COVID-19 PANDEMIC AND STOCK MARKET VOLATILITY: EVIDENCE FROM SELECTED AFRICAN COUNTRIES

*AKUNOMA ONOME OMENA
Department of Accounting, Federal Polytechnic, Orogun, Delta State, Nigeria
Email: akunomaonome@gmail.com; 08148220067

BENEDICTA .O. OROBATOR
Department of Actuarial Science of Insurance, University of Benin, Benin City, Edo State, Nigeria
Email: benedicta.orobator@uniben.edu, benedictaorobator@gmail.com, 0806 6857309

ABSTRACT
The paper investigates the impact of the COVID-19 pandemic on stock market volatility using evidence from 15 selected African countries. Monthly COVID-19 data for these countries, covering the period from March to November 2020, was sourced from various databases, including the World Bank Development Indicators (WDI) and Worldometer. The study employs the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to generate stock returns volatility, which is then regressed against the COVID-19 data using pooled Ordinary Least Squares (OLS) and System-Generalized Method of Moments (GMM) estimation procedures. The empirical findings indicate that the COVID-19 pandemic significantly induced stock market volatility, largely driven by the heightened uncertainty that characterized the period, particularly during the peak growth phase of the pandemic. Both active infection cases and total deaths were shown to increase volatility, reflecting the destabilizing effects of the pandemic on market activities. Additionally, the study found a negative impact of exchange rate depreciation on stock market stability, exacerbating market fluctuations during the crisis. The study recommends the implementation of strong interventionist policies aimed at mitigating the effects of external shocks, such as pandemics, on financial markets. This includes the adoption of stable and competitive exchange rate policies, government interventions, and financial market regulations to enhance market resilience and promote stability in the aftermath of crises like the COVID-19 pandemic.

Keywords: COVID-19 Pandemic, Stock market volatility, External vulnerabilities, Volatile commodity exports

JEL CLASSIFCATIONS: G15, G01, I15, E44, O55.

1. INTRODUCTION

The COVID-19 pandemic had profound and far-reaching consequences on global economies, with African economies particularly vulnerable. Among the critical sectors impacted was the stock market, which experienced significant volatility. This volatility was driven by a combination of investor uncertainty and a sharp decline in market activities, leading to adverse effects on stocks. The pandemic destabilized economic systems, triggering widespread stock market declines and herd behavior, where foreign investors engaged in mass repatriation of investment funds. Globally, the economic impact of COVID-19 varied across regions and countries (Chriscaden, 2020; Ang, 2020).

The first COVID-19 case in Africa was reported on February 14, 2020, after its detection in Wuhan, China in 2019, and by February 2021, over 123 million global cases and 2.7 million deaths were recorded, causing severe economic damage, overwhelmed medical systems, job losses, and production halts due to lockdowns and trade restrictions. Report from the World Bank (2022) showed that due to the pandemics among other factors, Africa's growth rate fell sharply from 3.5% in 2019 to between -2.7% and -6.2% in 2020. The contraction was also driven by significant economic downturns in Nigeria, South Africa, Kenya, Egypt, and Angola, all of which have major stock markets in the African region.

Recent data from 2024 highlights that although some African economies have begun to recover, significant challenges persist. The World Bank's Africa's Pulse Report (2024) reveals that sub-Saharan Africa's economic recovery remains fragile, with growth projected at 2.9% for 2024, still below pre-pandemic levels. This sluggish growth is compounded by persistent inflation, high interest rates, and currency depreciation across several major African economies, which continue to affect investor confidence. Data from the Central Bank of Nigeria (CBN) shows that Nigeria's stock market, while showing signs of recovery, remains volatile, with the Nigerian Stock Exchange All Share Index (NSE-ASI) experiencing fluctuations in the first quarter of 2024. The National Bureau of Statistics (NBS) also reported a modest increase in foreign direct investment (FDI) inflows in 2024 compared to the sharp decline observed in 2020. However, FDI levels have not returned to pre-pandemic figures, reflecting lingering uncertainty in global financial markets.

The World Bank (2024) reports that stock market activities in major developed economies, like the U.S. and Europe, have stabilized, showing growth in 2024, while Africa's trade performance fell significantly (Liu et al., 2020). Though some African nations have resumed pre-pandemic trading levels (FAO, 2024), many still face the economic aftermath (Eze, 2023), hindered by supply chain disruptions and climate challenges. Sub-Saharan Africa's stock markets, constrained by underdeveloped capital markets, continue to experience muted recovery and volatility due to external shocks like fluctuating commodity prices. Despite studies on COVID-19's global economic impact (Baldwin & Weder di Mauro, 2020; He et al., 2020; World Bank, 2022; IMF, 2023), few have focused on Africa's stock market volatility, a crucial area for policymakers. This study bridges that gap, examining the pandemic's effect on African stock markets and providing policy insights for maintaining stability amid external shocks.

The subsequent sections of this paper are structured as follows: Section 2 presents the review of related conceptual, theoretical and empirical literature; meanwhile section 3 presented the methodology employed in the study. In addition, section 4 presents and discusses the results of the analysis while section 5 concludes the study and provided relevant recommendations.

2. LITERATURE REVIEW

2.1 Conceptual Review

The COVID-19 pandemic created unprecedented disruptions in financial markets globally, and African stock markets were no exception. Conceptually, **stock market volatility** refers to fluctuations in stock prices over a period, often caused by economic, political, or social instability. The pandemic triggered significant volatility due to lockdown measures, reduced economic activities, and uncertainties surrounding government policies. According to Ncube et al. (2024), the volatility observed in African markets was predominantly driven by government responses to the pandemic, including stringent lockdowns and restrictions on economic activities. Similarly, Fan et al. (2021) found that sector-specific responses to the pandemic in China showed significant volatility across various industries, emphasizing the

differential impact of COVID-19 on stock performance. These studies align with Donadelli et al. (2020), who highlighted that investor sentiment, driven by media coverage and public health alerts, heavily influenced global stock market behavior.

In the African context, this volatility was exacerbated by weaker macroeconomic fundamentals, limited diversification in financial markets, and a high reliance on foreign investment. Furthermore, the underdeveloped nature of African capital markets made them more vulnerable to external shocks. This conceptual framework emphasizes the interplay between external shocks, government interventions, and inherent market vulnerabilities (Ncube *et al.* 2024) Wang et al. (2022), highlighting the unique challenges faced by African stock markets during the COVID-19 pandemic. For instance, Bello and Gidigbi (2023) highlighted that in Nigeria, COVID-19 exacerbated stock market volatility due to delayed policy responses, resulting in significant impacts on investor confidence and market performance.

2.2 Theoretical Review

There are relevant theories reviewed in this study, including Infectious Disease Proliferation Theory, Efficient Market Hypothesis (EMH), and Behavioral Finance Theory. At the end, Infectious Disease Proliferation Theory will be used as the theoretical framework of the study.

Infectious Disease Proliferation Theory: This theory, attributed to Anderson and May (1992) and Gersovitz and Hammer (2004), suggests that pandemics negatively affect economic performance by disrupting business, trade, and investment. In the context of stock markets, infectious diseases like COVID-19 induce uncertainty and may cause market volatility due to widespread disruptions in production and lockdown measures. For example, Ajibo et al. (2020) explored the broader socioeconomic impacts of COVID-19 in Nigeria, which contributed to increased stock market volatility due to economic instability.

Efficient Market Hypothesis (EMH), proposed by Eugene Fama (1970), posits that stock prices reflect all available information. During pandemics like COVID-19, the rapid dissemination of information about infection rates, lockdowns, and government policies could lead to sharp stock market fluctuations as investors react swiftly to incoming news. Fan et al. (2021) supported this view, noting that different sectors responded to pandemic-related news in varied ways, causing significant volatility across global markets.

In addition, **Behavioral Finance Theory**, proposed by Daniel Kahneman and Amos Tversky (1979), explored how psychological factors influence investor behavior, leading to market anomalies like volatility. During the COVID-19 pandemic, fear, panic, and uncertainty drove irrational behavior in financial markets, resulting in herd behavior and heightened volatility. This theory helps explain why investors overreacted to pandemic news, leading to the extreme volatility observed in African stock markets, as noted by Ngutsav & Ijirshar (2020).

2.3 Empirical Literature

The impact of the COVID-19 pandemic on global economies, particularly financial markets, has been a subject of extensive research since 2020 globally. Many authors focused on the medical aspects of the pandemic, estimating the strain on medical facilities and personnel. Other authors examined the economic consequences of the pandemic on sectors such as the stock market (Ivanov, 2020; Sirkeci & Yucesahin, 2020; Zhang et al., 2020). Some studies (Eichenbaum et al., 2020; Kohlscheen et al., 2020; Correia et al., 2020, Yaro, 2023) simulated various scenarios of the pandemic's impact on economic activities.

For African countries, Ncube et al. (2024) analyzed the effects of the pandemic on stock volatility in sub-Saharan Africa using generalized autoregressive conditional heteroskedasticity (GARCH) models and Explainable Artificial Intelligence (XAI). Their study focused on both large and small African stock exchanges, revealing that government stringency measures, including lockdowns and movement restrictions, were key drivers of stock volatility. This aligns with the findings of studies like Bakry et al. (2022), which noted that government actions during the pandemic played a crucial role in shaping market responses.

In a wider study, Wu et al. (2020) demonstrated that global stock market volatility surged during the COVID-19 pandemic, with developing economies being particularly affected. Similarly, Hatmanu and Cautisanu (2021) observed significant instability in Romania's stock market during the same period. Moreover, Donadelli et al. (2020) highlighted how investor sentiment, influenced by media coverage and public health alerts, drove stock movements, particularly in the healthcare sector. In addition, Bai and Chen (2022) found that persistent volatility in China, the U.S., and Japan varied based on the effectiveness of government responses in controlling market instability.

Furthermore, Tetteh et al. (2022) showed that, although both Ghana and Nigeria experienced volatility, Ghana's market demonstrated greater resilience due to proactive government measures. Similarly, Wang et al. (2022) emphasized that frequent economic shocks, compounded by high-frequency macroeconomic data, played a crucial role in shaping stock market performance across emerging markets.

Thus, in Africa, studies like that of Ozekhome and Izilen (2022) and Ncube et al. (2024) underscored the vulnerability of underdeveloped stock markets, with smaller exchanges exhibiting more volatility due to weaker macroeconomic fundamentals. This point is further reinforced by Oburota and Obafemi (2023), who noted that macroeconomic stability is essential for mitigating the impact of stock market shocks during crises.

Meawhile, Ghergina and Armeanu (2021) analyzed the Romanian stock market during the pandemic using the GARCH model, finding that volatility in early 2020 mirrored levels seen during the 2007-2009 global financial crisis. In another perspective, Mishra and Mishra (2021) studied stock market reactions across 15 Asian countries and found that COVID-19 cases, death rates, oil prices, inflation, and interest rates drove volatility, similar to patterns seen in Europe and Africa. In similar study, IMF (2022) reported a 15% decline in African stock markets due to the pandemic, highlighting the vulnerability of the continent's financial systems and the long-term impact of lost trade and investment finance.

Thus, most of the literature consistently underscores the profound impact of the COVID-19 pandemic on stock markets globally, with volatility largely driven by government policies, macroeconomic instability, and shifting investor sentiment. The African context, in particular, demonstrates how underdeveloped financial markets were more susceptible to pandemic-induced shocks, highlighting the need for robust economic policies and stronger market frameworks to mitigate future crises.

2.4 GAPS IN THE LITERATURE AND VALUE ADDITION

Existing literature on COVID-19's impact on stock markets reveals gaps, particularly in the African context, where unique factors such as underdeveloped capital markets and reliance on commodity exports are often overlooked. Studies like Ghergina and Armeanu (2021) and Mishra and Mishra (2021) focus on global markets, leaving African market dynamics and the effects of policy measures on long-term stability underexplored. Additionally, there is limited research on sector-specific volatility and investor sentiment in African stock exchanges. This

study addresses these gaps by providing comprehensive data and analysis on African stock markets during and after the pandemic, offering critical insights into market resilience, investor confidence, and strategies to strengthen financial frameworks in response to future global disruptions.

3. METHODOLOGY
3.1   Theoretical Framework
The relationship between the COVID-19 pandemic and stock market volatility in selected African countries is best explained through Pandemic Proliferation Theory, attributed to Anderson and May (1992) and expanded by Gersovitz and Hammer (2004). This theory posits that pandemics disrupt economic systems by contracting trade, business, and investment, leading to financial instability. The containment measures required to control the spread of diseases, such as lockdowns, cause significant economic losses, resulting in stock market volatility. In the case of COVID-19, these disruptions led to heightened uncertainty and fluctuations in African stock markets as investor confidence diminished.

Building on this, Chakraborty *et al.* (2010) and Ozekhome and Izilein (2022) suggest that the infection dynamics of pandemics have long-term detrimental effects on stock markets, business activities, and investment. That COVID-19 pandemic exacerbated market instability in African countries thus aligned with the theory's view that pandemics trigger economic shocks and uncertainty. This framework provides a comprehensive understanding of how the spread of COVID-19 induced volatility in African stock markets, highlighting the vulnerability of financial markets during global health crises.

3.2 Model Specification
On the premise of the Theoretical Framework, this study adopted GARCH model:

The **GARCH model** (Generalized Autoregressive Conditional Heteroskedasticity) is a statistical model used in time series analysis to estimate and predict the volatility (or variance) of a financial asset over time. The model accounts for periods of high and low volatility, often referred to as volatility clustering, where periods of intense market fluctuations are followed by calmer ones. The GARCH (p, q) model, where "p" refers to lagged variances and "q" to lagged squared residuals, provides a framework to evaluate risk and make predictions based on historical volatility patterns. This model is commonly used for tasks such as risk management, portfolio allocation, and pricing derivatives (Chance & Brooks, 2021).

Thus, the GARCH Model was used to calculate the Stock market volatility (as the dependent variable) of the data series obtained from the selected African countries. Meanwhile the independent variables were TCI, TDS and EXR as expressed in the following econometric form:

$$SMV_{i,t} = \alpha_0 + \alpha_1 TCI_{i,t} + \alpha_2 TDS_{i,t} + \alpha_3 EXR_{i,t} + \varepsilon_{i,t}$$

Where:

SMV_{it} = Stock market volatility (Dependent variable), where the volatility of stocks is generated using the GARCH model. The independent variables are:

TCI= Total cases of infection,

TDS= Total recorded deaths from the coronavirus pandemic,

EXR = Exchange rate- measured as nominal exchange to the US,

i = Represents the number of countries (i.e. 15 African countries); t is year fixed specific effect;

$\alpha_1 - \alpha_3$ are parameters to be estimated, and ε is the unobserved error term.

The apriori expectations are $\alpha_1, \alpha_2, < 0$; $\alpha_3 < 0$.

3.3. Sources of Data

The data were sourced from the World Bank Development Indicators (WDI) and Worldometer, with COVID-19 data for fifteen African countries collected from March to November 2020. These countries, including Nigeria, Ghana, South Africa, Kenya, Egypt, Algeria, Angola, Sierra-Leone, Botswana, Ethiopia, Togo, Cameroon, Senegal, Gambia and Guinea were selected for their regional coverage, economic strength, and high COVID-19 infection rates during the pandemic's peak.

3.4   Method of Estimation and Data Analysis

The estimation is done using the Pooled Ordinary Least Squares (OLS) and the system-Generalized Method of Moment (GMM), with the latter used for the test for robustness and policy inferences. The Pooled Ordinary Least Squares (OLS) corrects for autocorrelation, potential endogeneity of regressors and reverse causality. It is able to account for considerable heterogeneity to produce asymptotic unbiased, consistent and efficient estimates (Pedroni, 2000). The system-Generalized Method of Moments (GMM), on the other hand, is asymptotically efficient, robust to heteroskedasticity, and capable of addressing the problems of endogeineity, omission bias and reverse causality (simultaneity). The system-GMM estimator also provides highly precise and less biased and consistent estimates when compared to the first-differenced-GMM estimator.

4. RESULTS AND DISCUSSION OF FINDINGS

Descriptive Statistics

Table 1 shows the descriptive statistics of the data on the variables used for the analysis. The mean stock market volatility is -12.7 percent, with a standard deviation value of 4.2. The maximum and minimum values are -15.8 percent and -1.22 percent. The average monthly total cases of infection is 27,252, while that of recorded deaths stands at 4,022. The mean value for exchange rate of the Naira to the dollar is 495.3.

Table 1: Descriptive Statistics

	Mean	Median	Max.	Min.	Std. Dev.
SMV	-12.72	-12.23	-15.8	-1.22	4.20
TCI	27,252	21,380	65,250	12,452	37.2
TDS	4,022	3,840	9,240	235	15.8
EXR	405.3	398.2	520.5	242.6	15.7

Source: Author's computation (2024).

Test of Endogeneity

The test for endogeneity of the variables against the dependent variable (Stock Market Volatility) is carried out. The test is necessary to determine the appropriateness of the system Generalized Method of Moments (GMM), given that the system GMM is usually adopted when there is endogeneity problem in a model. The test requires that the error terms or residuals of the instruments are obtained and included in the baseline estimation of the stock market volatility model. The result of the Hausman test for endogeneity is reported in Table 2

Table 2: Hausman Test of Endogeneity

Variable	Coefficient	T-ratio
Constant	9.163	2.421
TCI	-70.24**	-2.150
TDS	-1250.3***	-3.063
EXR	-0.081	-1.216
Diagnostics:		
Adjusted R^2	0.67	
F-statistics	12.25	
Durbin-Watson	1.58	

Note: ***, ** & * indicate significance at the 1%, 5% & 10% levels, respectively.
Source: Author's computation (2024).

The result shows impressive goodness of fit statistics, thereby displaying the suitability of the estimation. The focused is on the coefficient of the residual variable that is statistically significant at the 5 percent level, leading to rejection of the hypothesis of no endogeneity between stock market volatility and the regressors, a justification for the adoption of system generalised methods of moments (GMM) is that it has the capacity to address endogeneity bias in the model.

Table 3: Estimates of Stock Market Volatility and COVID-19 Pandemic

Variables	Pooled OLS	Two step-System-GMM
Constant	0.025 (0.28)	-
SMV(-1)		0.721 (1.15)
TCI	0.072 (1.11)	0.420 (2.24)**
TDS	0.015** (2.27)	1.162** (2.27)
EXR	-0.063 -0.787	-0.062 (-2.18)
RESID	-1.224***	-4.871
Instrument Count		5
p-value of Sargan test		0.771
Hansen-J		2.66 (0.703)
AR (1)		-2.94 (0.03)**
AR(2)		-0.82(0.67)

T-statistics in parenthesis; ***, ** & * indicate significance at the 1%, 5% & 10% levels, respectively. Source: Author's computation (2024).

The results of the pooled ordinary least square (OLS) and system-generalized methods of moment (GMM) are presented in Table 3. Inferences drawn from the system-GMM approach provide key insights into the dynamics of stock market volatility in response to the COVID-19 pandemic.

Stock Market Volatility: Impact of COVID-19 Pandemic

The first lag of stock market volatility was positively signed but statistically insignificant. This implies that while past volatility contributes to current or future volatility, the magnitude of this influence is limited. Nonetheless, the significance of total active infection cases and total deaths demonstrates a pronounced effect of the pandemic on market instability. These variables were positively correlated with stock market volatility, with significance at the 5% level, highlighting the destabilizing effect of the COVID-19 pandemic on market activities. A 1% increase in total active infection cases and total deaths resulted in a 0.4% and 1.2% rise in market volatility, respectively.

This finding aligns with Ncube *et al.* (2024), who investigated stock volatility in sub-Saharan Africa and concluded that pandemic-related shocks significantly heightened volatility across various African stock markets. Moreover, Donadelli *et al.* (2020) underscored that media coverage during pandemics further amplified volatility, as announcements from global health organizations contributed to market panic and uncertainty. In line with these studies, the results underscore that COVID-19-induced border closures, economic restrictions, and public fear exacerbated the volatility due to the uncertainty surrounding both the pandemic's progression and its economic consequences.

Similar outcomes were also noted in other regions globally. Wu et al. (2020) compared global stock market responses during different financial crises, including the subprime mortgage crisis, the European debt crisis, and the COVID-19 pandemic, and found that the COVID-19 crisis led to unique levels of market instability, highlighting the widespread and unprecedented nature of the pandemic's impact.

Exchange Rate and Market Volatility

The exchange rate variable was positively signed and statistically significant, indicating that currency depreciation or devaluation further fueled stock market volatility. This finding highlights the vulnerability of African economies to exogenously transmitted shocks and uncertainties, as emphasized by studies like Narayan et al. (2020), who observed similar outcomes in the Japanese markets during the COVID-19 pandemic. The results support the position of the International Monetary Fund (2014) on the susceptibility of emerging economies to currency fluctuations but deviate from the findings of Ozekhome (2021), who suggested a more tempered relationship between exchange rates and market volatility.

In the African context, the depreciation of local currencies and the reliance on foreign trade exacerbated the economic shocks of the pandemic, further intensifying market instability. Ozekhome and Izilen (2022) similarly found that trade disruptions during the pandemic amplified volatility in sub-Saharan Africa, linking the economic downturn to weakened exchange rates. These insights reinforce the observed relationship between currency depreciation and increased stock market volatility in the study.

Model Robustness and Validity

The post-diagnostic tests confirm the robustness and validity of the system-GMM results. The Sargan and Hansen tests verified the appropriateness and consistency of the instruments used,

ensuring the reliability of the estimates. Additionally, the rejection of the null hypothesis of no serial correlation at order one, but failure to reject it at order two, further substantiates the model's validity (AR(1) = 2.94 (0.03)***; AR(2) = -0.82 (0.67)).

This level of empirical rigor is comparable to the approach used by Bai and Chen (2022), who validated their models on stock market volatility during the pandemic across China, the U.S., and Japan. Similarly, Hatmanu and Cautisanu (2021) applied the GARCH model to measure the impact of COVID-19 on stock markets in Romania, reinforcing the importance of robust econometric modeling in understanding pandemic-induced volatility.

Hence, the pandemics significant effects on market volatility, driven by both health and economic crises, mirrors global trends. The findings corroborate existing research in both African and global contexts, confirming that the COVID-19 pandemic, through both infection rates and economic repercussions, heightened uncertainty and volatility in stock markets. Furthermore, currency depreciation compounded these effects, demonstrating the multifaceted nature of the pandemic's impact on financial markets.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The paper examined the impact of the COVID-19-Pandemic on stock market volatility, using evidence from fifteen (15) African selected countries. COVID-19 is decomposed into total number of active cases and total number of recorded deaths The pooled OLS and system-GMM estimation techniques (with the latter also used for the test of robustness) were employed. The empirical results show that the coronavirus pandemic has had a significant deteriorating impact on stock market activities, generating instability, and hence volatility in the market.Against the foregoing background, it is important that African countries develop strong policy capacity, economic resilience, effective and efficient initiatives, as well as robust strategies to address uncertain and vulnerable times, like the coronavirus pandemic. The adoption of a stable and competitive exchange rate is also important to stabilizing African stock markets, since the exchange rate is a major channel through which volatility is generated in the stock market. Government and regulatory interventions is to stabilize the capital market in times of vulnerability, and also constitutes a sure way of restoring the financial markets to its normalcy, after such external shock.

6. REFERENCES

Ajibo, H. T., Peace, N., & Onuoha, E. C. (2020). Assessment of the impact of COVID-19 pandemic in Rivers State, Nigeria, and government palliative measures. *Journal of Economics and Allied Research, 5*(1), 147–156. Retrieved from https://jearecons.com/index.php/jearecons/article/view/70

Anderson, R. M. & May, R. M. (1992).Infectious diseases of humans, Oxford University Press. Epidemiology and Infection United Kingdom, doi 10.1017/s0950268800059896

Ang, C. (2020). Economic impact of COVID-19: Positives and negatives. *Emerging and developing economies Perspectives,* 16(4), 1-8.

Bai, Y., & Chen, X. (2022). Stock market volatility and pandemic responses: A comparative study of China, the US, and Japan. *Journal of Financial Stability, 53* (1), 15-17. https://doi.org/10.1016/j.jfs.2021.100918

Bakry, W., Ang, C., & Saeed, A. (2022). Government responses and stock market reactions to COVID-19: Lessons from African markets. *Emerging Markets Review, 49* (1), 40-45. https://doi.org/10.1016/j.ememar.2021.100785

Baldwin, R., & Weder di Mauro, B. (2020). *Economics in the time of COVID-19*. CEPR Press.

Baldwin, R., &Tomiura, E. (2020).Thinking ahead about the trade impact of COVID-19.*Economics in the Time of COVID-19*, 59.

Bello, K. M., & Gidigbi, M. O. (2022). COVID-19 Pandemic, Oil Slump and the Nigerian Economy. *Management and Economics Review*, 7(3), 438-453.

Chakraborty, S., Papageorgiou, C. & Sebastian, F.P. (2010). Disease infection dynamics and development, *Journal of Monetary Economics*, 57(7), 859-872

Chance, D. M., & Brooks, R. (2021). *An introduction to derivatives and risk management*. South-Western, Cengage Learning.

Chriscaden, K. (2020). Joint statement by ILO, FAO, IFAD and WHO.World Health Organization (WHO), Paris, France.

Correia S., Luck S., &Verner E. (2020). Pandemics depress the economy, public health interventions do not: Evidence from the 1918 Flu.

Donadelli, M., Kizys, R., & Riedel, M. (2020). Media coverage and the stock market: Evidence from WHO announcements during pandemics. *Journal of Economic Behavior & Organization, 177* (1), 533-550. https://doi.org/10.1016/j.jebo.2020.07.032

Eichenbaum M. S., Rebelo S., &Trabandt M. (2020).The macroeconomics of epidemics.*NBER Working Paper Series*, No. 26882.

Eze, T. C. (2023). Granger causality approach to the confirmation of post-COVID-19 Keynesian twin-deficit hypothesis in Nigerian economy. *Journal of Economics and Allied Research, 8*(1), 226–239. Retrieved from https://jearecons.com/index.php/jearecons/article/view/286

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383-417. https://doi.org/10.2307/2325486

Fan, X., Chen, B., Wang, S., et al. (2021). COVID-19's impact on stock prices across different sectors: An event study based on the Chinese stock market. *Emerging Markets Finance and Trade, 56*(10), 2198–2212.

Food and Agriculture Organization of the United Nations. (2024). *State of agricultural commodity markets 2024: The impact of COVID-19 on trade and markets*. FAO. https://www.fao.org/publications

Gersovitz, M., & Hammer, J. S. (2004).The economical control of infectious diseases. *Economics Journal,* 114 (2), 1–27.

Ghergina, S.C., Armeanu, D.S., Joldes, C.C. (2021). Covid-19 pandemic and Romanian stock market volatility: A GARCH approach. *Journal of Risk and Financial Management*, 14, 1-29.

Hatmanu, M., & Cautisanu, C. (2021). Impact of COVID-19 on stock markets in Romania: Evidence from GARCH models. *Romanian Journal of Economic Forecasting, 24*(1), 53-65.

He, P., Sun, Y., Zhang, Y., & Li, T. (2020). COVID-19's impact on stock prices across different sectors: An event study based on the Chinese stock market. *Emerging Markets Finance and Trade, 56*(10), 2198-2212.

International Monetary Fund (IMF) (2022). COVID-19 and the global impact on investment and trade finance. *IMF Occasional Papers 242, IMF, Washington DC*.

International Monetary Fund (IMF) (2020).World Economic Outlook, April 2020: The great lockdown. *IMF, Washington DC*.

International Monetary Fund (IMF). (2023). *Global Financial Stability Report: Navigating the high inflation era*. Washington, DC: International Monetary Fund.

Ivanov D. (2020).Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2)

case. Transportation Research Part E: *Logistics and Transportation Review*, 136,(1), 217-219.

Kahneman, D., Tversky A. (1979) 'Behavioural Finance Theory: An analysis of decision under risk', *Econometrics*, *47*(2), 263-291.

Kassa, S. M., Njagarah, H. J., & Terefe, Y. A. (2020). Analysis of the mitigation strategies for COVID-19: From a mathematical modeling perspective. *Mathematical Modelling and Control*, 15(1), 5-17.

Kohlscheen E., Mojon B. & Rees D. (2020). The macroeconomic spillover effects of the pandemic on the global economy. *Bank for International Settlement Bulletin*, No. 4, April.

Liu, M., Choo, W. C., & Lee, C. C. (2020). The response of the stock market to the announcement of a global pandemic. *Emerging Markets Finance and Trade, 56*(15), 3562–3577.

McKibbin W. & Fernando R. (2020). The global macroeconomic impacts of Covid-19: seven scenarios. *CAMA Working Paper*, No. 19/2020.

Mishra, P.K., & Mishra, S.K. (2021): Covid -19 pandemic and stock market reaction: empirical insights from 15 Asian countries, *Transnational Corporations Review*, 3(1), 1 -18.

Narayan, P. K., Devpura, N., & Wang, H. (2020). Japanese currency and stock market reactions during the COVID-19 pandemic. *Economic Analysis and Policy, 68* (1), 191–198.

Ncube, M., Sibanda, M., & Matenda, F. R. (2024). Investigating the effects of the COVID-19 pandemic on stock volatility in sub-Saharan Africa: Analysis using Explainable Artificial Intelligence. *Economies, 12*(5), 111-112. https://doi.org/10.3390/economies12050112

Ngutsav, A., & Ijirshar, V. U. (2020). SMEs as drivers of economic recovery and sustainability during COVID-19 and beyond in Nigeria. *Journal of Economics and Allied Research, 4*(4), 234–247. Retrieved from https://jearecons.com/index.php/jearecons/article/view/186

Oburota, C. S., & Obafemi, F. N. (2023). Productivity, human capital development and COVID-19 pandemic in Nigeria. *Journal of Economics and Allied Research, 8*(3), 143–149. Retrieved from https://jearecons.com/index.php/jearecons/article/view/332

OECD (2020).Evaluating the initial impact of COVID containment measures on activity, 27 March.

Ozekhome, H. O., & Izilen, E. I. (2022). The trade impact of COVID-19 pandemic: Evidence from sub-Saharan African countries. *Journal of International Trade and Development, 16*(4), 80-98. https://doi.org/10.1080/09638199.2022.1984332

Ozekhome, H.O. (2021). The Covid-19 pandemic and economic outcomes in Nigeria. *Journal of Contemporary Economics:* Preprints for sustainable development in the COVID-19 Pandemic era and beyond, 1(2), 177-197.

Pedroni, P. (2000). Fully Modified Ordinary Least Square for Heterogeneous Cointegrated Panels. *Advances in Econometrics,* 15 (1); 93-130.

Sirkeci, I., &Yucesahin, M. M. (2020). Coronavirus and migration: Analysis of human mobility and the spread of COVID-19. *Migration Letters,* 17 (2), 379-398.

Tetteh, E. N., Asongu, S. A., & Nwachukwu, J. (2022). COVID-19 pandemic and African stock markets: Comparative resilience in Ghana and Nigeria. *Journal of Risk and Financial Management, 15*(2), 31-32. https://doi.org/10.3390/jrfm15020032

Wang, E. Z., Liu, M., & Lee, C. C. (2022)**.** Time-varying effects of the COVID-19 pandemic on CDS, stock returns, and economic activity. *Annals of Operations Research, 310*(1), 235-256.

Weder di Mauro, B. (Ed.). (2020). *Economics in the time of COVID-19*. CEPR Press. https://voxeu.org/content/economics-time-covid-19

World Bank (2020).Sub-Saharan Africa growth performance.World Bank Paper Washington DC.

World Bank. (2022). *The long shadow of informality: Challenges and policies*. Washington, DC: World Bank.

World Bank. (2024). *Africa's pulse: An analysis of issues shaping Africa's economic future (Issue 28)*. World Bank Group. https://www.worldbank.org/en/region/afr/publication/africas-pulse

World Health Organization (WHO). (2021). *Coronavirus disease (COVID-19) situation report*. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports

Worldometer: Coronavirus Incubation Period (Accessed on March 29, 2020). Retrieved from https://www.worldometers.info/coronavirus/coronavirus-incubation-period/ 747

Worldometers: COVID-19 Coronavirus Pandemic (Accessed on April 9, 2020). Available from https://www.worldometers.info/coronavirus/?fbclid= 749

Wu, L., Zhang, W., & Li, Y. (2020). Global stock market responses to financial crises: A comparative analysis of the subprime crisis, European debt crisis, and the COVID-19 pandemic. *Finance Research Letters, 42* (1), 12-15 https://doi.org/10.1016/j.frl.2020.101917

Yaro, B. I. (2023). COVID-19 and stock market volatility in Nigeria. *Journal of Economics and Allied Research, 8*(1), 349-360.

Zhang W., Wang, Y., Yang, L., & Wang, C. (2020).Suspending classes without stopping learning: China's education emergency management policy in the COVID-19 outbreak. *Journal of Risk and Financial Management, MDPI, Open Access Journal*, 13(3), 1-6.