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EFFECT OF COVID-19 PANDEMIC ON FOREIGN EXCHANGE RATE VOLATILITY: THE NIGERIA EXPERIENCE

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ABSTRACT

The outburst of the Covid-19 brought anxiety that led to social distancing, stay at home, restriction in traveling locally and internationally, and finally, the financial instability globally as many economic activities shut down. Consequently, the study examined the effect of the coronavirus pandemic on exchange rate volatility from February 29, 2020, to March 31, 2021. The study utilized two-time series data which were sourced from daily reports on covid-19 from the Nigerian Centre for Disease Control (NCDC) and daily exchange rates US$/Nigerian₦ from the Central Bank of Nigeria (CBN) statistical bulletin. The study used Error Correction Model (ECM) to analyze the data. The bound test was used in the survey to establish a level of association between the independent variables and the regressor set. The findings revealed that daily reported COVID-19 instances, daily death cases, and cumulative death cases had a positive effect on Nigerian exchange rate volatility. Conversely, confirmed cumulative coronavirus cases do not impact the exchange rate in Nigeria in the short run. Coronavirus significantly affected all macroeconomic indices, including the exchange rate. The study will be helpful to the government and its agencies in the determination of the palliatives for the needy citizens. It will also help the policy makers to develop strategies that can stabilize the economy and health sector to reduce the effect of the pandemic on the citizenry

Keyword: COVID-19 Pandemic, Foreign Exchange Rate Volatility, Error Correction Model

JEL Code: I15, F31, C22

1. INTRODUCTION

The financial crisis caused by the pandemic in 2020 revealed certain signals on the global economy, including a fall in Gross Domestic Product (GDP), an increase in unemployment rates, and deficit numbers from the world's top thrifts (World Health Organisation, 2020). It also fine-tunes volatility in the foreign exchange market. The

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major losers in this regard are emerging economies, which must spend reserves to protect against currency devaluation at the most inconvenient periods (W.H.O, 2020). The pandemic outbreak was triggered by the economic crisis, which was exacerbated by the lockdown and social isolation measures. The significant devaluation of emerging market currencies, on the other hand, had nothing to do with the strengths and imbalances of each country's balance of payments, particularly in Africa. The trickle in exchange rates for developing market currencies was caused by COVID-19's dual tremor: an unprecedented decrease in economic activity combined with an episode of global risk aversion equivalent in severity to the Lehman crisis of 2008-2009. These two factors contributed to an increase in the developing risk premium and, as a result, a decrease in current account financing (portfolio flows and foreign credit lines), which has become more volatile.

Among emerging market countries, Verduzco, Santiago, García, Correia, Carrascal, Castro, García, Carrasco, Calle, & Sabido, (2020) identified four separate groups: '(i) those with current account residues and, as a result, currency steadiness; (ii) those with a deficit and steady funding; (iii) those with a deficit and flow-dependent finance; and (iv) those with unmaintainable current account overages'. Countries with a high current account excess, such as China (the world's largest autonomous creditor) and the oil-producing countries, are included in the first group of exporters of savings. The two middle assemblages are made up of nations that have current account shortfalls that are manageable in the long run (with either stable or flow-dependent funding). In addition to rising Europe, non-oil exporting Asian nations (such as Indonesia and the Philippines) and popular Latin American nations such as Mexico, Brazil, Colombia, and Peru are included in the scope of the study. However, the spectrum is comprised of nations that have large and unsustainable current account deficits, which are typically the result of structural factors (large structural deficits), low productivity, and a reliance on external savings, particularly portfolio and credit flows, as well as other factors. Countries such as Turkey, Argentina, Nigeria, and South Africa are included in this category because they are experiencing balance of payments difficulties and severe changes in their operations or exchange rates from 2019.

The volatility in exchange rates has been worsened in recent times by the low-interest-rate policies implemented by central banks throughout the world. Under normal circumstances, national economies respond to market volatility by lowering interest rates to stimulate economic activity and restore stability. The ability to borrow money is no longer available in a world with zero interest rates, and currency takes on this function, resulting in increased exchange rate instability.

Table: 1.1 COVID-19 cases and deaths among Ten hardest-hit countries worldwide as of December 12, 2021

S/N	Countries	Total Number Infected	Daily Average Number of New Cases in the last 7 days	Total Number of Deaths	Change in Average new Deaths last 7 days vs previous 7 days
1.	United States	49,387,208	120,000	791,514	1,600
2.	India	34,656,822	8,600	473,952	670

3.	Brazil	22,157,726	9,000	616,018	190
4.	Great Britain	10,620,535	48,000	146,281	120
5.	Russia	9,692,411	32,000	278,131	1,200
6.	Turkey	8,945,807	21,000	78,215	200
7.	France	8,091,667	45,000	120,883	110
8.	Germany	6,291,621	55,000	104,047	320
9.	Iran	6,141,335	3,400	130,356	75
10.	Argentina	5,346,242	2,200	116,703	16

Source: Adopted by the Author from Statista Corporate Solutions

Previous studies such as Albulescu (2020) (United States of America), Zhang Hu, and Ji (2020), Al-Awadhi, Alsaifi, Al-Awadhi, & Alhammadi (2020) (China), Akanni and Gabriel Nigeria) (2020) (Nigeria), and Onali (2020) (United States of America) contained a relatively high rate of confirmed cases. However, substantial research has been conducted to determine the origins and drivers of exchange rate volatility (Ben-Omrane & Savaşer, 2017; Choudhry and Hassan, 2015; Coudert, Couharde, & Mignon, 2011). Also, numerous studies have shed light on the economic and social consequences of the pandemic economic and social consequences. As the epidemic approached, a rapidly expanding body of study investigated how financial factors reacted to the event (Goodell 2020, Albulescu 2020, Zhang et al. 2020, Akanni et al. 2020, and Onali 2020). Benzid & Chebbi 2020, and Ali & Tokhy 2020) have investigated the relationship between the COVID-19 pandemic and exchange rate volatility, but no such study has been conducted in Nigeria to the best knowledge of the researcher. As a result, this is the first time that an investigation into the influence of the COVID-19 plague on exchange rate volatility will be conducted in Nigeria.

The primary objective of this study was to investigate the effect of COVID-19 pandemic variables on the volatility of Nigeria's exchange rate. Hence, the specific objectives are to:

- examine the effect of daily coronavirus incidences on the volatility of Nigeria's foreign exchange rate instability
- investigate the outcome of accumulated coronavirus incidences on the volatility of Nigeria's foreign exchange rate.
- analyze the influence of daily coronavirus mortality cases on Nigerian foreign exchange rate unpredictability.
- evaluate the influence of coronavirus cumulative death cases on foreign exchange rate instability in Nigeria

The rest of the paper shall be structured as follows: Section two discusses theoretical and empirical reviews of the past literature, Section three deals with methodology, Section four explains the results and discussion of findings; lastly, Section five deliberates on the conclusions
and recommendation.

1.1 Key Variable Trends of the Study

Figure No. 1 illustrates the trend in US$/Nigerian ₦ exchange rate movement in the period under study (29/2/2020 to 31/3/2021). It shows fluctuation, which ranges from ₦359.56/US$1 as of 25/3/2020 and peaked at ₦412.44/US$1 as of 22/2/2021 less than one-year interval. The statistics show an unbalanced trend for the period under review.

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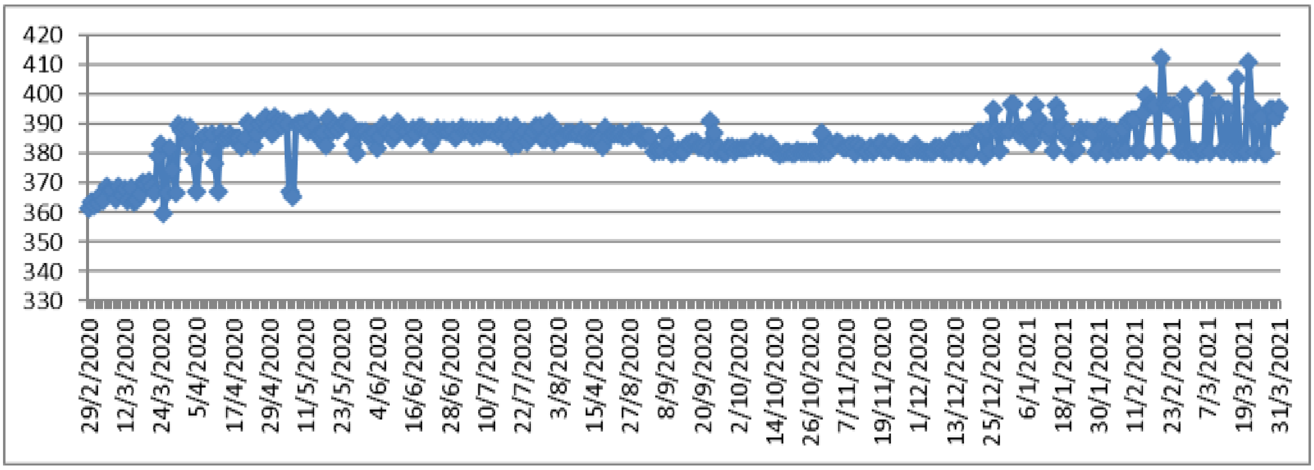

Fig. 1.1: Trend in daily US$ / ₦ Exchange rate movement from 29/2/2020 to 31/3/2021
Source: Own estimation using Central Bank of Nigeria (CBN) Statistical Bulletin

Figure No. 2 exemplifies the trend of daily COVID-19 confirmed cases that started with one (1) on 29/2/2020 rose to 779 occurrences on 27/6/2020. The figure plunged to zero (0) as of 21/7/2020. It rose to 604 cases on 23/7/2020, just within a space of two (2) days. On 17/10/2020, it dropped to 113 patients before it rose to 548 patients on 8/11/2020. The statistics showed a leap to 1145 cases on 17/12/2020, which was more than double of reported confirmed cases as of 8/11/2020. COVID-19 confirmed cases recorded an unprecedented increase to 2341 cases on 22/1/2021 before its gradual decline and nose-dived to 86 instances on 31/3/2021. The highest reported confirmed cases revealed a rise of 80% when compared with 1301 confirmed cases of 19/1/2021, a space of three (3) days interval

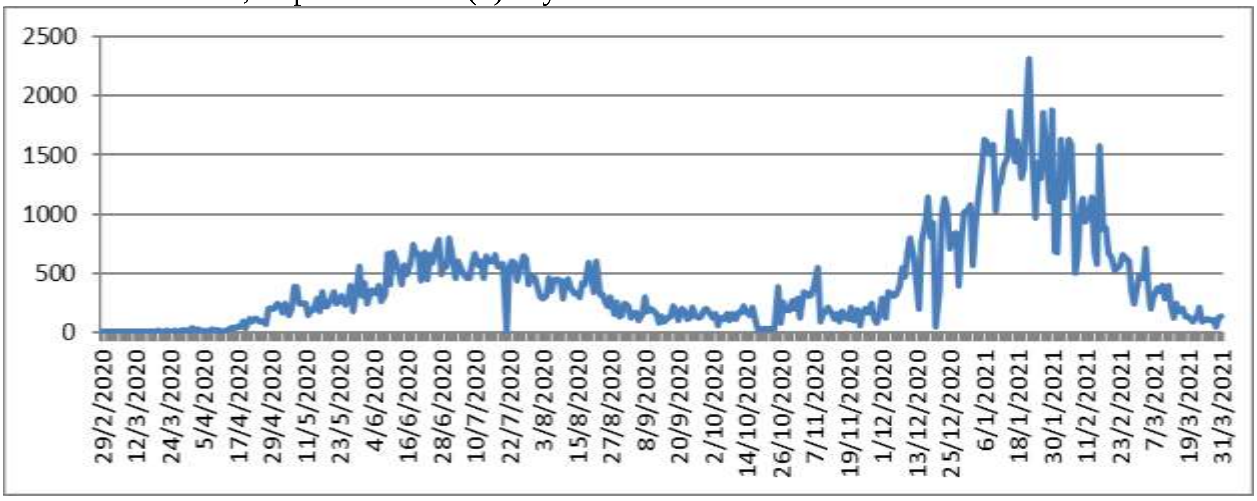

Fig. 1.2: Trend in daily confirmed cases in Nigeria from 29/2/2020 – 31/3/2021
Source: Own estimation using NCDC data

Figure No. 3 illustrates trends in cumulative coronavirus confirmed cases for the period under review from 29/2/2020 to 31/3/2021. It is the accumulation of daily established instances that increases overtime the period. Figure No. 3 shows a linear trend. It rose from 67 cases as of 25/3/2020 to 163,235 cases as of 26/3/2021. It implies an increase of 2435.34% within one year

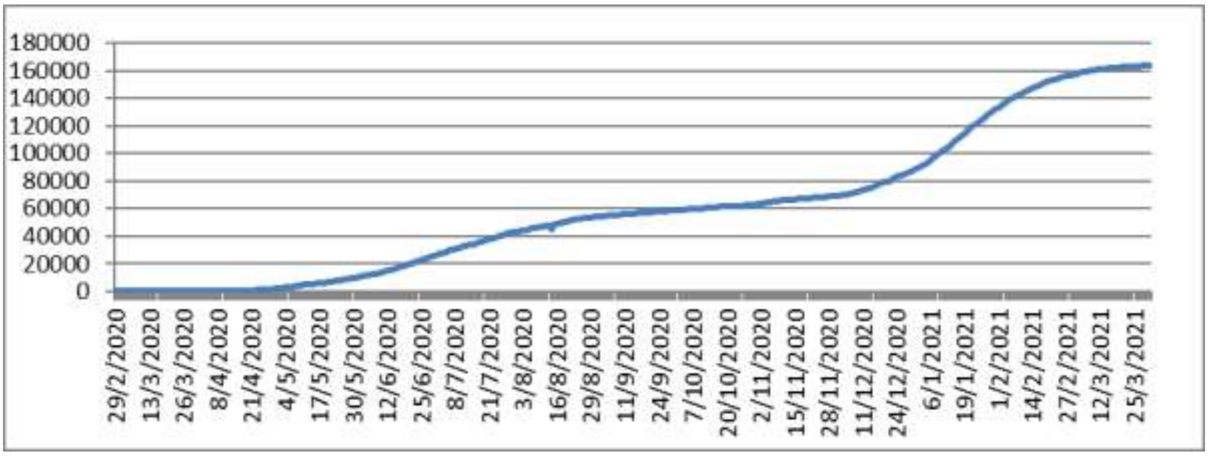

Fig. 1.3: Trend in cumulative confirmed cases in Nigeria from 29/2/2020 – 31/3/2021
Source: Own estimation using NCDC data

As explained in figure No. 4, the daily coronavirus death cases range from zero (0) instances to 31cases. Figure No. 4 recorded a zero (0) COVID-19 everyday death case on 29/2/2020, which rose to seventeen (17) COVID-19 daily death cases as of 2/3/2020. It declined to five (5) COVID-19 daily COVID-19 death cases as of 11/6/2020 but peaked at thirty-one (31) COVID-19 daily death cases on 16/6/2020. The COVID-19 daily death cases dropped to two (2) as of 26/7/2020. The statistics rose to twenty-one daily COVID-19 death cases as of 3/9/2020. Figure No.4 daily COVID-19 death cases further increased to twenty-three (23) as at 14/1/2021, which declined to three (3) as at 25/1/2021. It rose to twenty-seven (27) as of 29/1/2021. However, the daily COVID-19 death cases experience a drop to twenty-four (24) on 12/2/2021, with a subsequent decline by eight (8) as of 3/3/2021. The reported daily COVID-19 death cases dropped to three (3) as of 26/3/2021. The statistics also showed that there were some other days without reported everyday COVID-19 death cases besides 29/2/2021

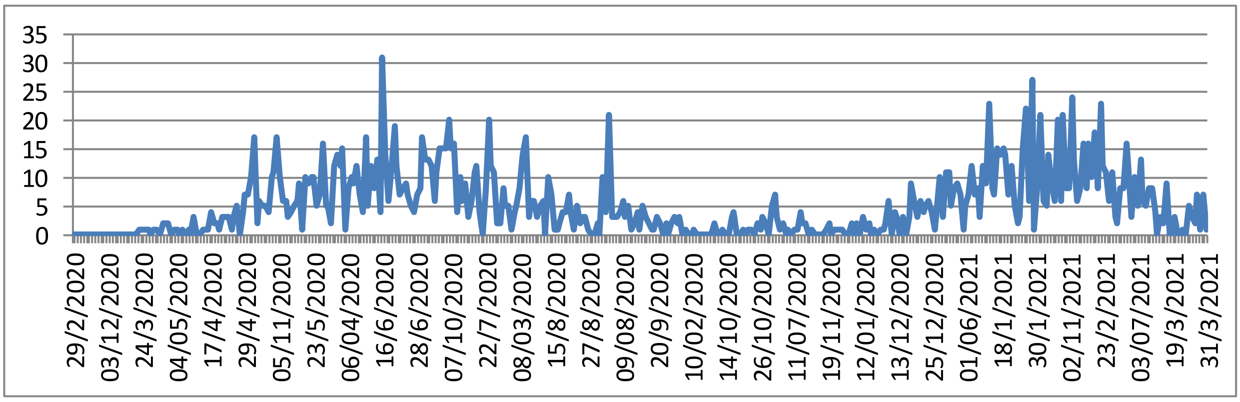

Fig. 1.4: Trend in daily death confirmed cases in Nigeria from 29/2/2020 to 31/3/2021
Source: Own elaboration using NCDC data

From figure No. 5 reflects a linear trend, but the first twenty-three (23) days are without reported daily COVID-19 death cases. The first confirmed everyday COVID-19 death case was on 23/3/2020. Figure No. 5 showed a flat trend between

23/3/ 2020 and 14/4/2020 with daily COVID-19 death cases ranging from one (1) or two (2)

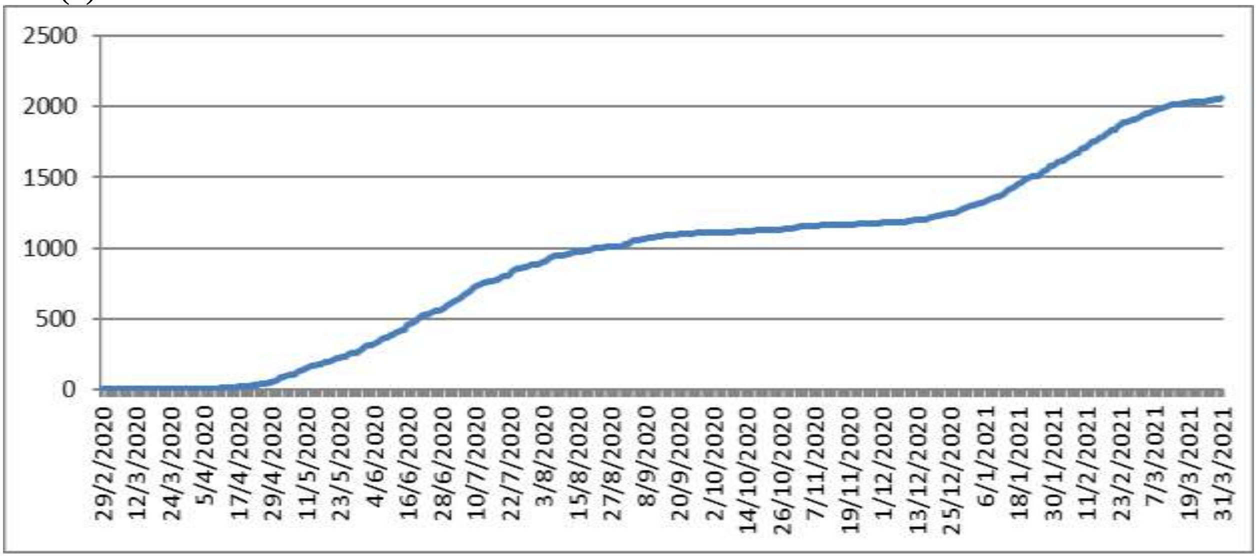

Fig. 1.5: Trend in Death Toll Cases in Nigeria from 29/2/2020 to 31/3/2021
Source: Own elaboration using NCDC data

2. LITERATURE REVIEW

2.1 Theoretical Review

The risk society theory was developed by Beck (1992) and Giddens (2002). Modern developments, according to the theory, are accompanied by the duplication of risks in this situation, created risks lead to the progressive formation of a risk society (Giddens, 2002). Human intervention exacerbates and manages "manmade risks." "A methodical approach of coping with hazards and insecurity created and introduced by modernity itself," according to risk society (Beck, 1992). "Risk" is employed by Beck in the contexts of hazard and susceptibility. The premise behind this study is that there are unintended and unanticipated side effects of contemporary life that harm innovation (Wimmer & Quandt, 2006). These side effects have a significant impact on human society. Through human migration, a healthy risk in Wuhan (China) became a pandemic, affecting all countries worldwide and resulting in millions of fatalities.

2.2 Review of Empirical Literature

Gen-Fu. Hao- Chang, Qiang, & Chun-Ping (2021) The study delves into the impact of COVID-19 and the relevant government reaction strategies from January 13, 2020, to July 21, 2020, exchange rate volatility in twenty (20) nations was evaluated using the Generalized Method of Movements (G.M.M.) approach. The findings showed that an increase in confirmed cases corresponds to an increase in exchange rate volatility, consequently, Governments' different responses to the epidemic, such as school closures, constraints on domestic mobility, and public education campaigns, all contribute to exchange rate unpredictability. They concluded that the quick spread of COVID-19 in 2020 deeply wedged world economies. Thus, attempts to bail out the economy through government interferences led to exchange rate instability. The outcome of this study gives invaluable data and insights to politicians and financial investors all across the world.

Banerjee, Kumar, and Bhattacharyya (2020) examined the impact of COVID-19 on India's foreign currency rates volatility and stock market performance. The study lasted 48 days and employed secondary data. At various pre-and post-lockdown stages, the growth rate of confirmed cases (Growth C), an exchange growth rate (G.E.X.), and the SENSEX value stayed constant. The SENSEX index represents the total value of the stocks of 30 specific firms listed on the Bombay Stock Exchange (B.S.E.), whereas the G.E.X. index represents exchange rate growth. Using Vector Auto-Regressive (V.A.R.) models, the study attempts to capture any possible changes over time. The result revealed a positive association between the pace of growth of confirmed cases and the rate of growth of the exchange rate, as well as a negative correlation between the enhanced degree of coronavirus established cases and the rate of advancement of the SENSEX value. A resourceful analysis revealed that as the number of identified instances increased, the economy grieved a blow, which was reflected by the depreciation of the Indian rupee. The stock exchange directory, too, agonized from a negative impression. However, with the addition of a V.A.R. model, the result observed that a rise in confirmed COVID-19 cases had no meaningful impact on the exchange rate or the SENSEX index.

Benzid et.al. (2020), assess the influence of Covid-19 cases/related fatalities in the United States on exchange rate volatility. Data collected included US$/EUR€, US$/Yuan¥, and US$/Livre and Sterling£ exchange rates. The GARCH (1,1) model was used to anticipate the daily instability of three exchange rate series including the US$, which enabled the study to be successful. The findings showed that a rise in the number of incidents and deaths (both recorded in logs) in the United States has a favourable influence on the exchange rate. The results are useful for anyone who wish to make predictions about the volatility of exchange rate futures.

Ali et.al. (2020), investigated the impact of COVID-19 on currency exchange instability in Egypt. The study used supplementary sources. The independent variables in this study were daily coronavirus cases and cumulative coronavirus cases. Instead, the exchange rate served as the dependent variable. The result showed a negative influence on the currency exchange rate between the United States dollar (US$) and the Egyptian pound (EG£). In addition. The findings also revealed a positive and statistically significant relationship between the cumulative number of coronavirus cases and fluctuations in currency exchange rates.

Abu Bakar and Rosbi (2020) investigated the Impact of Coronavirus Disease (COVID-19) on the Equity Market and Currency Exchange Rate. The study designated two types of time series data namely KLSE index and currency exchange rate for USD/MYR as dependent variables. The period between January 2020 until March 2020 was the surveillance period selected. They used Spearman rank correlation analysis between changes of KLSE index and currency exchange rate. The result showed a positive association between changes in the KLSE index and currency exchange rate. They concluded that (COVID-19) creates a significant effect on the equity market index and currency exchange rate.

Onali (2020) examined the influence of COVID-19 occasions and related mortality on the United States stock market (Dow Jones and S&P 500 indexes) after controlling for changes in trading volume and instability potentials, as well as day-of-week impacts, Analysis of secondary data collected from the United States and six other countries were carried out with the use of the GARCH 1.1 model. The referendum was piloted between April 8, 2019, and April 9, 2020, online. Findings showed that Covid-19 reported instances had an influence on stock market returns in all nations in the sample save the United States, Although the number of recorded victims in Italy and France has a deleterious effect on stock market returns. The result further revealed that the volatility index (V.I.X.) yields have a positive effect on stock market returns using the V.A.R. models. Finally, Markov-Switching simulations demonstrated that, by the end of February 2020, the extent of the negative impact of the V.I.X. on stock market returns had grownup thrice from its pre-election levels.

Albulescu (2020) examined the effect of authorized statements concerning new cases of contagion and death ratio on the financial markets volatility index (VIX). The findings revealed that the new cases reported in China and outside China have a mixed effect on financial volatility, the death ratio positively influences VIX, with that outside China causing more influence. In addition, the findings observed that the more the number of affected countries, the higher the financial volatility becomes.

Zhang et.al. (2020) investigated the effects of the coronavirus on global financial markets in the United States. Daily data up to March 27, 2020, were collected. The result showed that global financial market risks increased the reaction to the pandemic. The findings further revealed that international stock market links exhibit distinct differences in patterns before and after the pandemic's declaration and that governmental responses increase the level of uncertainty in global financial markets even more.

Chukwuka and Ekeruche (2020) examined the economic penalties of the COVID-19 outbreak in Nigeria. The findings showed that Nigeria's economy is expected to grow by 2.5 percent in the Gross Domestic Product (G.D.P.) in 2020 but was reduced due to the epidemic. Consequently, a significant increase in the nation's debt disbursement obligations. The results concluded that the revenue ratio staying at 60% at a period of dipping oil prices has been a prime cause of concern for policymakers since it would make it problematic for the economy to develop in the future.

Akanni et.al. (2020) looked at the economic impact of COVID-19 on the Nigerian economy. “It has been determined that the COVID-19 pandemic has resulted in interruption of operations and economic instability, which according to the United Nations and development agencies has cost the world around $2 trillion since the inception of the pandemic” (Akanni et.al. 2020). The findings highlighted some of the factors to include: social alienation, staying at home, spending limitations, and supply factors, such as declining or stopping manufacturing and output, which all hurt economic growth.

Saha, Bhattachrya, Roy, Basu, Roy, and Maity (2008) investigated the relationship between the epidemic and the Indian rupee's value as of January 1, 2008. The findings observed the unpredictable market condition, the unstable stock market and, the volatility of B.S.E. stock prices. This is in contrast to prior research, which indicated that the Sensex and the stock prices of leading corporations listed on the Bombay Stock Exchange were favourably associated.

Choudhry et.al. (2015) examined the function of exchange rate volatility in inducing the actual imports of goods and services into the United Kingdom from three important emerging markets: Brazil, China, and South Africa. The study used the asymmetric autoregressive distributed lag (ARDL) technique to analyze collected the monthly data from January 1991 to December 2011. The result revealed a positive relationship between volatility and international business consequently a significant positive association between the financial crisis and UK import. The findings also observed a causal relationship between exchange rate volatility and UK imports. Finally, the result displayed a significant effect on all the third countries' samples included in the study.

Coudert et.al. (2011) examined the impact of global financial chaos on the exchange rate strategies in developing countries. The study selected a sample of 21 emerging countries from January 1994 to September 2009. The outcome showed that most of the countries studied exhibited a higher proportionate level of exchange rate instability than the global financial pressure. The results further revealed the spread of contagion effect from one emerging currency to other currencies in the neighbourhood

3. DATA & METHODOLOGY

3.1 Sample of the study

The sample used for this study is daily data covering 29/2/2020 to 31/3/2021 which is 394 days which translates to 1970 observations. This period was chosen because it constitute the time with steadily reported cases and thereafter there was a break-in of reported cases by NCDC The data was estimated using the Ordinary Least Square method (O.L.S) and to obtain the optimal lag length ARDL was adopted.

3.2 Data collection

Daily data for daily confirmed reported cases, cumulative coronavirus confirmed reported cases, daily death reported cases, and cumulative death toll cases from Nigeria Centre for Disease Control (NCDC) website while daily US$/₦ exchange rates movement was obtained from the Central Bank of Nigeria (CBN) Statistical Bullet. The dependent variable of the study was exchange rate volatility while the independent variables include: daily coronavirus confirmed cases, cumulative coronavirus cases, daily coronavirus death cases, and cumulative coronavirus death cases

3.3 Model Specification

EXCR = f(DCC+CCC+DDC+CDC) ……………………………………………………………. 1

Where: EXCR = US$/₦ Daily exchange rates,
DCC = Daily coronavirus confirmed cases,
CCC = Cumulative coronavirus confirmed cases,
D.D.C. = Daily coronavirus death cases, while
CD.C. = Cumulative coronavirus confirmed cases
(Benzid et al. 2020 & Ali et al. 2020)
Representing equation (i) econometrically gives:

$ESCR_{it} = \beta_0 + \beta_1 DCC_{it} + \beta_2 CCC_{it} + \beta_3 DDC_{it} + \beta_4 CDC_{it} + \varepsilon_{it}$ ……………………………………… 2

Where: β_0 = Intercept, $\beta_1 - \beta_5$ = Coefficient of predictor variables, ε_{it} represents error term

Pesaran, Shin, and Smith. 2001, used the A.R.D. Bounds testing method for cointegration written as:

$$\Delta lnERV_t = \propto_1 + \sum_{i=0}^{p} \beta_i \, \Delta lnERV_{t-i} + \sum_{i=0}^{p} \theta_i \, \Delta lnDCC_{t-i} + \sum_{i=0}^{p} \delta_i \, \Delta lnCCC_{t-i} + \sum_{i=0}^{p} \rho_i \, \Delta lnDDC_{t-i} + \sum_{i=0}^{p} \tau_i \, \Delta lnCDC_{t-i} + \mu_t \quad (3).$$

Where μ_t = error correction term and Δ is the first difference operator.
$\propto$ = The drift component and γ_i = the long-run multipliers.
LDCC = Log of Daily Coronavirus Confirmed Cases

LCCC = Log of Cumulative Coronavirus Confirmed Cases
LDDC = Log of Daily Coronavirus Death Cases
LCDC = Log of Cumulative Coronavirus Death Cases
LEV = Log of Exchange Rate Volatility
β_i = Coefficient of Exchange Rate Volatility
θ_i = Coefficient of Daily Coronavirus confirmed Cases
δ_i = Coefficient of Cumulative Coronavirus confirmed Cases
ρ_i = Coefficient of Daily Coronavirus Death Cases
τ_i = Coefficient of Cumulative Coronavirus Death Cases
$\propto_1$ = Intercept
Δ = First Difference Operator
μ_t = White Noise Stochastic Error Term

Therefore, equation (3) is estimated using the ordinary least squares (O.L.S.) method. The ARDL method estimates $(p+1)^k$ number of regressions calculated to obtain the optimal lag length for each variable in the equation, and the choice between different lag lengths made by using information criteria such as Akaike (A.I.C.) or Schwarz criterion (S.C.). Schwarz information criterion (S.C.) is preferred to A.I.C. because it tends to define more parsimonious specifications (Pesaran et al., 2001). Thus, if there is evidence of cointegration among the variables, the long-run model in equation (4) is estimated. Similarly, the ARDL specification of the short-run dynamics derived by constructing an error correction model of the form:

$$\Delta lnERV_t = \propto_1 + \sum_{i=0}^{p} \beta_i \, \Delta lnERV_{t-i} + \sum_{i=0}^{p} \theta_i \, \Delta lnDCC_{t-i} + \sum_{i=0}^{p} \delta_i \, \Delta lnCCC_{t-i} + \sum_{i=0}^{p} \gamma_i \, \Delta lnDDC_{t-i} + \sum_{i=0}^{p} \rho_i \, \Delta lnCDC_{t-i} + \omega ECM_{t-1} + \mu_t$$

....(4).

Where E.C.M. $_t$ is the error correction model and defined as:

$$ECM_t = \Delta lnERV_t - \propto_0 + \sum_{i=0}^{p} \beta_i \, \Delta lnERV_{t-i} + \sum_{i=0}^{p} \theta_i \, \Delta lnDCC_{t-i} + \sum_{i=0}^{p} \delta_i \, \Delta lnCCC_{t-i} + \sum_{i=0}^{p} \gamma_i \, \Delta lnDDC_{t-i} + \sum_{i=0}^{p} \rho_i \, \Delta lnCDC_{t-i}$$

.... (5).

All coefficients of the short-run equation are coefficients relating to the short-run dynamics of the model's convergence to equilibrium, and ω in equation (4) above represents the speed of adjustment

4. RESULTS

Table 4.1 explains the descriptive statistics of the variables used in the regression analysis reported included: Exchange rate (EXCR), Daily Coronavirus Confirmed Cases (DCCC), Cumulative Coronavirus Confirmed Cases (CCCC), Daily Coronavirus Death Cases (DCDC), and Cumulative Coronavirus Death Cases (CCDC) have averages of 0.116, 290.3, 18101, 5.683, and 397.3 respectively. (EXCR), (DCCC), (CCCC), (CCCC), and (CCDC) have the median of 0.956, 4.401, 0.600, 2.503 and, 37.60 correspondingly. The maximum of 24.283, 790.3, 54008, 31.281, and 1013.0 for (EXCR), (DCCC), (CCCC), (CCCC), and (CCDC) respectively. 23.701, 0.009, 1.321, 0.003 and 0.002 are for minimum. However, in the case of Standard deviation, the rule of thumb is that the standard deviation of any variable should be equal to zero or close to zero, which implies that the deviation from the mean must be minima overtime for the chosen series to be less volatile. The standard deviation of (EXCR), (DCCC), (CCCC), (CCCC), and (CCDC) are 0.531, 0.229, 0.779, 0.551, and 0.374. Therefore, all the variables conform to the rule of the thumb.

Table 4.1: Descriptive Statistics

Descriptive and Correlation Analysis

	lnEXCR	lnDCCC	lnCCCC	lnDCDC	lnCCDC
Mean	0.116	290.3	18101	5.683	(397.3)
Median	0.956	4.401	0.600	2.503	37.60
Maximum	24.283	790.3	54008	31.281	1013.0
Minimum	23.701	0.009	1.321	0.003	0.002
Std. Dev.	0.531	0.229	0.779	0.551	0.374
Skewness	0.034	0.012	0.011	0.328	1.002
Kurtosis	2.111	1.811	1.024	2.128	3.521
Jarque-Bera	1.162	2.024	1.013	4.016	3.121
Probability	0.094	0.109	0.215	0.115	0.051
Sum	10.031	117.07	11.110	33.021	20.032
Sum Sq. Dev.	5.114	11.109	5.070	14.014	8.914
Observations	384	384	384	384	384

Source: Own estimation (CBN &NCDC database) using E-view 10

The skewness of (EXCR), (DCCC), (CCCC), (CCCC), and (CCDC) are 0.034, 0.012, 0.011, 0.328, and 1.002, respectively. In this series, skewness has a normal distribution. Skewness examines the spread of the data the distance of these data values to the mean. The closer the data values are to the average, the closer S.D. to zero. In this sequence, all the variables are regular and conform to the decision rule of statistics. The Kurtosis for the variables is 2.111, 1.811, 1.024, 2.128, and, 3.521 respectively. Kurtosis looks at the height and how peak is the values of the variables. Thus, the optimal threshold for Kurtosis is three (3). Thus, four out of five variables of this Study are below the optimal verge of Kurtosis Platykurtic) while cumulative coronavirus death cases operated above the optimal threshold value (leptokurtic). The Jarque-Bera for (EXCR), (DCCC), (CCCC), (CCCC), and (CCDC) include 1.162, 2.024, 1.013, 4.016 and 3.121 respectively. The Study deals with daily data series that are highly volatile; hence Jarque-Bera Statistics test becomes sacrosanct. It is a test statistic for normal distribution in terms of the series stability and volatility over time. The null hypothesis for the test implies normal distribution in terms of the series stability and volatility over time.

Table 4.2 presents the results of correlation analysis which is essential to establish the level of association among the variables used in the regression analysis. The study aims to determine the association between exchange rate volatility and COVID-19 pandemic variables, which has implications for their inclusion in the same models. The results suggested that the correlation coefficients between these two variables were moderate and can co-exist in the same model

Table 4. 2: Correlation Analysis Results

	lnEXCR	**lnDCC**	**lnCCC**	**lnDDC**	**lnDCD**
LnEXCR	1.000				
lnDCC	0.112	1.000			
lnCCC	0.201	0.072	1.000		
LnDDC	0.139	0.232	0.117	1.000	
LnDCD	0.501	0.242	0.182	0.288	1.000

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Source: Own estimation (CBN &NCDC database) using E-view 10

Table: 4.3 displays the projected results of unit root tests from the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests

Table 4.3 It is necessary and easy to test for the presence of unit roots when examining time series models since they are critical in the analysis of time-series data. The presence of a unit root implies that the time series under research is non-stationary, whereas the lack of unit roots suggests that the stochastic process under inquiry is stationarised (Iyoha and Ekanem, 2002). Most macroeconomic time series data are not static at their levels because some variables may be too little or too large to the point that they may never return to their predicted mean, as is the case in most cases. It became necessary to do a unit root test or a stationarity test to fully comprehend the integration of the variables as a result of this. As a result, the Phillip-Peron (P.P.) and Augmented Dickey-Fuller (A.D.F.) tests (Phillips and Perron, 1988) with and without intercept were used in the study. The study indicates that the examined variables are non-stationary if the absolute value of the P.P. and A.D.F. statistics is less than the 1 percent, 5 percent, and 10 percent critical values. According to the alternate hypothesis, the absolute value of the PP and ADF tests is larger than the 5 percent critical value, indicating that the variable under consideration is stationary. The test for stationarity for the variables used in this study is therefore essential and reasonable before proceeding with the ARDL bounds test, as previously stated. However, it is essential to examine if the variables are stationary to prevent producing erroneous findings. Assume that the variables in the study are either at levels or first-differenced static for the sake of the limits testing method and that the F-statistics for bounds testing have been generated for the bounds testing procedure. The stationarity of the variables was determined in the study using the ADF and P.P. methods. The results from the A.D.F. and Phillip Perron tests in table 4.3 showed that all the variables became stationary at the first difference (with and without trends) except for exchange rate volatility (ERV) and Daily Coronavirus Death Cases (DCDC) that were stationary at levels. All the variables were significant at (1%, 5%, and 10%) level

Table 4.3: Results of Unit Root Test

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	Augmented Dickey-Fuller (A.D.F.)				Phillip Perron (P.P.)				
Variable	**Level**								
	Constant	**Constant and Trend**	**None**	**Prob**	**Constant**	**Constant and Trend**	**None**	**Prob**	**Decision**
LERV	-6.1551**	-6.2706***	-6.8238*	0.001	-8.0217	-8.5594	-8.4029**	0.0000	I(0)
LDCC	0.5968	-1.8011	-1.8301	0.112	2.8456	-2.1210	2.8512	0.1188	I(1)
LCCC	-0.6349	-2.4121	-0.6291	0.210	0.8091	-2.8491	-3.4865	0.1812	I(1)
LDDC	-2.0886	-5.1561**	-3.0236**	0.034	-7.2758*	-8.2412*	-7.5185*	0.0005	I(0)
LCDC	0.2251	-2.4150	-2.9480**	0.005	1.0573	-2.9512	1.6851	0.2114	I(1)
First Difference									

	Constant	Constant and Trend	None	Prob	Constant	Constant and Trend	None	Prob	Decision
LERV	None	None	None	0.000	None	None	None	0.0000	I(0)
LDCC	-6.1551**	-6.2706***	-15.2100*	0.000	-6.0217*	-5.5594*	-5.4029*	0.0000	I(1)
LCCC	-3.4694**	-3.4337***	-5.7737*	0.002	-3.4889**	-2.8455**	-16.1061*	0.0000	I(1)
LDDC	None	None	None	0.001	None	None	None	0.0000	I(0)
LCDC	-3.3378*	-2.9315***	-2.9536**	0.004	-6.3248**	-8.2410*	-8.9911*	0.0000	I(1)

Note: ***, **and * implies statistical significance at 1%, 5% and 10% level respectively

Source: Own estimation (CBN &NCDC database) using E-view 10

Table 4.4 reveals ADRL bounds cointegration tests. It showed the calculated F-statistic when the regression focused on LERV, the proxy for the exchange rate volatility, and the impact of COVID '19 pandemic variables. From the estimated Bounds test, results depicted that the F-statistics of 27.6 is more significant at all levels for the upper and lower critical values. Therefore the study does not reject the null hypothesis with cointegration. The study established a long-run cointegration relationship among the dependent and independent variables in the model. The estimated coefficients of the short-run relationship between the COVID '19 pandemic variables and exchange rate volatility produced mixed and expected results in line with the diversity of existing literature evidence. Hence, the short-run ARDL estimates presented in table 5 indicated a positive and significant relationship between three independent variables and exchange rate volatility with coefficient values. It displays that a unit increase in the selected independent variables will lead to a positive change in the exchange volatility in the short run. The (0.5104), (LDCC), (LCCC) and (LDDC) had a positive relationship each with variability/volatility of exchange rate at !%, 7%, 3.8%, level correspondingly with a coefficient value (0.5104), (0.0374), and (0.0711)) respectively. It implies that LDCC, LCCC, and LDDC have a significant positive relationship with exchange rate volatility. The result corroborated the Study of (Gen-Fu et al. 2021, Benzid et al. 2020 &Ali et al. 2020).

Table 4.4: ARDL Bounds Test for Co-integration Relationship

Model	Computed F-Statistic	
LERV.	27.633	
Bounds Level	**I(0) Bound**	**I(1) Bound**
1% critical Value	3.93	5.23
5% critical Value	3.12	4.25
10% critical Value	2.75	3.79

Source: Own estimation (CBN &NCDC database) using E-view 10

On the other hand, LCDCC has a positive but insignificant correlation with exchange rate fluctuation. Consequently, Table 5 gives the short-run dynamic coefficients associated with the long-run relationships obtained from the E.C.M. equation. The error correction term is appropriate for the model. It implies that deviations from the long-term macroeconomic stability adjust quickly.

Hence, the short-run impact of COVID'19 seemed not to be serious in Nigeria, particularly and the African continent, as speculated by United Nations and W.H.O., due to the minimal death toll recorded.

Table 4.5: ARDL Short-Run Estimates - E.C.M. Coefficient Results

Dependent Variable: LREV

Variable	Coefficient	Std. Error	t-Statistic	Prob.

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D(LDCC)	0.037365	0.075488	0.494979	0.0711
D(LCCC)	0.071071	0.077691	0.914790	0.0381
D(LDDC)	0.510350	0.090037	5.668225	0.0000
D(LCDC)	0.010166	0.023311	0.436103	0.1120
ECM(-1)	-0.549480	0.128008	-4.292544	0.0003

ECM = LREV + (0.037*LDCC + 0.071*LCCC + 0.510*LDDC + 0.010*LCDC)

R-Squared = 0.9559 Adjusted R-Squared = 0.9446

F-Statistic = 19.35 (0.0000) Durbin-Watson Stat = 1.9324

Short-Run Diagnostic Tests

Serial Correlation LM Test = 1.0527 (0.5114)

Heteroskedasticity Test (ARCH) = 0.2286 (0.5924)

Jacque-Bera (Normality Test) = 1.1449 (0.5931)

Ramsey RESET Test = 0.3479 (0.5608)

Note: *, ** and*** denote significance at 1%, 5% and 10% levels respectively

Source: Own estimation (CBN &NCDC database) using E-view 10.

The null hypothesis for the long-run series test implies normal distribution. There are three (3) conventional levels of statistical significance in econometrics namely 1% (0.01), 5% (0.05) and 10% (0.10) in this study. Therefore, the decision rule is that if the computed probability values for the test are greater than the chosen probability values, the Study will not accept the null hypothesis; otherwise, the study will accept. In table 4.5, at 1%, 5%, and 10% significance levels, all the computed probability values for the series are within 1% (0.01) & 5% (0.05) and 10% (0.10) the chosen probability values, which imply that we do not reject the null hypothesis at 1%, 5% and 10% significant levels, meaning that all the series enjoyed normal distribution. Only cumulative coronavirus death cases had 11.2%, the hypothesis of which the Study did not accept.

The projected coefficients of the long-run relationship between the COVID-19 pandemic variables and exchange rate volatility produced results in line with the diversity of existing literature evidence. Hence, the short-run ARDL estimates presented in table 4.6 indicated a positive and significant relationship between four independent variables and exchange rate volatility with coefficient values. It displays that a unit increase in the selected independent variables will lead to a positive change in the exchange volatility in the long run. The (LDCC), (LCCC) and (LDDC) had a positive relationship each with variability/volatility of exchange rate at 1%, 2%, 7%, and 9% level respectively with a coefficient value (0.014063), (0.301299), (0.065399) and (0.141036) respectively. It implies that LDCC, LCCC, LDDC, and LCDC have a significant positive relationship with exchange rate volatility. It indicates that all the selected covid-19 variables positively correlated with the exchange rate volatility in the long run. The finding was corroborated by (Gen-Fu et al. 2021, Benzid et al. 2020 &Ali et al. 2020.

Table 4.6 - Long-Run ARDL Estimate and Coefficient Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDDC	0.065399	0.034745	1.882256	0.0702

LCCC	0.301299	0.220119	1.368800	0.0177
LDCC	0.014063	1.166416	0.012057	0.0015
LCDC	0.141036	1.210034	0.116555	0.0989
C	0.957735	3.012207	0.317951	0.1529
@TREND	0.004112	0.007886	0.521413	0.6062

Note *** ,** and * denote significance at 1%, 5% and 10% levels respectively
Source: Own estimation (CBN &NCDC database) using E-view 10

The null hypothesis for the long-run series test implies normal distribution. There are three (3) conventional levels of statistical significance in econometrics namely 1% (0.01), 5% (0.05) and 10% (0.10) in this study. Therefore, the decision rule is that if the computed probability values for the test are greater than the chosen probability values, the Study will not accept the null hypothesis; otherwise, the Study will accept. In table 6, at 1%, 5%, and 10% significance levels, all the computed probability values for the series are within 1% (0.01) & 5% (0.05) and 10% (0.10) the chosen probability values, which imply that we do not reject the null hypothesis at 1%, 5% and 10% significant levels, meaning that all the series enjoyed normal distribution.

5. CONCLUSION

This paper delivers a simple and original statistical analysis of the impact of the COVID-19 pandemic on exchange rate volatility in Nigeria. The coronavirus has claimed thousands of lives and brought significant threats to countries from all over the World. The exchange rate actions have witnessed fluctuations due to the COVID '19 pandemic. The present results show that exchange rate risks have increased considerably in response to the covid-19 pandemic. Individual and national reactions are related to the harshness of the eruption in Nigeria. The great uncertainty of the pandemic and its associated economic losses has caused the exchange rate to become highly volatile.
Policy reactions to control the virus and level the exchange rate fluctuation are needed; however, most countries cannot cope with these defies. The exchange rate in most nations is responding differently to national-level policies and the general development of the pandemic.

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