

## Volatility Spill-Over and Financial Contagion Effect of Conventional Stock on Islamic Equity in Nigeria: Evidence from Covid-19

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### ABSTRACT

This study empirically investigated volatility spill-over and financial contagion effect between conventional stocks and shariah compliant equities before and during covid-19 pandemic in Nigeria. Banking and insurance sectoral stocks indices were selected to represent conventional equities while Nigerian stock exchange lotus islamic index represent islamic stocks. Daily closing stock price data from 02-01-2018 to 26-02-2020 for pre-covid and 27-02-2020 to 31-12-2021 for pre-covid and during covid were considered. DCC-GARCH model (Dynamic conditional correlation- Generalized Autoregressive Conditional Heteroskedasticity Model) was deployed to examine the spill-over effect while t-test was applied to check the consistency of the DCC coefficient before and during the pandemic. The result of the multivariate GARCH show that both banking and insurance stocks have long run volatility spillover effect on lotus islamic index, the result also revealed no significant increase in conditional correlation during covid-19 pandemic which indicate absence of financial contagion from the conventional to islamic stocks. The results provide important information to researchers, investors, and policymakers

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## INTRODUCTION

The lethal coronavirus, also known as COVID-19, is a highly contagious disease caused by the SARS-COV2 virus. It started in Wuhan, China, in early December 2019 and spread throughout the world, posing a threat to human health and the economy. Baker et al. (2020) claim that the COVID-19 pandemic has resulted in a major disruption to the economy that is comparable to the Great Depression of 1929–1933 and larger in scope than the financial and economic harm brought on by the global financial crises of 2008–2009. Despite the fact that the COVID-19 virus originated in China, its detrimental effects on the financial and economic sectors spread beyond Asian and Chinese capital markets to include the entire global economy through spillover effects. This was made possible by the high level of interconnection that exists within the global financial system. The increasing globalization of financial markets has led to a mechanism whereby risk in one market can swiftly and easily spread to others, as noted by Adekoya et al. (2020). This was especially true during the Covid-19 pandemic, which significantly disrupted the financial and economic environments.

Major stock markets including the Dow Jones Industrial Average (DJIA), the Financial Times Stock Exchange (FTSE), the Standard & Poor's (S&P) 500 Index, and the National Association of Securities Dealers Automated Quotations (Nasdaq) reported their largest single-week declines since the 2008 Global Financial Crisis at the height of the crisis (end-February 2020). (Alim,2021). For example, the S&P 500, which is commonly used as a barometer for the stock market's overall performance, dropped by more than 34% between its peak in February 2020 and its lowest position in March 2020. (Mehrotra,2023). Islamic equity was able to outperform its conventional counterpart despite being a crucial component of the global financial system and not being immune to the pandemic's destructive economic effects. (Alim, 2020) claims that the COVID-19 pandemic had a comparable impact on the performance of the Islamic equity market as it did on the conventional equity markets. However, Islamic indexes continued to beat their conventional equivalents, as they had done in the 2008 global financial crisis.

On February 27, 2020, news of the first confirmed case of the contagious COVID-19 illness was released from Nigeria (Nigeria Centre for Disease Control, 2020). Similar to any other nation, the rapid virus spread has resulted in unspeakable financial instability and economic losses. In addition to losing roughly N2 trillion in market capitalization, which represents the market value of all listed companies, the Nigerian capital market saw a significant decline in the first quarter of 2020, with a negative return of 20.65 percent compared to a negative return of 1.24 percent in the same period in 2019. (Olubiyi,2020).

Although Nigerian Islamic finance is still in its infancy, there are many opportunities for expansion in each of its three primary categories (banking, capital market and Takaful). The Nigerian Stock Exchange's Lotus Islamic Index was developed to monitor the performance of stocks listed on its floor that operate in accordance with shariah and that have complied with all regulations set forth by the Shariah Advisory Council.

The Islamic economics and finance literature contains very few empirical studies that specifically address Nigeria and other emerging nations; the ones that do exist mostly focus on the Islamic banking issue. To the best of my knowledge, this is the first study in Nigeria to look at the volatility spillover between Islamic and conventional stocks. In light of the COVID-19 epidemic, the primary goal of this article is to examine the financial infectious effect and volatility spillover of conventional stocks on Islamic stocks in Nigeria. Consequently, the structure of the document is as follows: After this introduction, the literature review is covered in section two, the methodology is covered in section three, the results and discussion are covered in section four, and the conclusion is covered in section five.

## **LITERATURE REVIEW**

### **1 Concept of Financial Contagion**

When a country or group of countries experiences a shock, there is a noticeable increase in market interconnections, which is referred to as financial contagion. In contrast to the degree of co-movement seen during calm and stable times, this can be seen by greater movement and correlation of asset prices or financial flows across markets. Park, Dornbusch, and Claessens (2000). Global financial markets are susceptible to contagious effects, which during turbulent times show up as an increased shock's transfer from one market or asset to another. In the financial market, contagion is defined as a rise in the co-movements between financial assets. Contagion, according to Forbes & Rigobon (2002), only materializes when there is a large increase in cross-market correlation during a crisis. Interdependence, which denotes strong actual links between two economies or markets, is the term used to describe this co-movement between financial markets in the absence of a discernible increase in correlation. Celik (2012) has highlighted the importance of comparing the correlation between two financial markets during periods of relative stability (pre-crisis) and turbulence (crisis period). Contagion would result if two markets exhibit a reasonable degree of correlation during times of stability and the emergence of a shock in one market causes a sharp rise in market co-movement. However, even if the correlation between two markets is historically high and keeps rising after one of them encounters an economic shock, this might not lead to contagion.

### **2 Theoretical Review**

The study's theoretical foundation is contagion theories, which, according to Herman (2016), aim to clarify how shocks might propagate from one market (or a collection of markets) to another. He claims that there is a lack of consensus and full discussion of contagion and its possible routes. Notably, some channels—like financial ties, herding behavior, and trade linkages—have gotten increased attention in the literature. Even though these routes have received a lot of attention, shocks can also be transmitted through other channels, such as political connections and wake-up calls.

The first group, known as the non-crisis contingent theories by Forbes & Rigobon (2001), attributes the spread of shocks between nations to trade connections, financial ties, wake-up calls, and common external variables. These elements were referred to as the "interdependence factors" and the "monsoonal effect" by Masson (1998). According to this view, these pathways stay the same or barely alter during times of stability and crisis. Another name for the situation is "fundamental based contagion."

Jithendranathan (2013) characterized a second group of theories called crisis contingent theories as irrational behavior driven by non-economic factors such multiple equilibria, herding, and endogenous liquidity. In contrast to non-contingent channels, these processes are thought to alter during a crisis, leading to an increase in cross-border market connection. Under endogenous liquidity channel, a crisis in a market or country may result to reduction of liquidity of the investors and in order to meet margin calls or remain relevant in the market, they sell assets held in other countries. Following this trend, uninformed traders may fail to distinguish whether the reaction of investors is as a result of liquidity shocks or is indeed a bad signal, and they overreact. As a result, these nations have a higher link between stock prices (Calve, 1999). Multiple equilibria, or self-fulfilling expectations, hold that investors in the financial market rely on one another when an adverse event in one market causes a widespread occurrence of the same situation.

### **3 Empirical literature.**

The body of research now in publication contains a large number of empirical studies on financial contagion and volatility spillover. While several studies concentrate on the consequences of shocks spreading from established to emerging markets, others examine the spillover between conventional and shariah compliant markets.

Erdoğan et al. (2020) used daily data for the period 2013-2019 to use the causality-in-variance test to evaluate the existence of volatility spillover effects between foreign exchange markets and Islamic stock markets in three important emerging countries: Turkey, Malaysia, and India. The study's conclusions showed that there were volatility spillovers from Turkey's Islamic stock market to the foreign exchange market. The results of the time-varying test demonstrate that, at some times, there is at least one direction of volatility spillover between exchange rates and the Islamic stock market. In a related study, Bossman et al. (2022) investigated the dynamic connections and spillovers between Islamic and conventional stock markets, specifically referencing the COVID-19 epidemic. From November 23, 2015, to September 8, 2021, the study used time-varying parameter vector autoregressions (TVP-VAR) on daily stock market indices for Islamic and conventional (G7) markets. Their findings show that Volatility spillovers within and between Islamic and/or G7 markets exhibit variability over time. However, when market turbulence occurs, conventional stocks tend to experience higher levels of volatility compared to Islamic stocks. The result also divulges contagious spillovers among Islamic and conventional stocks during Brexit and the studied COVID-

19 period. In a related study, Mandaci & Cagli (2021) investigate the transmission of volatility into the Islamic stock and Sukuk markets of a particular group of Middle East and North Africa (MENA) countries from a variety of sources, including the global and regional Islamic stock markets, the global conventional stock market, the global commodity markets, including oil and gold, as well as US long-term interest rates. They used time varying parameter vector autoregressions (TVP-VAR) of Antonakakis, Chatziantoniou, and Gabauer (2020) and the Diebold and Yilmaz (2012, 2014) spillover index on daily data collected between November 3, 2009, and November 1, 2019. The study's conclusions show that there are very little volatility spillovers within Islamic markets, and that there are very few relationships between the Sukuk market, international Islamic markets, and traditional stock markets.

Arif et al. (2022) used time-varying cross-quantile correlation to track the evolution of Islamic stocks' safe-haven potential by drawing a comparison between the Global Financial Crisis (GFC) and the COVID-19 pandemic crisis to evaluate the safe-haven potential of Islamic stocks for G7 stock markets. According to their findings, G7 stock markets do not see Islamic stocks as safe havens. Nonetheless, the study's findings indicate that Islamic stocks helped the G7 stock markets diversify a little bit during the Great Financial Crisis. In a different study, Owusu (2022) uses the daily bond yield indices for Islamic and G6 markets to investigate the dynamic connectivity and spillovers between Islamic and conventional (G6) bond markets. The study used the BK-18 Spillover Index Approach and covered the period from August 22, 2012, to September 17, 2021. It discovered that the results highlighted delayed contagious spillovers coming from the UK, Canada, and the USA during the COVID-19, Brexit, and European debt crisis periods. Short-term spillovers are more significant than long-term spillovers in both the Islamic and G6 bond markets.

A study comparing the effects of the COVID-19 pandemic and the Global Financial Crisis (GFC) on financial market contagion between developed and emerging markets was conducted by Muzindutsi et al. in 2022. The study used a DCC-GARCH model with weekly returns for the S&P 500 (US), FTSE-100 (UK), ASX 200 (AUS), IBOVESPA (BRA), BSE SENSEX (IND), and BVM IPC to assess the contagion impacts of established and emerging markets (MEX). The outcomes demonstrated market integration for effective financial systems. Any connected market that has a crisis is likely to be greatly affected. The results indicate that the COVID-19 pandemic had a more severe impact on all markets than the Great Financial Crisis (GFC), and that during both the pandemic and the GFC, emerging countries saw more significant spillover effects than established markets. The financial contagion effect from China to the markets of Canada, France, Germany, Italy, Japan, United Kingdom, United States of America, and Russia was examined in a related study by Natalia (2020). The study used the Dynamic Conditional Correlation (DCC) GARCH model, and the findings indicated that there was evidence of a contagion effect in five of the eight nations that were sampled. It may be inferred that the conditional correlations of the markets under examination were dynamic because Canada,

France, Germany, Italy, and Russia have statistically significant dynamic correlations and their DCC means grew during the turbulent period. Udejaja (2019) examined the degree of connectivity between Nigeria's financial markets from January 2000 to December 2018 using the Diebold and Yilmaz technique. The study measured the stock market, money market, and exchange rate market using the all shares index, the Treasury bill rate, and the official Naira/USD exchange rate, respectively. According to the study's findings, there is a significant temporal variation in the connectedness of the Nigerian financial markets, with a higher level observed during the naira's high depreciation period, which falls between the periods of falling oil prices and the country's respective economic meltdowns in 2014 and 2016. This indicates that in times of internal turmoil, the interconnectedness of financial markets is likely to become more pronounced in comparison to external shocks.

Using conditional correlation and variance causation, Gençyürek et al. (2023) examined the volatility spillover between the WTI oil market and the S&P (Stand and Poor's) Energy, Financial, and Industry sector indices. They used Hafner-Herwartz (2006) Variance Causality models and DCC-GARCH (Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroscedasticity) models on daily data for the period of January 3, 2012, to December 31, 2019. The study's findings show that there is a positive, time-varying, conditional link between sector indexes and the oil market. Cui (2023) used monthly data from 2000-01-03 to 2022-08-30 to investigate the relationship between gold, crude oil, exchange rates, and Chinese stock market indices in a different study. The DCC-GARCH model was applied to two indices that represent the Chinese financial market, the China Industrial Index and the Shanghai Stock Exchange Index, for the purpose of this study (Generalized Autoregressive Conditional Heteroskedasticity Model). The results indicate that there is a negative correlation between the USD CNY exchange rate and the two Chinese stock indexes, but a positive correlation between gold and crude oil and the China Industrial Index and the Shanghai Stock Exchange Index. In a related study, Köseoğlu (2023) investigated the relationship between stock returns, inflation, interest rates, and Turkey's exchange rate. The findings investigate the Total Connectedness Index's (TCI) maximum value, which is related to both COVID-19 and the currency crisis. The results showed that there is more connectivity between the interest rate and exchange rate and the dynamic derived from the total directional connectedness. In a similar vein, there is a high correlation between the TCI and both inflation and the stock market in 2021–2022. The findings also demonstrated that during the Turkish crisis, every indication had a role in the TCI. Similar to this, Mensi et al. (2019) investigated the interactions between five Gulf country's conventional and Islamic bank stock indices and commodity markets. The study's conclusions revealed that there are risk spillovers between the bank indices of Gulf countries and the commodities market.

## METHODOLOGY

### 1. Data and Sample selection

The study adopted Nigerian stock exchange Lotus islamic index (NGX LII) which measure the performance of shariah complaint stocks to represent Islamic stocks while Nigerian Stock exchange Banking (NGX BANKING) and Nigerian Stock Exchange insurance (NGX INSURANCE) which capture the performance of most capitalized and liquid companies in banking and insurance sector to represent the Conventional stocks. Conventional banking and insurance were selected because of their dealings in Interest (Riba) and Gharar (uncertainty) which are part of transactions that are prohibited in islamic financial system. The study used daily closing stock price data (02-01-2018 to 26-02-2020) for period before covid19 and (27-02-2020 to 31-12-2021) for period During Covid-19. The sample period includes only days at which the market was open and exclude weekends and public holidays. All the data were extracted from investing.com. In this study, daily log returns of all the stocks indexes were calculated using the following formula

$$\text{daily returns} = \ln \left( \frac{P_t}{P_{t-1}} \right) \quad (1)$$

### 2. Autoregressive Conditional Heteroscedasticity (ARCH).

According to Engel's (1982) introduction of the ARCH model, the variance of the residuals at a given time  $t$  is dependent upon the residual's dependence on the squared error terms from previous periods. When the conditional variance is not constant, Engel suggested modelling the mean and variance simultaneously. The ARCH process is shown as.

$$\sigma_t^2 = \alpha_0 + \sum_{j=1}^q \alpha_j \varepsilon_{t-j}^2 \dots \dots \dots (2)$$

### 3. Generalized Autoregressive Conditional Heteroskedasticity (GARCH).

Bollerslev (1986) developed GARCH, a generalized form of ARCH that permits "for past conditional variances in the current conditional variance equation." The Generalized autoregressive conditional heteroskedasticity model is defined as follows:

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \beta_j \sigma_{t-j}^2 \dots \dots \dots (3)$$

### 3. Constant Conditional Correlation (CCC- GARCH) Model.

Bollersev (1990) proposed the constant conditional correlation, which is an n-dimensional GARCH model consisting of n univariate GARCH processes

connected to each other through a constant conditional correlation matrix. The CCC-GARCH model is specified as

$$H_t = D_t R D_t = (\rho_{ij} \sqrt{h_{iit}} \sqrt{h_{jtt}}) \dots \dots \dots (4)$$

Where:

$$D_t = \text{diag}(\sqrt{h_{iit}}) \dots \dots \dots (5)$$

And:

$$R = (\rho_{ij}) \dots \dots \dots = \dots (6)$$

R is the correlation matrix of the conditional correlations. Ht is positive only if the variances of the symmetrical matrix R are positive.

### 3.4 DCC GARCH Model Specification

Using Engel's Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroscedasticity (DCC GARCH) model, the study investigated the financial contagion and transmission of volatility in conventional and Islamic stocks in Nigeria (2002). In addition to directly accounting for heteroscedasticity, Lee & Tran (2021) claim that this methodology can test for dynamic conditional correlation, which is a function of time and reflects the actions of investors in response to various shocks. Two phases comprise the model's implementation. The univariate GARCH model is estimated in the first step, and the conditional correlation is estimated in the second stage, which also considers the dynamics of the volatility and the correlation between the two variables. The DCC-GARCH model is specified as

$$H_t = D_t R_t D_t \dots \dots \dots (7)$$

$$H_{11t} = \alpha_{0,1} + \alpha_{11} \varepsilon_{1,t-1}^2 + \beta_{11} H_{11,t-1} \dots \dots \dots (8)$$

$$H_{22t} = \alpha_{0,2} + \alpha_{21} \varepsilon_{2,t-1}^2 + \beta_{21} H_{22,t-1} \dots \dots \dots (9)$$

Where:

$$D_t = \begin{pmatrix} \sqrt{H_{1t}} & 0 \\ 0 & \sqrt{H_{2t}} \end{pmatrix}, R_t = \begin{pmatrix} 1 & \rho_{12,t} \\ \rho_{21,t} & 1 \end{pmatrix} \cdot \varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t}) \dots \dots \dots (10)$$



with  $E(\varepsilon_t) = 0$ ,  $\text{Cov}(\varepsilon_t) = H_t$ .  $\varepsilon_t$  is the error vector i.i.d and therefore is the conditional variance-covariance matrix.

The parameters of interest are:  $\alpha_{0,1}$ ,  $\alpha_{11}$ ,  $\beta_{11}$ ,  $\alpha_{21}$ ,  $\alpha_{0,2}$ ,  $\beta_{21}$ ,  $DCC_\alpha$ , and  $DCC_\beta$ . The assets 1 and 2 represents conventional and islamic stocks. The parameters of the DCC model are estimated using maximum likelihood estimator and can be written as:

$$L = \frac{1}{2} \sum_{t=1}^T (n \log(2\pi) + 2\log/D_t/ + \log/R_t / + \eta'_t R_t^{-1} \eta_t) \dots \dots \dots (11)$$

In order to investigate the presence of financial contagion between the conventional and islamic stocks in Nigeria, the study employed t-statistics to test the consistency of DCC-GARCH coefficients between conventional and islamic stocks during covid19 periods and pre-covid19 periods by testing the following null and alternative hypothesis.

$$H_0 : \mu_p^{Pre-covid} = \mu_p^{During Covid19} \dots \dots \dots (12)$$

$$H_1 : \mu_p^{Pre-covid} \neq \mu_p^{During Covid19} \dots \dots \dots (13)$$

Where  $\mu_p^{Pre-covid}$  is the mean of conditional correlation coefficient during the pre-covid19 period while  $\mu_p^{During Covid19}$  is the mean of conditional correlation coefficient during covid19 pandemic. Failure to reject the null hypothesis implies that the mean of DCC coefficient is the same in pre-covid19 period and during covid19 period which means no significant increase in shock transmission during unstable period (During covid 19 periods) and hence no contagion effect. However, when the null hypothesis is rejected, it implies that the mean of DCC coefficient is not the same for the two periods signifying an increase in transmission mechanism of shocks between the two markets or assets and hence presence of contagion effect

## RESEARCH RESULT

### 1 Descriptive Statistics

Table 1 below illustrates the descriptive statistics of the daily returns of Lotus islamic index (NGX LII), Nigerian Stock exchange Banking (NGX BANKING) and Nigerian Stock Exchange insurance (NGX INSURANCE) for both pre-covid period (02-01-2018 to 26-02-2020) and for period and during covid (27-02-2020 to 31-12-2021).

**Table 1: Descriptive Statistics**

| Pre-covid 19   | NGX-lotus  | NGX-banking | NGX-insurance |
|----------------|------------|-------------|---------------|
| Mean           | 2.0529     | 0.9027      | -0.4255       |
| Median         | 2.3637     | 1.0852      | -0.1567       |
| Maximum        | 4.5951     | 3.3436      | 1.4702        |
| Minimum        | -3.5066    | -3.2189     | -4.6052       |
| Std-Dev        | 1.4077     | 1.2209      | 1.2406        |
| Skewness       | -1.0244    | -0.6655     | -1.0842       |
| Kurtosis       | 3.4198     | 3.8822      | 4.3626        |
| J-Bera         | 60.8071*** | 19.72397*** | 59.82864***   |
| During-Covid19 | NGX-lotus  | NGX-banking | NGX-insurance |
| Mean           | 1.7241     | 0.7079      | 0.1508        |
| Median         | 1.8578     | 0.9322      | 0.3715        |
| Maximum        | 3.5219     | 2.7887      | 4.9471        |
| Minimum        | -3.9120    | -4.6052     | -3.9120       |
| Std-Dev        | 1.6754     | 1.4949      | 1.4949        |
| Skewness       | -0.6447    | -1.1286     | -0.7819       |
| Kurtosis       | 3.3007     | 4.6368      | 4.6368        |
| J-Bera         | 18.0391*** | 74.8271***  | 34.9825***    |

Source: Author's computation using E-views. \*\*\* significance at %1.

The table 1 above captures the descriptive statistics for the daily closing stock returns of both islamic and conventional stocks for the period before and during covid 19 in order to demonstrate the impact of the pandemic in the two markets. The descriptive statistics indicates that the mean return for the periods before covid 19 for lotus and banking indexes are greater than the mean return during the pandemic except for the insurance index, confirming the better performance of the Nigerian stocks before the pandemic.

As regards the volatility of the stocks returns, the result reveals that the standard deviation of all the three indexes are greater during the pandemic compare to the pre-covid 19 confirming a significant increase in volatility and risks during the pandemic period. The skewness of all the indexes is negative indicating downward mark spirals. The kurtosis in both the periods and for all the indexes are positive and greater than 3 indicating leptokurtic distributions with high probability of greater fluctuation, this is confirmed by Jaque-Bera statistics where null hypothesis of normality is rejected at 1% level of significance.

## **2. Stationarity And Heteroscedasticity Testing.**

In order to apply GARCH family models in the analysis of financial and economic time series it is necessary to test for stationarity of the data as well as the presence of ARCH effect. Augmented Dickey-Fuller (ADF) and Philips-Perron Unit roots were conducted on the three indexes using the full sample

(02-01-2018 to 31-12-2021). The table 2 below summarizes the results of the unit root tests and ARCH effect test conducted on the full sample.

**Table 2: Unit Root and Heteroscedasticity testing**

|                               | NGX- Lotus            | NGX- Banking          | NGX- Insurance       |
|-------------------------------|-----------------------|-----------------------|----------------------|
| Augmented-Dickey-Fuller (ADF) | -26.3570<br>(0.0000)  | -26.12172<br>(0.0000) | -28.5377<br>(0.0000) |
| Philips- Perron               | -26.8184<br>(0.0000)  | -26.0039<br>(0.0000)  | -28.6839<br>(0.0000) |
| ARCH. (Obs*R-Square)          | 22.072273<br>(0.0000) | 73.57524<br>(0.0000)  | 125.5705<br>(0.0000) |

Source: Author's computation using E-Views

According to both the Augmented Dickey-Fuller and Philips-Perron unit root test in table 2 above, the null hypothesis of absence of unit root is rejected in all the series and alternative hypothesis of stationarity is accepted because the p-values of all the tests are less than 5% level of significance. In addition to stationarity test, it is crucial to examine the presence of ARCH effect in all the three series. The ARCH test for heteroscedasticity, is actually a regression of the squared residuals to a constant term and p lags that may vary. The null hypothesis for this test is that there is no ARCH effect against the alternative hypothesis that there is ARCH effect. Therefore, based on the P-Values of the test the null hypothesis of no ARCH effect is rejected and alternative hypothesis is accepted in all the series at 1% level of significance, this means the application of GARCH family model is compatible with the study's data since periods of high/low volatility are followed by periods of high/low volatility. This is confirmed by the graphs of all the three series in the figures below which also showed an evidence of volatility clustering.

**Figure 1: NGX-Lotus Graph**

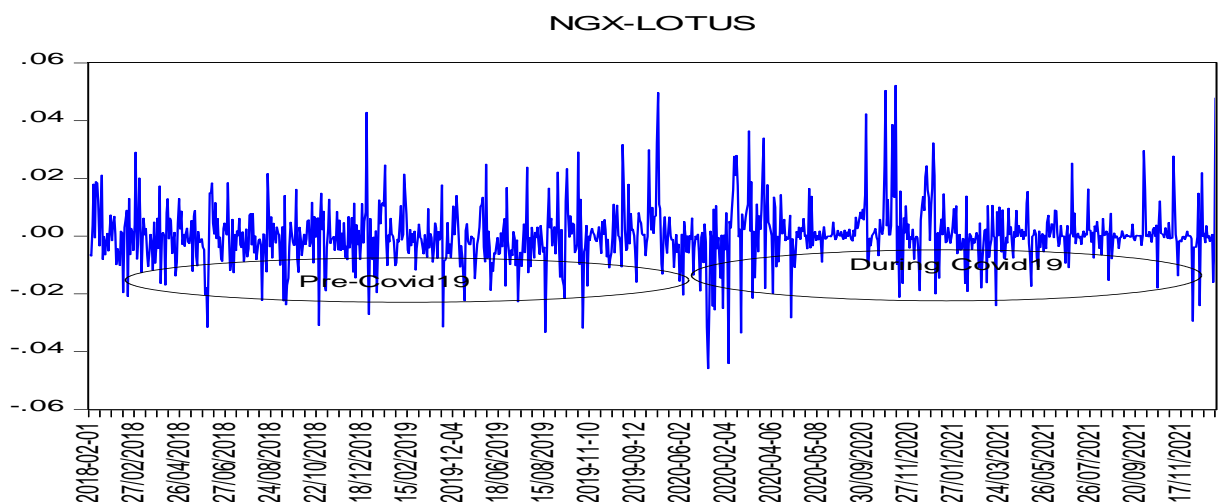


Figure 2: NGX-Banking Graph

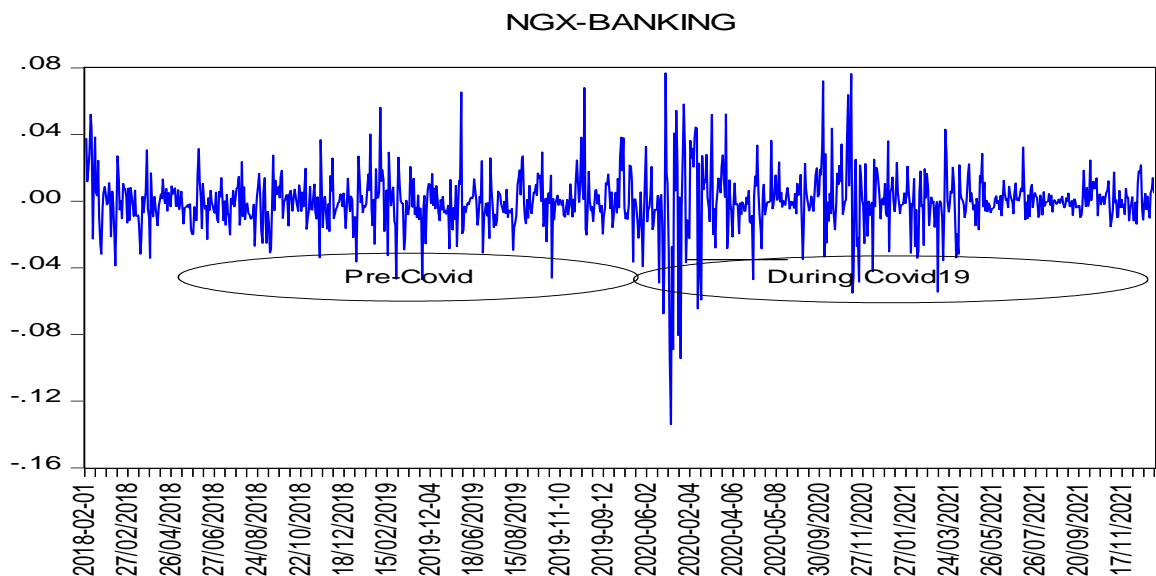
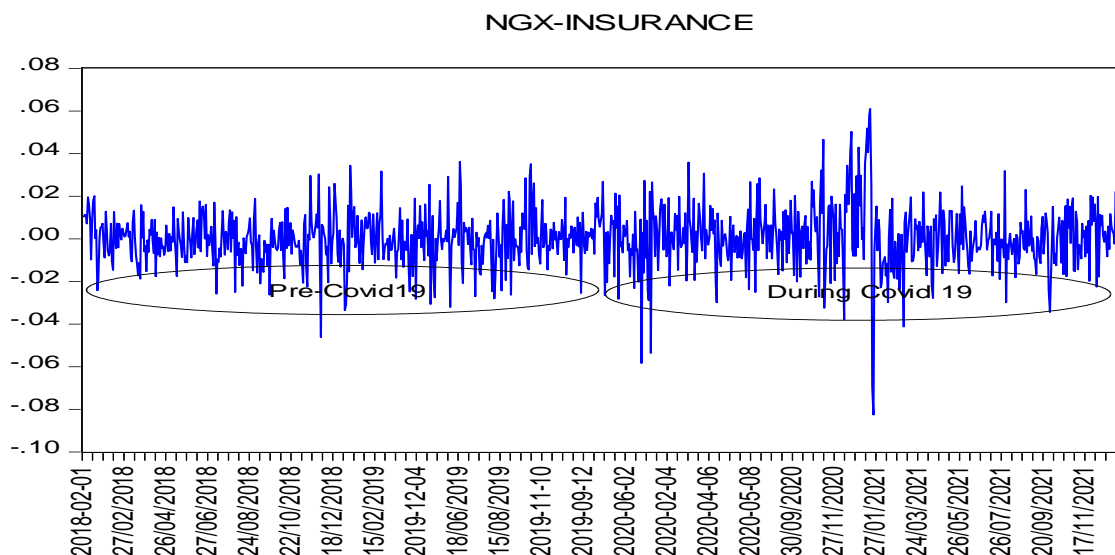


Figure 3: NGX-Insurance Graph



The three figures above showed a sharp increase in volatility during the covid19 period

### 3. Volatility Spill-Over And Financial Contagion Tests

In order to achieve the study's objective of investigating volatility spill over and financial contagion effect of conventional stocks on shariah compliant stocks in Nigeria, the study deployed DCC-GARCH and t-Statistics to investigate the consistency of DCC coefficients between pre-covid19 and during Covid19 periods in order to determine the effect of financial contagion between the conventional and islamic stocks in Nigeria. The table 3 below summarizes the result of the volatility spill over and financial contagion for the periods under investigation.

Table 3: DCC-GARCH Model

| PRE-COVID   |             | PANEL A                         |          |                                |           |
|---|-------------|---------------------------------|----------|--------------------------------|-----------|
| $\omega$  |             | $\alpha$                        |          | $\beta$                        |           |
| $\omega_{\text{NGX-LOTUS}}$   | 0.0007      | $\alpha_{\text{NGX-LOTUS}}$     | 0.0976** | $\beta_{\text{NGX-LOTUS}}$     | 0.8723*** |
| $\omega_{\text{NGX-BANKING}}$   | 0.0004      | $\alpha_{\text{NGX-BANKING}}$   | 0.1778** | $\beta_{\text{NGX-BANKING}}$   | 0.8212*** |
| $\omega_{\text{NGX-INSURANCE}}$   | -<br>0.0004 | $\alpha_{\text{NGX-INSURANCE}}$ | 0.1575** | $\beta_{\text{NGX-INSURANCE}}$ | 0.5440*** |
| <b>DCC<math>\alpha</math>(NGXBANKING-NGXLOTUS): 0.0444 DCC<math>\alpha</math>(NGXINSURANCE-NGXLOTUS): 0.0000</b><br><b>DCC<math>\beta</math>(NGXBANKING-NGXLOTUS): 0.8927***. DCC<math>\beta</math>(NGXINSURANCE-NGXLOTUS): 0.9097***</b> |             |                                 |          |                                |           |
| DURING COVID  |             | PANEL B                         |          |                                |           |
| $\omega$  |             | $\alpha$                        |          | $\beta$                        |           |
| $\omega_{\text{NGX-LOTUS}}$   | 0.0006      | $\alpha_{\text{NGX-LOTUS}}$     | 0.1009** | $\beta_{\text{NGX-LOTUS}}$     | 0.8684*** |
| $\omega_{\text{NGX-BANKING}}$   | 0.0003      | $\alpha_{\text{NGX-BANKING}}$   | 0.1633** | $\beta_{\text{NGX-BANKING}}$   | 0.8357*** |
| $\omega_{\text{NGX-INSURANCE}}$   | 0.0003      | $\alpha_{\text{NGX-INSURANCE}}$ | 0.1743   | $\beta_{\text{NGX-INSURANCE}}$ | 0.7106*** |
| <b>DCC<math>\alpha</math>(NGXBANKING-NGXLOTUS): 0.0477 DCC<math>\alpha</math>(NGXINSURANCE-NGXLOTUS): 0.0067</b><br><b>DCC<math>\beta</math>(NGXBANKING-NGXLOTUS): 0.8872*** DCC<math>\beta</math>(NGXINSURANCE-NGXLOTUS): 0.9823***</b>  |             |                                 |          |                                |           |
| CONTAGION EFFECT  |             | PANEL C                         |          |                                |           |
| EFFECT STATISTICS   |             | PERIOD                          |          | MEAN                           | T-        |
| NGXBANKING-NGXLOTUS.  |             | PRE-COVID                       |          | 0.0172                         | 0.1607    |
| NGXBANKING-NGXLOTUS.  |             | DURING-COVID                    |          | 0.1770                         |           |
| NGXINSURANCE-NGXLOTUS.  |             | PRE-COVID                       |          | 0.0796                         | 0.0761    |
| NGXINSURANCE-NGXLOTUS.  |             | DURING-COVID                    |          | 0.1560                         |           |

Source: Author's computation using R. Note \*\*\* significance at %1, \*\* significance at %5

The DCC-GARCH (Engle Two-Step Procedure) model provides the following kinds of information about the data set. These are as follows: Univariate autoregressive conditional heteroscedastic structure of the series

which is captured by the  $\alpha$  and  $\beta$  parameters in both panel A and B of the table above while  $\omega$  is the constant of the univariate GARCH in both the two periods.  $\alpha$  is the ARCH component shows the effect of shock on the volatility while GARCH shows the effect of volatility in the previous period on current volatility. Additionally,  $(\alpha + \beta)$  is less than 1 in all the three series during both pre-covid19 and covid19 periods which indicates volatility persistence.

The second part of the DCC-GARCH shows the existence of volatility spillover between series - and dynamic nature (time-varying) power of spillover. DCC alpha ( $DCC\alpha$ ) and DCC beta ( $DCC\beta$ ) reveals how the correlations are evolving over time in an autoregressive manner.  $DCC\alpha$  provides the contribution of the realized correlation matrix from last period (short term volatility impact) while  $DCC\beta$  provides the contribution of correlation matrix that is due to all previous periods (long term volatility impact). The result from the table above shows that  $DCC\alpha$  of both NGX\_BANKING - NGX\_LOTUS and NGX\_INSURANCE-NGX\_LOTUS for pre-covid19 and During Covid19 periods are statistically insignificant. By implication there is absent of volatility spillover effect of conventional stocks on shariah compliant stocks in the short run for the two periods.

However,  $DCC\beta$  of both NGX\_BANKING - NGX\_LOTUS and NGX\_INSURANCE-NGX\_LOTUS for pre-covid19 and During Covid19 periods are statistically significant at 1% which implies the presence of long run volatility spillover from conventional to islamic stock before and during covid19 pandemic. The sum of two coefficient DCC alpha ( $DCC\alpha$ ) and DCC beta ( $DCC\beta$ ) is less than 1 ( $DCC\alpha + DCC\beta < 1$ ) which confirms the dynamic nature of the conditional correlation in the model.

The panel C of the table 3 above show the result of the financial contagion effect test using (t-test) which is apply to examine the difference in dynamic conditional correlation coefficients in pre-covid 19 and during covid19 periods. Based on the result the null hypothesis that the Mean of DCC coefficient is the same for both the periods cannot be rejected because the t-statistics are not statistically significant. This means there is absent of financial contagion effect from conventional and shariah compliant stocks in Nigeria as there is no significant increase

## CONCLUSION

This paper empirically examined the volatility spillover and financial contagion effect between conventional and islamic stocks in Nigeria taking in to cognizance the role of covid-19 in influencing the relationship. The study used daily returns of Nigerian stock exchange Lotus islamic index (NGX LII) which measure the performance of shariah complaint stocks to represent Islamic stocks, Nigerian Stock exchange Banking (NGX BANKING) and Nigerian Stock Exchange insurance (NGX INSURANCE) which capture the performance of most capitalized and liquid companies in banking and insurance sector to represent the Conventional. The study adopted econometrics technique of Dynamic Conditional Correlation Generalized Autoregressive Conditional

Heteroscedasticity; this is in addition to application of t-test to investigate the existence of financial contagion effects between the assets.

The result of the DCC-GARCH model indicated an absence of volatility spillover effects of banking and insurance index on lotus islamic index in the short for both pre and during covid-19 periods. However, in the long run volatility spillover effect of conventional stocks on islamic stocks was detected for the two periods. The result further indicates no significant increase in the mean of conditional correlation between conventional and islamic stocks during covid-19 and therefore the study concludes that there is no contagion effect between the series.

On the basis of the findings, it is recommended that policy makers in Nigeria should implements sound economic policies that takes in to consideration the dynamic nature of the stock market in order to improve its capacity in weathering financial catastrophe.

### ADVANCED RESEARCH

The major limitation of this study is failure to consider the effects of other sectoral stocks on islamic equities before, during and after the pandemic, therefore there is need to carry out more studies especially on the effects of shock transmission from islamic equities to conventional stocks especially in the real sector of Nigeria's economy.

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