Impact of Covid 19 on Stock Market and Exchange Rate in Nigeria

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ABSTRACT

The study investigates the impact of COVID–19 on the stock market and exchange rate in Nigeria. To achieve this objective, the impulse response function of the Toda-Yamamoto model (TY Model), and the variance decomposition were applied to all-share index, exchange rate, oil prices and Covid-19 cases. The impulse response function reveals that all-share index and exchange rate respond negatively to COVID-19 shocks. More so, the forecast variance decomposition revealed that the impact of COVID-19 pandemic on stock market was minimal. In general, the study found evidence of poor performance in the stock market and depreciation of exchange rate due to fall in oil prices. The study recommends effective exchange rate management during periods of crisis, and the diversification of the economy to broaden export base to mitigate the effect of exchange rate changes on the stock market and other sectors of the economy.

Keywords: COVID-19, stock market, exchange rate

INTRODUCTION

The COVID–19 pandemic broke out in Wuhan, China, in December 2019. The virus spread fast over the world, wreaking havoc on economies globally. Nigeria recorded its first case of COVID–19 on 27th February 2020, and since then, the country witnessed a surge in the number of cases across several states. The pandemic adversely affected most segments of the economy, including the financial and real sectors, due to the inter–connectedness among various sectors of the economy. Most authorities responded immediately by imposing a lockdown in order to curtail the spread of the virus and for easy tracing.

The 'Great Lockdown', as tagged by the International Monetary Fund (IMF), strongly impacted on economies differently, depending on its dynamics at the time of the outbreak (IMF, 2020). The lockdown involved the restriction of movement, thereby disrupting demand and supply chains, hence, bringing most economic activities to a halt. Consequently, the demand for crude oil dropped significantly, causing a crash in price and revenue shortages. The resultant shortfall in foreign receipts adversely affected Nigeria's fiscal releases and depleted its foreign reserve substantially. The shortfall in fiscal revenue aggravated Government borrowings in order to finance the 2020 budget, which placed the Nigerian economy in a precarious situation, even as the country struggles to fully recover from the impact of two recessions in five years. Similarly, low accretion reserves undermine the CBN's capacity to defend the exchange rate. Thus, the pandemic also had an impact on stock prices as a result of the link between the stock market and the exchange rate.

The stock market contributes significantly to the growth of most economies through the movement of long-term funds from surplus to deficit sectors. By influencing financial deepening and promoting investment, the stock market enhances economic growth and development. A major determinant of stock market performance is the exchange rate, due to its role in linking the external sector with the domestic economy.

The level of stability of a country's exchange rate signals to a large extent, the strength of its economy; thus, influencing investors' decisions on whether to commit funds into the economy or not. Stock prices, on the other hand, influence exchange rate behaviour through the income effect. As income falls, so does aggregate demand, thus, hurting the performance of most publicly traded enterprises (Dang et'al, 2020).

This has recently sparked a lot of research and policy attention, as economists and policymakers try to figure out how the epidemic may affect macroeconomic indicators like the exchange rate and stock prices. Given the importance of the stock market to economic growth, some authors focused on the impact of COVID -19 on the stock market (see Osagie et al., 2020 and Salisu et al., 2020), while others dwelled on the pandemic's knock-on effect on the financial market through the exchange rate (see Eda & Ibrahim, 2020; Benzid & Chebbi, 2020), as exchange rate provides signal for stock market investment decisions.

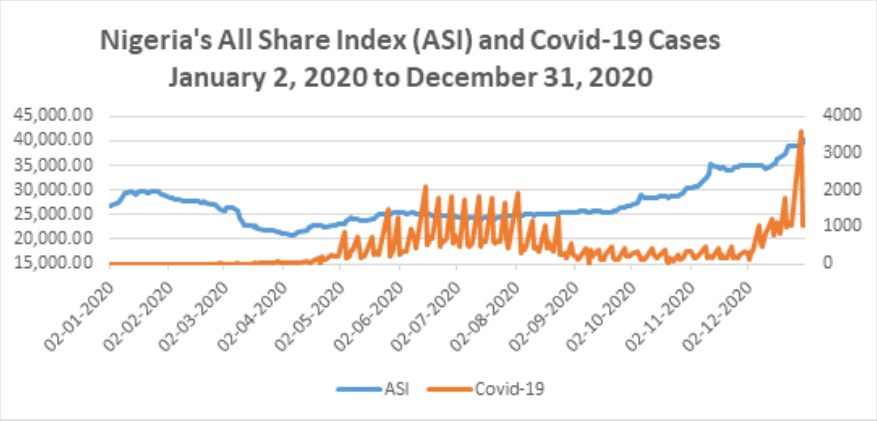
Salisu et al. (2020) observed that the effects of the current health and economic crisis could surpass that of the Global Financial Crisis (GFC), World War II and the SARS of 2003 put together. This establishes COVID-19 as one of the most disastrous and record-breaking crisis in the history of the world, prompting policy makers to analyze its effect on economic performances. According to Banerjee et al. (2020), the relationship between the pandemic and the economy could be likened to that between health and wealth, implying that policy makers have to balance the decision to preserve nationwide health and opportunity to create national wealth by allowing the economy to operate.

Considering the significance of the stock market to Nigeria's economic performance, a study of the impact of the Covid-19 pandemic on the Nigerian stock market and exchange rate would provide a deeper understanding and insight to inform policy recommendations, as the exchange rate determines stock market performance and conversely, stock market influences exchange rate behavior. The stock market boost investment in an economy due to its crucial function of mobilizing savings from surplus to deficit units of the economy, hence enhancing growth and generating employment. Thus, this study seeks to add to existing knowledge by evaluating the Impact of COVID-19 on the Nigerian stock market and exchange rate concomitantly, given that a crucial determinant of stock market performance is the exchange rate. This is important, especially at a time when the country is facing exchange rate pressures, which could downplay the inflow of investment and stock market performance.

STYLIZED FACTS

This section discusses the characteristics of this study's main variables, All Share Index (ASI) and Exchange Rate. The analysis is majorly focused on the Post-COVID19 period. Nigeria recorded its first coronavirus case on February 28, 2020. However, the analysis begins from January 2020, the period before the first coronavirus case emerged, which is described as the Pre-COVID19 period.

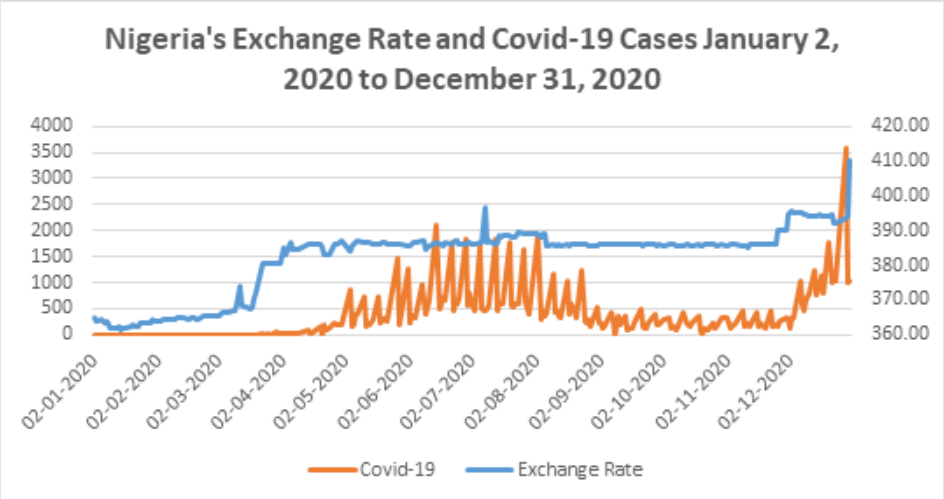
Figure 1



In figure 1, the All Share Index (ASI) trended upward in January 2020. This was the aftermath of the directive by the Central Bank of Nigeria (CBN), that effective October 23, 2019, all non-bank locals would not be allowed to participate in Open Market Operations (OMO) at both the primary and secondary markets. Due to this directive, investors, especially pension fund managers seeking alternative investment platforms, channeled their investible funds to the capital market. However, the upward trend was short-lived due to the emergence of COVID -19. Although Nigeria recorded its first coronavirus case on February 28, 2020, ASI started declining before this date. At the start of February 2020, ASI began a downward trend as a result of declining reserves, triggered by weak crude oil price which dampened investors' confidence in the market. With the emergence of COVID -19 in Nigeria, ASI continued to decline, as a result of lower valuation and increased volatility in the equities market, due to uncertainty caused by the lockdown which disrupted economic activities. Low crude oil price, uptick in inflation, and weak Gross Domestic Product (GDP), were the key factors that contributed to further dampening investors' confidence.

Despite some weak economic fundamentals, by mid-April 2020, ASI began to improve marginally. Several factors, such as gradual phasing out of the lockdown, improved oil price and increase in the external reserve contributed to boosting investors' confidence. In April 2020, the International Monetary Fund (IMF) approved $3.4 billion loan for Nigeria, this helped improve the country's external reserve. Between April 2020 and September 2020, despite several fluctuations observed no significant increase or decline occurred in the value of ASI. As the rate of COVID19 infections continued to decline and economic activities improved further, ASI began to increase by mid-September 2020 albeit marginal, this trend continued till December 2020.

Figure 2



With the emergence of COVID-19, exchange rate volatility increased, propelling the rate to trend upwards, due to forex scarcity (see figure 2). Post-COVID -19, global crude oil price declined significantly because of decreased demand, due to the lockdown imposed. Crude oil, being the country's major foreign exchange earner, the decline in global crude oil price negatively affected the strength of the Naira. Traditionally, exchange rate is susceptible to changes in crude oil price (Ogundipe et al., 2014).

The ban of non-bank locals' participation in OMO markets, also impacted negatively on the exchange rate. The ban resulted in increased dollar demand, as locals sourced for foreign exchange in a bid to disguise as foreign investors to participate in OMO markets.

However, in August 2020, it was observed that a marginal decrease occurred in exchange rate and since then, the rate remained relatively stable (See figure 2). This development could be attributed to several interventions by the CBN, which include: Strategies towards unification of the exchange rate and the

resumption of forex sales to Bureau De Change Operators.

LITERATURE REVIEW

Theoretical Literature

Monetary Model of Exchange Rate

The linkage between exchange rate and stock prices is bidirectional. In one way, a movement in exchange rate determines competitiveness of multinational firms; this translates to their profits and values of their stocks. For example, a depreciation of the domestic currency makes export cheaper, as a result, foreign demand and sales increases and consequently, the stock prices. Conversely, an appreciation of the local currency makes export dearer, consequently, foreign demand dips and stock prices plunges. On the flipside, the implications exchange rate movement holds for importing firms is a function of the firms' outstanding value of foreign currency payables and receivables, and this transmits to stock prices, depending on the country's international trade position (Cakan et al, 2013). This position is established in the Monetary Model of Exchange rate, which premised that domestic and foreign financial asset (i.e. stock) are perfect substitutes (Pilbeam, 1998). This implies that the expected returns on domestic and foreign financial assets do not influence investment decisions on the basis that they yield equal, rather the decision to invest in any assets by international investors is a function of their currency of denomination, domestic and foreign.

The portfolio Balance model (PBM) explains the other direction of the linkage, which bears a slight difference from the monetary models. The theory accounts for the possibility of international investors recognizing other attributes among assets, other than their currency of denomination, i.e., the investment risk of an asset (Frankel, 1983). In the light of the portfolio balance theory, stock price variation can influence the movement in exchange rate. The market mechanism works to determine exchange rate, in so much that an expected improvement in stock market performance (stock prices) due to economic growth would attract foreign capital inflow, thereby strengthening the domestic currency. Therefore, the rise (fall) in stock prices are closely linked with a country's currency appreciation (depreciation).

Thus, movement in stock prices may drive exchange rate changes, following the tendencies for investors' wealth and money demand to respond to stock market performance. Empirical evidence have shown that during crisis (i.e. financial, currency, political etc.) or even news of crisis, which is often associated with loss of investment confidence, stock markets often react negatively and hence influences the direction of exchange rate movement (Cakan & Ejara, 2013). A more recent crisis that characterise the history of humankind is the health and economic crisis engendered by the outbreak of Covid-19, which cause a global demand and supply chain disruption. Evidence abound suggesting investors' withdrawal of capital from securities market across economies. This consequently led to stock market prices plummeting and exerting negative pressure on domestic currencies (Oshikawa & Yoshimi, 2021).

However, according to the monetary model, exchange rate movement is influences by money market, interest rate and purchasing power parity condition. Money demand is assumed to have negative relationship with stock returns, since a higher return for example, implies low demand for money. Thus, a decline in money demand, reduces interest rate and hence raises output, and consequently, brings about an improvement in stock returns. Conversely, the decline in demand for money, leading to a fall in domestic interest rate relative to foreign interest rate, impacts negatively on the international competitiveness of the economy, hence, fall in cash inflow and by extension, a fall in stock returns.

COVID -19, being a global pandemic that led to lower productivity and output, it is associated with a low demand for money due to the fall in income, as a result of the decrease in commercial activities caused by the lockdown. This had negative impact on economies, hence, fall in cash flow as well as fall in stock returns. In view of this, the monetary theory of exchange rate is relevant in explaining the behaviour of the

stock market and exchange rate during the COVID – 19 pandemic.

Empirical Literature

Within a short span of time, the COVID-19 pandemic has shaken the global economy. Many countries around the world were left with no option than to impose border closure, travel rationing, total/partial lockdown measures, as well as social distancing, all with the aim of curtailing the pandemic. These measures negatively influenced international trade, supply channels and economic activities, which prompted scholars and policy makers to carefully investigate the impact of the pandemic on selected macroeconomic variables. As economists seek to understand the effect of the pandemic, studies investigated its impact on stock market performance due to the crucial role the market plays in economic growth, and others examined the effect of the pandemic on the financial market through exchange rate. Studies, on this subject cut across the globe and within Nigeria.

Quing et al (2020) investigated the impact of COVID – 19 on the stock market of China, Korea, France, United State of America, Spain, Germany, and Japan. Using daily return data, the study utilized the conventional t-tests and nonparametric Mann–Whitney tests. The empirical result revealed that COVID-19 has a negative but short-term impact on stock markets of affected countries and that the impact of the pandemic on stock markets has bidirectional spillover effects between Asian, European and American countries. However, there was no evidence that the pandemic negatively affected the countries more than it did the global average.

In the same vein, Topcu & Gulal (2020) examined the Impact of COVID-19 on emerging stock markets in Asia and Europe', their findings revealed that the negative impact of the pandemic on emerging stock markets fell gradually and even begun to taper off by mid-April 2020. In terms of regional classification, the impact of the outbreak was found to be highest in Asian emerging markets, with milder impact in the emerging markets in Europe. The efficiency of foreign exchange market during the period of Covid-19 pandemic was also investigated using the multifractal detrended fluctuation analysis (Aslam et al. 2020). The study found Canadian dollar and the Swiss franc to have exhibited the highest efficiency during the COVID-19 outbreak. Prabheesh and Kumar (2021) reported a contrary finding in the investigation on the dynamics of oil prices, exchange rate and the stock market under Covid-19 uncertainty evidence from India, using daily data analyzed with SVAR, the study observed that although Covid-19 induced uncertainty dampened the oil and stock market, the foreign exchange market remained unaffected.

Conversely, Hoshikawa & Yoshimi (2021) examined the effect of the Covid-19 pandemic on South Korea's stock market and exchange rate, using VAR model, the study observed that an increase in new infection induces stock price index volatility and this decreases foreign investors' holdings of the domestic stock and thus depreciates the South Korean Won. The study also observed that despite the intervention in the foreign exchange market by Bank of Korea, the impact of the measure was limited. Czech et al. (2020) used an asymmetric Threshold GARCH model, to investigate the Shaking Stability: COVID-19 Impact on the Financial Markets of Visegrad Group Countries. The study confirms a negative correlation between the Covid-19 pandemic and the Czech Koruna, the Hungarian forint, and the Polish zloty, as well as a negative relationship with the major blue chip stock market indices. This means that the Visegrad currencies depreciated and stock indexes fell during Covid-19.

In Nigeria, Salisu et al. (2020) examined the oil-stock nexus for Nigeria during COVID -19 pandemic, using a panel Vector Autoregressive (PVAR) model. Their analyses suggested among other things, that both oil and stock markets experienced greater initial and prolonged impacts of own and cross shocks during the pandemic, than the preceding period. More so, the probability of having negative oil and stock returns during the pandemic could be due to uncertainty associated with the relevant markets. In a similar research, Osagie et al. (2020) investigated the effect of COVID-19 outbreak on the performance of the Nigeria Stock

Exchange using the Quadratic GARCH (QGARCH) and Exponential GARCH (EGARCH) models. Their findings revealed a loss in stock returns and high volatility during the COVID-19 period in Nigeria, compared to the pre-pandemic period. The study recommended appropriate political and economic policies, such as stable political environment, incentive to indigenous companies, diversification of the economy, and flexible exchange rate regime to improve the financial market, and to attract more investors to the Nigerian Stock Exchange. Furthermore, Salisu & Vo, (2020) examined the role of bad news in predicting stock returns using data from 20 most hit countries. Their findings revealed the significance of health news as a good predictor of stock returns since the emergence of the pandemic. This was evident in the model that incorporates health news index, which outperformed the benchmark historical average model.

Ozili (2020) also analysed the impact of the COVID-19 spillovers to Nigeria and the structural weaknesses in infrastructure that accentuated the associated economic crisis. Findings showed that external shocks inform of the spillover of COVID -19 pandemic into Nigeria, and the decline in oil price, led to the 2020 Nigeria's economic crisis. Given the prolong structural nature of the crisis, largely due to the underling challenges the study recommended targeted reforms in Nigeria's economy. Nwosa (2020) investigated the impact of COVID-19 pandemic on oil price, exchange rate and stock market performance, and the implications for Transnational Corporations (TNCs) and Foreign Direct Investment (FDI) inflow in Nigeria with the use of both descriptive and causality techniques, findings revealed the adverse effect of the pandemic on oil price, exchange rate and stock market performance in Nigeria. It also found that its impact on oil price, exchange rate and stock market performance was more severe than both the 2009 and 2016 global recessions.

Few other studies also examined the effects of the pandemic by including exchange rate in the analysis. For instance, Banerjee et al. (2020) investigated the impact of COVID-19 on the stock market of India to determine the causal relationships and directions among the growth rate of confirmed cases (GROWTHC), exchange rate (GEX) and SENSEX value (GSENSEX) remained the same across both pre and post-lockdown period. Using the Vector Autoregressive (VAR) models, the study found a positive correlation was found between the growth rate of confirmed cases and the growth rate of exchange rate, and a negative correlation between the growth rate of confirmed cases and the growth rate of SENSEX value.

While several studies examined the impact of the pandemic on the economies of several countries, not much research work has been conducted using Nigerian data. In addition, no study has perhaps attempted to investigate the impact of the pandemic on exchange rate and stock market simultaneously. The important roles of these two macroeconomic indicators to the overall performance of the economy underscores the need to undertake this study.

METHODOLOGY AND DATA

Model Specification

The study employs the Toda-Yamamoto model (TY Model) to examine the response of the NGX All- Share Index, exchange rate and oil price to the Covid-19 pandemic. We chose oil price as a control variable because Nigeria is the of the largest producers in Africa and one of the largest in the world, with crude oil contributing over 70% of its exports. Therefore, as a major source of foreign exchange earnings in Nigeria, any major changes in oil price affects almost all the sectors of the economy, including the stock market.

The Toda and Yamamoto (1995) model is an extension of the standard VAR model, however, while the latter requires all variables to be integrated of order zero (i.e. I(0)), the former is better suited for variables with mixed order of integration (Mavrotas and Kelly, 2001).

The selection of this technique was informed by the results of the unit root test (table 2), given that log of

ASI and exchange rate are integrated of order one (first difference), while covid-19 and oil price are integrated of order zero (levels).

The Toda-Yamamoto VAR Model is specified as follows:

$$ASI_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i}\, ASI_{t-1} + \sum_{j=k+1}^{k+d_{max}} \alpha_{2j}\, ASI_{t-j} + \sum_{i=1}^{k} \emptyset_{1i}\, ER_{t-i} + \sum_{j=k+1}^{k+d_{max}} \emptyset_{2j}\, ER_{t-j} + \sum_{i=1}^{k} \gamma_{1i}\, OIL_{t-1} + \sum_{j=k+1}^{k+d_{max}} \gamma_{2j}\, OIL_{t-j} + \sum_{i=1}^{k} \varphi_{1i}\, COVID_{t-1} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j}\, COVID_{t-j} + \varepsilon_{1t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$ER_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i}\, ASI_{t-1} + \sum_{j=k+1}^{k+d_{max}} \beta_{2j}\, ASI_{t-j} + \sum_{i=1}^{k} \sigma_{1i}\, ER_{t-i} + \sum_{j=k+1}^{k+d_{max}} \sigma_{2j}\, ER_{t-j} + \sum_{i=1}^{k} \delta_{1i}\, OIL_{t-1} + \sum_{j=k+1}^{k+d_{max}} \delta_{2j}\, OIL_{t-j} + \sum_{i=1}^{k} \varphi_{1i}\, COVID_{t-1} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j}\, COVID_{t-j} + \varepsilon_{2t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$OIL_t = \rho_0 + \sum_{i=1}^{k} \rho_{1i}\, ASI_{t-1} + \sum_{j=k+1}^{k+d_{max}} \rho_{2j}\, ASI_{t-j} + \sum_{i=1}^{k} \mu_{1i}\, ER_{t-i} + \sum_{j=k+1}^{k+d_{max}} \mu_{2j}\, ER_{t-j} + \sum_{i=1}^{k} \theta_{1i}\, OIL_{t-1} + \sum_{j=k+1}^{k+d_{max}} \theta_{2j}\, OIL_{t-j} + \sum_{i=1}^{k} \varphi_{1i}\, COVID_{t-1} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j}\, COVID_{t-j} + \varepsilon_{3t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$COVID_t = \omega_0 + \sum_{i=1}^{k} \omega_{1i}\, ASI_{t-1} + \sum_{j=k+1}^{k+d_{max}} \omega_{2j}\, ASI_{t-j} + \sum_{i=1}^{k} \mu_{1i}\, ER_{t-i} + \sum_{j=k+1}^{k+d_{max}} \mu_{2j}\, ER_{t-j} + \sum_{i=1}^{k} \theta_{1i}\, OIL_{t-1} + \sum_{j=k+1}^{k+d_{max}} \theta_{2j}\, OIL_{t-j} + \sum_{i=1}^{k} \varphi_{1i}\, COVID_{t-1} + \sum_{j=k+1}^{k+d_{max}} \varphi_{2j}\, COVID_{t-j} + \varepsilon_{3t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

ASI_t is the log of All Share Index, ER_t is the official exchange rate (US$/Naira), OIL_t is the bonny light oil price and $COVID_t$ is the number of covid-19 cases registered per day. K denotes the optimal lag length determined by the AIC and SIC criteria. d_{max} is the maximum order of integration as obtained from the unit root test. Given that the maximum order of integration is I (1) (see table 2),

The study uses daily time series data from February 27, 2020 to February 25, 2022 sourced from Bloomberg and CBN Database. To capture the impact of the pandemic, we used the number of confirmed COVID-19 cases obtained from the Nigerian Centre for Disease Control Database.

Research Hypothesis

H_{01}.Covid-19 does not have a significant influence on stock market in Nigeria.

H_{11} Covid-19 has a significant influence on stock market in Nigeria.

H_{02}: COVID-19 does not have a significant effect on exchange rate in Nigeria.

$H_{12\ COVID\text{-}19}$ has a significant influence on exchange rate in Nigeria.

RESULTS

Preliminary Analysis

Descriptive Statistics

The main statistical features: mean, maximum, minimum, standard deviation, skewness, and kurtosis of

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stock price, exchange rate, oil price and Covid-19 are examined over the sample period.

Table 3: Descriptive Statistics				
	Stock Price	**Exchange Rate**	**Oil Price**	**COVID-19**
Mean	34810.26	387.01	58.32	361.94
Maximum	47329.80	417.51	103.24	6158.00
Minimum	20669.38	305.95	7.15	0.000
Std. Dev.	7721.63	22.58	20.81	472.97
Skewness	-0.41	-1.14	4.60	-0.21
Kurtosis	1.68	5.45	2.39	46.90

The mean is positive for all variables; on the average, Nigeria recorded approximately 362 cases of coronavirus between 28th February 2020 and 22nd February 2022. Exchange rate and All-Share Index averaged N387.01/US$ and 34810.26 respectively in the sample period, while average oil price was US$58.32 per barrel. The standard deviation, suggested that oil price is the most volatile of all the variables in the analysis, while the ASI is the least volatile. This is in line with the findings of studies such as Gil-Alana and Mong (2020) and Bourghelle and Jawadi (2021), which found that the pandemic exacerbated the global oil volatility. Exchange rate, covid-19 and oil price are negatively skewed, while the stock price is positively skewed. Also, all the variables are platykurtic, except for exchange rate, which is leptokurtic. There is evidence of variations in the data as there are large differences between the maximum and minimum values of all variables.

5.1.2 Unit Root Tests

We began our analysis by employing the Augmented Dickey Fuller test and Phillip Perron test to investigate the stationarity or otherwise of the variables. Based on the unit root results, exchange rate and stock price were integrated of order one (I (1)), while oil price and covid-19 are integrated of order zero (I (0)). Thus, the VAR model is suitable for this study. The optimal lag length of 18 was selected using the Schwarz Information Criterion (SIC).

Table 2a: Augmented Dickey Fuller Test

Variable	Level	First Difference	I(D)
Stock Index	-1.510^{B}	-18.497*^{B}	I(1)
Exchange Rate	1.575^{C}	-22.529*^{C}	I(1)
Oil Price	-4.451*^{B}	-27.966^{*B}	I(0)
COVID-19	-2.188**^{C}	-10.816*^{A}	I(0)

Note: *, **, *** denote 1%, 5% and 10% levels of significance respectively; I(D) denotes order of integration and A, B or C represent test equation with constant, constant and trend or neither constant nor trend.

Table 2b: Phillip Perron Unit Root Test

Variable	Level	First Difference	I(D)
Stock Index	-1.734^{B}	-19.232^{*B}	I(1)
Exchange Rate	-1.579^{C}	-22.529*^{C}	I(1)

Oil Price	-4.548*[B]	-27.591*[B]	I(0)
COVID-19	-15.765*[A]	-61.289*[A]	I(0)

Note: *, **, *** denote 1%, 5% and 10% levels of significance respectively; I(D) denote order of integration and A, B or C represent test equation with constant, constant and trend or neither constant nor trend.

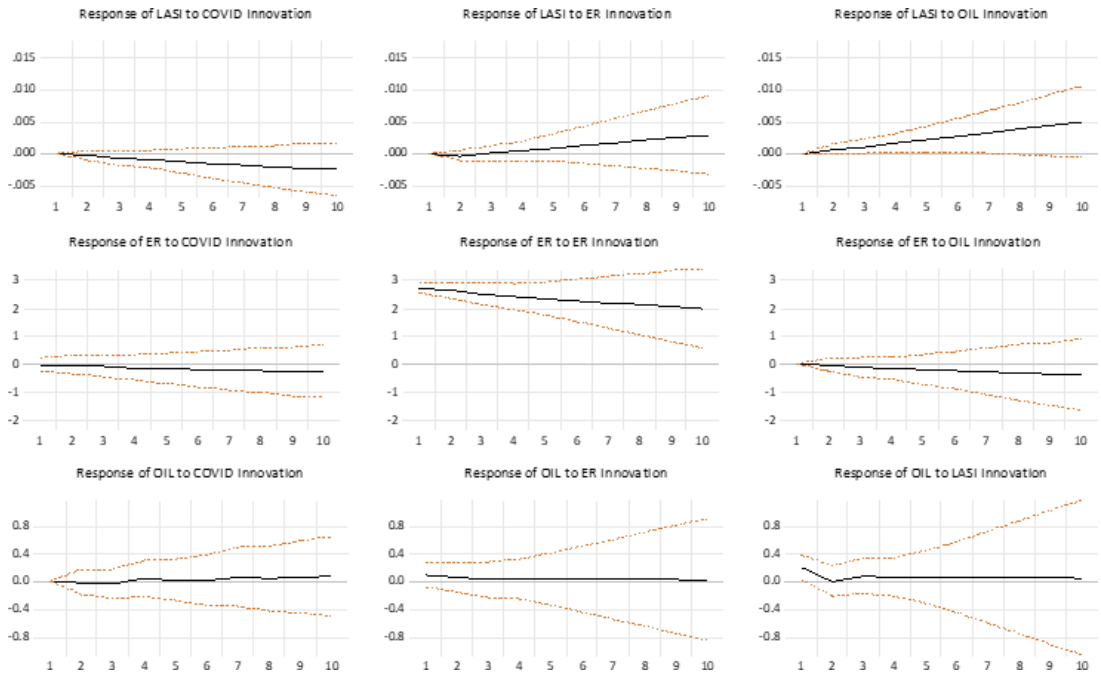
The impulse response functions and the variance decomposition results are discussed in this section. The optimal lag length of three (3) was selected using the Akaike Information Criterion (AIC) and the Schwartz Information Criterion (SIC) (see appendix), and the stability of the model was verified using a series of diagnostic tests (see section 6).

Discussion of Results

Impulse Response Functions

Figure 5 showed the response of the stock market, foreign exchange market and crude oil market to a daily rise in the number of confirmed Covid-19 cases. The impulse response functions show the reaction of each variable to a one-standard deviation COVID-19 shock using a 95 per cent confidence interval. Based on the theoretical and empirical underpinnings, we expect a general rise in volatility in financial markets due to the COVID-19 pandemic. Thus, a rise in the number of COVID-19 cases is likely to trigger a fall in ASI, a depreciation in exchange rate, and a fall in oil price (Salisu et al 2020).

Figure 5: Response of ASI, Exchange Rate and Oil Price to COVID-19 Shocks



Note: The graphs show the response of ASI, ER, and Oil to a One S.D. Innovations to COVID-19

The impulse response functions revealed that ASI responded negatively and significantly to a rise inCOVID-19 cases. This implies that the coronavirus pandemic adversely affected the performance of thestock market within the estimation horizon. This is likely due to the control measures implemented globally, which culminated in declined economic activities. First, restrictions were imposed on transportation ofpeople across countries, thereby restricting labor mobility. This also led to a decline in income to the

transportation and tourism sector and a decline in the returns on investment in the sector, causing investor apathy. In addition, there was an overall decline in economic activities, which triggered a sell-off of stocks and shares, leading to a decline in stock market performance. This finding is consistent with the findings of Boone et al., (2020) for Asia-Pacific, Europe and North America, which found that the stock market experienced significant losses in the periods following the outbreak of Covid-19. Similarly, our findings corroborate that of Ganie et al., (2022) that for Mexico, Brazil, USA, Spain and India.

The response of exchange rate to a rise in the number of COVID-19 cases was negative and significant during the period under consideration. At the initial period, exchange rate remains unchanged despite the covid-19 shock. This response is sustained until the third period, when exchange rate begins to decline gradually. This reaction is expected as the pandemic was accompanied by a shut-down of economic activities, including trade and investments. This caused a decline in foreign exchange earnings, and consequent, depreciation of exchange rate. This results validate the findings of Salisu et al., (2021) for the United States and Neykov and Robert (2021) for the Euro-Area. In the case of oil price, the reaction to a rise in the number of COVID-19 cases is negative and significant in the second and third periods, and a steady rise in subsequent periods. The fall in oil price can be explained by the decline in oil demand, a surge in oil inventories, which caused a decline in oil price during the pandemic (World Bank, 2020). Between the sixth and tenth periods however, the COVID-19 pandemic triggered a rise in oil price.

In summary, the results of the impulse response functions seem to be consistent with a priori expectations. The results corroborate the findings of Dahir et al (2017) and the findings of Salisu and Ndako (2019), that volatility in the exchange rate and stock markets increase during crisis periods and the shocks are transmitted between financial markets via contagion channels. Furthermore, the findings of this study are also in line with Zhang et al (2020) and Salisu et al (2020), which found that stock price, exchange rate and oil price were affected by the COVID-19 pandemic.

Forecast Variance Decomposition

The forecast error variance decomposition shows The forecast variance decomposition shows the percentage of movement in ASI, exchange rate, and oil price that can be explained by own shocks and shocks to other variables in the model. Based on the results displayed in Table 6, own shocks seem to explain the highest percentage of changes in all variables, compared to other variables considered.

In the 1st period, 100 per cent of movements in ASI can be explained by own shocks, while the other variables do not seem to have any impact. In subsequent periods, the percentage of movement explained by exchange rate shocks ranges between 0.08 per cent in the 2nd period to 2.02 per cent in the 10th period. The contribution of oil price shocks to variations in ASI ranges between 0.28 per cent in the 2nd period to 7.106 per cent in the 10th period. The shocks emanating from the COVID-19 pandemic contributed between 0.061 per cent and 2.06 per cent in the 2nd and 10th period respectively. These results indicate that apart from the own shocks, ASI was most affected by oil price shocks all through the estimation horizon. It also shows that compared to other variables considered, the contribution of COVID-19 shocks to ASI was negligible during the estimation horizon.

Table 6: Forecast Variance Decomposition

Variance Decomposition of ASI				
Period	ASI	ER	Oil Price	COVID-19
1	100.000	0.000	0.000	0.000
2	99.575	0.080	0.284	0.061
4	98.520	0.072	1.012	0.394

6	96.261	0.406	2.449	0.884
8	92.957	1.086	4.510	1.447
10	88.811	2.020	7.106	2.062
Variance Decomposition of ASI				
Variance Decomposition of ER				
Period	ASI	ER	Oil Price	COVID-19
1	0.673	99.327	0.000	0.000
2	0.482	99.514	0.003	0.000
4	0.305	99.499	0.130	0.065
6	0.257	99.221	0.329	0.185
8	0.505	98.527	0.607	0.361
10	1.088	97.392	0.974	0.547
Variance Decomposition of Oil Price				
Period	ASI	ER	Oil Price	COVID-19
1	1.094	0.028	98.621	0.000
2	0.704	0.274	99.022	0.000
4	0.549	0.186	99.231	0.033
6	0.462	0.153	99.353	0.032
8	0.414	0.134	99.398	0.062
10	0.384	0.121	99.394	0.102

Source: Computed by authors using Eviews 12

Own shocks contributed 99.327 per cent to the variation in exchange rate in the 1st period, while ASI contributes the remaining 0.673 per cent. Oil price shocks and COVID-19 do not contribute to the movements in exchange rate in the 1st period. Subsequently, the contribution of the other variables increased marginally, with the contribution of COVID-19 reaching 0.102 per cent in the 10th period. The contribution of ASI and oil price remained low between the 2nd and 10th period.

In the case of oil price, COVID-19 does not have an impact in the 1st period, however, the contribution increased to 0.10 per cent in the 10th period. Own shocks remained the highest contributor all through the estimation horizon. However, apart from own shock, shocks to ASI seem to contribute the highest to oil price all through the horizon.

Residual Diagnostic Tests

A series of diagnostic tests were conducted to test the stability and validity of the model. In particular, the Edgeworth and Shukur (1999) VAR Residual Serial Correlation (LM) test, was used to test for the presence of autocorrelation in the model. In addition, we also compute the AR root graph to enable us test the stability of the model.

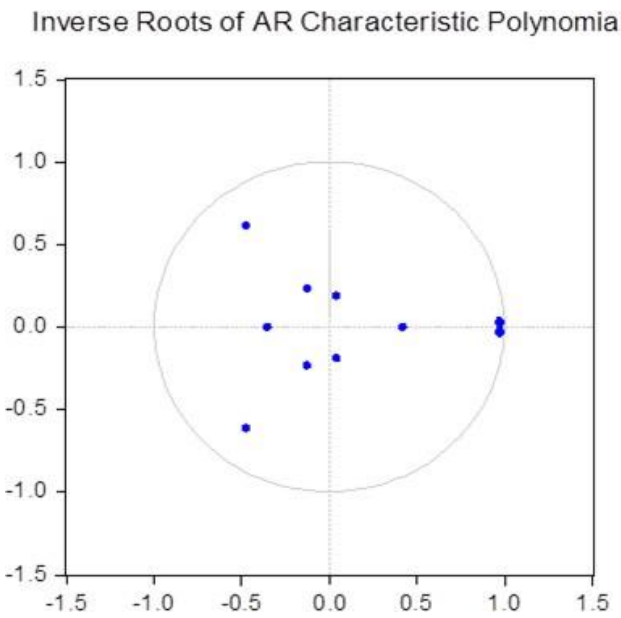
The results of the serial correlation test shown in table 7 suggests that there is no serial correlation as the LM statistic is not significant at any lag. Thus, we do not reject the hypothesis of no serial correlation. Similarly, no roots of the characteristic polynomial is outside the unit circle, indicating that the model is stable (see figure 6).

Table 7: Serial Correlation LM Test

Lag	LRE*stat	Prob	Rao F-Stat	Prob
1	10.341	0.842	0.645	0.848
2	12.998	0.673	0.812	0.673
3	14.894	0.532	0.931	0.533
4	22.141	0.139	1.388	0.139

Note: Null hypothesis is: No serial correlation at lag h of the residuals. The null is rejected if at 1%, 5%, and 10% levels of significance.

Figure 6:



Source: computed by author using eviews 12

CONCLUSION AND POLICY RECOMMENDATIONS

The study set out to investigate the impact of COVID – 19 on stock market and exchange rate in Nigeria. Variables utilized for the study are the daily cases of COVID-19, the all share index, exchange rate and oil prices. The study utilized the impulse response function of the Toda-Yamamoto model (TY Model), and the variance decomposition for the analysis.

The Impulse response function describes the nature of relationship between the aforementioned variables. It was found that response of the all share index to COVID-19 shocks was negative, suggesting that the Nigerian Stock market experienced poor performance during the period. The response of exchange rate to COVID-19 pandemic was negative and significant during the estimation horizon. This implies that exchange rate depreciated, which could be as a result of the decline in oil price and decrease in foreign exchange earnings. The forecast variance decomposition also revealed that the impact of COVID-19 pandemic on stock market was minimal, however, oil price shock impacted more on stock market. This could be as a result of the crucial role of oil price in determining exchange rate and stock market performance.

The overall implication of the findings of this study is that the COVID – 19 pandemic negatively affected the Nigerian economy as evidenced by the poor performance of the stock market and the depreciation of

exchange rate due to fall in oil prices. This could be as a result of over dependence of the country on oil export, which eventually affected the exchange rate and the performance of the stock market.

In view of this, the study recommends effective exchange rate management during such crisis to mitigate the effect of exchange rate changes on stock market and other sectors of the economy. Conscious move towards diversification of the economy should be put in place to broaden the export base of the economy for better exchange rate management. This can be achieved through the provision of incentives to sectors that are majorly affected by the pandemic, and the policy of selective credit control, targeted at productive sectors of the economy by the Central Bank. Also, effective stock market infrastructure to cushion the effect of exchange rate volatility and changes in economic activities should also be developed.

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