cost of COVID lockdowns: An out-of-equilibrium analysis. *Economics of Disasters and Climate Change*. https://doi.org/10.1111/sed2.12385
Mazur, M., Dang, M., & Vega, M. (2020). COVID-19 and the march 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters*, 101690. https://doi.org/10.1016/j.frl.2020.101690
McKibbin, W., & Fernando, R. (2020). The global macroeconomic impacts of COVID-19: Seven scenarios. *Asian Economic Papers*, 1-55. https://doi.org/10.1162/aeep_a_00796
Megaravalli, A. V., & Sampagnaro, G. (2018) Macroeconomic indicators and their impact on stock markets in ASEAN 3: A pooled mean group approach. *Cogent Economics & Finance*, 6(1), 1-14. https://doi.org/10.1080/23322039.2018.1432450
Mishra, A. K., Rath, B. N., & Dash, A. K. (2020). Does the Indian financial market nosedive because of the COVID-19 outbreak, in comparison to after demonetisation and the GST? *Emerging Markets Finance and Trade*, 56(10), 2162-2180. https://doi.org/10.1080/1540496X.2020.1785425
Mohan, R. (2006). Avian influenza pandemic: Preparedness within the financial sector. *Reserve Bank of India Bulletin*, 963-969.
Monthalo, J. G. (1995). Comparing cointegrating regression estimators: Some additional Monte Carlo results. *Economics Letters*, 48, 229-234. https://doi.org/10.1016/0165-1765(94)00632-C
Naidenova, I., Parshakov, P., & Shakina, E. (2020). Idiosyncratic and systematic shocks of COVID-19 pandemic on financial markets. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3574774
Narayan, P. K., & Narayan, S. (2010). Modeling the impact oil prices on Vietnam's stock prices. *Applied Energy*, 87(1), 356-361. https://doi.org/10.1016/j.apenergy.2009.05.037
Narayan, S., & Narayan, P. K. (2004). Determinants of demand for Fiji's exports: an empirical investigation. *Developing Economies*, 42(1), 95-112. https://doi.org/10.1111/j.1746-1049.2004.tb01017.x
Narayan, P. K., Phan, D. H. B., & Liu, G. (2020). COVID-19 lockdowns, stimulus packages, travel bans, and stock returns. *Finance Research Letters*, 101732. https://doi.org/10.1016/j.frl.2020.101732
Nigeria Centre for Disease Control (2020). An update of COVID-19 outbreak in Nigeria. Nigeria Centre for Disease Control. https://nccc.gov.ng/diseases/sitrepss/7cat%3Dname%3DAn%20update%20of%20COVID-19%20outbreak%20in%20Nigeria
The Nigerian Stock Exchange (2020). Weekly market reports. http://www.nse.com.ng/market-data/other-market-information/weekly-report
Nurdeen, A. (2009). Does stock market development raise economic growth? Evidence from Nigeria. *Review of Finance and Banking*, 1(1), 015-026.
Organization for Economic Cooperation and Development (2020). SME policy responses. https://read.oecdilibrary.org/view/?ref=119_119680-di6h3qgi4x&title=Covid-19_SME_Policy_Responses. Accessed 6 April 2020
Ozili, P., & Arun, T. (2020). Spillover of COVID-19: Impact on the global economy. *MPRA Paper*, 99850. https://doi.org/10.2139/ssrn.3562570
Park, J. Y. (1992). Canonical cointegrating regressions. *Econometrica*, 60(1), 119-143. https://doi.org/10.1111/j.1468-0262.1992.tb04378.x
Pesarani, M. H., & Shin, Y. (1999). An autoregressive distributed lag modeling approach to cointegration analysis. In S. Strom (Ed.), *Econometrics and economic theory in the 20th century* (pp. 371-413). The Ragnar Frisch centennial symposium econometric society monographs (31). Cambridge University Press.
Pesarani, M. H., Shin, Y., & Smith, R. (2001). Bound testing approaches to the analysis of level relationship. *Journal of Applied Econometrics*, 16(3), 289-326. https://doi.org/10.1002/jea.616
Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346. https://doi.org/10.1093/biomet/75.2.335
PwC (2020). COVID-19: Economic implication and policy responses. PwC Nigeria’s Webinar. https://www.pwc.com/ng/en/assets/pdf/Covid-19-economic-implications-webinar-presentation.pdf

Rafailidis, P., & Katrakilidis, C. (2014). The relationship between oil prices and stock prices: A nonlinear asymmetric cointegration approach. *Applied Financial Economics, 24*(12), 793-800. https://doi.org/10.1080/09603107.2014.907476

Saikkonen, P. (1992). Estimation and testing of cointegrated systems by an autoregressive approximation. *Econometric Theory, 8*(1), 1-27.

Salisu, A. A., Ebuh, G. U., & Usman, N. (2020). Revisiting oil-stock nexus during COVID-19 pandemic: Some preliminary results. *International Review of Economics & Finance, 69*, 280-294. https://doi.org/10.1016/j.iref.2020.06.023

Salisu, A. A., & Isah, K. O. (2017). Revisiting the oil price and stock market nexus: A nonlinear panel ardl approach. *Economic Modelling, 66*, 258-271. https://doi.org/10.1016/j.econmod.2017.07.010

Salisu, A. A., & Vo, X. V. (2020). Predicting stock returns in the presence of COVID-19 pandemic: The role of health news. *International Review of Financial Analysis, 71*, 101546. https://doi.org/10.1016/j.irfa.2020.101546

Şenol, Z., & Zeren, F. (2020). Coronavirus (COVID-19) and stock markets: The effects of the pandemic on the global economy. *Eurasian Journal of Researches in Social and Economics, 7*(4), 1-16.

Singh, T. (2015). Trade openness and economic growth in Canada: An evidence from time-series tests. *Global Economy Journal, 15*(3), 361-407. https://doi.org/10.1515/gej-2014-0009

Stock, J. H., & Watson, M. W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica, 61*(4), 783-820. https://doi.org/10.2307/2951763

Tang, C. F., & Lean, H. H. (2007). Is Phillips curve stable in Malaysia? New empirical evidence. *Malaysian Journal of Economic Studies, 44*(2), 95-105.

Tian, G. G., & Ma, S. (2010). The relationship between stock returns and the foreign exchange rate: the ARDL approach. *Journal of the Asia Pacific Economy, 15*(4), 490-508.https://doi.org/10.1080/13547860.2010.516171

Topçu, M., & Gulal, O. S. (2020). The impact of COVID-19 on emerging stock markets. *Finance Research Letters, 101*691. https://doi.org/10.1016/j.frl.2020.101691

United Nations Conference on Trade and Development (2020). The Covid-19 shock to developing countries: Towards a “whatever it takes” programme for the two-thirds of the world’s population being left behind. https://unctad.org/en/PublicationsLibrary/gds_tdr2019_covid2_en.pdf. Accessed 10 May 2020

Williams, C. C., & Kayaoglu, A. (2020). The coronavirus pandemic and Europe’s undeclared economy: Impacts and a policy proposal. *South East European Journal of Economics and Business, 15*(1), 80-92. https://doi.org/10.2478/jeb-2020-0007

Zarei, A., Ariff, M., & Bhatti, M. I. (2019). The impact of exchange rates on stock market returns: new evidence from seven free-floating currencies. *European Journal of Finance, 1-12*. https://doi.org/10.1080/1351847X.2019.1589550

Zeren, F., & Hizarci, A. E. (2020). The impact of COVID-19 coronavirus on stock markets: Evidence from selected countries. *Bulletin of Accounting and Finance Reviews, 3*(1), 78-84. https://doi.org/10.32951/mufider.706159

Zhang, D., Hu, M., & Ji, Q. (2020). Financial markets under the global pandemic of COVID-19. *Finance Research Letters, 101*528.