



## IMPACT OF COVID-19 PANDEMIC ON STOCK PRICE VOLATILITY OF SUB-SECTOR INDICES IN THE NIGERIAN STOCK EXCHANGE

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### Abstract

*Stock market volatility influences investor's participation in the stock market of any nation. The global pandemic created a lot of uncertainty about future of the economy, especially among developing stock market, like the Nigerian stock market. The emergence of COVID-19 pandemic impacted different sectors of Nigeria's economy in diverse ways and this affected investor's confidence in the Nigeria stock market. This study investigated the impact of COVID-19 pandemic on the sub-sector indices in the Nigeria stock exchange market. The study employed ex-post facto research design to determine the impact of COVID-19 infection rates and COVID-19 death rates on stock price volatility of sub-sector indices in the Nigeria stock exchange market, within the period of 2nd March 2020 to 28th February, 2022. The study employed GARCH and DCC-GARCH and found that COVID-19 pandemic (infection and death rates) had significant effect on the volatility of sub-sector indices in the Nigeria stock market, and that there was significant volatility transmission among the sub-sector indices of the Nigerian stock market during the COVID-19 pandemic period. The study recommends that policy makers should provide support to companies that were badly hit during the pandemic, and also encouraged portfolio managers to understand the nature of risk attached to stocks selected to be in portfolio of their investors and be aware of best way to mitigate adverse risk effect.*

**Keywords:** COVID-19 pandemic, coronavirus, financial crisis, economy infection rate, death rate, sub-sector indices, volatility transmission and Stock market return,

### INTRODUCTION

Globally, the stock market experienced unprecedented fluctuations following the impact of the contemporary international financial crisis. This volatility is critical to economic agents because it represents a measure of risk exposure in their investments. Volatility increases the uncertainty and risk of the stock market, erodes investor confidence, causes mispricing of shares and reduces participation in the market, which are detrimental to the normal operation of the stock market. The world has witnessed several stock market



crashes and large volatility of stock market returns through financial crunches such as the Asian crisis of 1997–1998, the global financial crisis of 2007–2008 and the recent COVID-19 pandemic (Sari, Achsani & Sartono, 2017; Piccoli, Da-Costa, Da-Silva & Cruz, 2018; Van & Alessie, 2012).

Coronavirus (COVID-19) which started in Wuhan, China, in December 2019, migrated across the globe and led to the emergence of several variants. Investors and markets are facing high uncertainties as a result of the physical and financial impacts of the virus. This outbreak has resulted in unprecedented volatility in the global markets of the world. The World Health Organization (WHO) declared COVID-19 as a pandemic on March 11, 2020 (Ducharme, 2020). This immediately exerted announcement effects on the stocks of travel related companies including airlines and hotel companies.

Consequent upon this announcement's effects, the stock markets became volatile amid the spread of the uncertainties of the dynamics of the virus. For example, in the US, CBOE Volatility Index (VIX) surged by over 80% on March 16, 2020, surpassing its 2008 record. S&P 500 and Nasdaq Composite indices dropped by 12% on March 16, 2020. (Business Insider, 2020). On the same day, the Wall Street Journal reported that the Dow Jones Industrial Average (DJIA) dropped by over 12%, marking the second worst day in its 124-year history (Wall Street Journal, 2020). Nigeria is one of the many countries that were affected by the COVID-19 pandemic. The country recorded its first case on 28<sup>th</sup> February, 2020 (an Italian man). The market capitalization of listed equities in the Nigeria stock market, which was valued at 13.657 trillion naira on February 28, 2020 fell to 11.308 trillion naira (US 29.1 billion dollars) on March 23, 2020 (Ozili, 2020).

The COVID-19 pandemic has impacted different sectors of Nigeria's economy in diverse ways, with many sectors experiencing declines in value as a result of the economic disruption caused by the virus. The Nigerian economy was already struggling with a range of issues including high inflation, currency devaluation and a shortage of foreign exchange before the pandemic outbreak, which further exacerbated the situation (Ozili, 2020). The oil and gas sector, which is a major contributor to the Nigerian economy, has been hard hit by the pandemic due to the decline in global oil demand and price. This has led to financial difficulties for many companies in this sector, and some have been forced to reduce production or seek government assistance (OECD, 2020).

The banking sector has also been negatively impacted by the pandemic. Banks in Nigeria were already facing challenges before the pandemic outbreak, such as increased non-performing loans and declining profitability, which were further exacerbated by the



pandemic (Nwosu, Okedigba & Anih 2020). The Central Bank of Nigeria (CBN) had to take measures such as liquidity support to the banks to help them overcome the crisis (CBN, 2020). The manufacturing sector was not left out, as it has also been affected by the pandemic, as lockdowns and supply chain disruptions have led to a decline in production and sales (Kumar, Luthra, Mangla & Kazançoğlu, 2020). This has led to financial difficulties for many companies in this sector, and some have been forced to reduce production or seek government assistance. On the other hand, the technology sector has been relatively resilient to the pandemic's effects. The increase in remote work and online services as a result of the pandemic has led to an increase in demand for technology products and services.

Sundry studies such as (Adenomoni, Maijama & John, 2020; Yilmazkuday, 2020; Al-Awadhi, Alsaifi & Alhammedi, 2020; Zhang, Hu and Ji, 2020; Ashraf, 2020; Salisu and Sikiru, 2020; Salisu and Vo, 2020; Harjoto, Rossi & Paglia, 2020; Sharif, Aloui & Yarovaya, 2020; Takyi and Bentum-ennim, 2021; Insaiddo, et.al., 2021; and Abu et. al., 2021, Alade, Adeusi & Alade, 2021, Amnim, Aipma & Obiora, 2021; Ayodele, Akinyede & Ojedele, 2021, among others) have examined the impact of covid-19 pandemic on stock market return. The few studies carried out used aggregate stock data, our study differs in terms of scope and implementation procedures, as this study will investigate the effects of COVID-19 (confirmed infection and death cases) on stock price of sub-sector indices in the Nigerian Stock Exchange. Besides, based on researcher's knowledge, no known study has considered volatility transmission among the sub-sector indices during the COVID-19 pandemic. Predicated on the problem and gap identified, the following hypotheses were formulated.

**Hypothesis 1 (H<sub>1</sub>).** There is no significant impact of COVID-19 on stock price volatility of sub-sector indices in the Nigerian Stock Exchange.

**Hypothesis 2 (H<sub>2</sub>).** There is no significant volatility transmission among selected sub-indices stock return of the Nigerian stock exchange market

## **LITERATURE REVIEW**

### **Theoretical Framework**

#### **Efficient Market Hypothesis (EMH) Theory**

The study is anchored on Efficient market hypothesis (EMH) theory propounded by Samuelson (1965) and Fama (1963, 1965). The theory suggests that stock prices reflect all publicly available information useful in evaluating their prices and, thus no one can consistently outperform the overall market without accepting higher risk. This implies that



prices adjust quickly and accurately to new information. In the case of the COVID-19 pandemic, this would suggest that sub-sector market indices reflect the impact of the pandemic on specific industries, such as airlines, hospitality, and entertainment. Some investors considered the volatility in the sector as an opportunity to invest in sectors that performed well during the pandemic (Machmuddah, Utomo, Suhartono, Ali, & Ali, 2020). While some others allocate portfolio assets using risk management (Susskind & Vines 2020)

### **Empirical Review**

He, Liu, Wang and Yu (2020) examined the direct and spill-over effect of COVID-19 on stock markets in the following countries; China, Italy, South Korea, France, Spain, Germany, Japan, and the United States of America (USA). Their study employed conventional t-tests and nonparametric Mann–Whitney tests, they found that COVID-19 pandemic has a negative but short-term impact on the selected stock markets; and that the impact of COVID-19 on stock markets has bidirectional spill-over effects between Asian countries and European and American countries. Similarly, Narayan (2020) evaluated the relative significance of COVID-19 infections and oil price news in influencing oil prices. They concluded that when oil prices are used as the threshold, news about the COVID-19 pandemic and negative oil price will affect oil prices under high volatility.

Sharif, Aloui and Yarovaya (2020) investigated the connectedness between the COVID-19 pandemic, oil price volatility shock, the stock market, geopolitical risk, and economic policy uncertainty in the US in the time-domain approach and the method based on frequency dynamics by applying the coherence wavelet method and the wavelet-based Granger causality. They found that the unprecedented impact of the COVID-19 pandemic on these elements leads to the development of low-frequency bands, and the impact of the COVID-19 pandemic on the geopolitical risk is substantially greater than on the US economic uncertainty.

Xu, (2020) examined the dynamic response of stock return to the unexpected changes in the Covid-19 cases and the uncertainty associated with the pandemic. Using Bivariate Structural GARCH-in-Mean VAR with daily data from Canada and the US, they found that there is a negative effect of an increase in the COVID-19 cases on the stock market in general. In addition, the stock return responses are asymmetric in the increase and decrease in the cases in Canada. They were of the opinion that the asymmetry is caused by the negative impact of uncertainty about the pandemic.

Uddin et al. (2021) investigated the effect of COVID -19 pandemic on global stock market volatility. Using data from 34 developed and emerging markets, they employed panel-



based EGARCH model, they found that these country level economic characteristics and factors (such as economic resilience, intensity of capitalism, level of corporate governance, financial development, monetary policy rate and quality of health system) do help to reduce the volatility arising due to the virus pandemic.

In Nigeria, Adenomon Maijama and John (2020), investigated the impact of COVID -19 on Nigeria Stock Exchange Performance. Their study employed the EGarch, QGarch model and they modeled stock market performance using daily All Share Index. The study found a negative effect of COVID -19 on stock market performance. Nwosa (2020), evaluated 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. Their study observed that COVID-19 had adverse effects on oil price, exchange rate and stock market performance in Nigeria, more than the 2009 and 2016 global recessions. The study concluded that COVID-19 pandemic had significance influence on oil price, exchange rate and stock market performance had implications for TNCs and FDI inflow in Nigeria.

Ozili and Arun (2020), investigated the impact of COVID -19 on stock return volatility on the Nigeria Stock Exchange Market and found that COVID -19 had a huge negative impact on Nigeria stock market. They stated that the increasing number of lockdown days, monetary policy decisions and international travel restrictions severely affected the level of economic activities and the closing, opening, lowest and highest stock price of major stock market indices.

Abu, et.al (2021) assessed the effect of COVID-19 on Nigeria's stock market over the 23rd March to 11th September 2020 period using the autoregressive distributed lag (ARDL), canonical co-integrating regression (CCR), dynamic ordinary least squares (DOLS) and fully modified ordinary least squares (FMOLS) techniques. The ARDL and CCR tests revealed 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 demonstrated 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, they also stated that 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 (consumer goods and healthcare sub-sectors) of the stock market.

The source of motivation for this study comes from coverage and methodological gap identified among empirical literatures on the impact of COVID -19 pandemic on volatility



of stock market return. Similarly, no known study to the best of researcher's knowledge has considered the impact of COVID -19 pandemic on the seven sector indices in the Nigerian stock exchange market, neither has any study investigated the volatility transmission among sub-sector indices using the BKK-GARCH and DCC-GARCH, during the COVID -19 pandemic. This however constitutes a coverage gap in this study.

Based on these empirical gaps i.e coverage and methodological gaps, this study intends to fill a gap in literature by assessing the impact of COVID -19 pandemic on stock price of sub-sector indices in the Nigerian Stock Exchange.

### **METHODOLOGY**

This study employed *expost facto* research design and focused on the impact of COVID -19 pandemic on seven sub-sector indices in the Nigeria stock exchange market within the period of 2nd March 2020 to 28th February 2022. Stock price represents the dependent variable while COVID -19 pandemic (infection and death rates) represents the independent variable. The study employed GARCH model to examine the impact of COVID -19 pandemic on seven subsector indices in the Nigeria stock exchange market and DCC-GARCH to examine volatility transmission among sub-sector indices during the COVID -19 pandemic. The study employed daily data which were sourced from secondary sources such as; Central Bank of Nigeria Statistical Bulletin, Nigerian Stock Exchange Market Report, Security and Exchange Commission (SEC) Report, Nigeria Centre for Disease Control (NCDC), and the World Health Organization (WHO) websites.

### **Model Specification**

Using the EMH theory, Samuelson (1965) and Fama (1963) revealed that stock prices reflect all publicly available information useful in evaluating their prices.

The formula is presented as follows:

$$P_t = E_t [P_{t+1}] / (1+r) \quad (1)$$

where  $P_t$  is the current price of a financial asset and  $E_t [P_{t+1}]$  is the expected price of the asset at some point in the future, based on all available information at the current time  $r$  is the required rate of return for the asset. Due to the peculiarity of this study in terms of its focus, equation (1) is adapted. Thus, the sectoral stock indices replace  $P_t$  while on the right-hand side of the equation, COVID-19 pandemic (COVID-19 infection cases and COVID -19 death cases) indicators were used to replace the existing variables. The functional form



of the relationship between the stock market and the COVID-19 pandemic for this study is specified as follows:

$$rASI_t = f(CIR_t) \quad (2)$$

where,  $rASI$  represents the all-share index and the seven sub-sector indices (banking sector, insurance sector, consumer goods sector, oil and gas sector stock, Lotus Islamic, industrial goods sector and asset management stock price), and  $CIR_t$  represents COVID-19 infection rates. The study model was examined for sensitivity to alternative measure of the incidence of COVID-19 pandemic by replacing CIR in the model with the total number of confirmed deaths (CDR).

## RESULTS AND DISCUSSION

The first step before checking the volatility of the models is to first establish if the series will show an ARCH effect. This implies that an ARCH test is needed to test the volatility of stock price and COVID-19 pandemic since daily data (2nd March 2020 to 28th February, 2022) were used for this study.

### Autoregressive Conditional Heteroskedasticity (ARCH) Test

Table 1: ARCH Test Result

Sector	F-statistic		Obs*R-squared	
	Value	p-value	Value	p-value
rASI	16.47045***	0.0001	16.03591***	0.0001
rNGXBank	113.9811***	0.0000	94.22246***	0.0000
rNGXINS	145.8674***	0.0000	114.9092***	0.0000
rNGXCons	70.77542***	0.0000	62.70009***	0.0000
rNGXOG	5.971361**	0.0149	5.927279**	0.0149
rNGXLOT	3.442706*	0.0641	3.433430*	0.0639
rNGXIND	9.212557***	0.0025	9.089784***	0.0026



rNGXASEM	0.055312	0.8143	0.055514	0.81 37
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Source: Author’s Computation, 2022.

Note: \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%

The ARCH test findings shown in Table 1 show that there is proof of the ARCH impact in all the variables tested, with the exception of the asset management stock price returns. The statistics and corresponding p-values are used to make this determination.

### Effect of COVID -19 Pandemic on Stock Market Return Volatility

The results of GARCH employed to investigate the effect of COVID -19 pandemic on stock market volatility are presented here. Tables 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8 and 4.9 showed the outcomes for overall stock price volatility, banking sector stock price volatility, insurance sector stock price volatility, consumer goods sector stock price volatility, oil and gas sector stock price volatility, Lotus Islamic stock price volatility, industrial goods sector stock price volatility, asset management stock price volatility respectively. Given that each of the tables features the mean and variance equations results and that the variance equation represents the volatility of the stock market, the indicators of COVID-19 pandemic are included in the variance equation to achieve this objective.

Result for Overall Stock Market

Table 2: GARCH Results for Overall Stock Market

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	15.82719	1.623119	0.1046
rASI(lag)	0.245727***	3.913970	0.0001
<b>Variance Equation</b>			
C	43240.21***	12.42193	0.0000
RESID(-1)^2	0.557039***	8.853313	0.0000
GARCH(-1)	0.056490	1.128425	0.2591
CIR	31.03664***	3.695917	0.0002




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CDR	-2338.743***	-5.678874	0.0000
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Source: Author’s Computation, 2022.

Note: *C* is constant;  $RESID(-1)^2$  is ARCH, news or shock effect;  $GARCH(-1)$  is GARCH effect or shock asymmetry; *CIR* is COVID-19 infection rate and *CDR* is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%

The results for overall stock market revealed that in the mean equation, lagged returns has a significant positive coefficient of 0.245727, which has a z-statistic of 3.913970 and a p-value 0.0001. This indicates that the coefficient is significant. Given that the lagged value of returns represent the effect of past return on future returns, the result indicate that increase in the returns of overall stock market leads to an increase in future returns by approximately 0.246 points.

The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of  $RESID(-1)^2$ , 0.557039, and its pvalue of 0.0000 is lower than all significance levels. This implies that the volatility of the overall stock price increases with a (positive or negative) shock to the market. GARCH or asymmetric effect is seen to be insignificant because its coefficient of 0.056490 has a p-value of 0.2591 that is greater than all significance levels. This indicates that for the overall stock market, a positive or negative shock do not have significantly different effect on stock price volatility. COVID-19 infection rate (*CIR*) has a significant positive coefficient (31.03664, with a p-value of 0.0002). This implies that an increase in the infection of COVID-19 will lead to an increase in the volatility of overall stock prices by approximately 31.04 points. COVID-19 death rate (*CDR*) has a significant negative coefficient (-2338.743, with a p-value of 0.0000). This implies that an increase in the death of COVID-19 will lead to a decrease in the volatility of overall stock prices by approximately 2338.7 points.

### Result for Banking Stock Prices

Table 3: GARCH Results for Banking Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	0.188082	1.024331	0.3057
rNGXBank(lag)	0.171961***	3.711996	0.0002



	Variance Equation		
C	0.736287***	6.769116	0.0000
RESID(-1)^2	0.099152***	7.720779	0.0000
GARCH(-1)	0.888280***	80.80262	0.0000
CIR	-0.000877***	-3.700900	0.0002
CDR	0.011284	0.520759	0.6025

Source: Author's Computation, 2022.

Note: C is constant; RESID(-1)^2 is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%.

The results for banking stock prices revealed that in the mean equation, lagged returns has a significant positive coefficient of 0.171961, which has a z-statistic of 3.711996 and a p-value 0.0002. This indicates that the coefficient is significant. Given that the lagged value of returns represent the effect of past return on future returns, the result indicate that increase in the returns of banking stock prices leads to an increase in future returns by approximately 0.172 points.

The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of RESID(-1)^2, 0.099152, and its pvalue of 0.0000 is lower than all significance levels. This implies that the volatility of the banking stock prices increases with a (positive or negative) shock to the market. GARCH or asymmetric effect is also seen to be significant because its coefficient of 0.888280 has a pvalue of 0.0000 that is less than all significance levels. This indicates that for the banking stock prices, positive and negative shocks have significantly different effect on stock price volatility, and it is the positive shock that generate greater volatility than negative shock. COVID-19 infection rate (CIR) has a significant negative coefficient (-0.000877, with a p-value of 0.0002). This implies that an increase in the infection of COVID-19 will lead to a decrease in the volatility of banking stock prices by approximately 0.001 points. COVID-19 death rate (CDR) has an insignificant coefficient (0.011284, with a p-value of 0.6025). This implies that an increase in the death of COVID-19 does not cause a change in the volatility of banking stock prices.

Result for Insurance Stock Prices

Table 4: GARCH Results for Insurance Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	0.071924	0.850520	0.3950
rNGXINS(lag)	-0.071042	-1.389353	0.1647
<b>Variance Equation</b>			
C	0.510959***	2.772047	0.0056
RESID(-1) <sup>2</sup>	0.199890***	4.252877	0.0000
GARCH(-1)	0.705128***	11.33851	0.0000
CIR	0.000585	1.438640	0.1503
CDR	-0.032588	-1.389022	0.1648

Source: Author's Computation, 2022.

Note: C is constant; RESID(-1)<sup>2</sup> is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%

The results for insurance stock prices revealed that in the mean equation, lagged returns has a insignificant coefficient of -0.071042, which has a z-statistic of -1.389353 and a p-value 0.1647. This indicates that the coefficient is significant. This indicates that change in the returns of insurance stock prices does not affect future returns. The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of RESID(-1)<sup>2</sup>, 0.199890, and its pvalue of 0.0000 is lower than all significance levels. This implies that the volatility of the insurance stock prices increases with a (positive or negative) shock to the market. GARCH or asymmetric effect is also seen to be significant because its coefficient of 0.705128 has a pvalue of 0.0000 that is less than all significance levels. This indicates that for the insurance stock prices, positive and negative shocks have significantly different effects on stock price volatility, and it is the positive shock that generates greater volatility than negative shock.



COVID-19 infection rate (CIR) has an insignificant coefficient (0.000585, with a p-value of 0.1503). This implies that an increase in the infection of COVID-19 does not affect the volatility of insurance stock prices. COVID-19 death rate (CDR) has an insignificant coefficient (-0.032588, with a p-value of 0.1648). This implies that an increase in the death of COVID-19 does not cause a change in the volatility of insurance stock prices.

Result for Consumer Goods Stock Prices

Table 5: GARCH Results for Consumer Goods Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	2.384276	0.920424	0.3574
rNGXCons(lag)	-0.083771	-0.324352	0.7457
<b>Variance Equation</b>			
C	272.7409***	7.734692	0.0000
RESID(-1) <sup>2</sup>	0.069510	1.566120	0.1173
GARCH(-1)	0.565486***	10.04311	0.0000
CIR	-0.078841***	-24.65091	0.0000
CDR	-8.513565***	-17.22710	0.0000

Source: Author's Computation, 2022.

Note: C is constant; RESID(-1)<sup>2</sup> is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%

The results for consumer goods stock prices revealed that in the mean equation, lagged returns has an insignificant coefficient of -0.083771, which has a z-statistic of -0.324352 and a p-value 0.7457. This indicates that the coefficient is insignificant and a change in the returns of consumer goods stock prices does not affect future returns. The result also revealed from the variance equation that there is no effect from shocks to the market. This is viewed from the insignificant coefficient of RESID(-1)<sup>2</sup>, 0.069510, and its pvalue of 0.1173 is greater than all significance levels. This implies that the volatility of the consumer stock prices does not react to market shocks. GARCH or asymmetric effect is seen to be significant because its coefficient of 0.565486 has a p-value of 0.0000 that is lower than

all significance levels. This indicates that for the consumer goods stock prices, positive and negative shocks have significantly different effect on stock price volatility, and it is positive shock that exert greater effect on volatility. COVID-19 infection rate (CIR) has a significant negative coefficient (-0.078841, with a p-value of 0.0000). This implies that an increase in the infection of COVID-19 will lead to a decrease in the volatility of consumer goods stock prices by approximately 0.079 points. COVID-19 death rate (CDR) also has a significant negative coefficient (-8.513565, with a p-value of 0.0000). This implies that an increase in the death of COVID-19 will lead to a decrease in the volatility of consumer goods stock prices by approximately 8.51 points.

Result for Oil and Gas Stock Prices

Table 6: GARCH Results for Oil and Gas Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	0.318992*	1.860201	0.0629
rNGXOG(lag)	0.147972***	3.003251	0.0027
<b>Variance Equation</b>			
C	0.876250***	5.729118	0.0000
RESID(-1)^2	0.135081***	8.436383	0.0000
GARCH(-1)	0.833280***	57.21135	0.0000
CIR	0.000532**	2.295147	0.0217
CDR	-0.008043	-0.374246	0.7082

Source: Author's Computation, 2022.

*Note: C is constant; RESID(-1)^2 is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%*

The results for oil and gas stock prices revealed that in the mean equation, lagged returns has a significant positive coefficient of 0.147972, which has a z-statistic of 3.003251 and a p-value 0.0027. This indicates that the coefficient is significant. Given that the lagged value of returns represent the effect of past return on future returns, the result indicate that



increase in the returns of oil and gas stock prices leads to an increase in future returns by approximately 0.148 points.

The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of  $RESID(-1)^2$ , 0.135081, and its pvalue of 0.0000 is lower than all significance levels. This implies that the volatility of the oil and gas stock prices increases with a (positive or negative) shock to the market. GARCH or asymmetric effect is also seen to be significant because its coefficient of 0.833280 has a pvalue of 0.0000 that is less than all significance levels. This indicates that for the oil and gas stock prices, positive and negative shocks have significantly different effect on stock price volatility, and it is the positive shock that generate greater volatility than negative shock. COVID-19 infection rate (CIR) has a significant positive coefficient (0.000532, with a p-value of 0.0217). This implies that an increase in the infection of COVID-19 will lead to an increase in the volatility of oil and gas stock prices by approximately 0.0005 points. COVID-19 death rate (CDR) has an insignificant coefficient (-0.008043, with a p-value of 0.7082). This implies that an increase in the death of COVID-19 does not cause a change in the volatility of oil and gas stock prices.

Result for Lotus Islamic Stock Prices

Table 7: GARCH Results for Lotus Islamic Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	1.625685	1.615814	0.1061
rNGXLOT(lag)	0.127299***	2.742730	0.0061
<b>Variance Equation</b>			
C	26.90048***	5.041817	0.0000
RESID(-1) <sup>2</sup>	0.057254***	4.825815	0.0000
GARCH(-1)	0.893780***	46.79229	0.0000
CIR	0.063010***	4.512980	0.0000
CDR	-5.476130***	-5.894834	0.0000

Source: Author’s Computation, 2022.



*Note: C is constant; RESID(-1)<sup>2</sup> is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%*

The results for Lotus Islamic stock prices revealed that in the mean equation, lagged returns has a significant positive coefficient of 0.127299, which has a z-statistic of 2.742730 and a pvalue 0.0061. This indicates that the coefficient is significant. Given that the lagged value of returns represent the effect of past return on future returns, the result indicate that increase in the returns of Lotus Islamic stock prices leads to an increase in future returns by approximately 0.127 points.

The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of RESID(-1)<sup>2</sup>, 0.057254, and its pvalue of 0.0000 is lower than all significance levels. This implies that the volatility of the Lotus Islamic stock prices increases with a (positive or negative) shock to the market. GARCH or asymmetric effect is also seen to be significant because its coefficient of 0.893780 has a pvalue of 0.0000 that is less than all significance levels. This indicates that for the Lotus Islamic stock prices, positive and negative shocks have significantly different effect on stock price volatility, and it is the positive shock that generate greater volatility than negative shock. COVID-19 infection rate (CIR) has a significant positive coefficient (0.063010, with a p-value of 0.0000). This implies that an increase in the infection of COVID-19 will lead to an increase in the volatility of Lotus Islamic stock prices by approximately 0.063 points. COVID-19 death rate (CDR) has a significant negative coefficient (-5.476130, with a p-value of 0.0000). This implies that an increase in the death of COVID-19 will lead to a decrease in the volatility of Lotus Islamic stock prices by approximately 5.476 points.

Result for Industrial Goods Stock Prices

Table 8: GARCH Results for Industrial Goods Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	-1.687255	-0.953431	0.3404
rNGXIND(lag)	-0.004983	-0.056440	0.9550
<b>Variance Equation</b>			
C	467.3005***	13.62598	0.0000



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RESID(-1) <sup>2</sup>	0.116500***	4.395467	0.0000
GARCH(-1)	0.550663***	12.55890	0.0000
CIR	-0.135215***	-20.24568	0.0000
CDR	-14.81344***	-23.16322	0.0000

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Source: Author's Computation, 2022.

Note: *C* is constant; RESID(-1)<sup>2</sup> is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%

The results for industrial goods stock prices revealed that in the mean equation, lagged returns has an insignificant coefficient of -0.004983, which has a z-statistic of -0.056440 and a p-value 0.9550. This indicates that the coefficient is insignificant and past returns of industrial goods stock prices does not affect future returns.

The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of RESID(-1)<sup>2</sup>, 0.116500, and its pvalue of 0.0000 is lower than all significance levels. This implies that the volatility of the industrial goods stock prices increases with a (positive or negative) shock to the market. GARCH or asymmetric effect is also seen to be significant because its coefficient of 0.550663 has a p-value of 0.0000 that is less than all significance levels. This indicates that for the industrial goods stock prices, positive and negative shocks have significantly different effect on stock price volatility, and it is the positive shock that generate greater volatility than negative shock. COVID-19 infection rate (CIR) has a significant negative coefficient (-0.135215, with a p-value of 0.0000). This implies that an increase in the infection of COVID-19 will lead to a decrease in the volatility of industrial goods stock prices by approximately 0.135 points. COVID-19 death rate (CDR) has a significant negative coefficient (-14.81344, with a p-value of 0.0000). This implies that an increase in the death of COVID-19 will lead to a decrease in the volatility of industrial goods stock prices by approximately 14.81 points.



Result for Asset Management Stock Prices

Table 9: GARCH Results for Asset Management Stock Prices

Variable	Coefficient	z-Statistic	Prob.
<b>Mean Equation</b>			
C	-0.133404	-1.372749	0.1698
rNGXASEM(lag)	-0.004286	-0.027716	0.9779
<b>Variance Equation</b>			
C	2.517272***	5160.907	0.0000
RESID(-1) <sup>2</sup>	-0.006876**	-2.328333	0.0199
GARCH(-1)	0.576362***	99.67880	0.0000
CIR	-0.000739***	-7.657943	0.0000
CDR	-0.077908***	-9.445881	0.0000

Source: Author's Computation, 2022.

Note: C is constant; RESID(-1)<sup>2</sup> is ARCH, news or shock effect; GARCH(-1) is GARCH effect or shock asymmetry; CIR is COVID-19 infection rate and CDR is COVID-19 death rate. \*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%

The results for asset management stock prices revealed that in the mean equation, lagged returns has an insignificant coefficient of -0.004286, which has a z-statistic of -0.027716 and a p-value 0.9779. This indicates that the coefficient is insignificant and past returns of asset management stock prices do not affect future returns.

The result also revealed from the variance equation that there is an effect from shocks to the market. This is viewed from the significant coefficient of RESID(-1)<sup>2</sup>, -0.006876, and its pvalue of 0.0199 is lower than 5% significance level. This implies that the volatility of the asset management stock prices decreases with a (positive or negative) shock to the market. GARCH or asymmetric effect is also seen to be significant because its coefficient of 0.576362 has a pvalue of 0.0000 that is less than all significance levels. This indicates that for the asset management stock prices, positive and negative shocks have significantly different effect on stock price volatility, and it is the positive shock that generates greater reduced volatility than negative shock. COVID-19 infection rate (CIR) has a significant negative coefficient (-0.000739, with a p-value of 0.0000). This implies that an increase in

the infection of COVID19 will lead to a decrease in the volatility of asset management stock prices by approximately 0.0007 points. COVID-19 death rate (CDR) also has a significant negative coefficient (0.077908, with a p-value of 0.0000). This implies that an increase in the death of COVID-19 will lead to a decrease in the volatility of asset management stock prices by approximately 0.078 points.

**Volatility Transmission among the Sub-Indices of the Stock Market Index**

This sub-section is devoted to presenting the results of the Dynamic Conditional Correlation (DCC) multivariate GARCH model for examining the transmission of volatilities among the different sectors or sub-indices of the stock market. This exercise is as well, devoted to achieving the fourth objective of the study. The analysis was carried out for transmission between the returns of each of a pair of sub-indices for banking sector (NGXBank), insurance sector (NGXINS), consumer goods sector (NGXCons), oil and gas sector (NGXOG), Lotus Islamic (NGXLOT), and industrial goods sector (NGXIND). The return of asset management sub-index was not included in the analysis because the initial ARCH effect test conducted shows that there is no presence of ARCH effect (or volatility) in it. The DCC MGARCH result is presented in Table 4.29 below.

**Table 10: Result of DCC MGARCH for Volatility Transmission among Sectors**

Transmission	Coefficient	z-statistic	p-value
corr(rNGXBank, rNGXINS)	0.383873***	4.03	0.000
corr(rNGXBank, rNGXCons)	0.750263***	17.01	0.000
corr(rNGXBank, rNGXOG)	0.340055***	3.44	0.001
corr(rNGXBank, rNGXLOT)	0.672961***	14.77	0.000
corr(rNGXBank, rNGXIND)	0.409746***	4.46	0.000
corr(rNGXINS, rNGXCons)	0.405337***	3.48	0.001
corr(rNGXINS, rNGXOG)	0.190981**	2.4	0.016
corr(rNGXINS, rNGXLOT)	0.351168***	3.37	0.001
corr(rNGXINS, rNGXIND)	0.220697**	2.59	0.010
corr(rNGXCons, rNGXOG)	0.350545***	2.89	0.004
corr(rNGXCons, rNGXLOT)	0.863253***	35.78	0.000



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corr(rNGXCons, rNGXIND)	0.483859***	4.45	0.000
corr(rNGXOG, rNGXLOT)	0.30093***	2.79	0.005
corr(rNGXOG, rNGXIND)	0.16466*	1.95	0.051
corr(rNGXLOT, rNGXIND)	0.755851***	12.81	0.000
Wald Chi-squared	90.88***		0.000
Wald Dynamic test	25243.8***		0.000

Source: Author's Computations, 2022.

\*\*\* significant at 1%; \*\* significant at 5%; and \* significant at 10%.

The result from the DCC MGARCH model revealed that the transmission between banking and insurance stock returns is positive and significant, with a coefficient of 0.383873 and pvalue of 0.000. Therefore, a transmission of volatility exists between the two sectors during the COVID-19 period under investigation. The result also revealed that there is significant positive volatility transmissions between banking and consumer goods stock returns (0.750263 and pvalue of 0.000); banking and oil and gas stock returns (0.340055 and p-value of 0.001); banking and Lotus Islamic stock returns (0.672961 and p-value of 0.001); and banking and industrial goods stock returns (0.409746 and p-value of 0.000).

Furthermore, the result revealed that there is significant positive volatility transmissions between insurance and consumer goods stock returns (0.405337 and p-value of 0.001); insurance and oil and gas stock returns (0.190981 and p-value of 0.016); insurance and Lotus Islamic stock returns (0.351168 and p-value of 0.001); and insurance and industrial goods stock returns (0.220697 and p-value of 0.010). More so, the result revealed that there is significant positive volatility transmissions between consumer goods and oil and gas stock returns (0.350545 and p-value of 0.004); consumer goods and Lotus Islamic stock returns (0.863253 and p-value of 0.001); and consumer goods and industrial goods stock returns (0.483859 and p-value of 0.000). Also, there is significant positive volatility transmissions between oil and gas and Lotus Islamic stock returns (0.30093 and p-value of 0.005); oil and gas and industrial goods stock returns (0.16466 and p-value of 0.051); and Lotus Islamic and industrial goods stock returns (0.755851 and p-value of 0.000).

The Wald Chi-squared statistic of 90.88 (with p-value of 0.000) suggests that the model is in good fit and wholly statistically significant. Wald test of dynamic conditional correlation revealed a statistic of 25243.8 (with p-value of 0.000), suggesting that the dynamic



conditional correlation (DCC) estimates are preferable to its constant conditional correlation (CCC) alternatives. From the foregoing, the finding from this analysis is that the volatility of each of the sectors of the Nigerian stock exchange (excluding asset management) is transmitted to the volatilities of other sectors during COVID-19 pandemic.

### **Discussion of Findings**

This sub-section presents the discussions of major findings in relation to the research objectives and hypotheses of the study. The discussions of findings were presented in the order to research objectives and hypotheses of the study.

### **Effect of COVID -19 Pandemic on Stock Market Return Volatility in the Nigeria Stock Exchange Market**

The first objective of this study sought to examine the effect of impact of COVID -19 on stock price volatility of sub-sector indices in the Nigerian stock exchange. The finding of the objective one indicated that COVID -19 infection rate increases the volatilities of overall stock returns, oil and gas stock returns and Lotus Islamic stock returns, and decreases the volatilities of banking, consumer goods, industrial goods and asset management stock returns. This was the same with COVID -19 death rate which decreases the volatilities of overall stock returns, consumer goods stock returns, Lotus Islamic stock returns, industrial goods stock returns and asset management stock returns. The reason for the increased volatility in the overall stock return and others (oil and gas and Lotus Islamic) was as a result of decline in global economic activity, increased uncertainty by investors, supply chain disruptions and fall in oil prices. However, CBN quick intervention (by reducing the cash reserve ratio and providing liquidity to banks), the need for essential goods and services, government's economic stimulus measures, and import substitution policy during the pandemic made the other sectors (banking, consumer goods, industrial goods) to be relatively stable and less volatile. Narayan, 2020 supported this argument that COVID-19 outbreak strongly affected the volatility and returns in some sectors such as the oil sector more than other sectors in the market, due to travelling restriction which led to low demand for oil products.

This finding aligns with the study of (He, Liu, Wang and Yu, 2020; Xu, 2020; Adenomon Majjama and John, 2020; Uddin et.al. 2021) that COVID -19 pandemic affects investors stock returns. Considering the theoretical support for this study finding, the Efficient Market Hypothesis Theory (EMH) supported this finding that COVID-19 pandemic determines stock return volatility in the Nigerian stock exchange market. It can be inferred that majority of past studies and EMH established that covid-19 pandemic determines stock return volatility, this study therefore rejected the null hypothesis ( $H_{01}$ ) that there is no



significant effect of COVID -19 pandemic on volatility of stock return in the Nigerian stock exchange market.

### **Examine the Volatility Transmission Among Selected Sub-Indices of the Nigerian Stock Market During The COVID-19 Pandemic**

The second objective of this study sought to investigate the volatility transmission among selected sub-indices stock return of the Nigerian stock exchange market. The study established that there is volatility transmission among selected sub-indices of the Nigerian stock market, specifically volatility transmissions exist among the banking, insurance, consumer goods, oil and gas, Lotus Islamic and industrial goods stock returns. This finding that there is volatility transmission among selected sub-indices of the Nigerian stock market were supported by Baek, Mohanty, Glambosky, 2020; that there were significant increases in total and idiosyncratic risk across all industries, while changes in systematic risk vary across industries, Dang, Nguyen and Vo, 2022 also found out that there was volatility transmission among sectors over the research period and spikes during the COVID -19 pandemic. They were of the opinion that the risks from the stock market spread quickly and easily across sectors in Vietnam and that an increase in daily COVID -19 infections increased volatility spillover across sectors.

Based on these assertions by past studies in Nigeria that there exists volatility transmission among selected sub-indices of the Nigerian stock market, this study rejected the null hypothesis ( $H_{02}$ ) that there is no volatility transmission among selected sub-indices stock return of the Nigerian stock exchange market. The study encourages portfolio managers to understand the nature of risk attached to stocks selected to be in portfolio of their investors and be aware of best way to mitigate adverse risk effect.

### **CONCLUSION AND RECOMMENDATION**

Consequently, the following major conclusions were drawn from the study and the align with the objectives of this study:

- (i) the study revealed that COVID-19 pandemic exert influence on the volatility of stock price. The reason for the increased volatility in the overall stock return and others (oil and gas and Lotus Islamic) was as a result of decline in global economic activity, increased uncertainty by investors, supply chain disruptions and fall in oil prices. However, CBN quick intervention (by reducing the cash reserve ratio and providing liquidity to banks), the need for essential goods and services, government's economic stimulus measures, and import substitution policy during the pandemic made the other sectors (banking, consumer goods, industrial goods) to be relatively stable and less volatility.



- (ii) Finding of the study revealed that there is volatility transmission among selected sub-indices of the Nigerian stock market, specifically volatility transmissions exist among the banking, insurance, consumer goods, oil and gas, Lotus Islamic and industrial goods stock returns. Hence, this study concludes that there is volatility transmission among selected sub-indices of the Nigerian stock market during the COVID -19 pandemic.

This study recommends that policymakers in Nigeria should provide support to sectors that have been hit particularly hard include travel, hospitality, and leisure, as well as oil and gas in order to mitigate the economic impact of the pandemic.

### References

- Abu, N., Gamal, A. A. M., Sakanko, M. A., Mateen, A., Joseph, D., & Amaechi, B. O. (2021). How have COVID-19 Confirmed Cases and Deaths Affected Stock Markets? Evidence from Nigeria. *Contemporary Economics*, 15(1), 76–99. <https://doi.org/10.5709/ce.1897-9254.437>
- Adenomon, M. O., Maijamaa, B., & John, D. O. (2022). The Effects of COVID-19 outbreak on the Nigerian Stock Exchange performance: Evidence from GARCH Models. *Journal of Statistical Modelling and Analytics*, 4(1), 25–38. <https://doi.org/10.22452/josma.vol4no1.3>
- Alade, M.E., Adeusi, S.A., Alade, F.O., (2020). COVID-19 pandemic and Nigerian stock market capitalization. *Ilorin Journal of Economic Policy* 7 (3), 12-23
- Al-Awadhi, Abdullah M., Khaled Alsaifi, Ahmad Al-Awadhi, and Salah Alhammedi. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. *Journal of Behavioral and Experimental Finance* 27: 100326
- Amnim, O. E. L., Aipma, O. P. C., & Obiora, C. O. F. (2021). Impact of COVID-19 pandemic on liquidity and profitability of firms in Nigeria. *International Journal of Academic Research in Business and Social Sciences*, 11 (3), 1331-1344.
- Asaolu T.O. and Ogunmakinwa M. S. (2011), ‘An Econometric Analysis of the Impact of Macroeconomic Variables on Stock Market Movement in Nigeria. *Asian Journal of Business Management*, 3(1), 72 – 78.
- 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>



- Ayodele, T. D., Akinyede, O. M., Ojedele, M. I. & Afolabi, T. S. (2021). COVID-19 pandemic and the Nigerian financial market. *Journal of Management Information and Decision Sciences*, 24(4), 1-10.
- CBN (2020). CBN Moves to Cushion the Impact of COVID-19 Crisis. ISSN No: 2695-2394  
2(4)<https://www.cbn.gov.ng/Out/2020/CCD/CBN%20UPDATE%208TH%20Edition%20-%20web.pdf>
- Ducharme, J. (2020). World Health Organization Declares COVID-19 a “Pandemic.” Here’s What That Means. Time Magazine. <https://time.com/5791661/who-coronavirus-pandemic-declaration>.
- Harjoto, M. A., Rossi, F., & Paglia, J. (2020). COVID-19: Stock Market Reactions to the Shock and the Stimulus. *SSRN Electronic Journal*.  
<https://doi.org/10.2139/ssrn.3622899>
- Insaidoo, M., Arthur, L., Amoako, S., & Andoh, F. K. (2021). Stock market performance and COVID-19 pandemic: evidence from a developing economy. *Journal of Chinese Economic and Foreign Trade Studies*, 14(1), 60–73.  
<https://doi.org/10.1108/jcefts-08-2020-0055>
- Kumar A., Luthra S., Mangla K.S., & Kazançoğlu Y. (2020). COVID-19 impact on sustainable production and operations management, *Sustainable Operations and Computers*, ISSN 2666-4127 (1) <https://doi.org/10.1016/j.susoc.2020.06.001>.
- Narayan, P. K. (2020). Oil Price News and COVID-19—Is There Any Connection? *Energy Research Letters*, 1(1). <https://doi.org/10.46557/001c.13176>
- Nwosu C.P., Okedigba D.O. and Anih D.O., (2020). Non-Performing Loans and Profitability of the Nigerian Commercial Banks. *Central Bank of Nigeria Economic and Financial Review* 58/3. <https://www.cbn.gov.ng/Out/2021/RSD/Non-Performing%20Loans%20and%20Profitability%20of%20the.pdf>
- Nwosu, C. P., Okedigba, D. O., & Anih, D. O. (2020). Non-performing loans and profitability of the Nigerian commercial banks. *Economic and Financial Review*. Central Bank of Nigeria, 58(3), 35–58.
- OECD (2020). The impact of coronavirus (COVID-19) and the global oil price shock on the fiscal position of oil-exporting developing countries. <https://www.oecd.org/coronavirus/policy-responses/the-impact-of-coronavirus-covid-19-and-the-global-oil-price-shock-on-the-fiscal-position-of-oil-exporting-developing-countries-8bafbd95/#section-d1e645> (Accessed on December, 2022)



- Ozili, P. K. (2020). COVID-19 Pandemic and Economic Crisis: The Nigerian Experience and Structural Causes. *SSRN Electronic Journal*.  
<https://doi.org/10.2139/ssrn.3567419>
- Ozili, P. K. (2020). COVID-19 Pandemic and Economic Crisis: The Nigerian Experience and Structural Causes. *SSRN Electronic Journal*.  
<https://doi.org/10.2139/ssrn.3567419>
- Piccoli, P., da Costa Jr., N. C. A., Silva, W. V., & Westarb Cruz, J. A. (2018). Investor Sentiment and the Risk-Return Tradeoff in the Brazilian Market. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2879415>
- Salisu, A. A., & Sikiru, A. A. (2020). Pandemics and the Asia-Pacific Islamic Stocks. *Asian Economics Letters*, 1(1). <https://doi.org/10.46557/001c.17413>
- 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>
- Sari, L. K., Achsani, N. A., & Sartono, B. (2017). The Volatility Transmission Of Main Global Stock's Return to Indonesia. *Buletin Ekonomi Moneter Dan Perbankan*, 20(2), 229–256. <https://doi.org/10.21098/bemp.v20i2.813>
- Sharif, A., Aloui, C., & Yarovaya, L. (2020). COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet-based approach. *International Review of Financial Analysis*, 70, 101496. <https://doi.org/10.1016/j.irfa.2020.101496>
- Takyi, Paul Owusu & Bentum-Ennin, Isaac, 2021. "The impact of COVID-19 on stock market performance in Africa: A Bayesian structural time series approach," *Journal of Economics and Business, Elsevier, vol. 115(C)*
- Uddin, M., Chowdhury, A., Anderson, K., & Chaudhuri, K. (2021). The effect of COVID – 19 pandemic on global stock market volatility: Can economic strength help to manage the uncertainty? *Journal of Business Research*, 128, 31–44. <https://doi.org/10.1016/j.jbusres.2021.01.061>
- Umoru, D. and Iweriebor, S. (2017). Econometric test of arbitrage pricing and its volatility in the Nigeria equities market. *CARD International Journal of Management Studies, Business and Entrepreneurship Research, Rivers State University of Science & Technology, Port Harcourt, Nigeria*, 2(2), 109 – 131.
- Van Rooij, M., Lusardi, A., & Alessie, R. J. (2011). Financial Literacy, Retirement Planning, and Household Wealth. *SSRN Electronic Journal*.  
<https://doi.org/10.2139/ssrn.1945732>



- Xu, L. (2021). Stock Return and the COVID-19 pandemic: Evidence from Canada and the US. *Finance Research Letters*, 38, 101872.  
<https://doi.org/10.1016/j.frl.2020.101872>
- Yilmazkuday, H. (2020). Stay-at-Home Works to Fight Against COVID-19: International Evidence from Google Mobility Data. *SSRN Electronic Journal*.  
<https://doi.org/10.2139/ssrn.3571708>
- Yong, N.C., J., Mahdi Ziaei, S., & R. Szulczyk, K. (2021). The Impact of COVID-19 Pandemic on Stock Market Return Volatility: Evidence from Malaysia and Singapore. *Asian Economic and Financial Review*, 11(3), 191–204.  
<https://doi.org/10.18488/journal.aefr.2021.113.191.204>
- Zhang, D., Hu, M., & Ji, Q. (2020). Financial markets under the global pandemic of COVID-19. *Finance Research Letters*, 36, 101528.  
<https://doi.org/10.1016/j.frl.2020.101528>