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PORTFOLIO DIVERSIFICATION OPPORTUNITIES FOR NIGERIA'S ISLAMIC (SHARIAH) STOCK INVESTORS WITH THEIR MAJOR TRADING PARTNERS

Fatima Muhammad Abdulkarim[1], Hamisu Sadi Ali[2], Ibrahim Muhammad Muye[3] and Mosab I. Tabash[4]

[1] Federal University Dutse, Nigeria, fatimakarim@fud.edu.ng
[2] Ahmadu Bello University, Nigeria, hamisusadi@gmail.com
[3] Department of Econometrics, Tashkent State University of Economics, Uzbekistan, muyeibrahim@gmail.com
[4] Al Ain University, United Arab Emirates, mosab.tabash@aau.ac.ae

ABSTRACT

This paper investigates potential diversification opportunities for Nigeria's Islamic stock investors with Nigeria's top trading partners (France, Spain, United Kingdom and India). It employs daily data of Islamic stock indices, namely Nigeria's LOTUS Islamic index and FTSE shariah indices of the four countries, from 14 July 2015 to 14 December 2022. Using multivariate GARCH-DCC, we show that Islamic investors from Nigeria have almost no portfolio diversification opportunities in the Islamic stock markets of these countries except for a slight portfolio diversification opportunity found in the UK Islamic stock market for a very short period (one year) and almost none for India, Spain, France. The results from the continuous wavelet transform (CWT) however suggest that diversification opportunities are present in UK, France, Spain and not in India. These findings have important policy implications for policy makers and investors seeking to invest in these countries to be mindful of the appropriate investment timing to minimize potential future losses in investments.

Keywords: Islamic stock indices, Portfolio diversification, Trading partners, M-GARCH, Wavelet analysis.
JEL classification: F30; G10; G11; G15.

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I. INTRODUCTION

Countries around the globe have in recent times liberalized their financial markets to attract foreign capital inflows and consequently make it possible for domestic investors to benefit from international diversified portfolios and seek higher returns from the markets (Belanes et al., 2024). Developing economies have in recent time aggressively liberalized their financial markets in order to attract more financial capital in to their economies (Jiang et al., 2024, and Mukherjee et al., 2021). The liberalization of these markets has made them become more interconnected with the developed markets. This development has greatly lowered cross boarder hurdles faced by investors at the international markets, (Yao et al., 2018). However, despite the advantages of financial liberalization to these economies, some researchers link it to the increased international stock market integration (Carrieri et al., 2007). This close integration among markets makes them more susceptible to global shocks. The recent unprecedented global events that sent the global economies into crisis have shown the negative side of financial integration. For examples, the 2008 global financial crisis and the recent COVID-19 forced global financial markets to temporarily cease operation causing disruption in the financial markets and adversely affecting world economic development (Aliani et al., 2022). The recent Russian-Ukraine war has had serious effect on most economies around the globe since Russia and Ukraine are important suppliers of basic raw commodities to the International markets (Karamti & Jeribi, 2023). The immediate global stock market reactions to these shocks show us that the global financial systems are well interconnected.

Stock market integration is a key aspect that global investors have concern about by holding a diversified portfolio with a view to reduce exposure to risk (Khan, 2011). International portfolio diversification is considered a risk reduction strategy, and it enhances the efficiency of the portfolio (Ziobrowski & Ziobrowski, 1995; Zonouzi et al., 2014). Since the groundbreaking work of Markowitz (1959), subsequent researchers have dealt with his modern portfolio theory to fully understand its real-world applications. International portfolio diversification is considered a risk-reduction strategy through investing in both domestic and foreign financial equities, (Agyei-Ampomah, 2011; Kapingura et al., 2014; Mensah & Alagidede, 2017).

Nigeria has strong economic ties with countries like India, France, Spain and United Kingdom. These countries together form the top destination for Nigeria's exports (Statista, 2021). Reports from national Bureau of Statistics (2023) show that in Q2,2023, Nigeria exports amounted to 44.23% of the total value of export with India having the highest share of 15.17%, followed by United Kingdom 13%, France 7.71% and Spain 7.17%, (Ventures Africa, 2022). The strong economic ties with these countries prompt this research to look at their financial markets, whether there exists potential international portfolio diversification opportunities for Nigeria's Islamic stock investors in their stock markets.

The global Islamic finance industry has maintained its growth trajectory with S&P global rating 2023 projected it to grow at 10% in 2023- 2024. Islamic finance is new in Nigeria and the first Islamic stock index was launched in 2008, namely the Nigerian Stock Exchange Lotus Index (NSE-LOTUS), a shariah compliant index that tracks the performance of shariah compliant stock listed on Nigerian

Stock Exchange (NSE), (Lotus Capital, 2009). Additionally, other segments of Islamic finance such as Islamic banks and sukuk have been developed in parallel. Since then, the Nigerian Islamic finance industry has continued to grow and is valued at USD 2.9 billion at the end of 2022 with Sukuk market being the largest in Africa and having the largest share (57%), followed by Islamic banks (42%) and finally, Islamic funds (1%), (Fitch ratings, 2021). Although Islamic stock market offers opportunities for investors, this study will look at the potential of Nigeria's Islamic investors investing in the Islamic stock markets of Nigeria's largest trading partners to have the opportunity of tapping the international investment spheres.

A handful of researchers have empirically investigated the benefits of international portfolio diversification using different sets of data (conventional and Islamic) and arrive at different findings, see for instances Saiti et al. (2014), Abbes & Trichilli (2015), Balcılar et al. (2015a), Rahim & Masih (2016), Oloko (2018), Aluko et al. (2018), Bugan et al. (2022), and Belanes et al. (2024). In the context of Nigeria's financial markets, only two studies investigate the portfolio diversification opportunities utilizing Nigeria's conventional stock index with special attention to UK and US investors diversifying portfolio investment in Nigeria (Oloko, 2018) and other developed economies' potential benefits in Nigeria's stock market (Aluko et al., 2018). This study departs from these studies as it focuses on Nigeria's Islamic stock indices and employs a more robust methodologies, which are Multivariate GARCH-DCC and wavelet coherence. The MGARCH-DCC method is employed accurately captures the changing nature of the data. It also allows us to test the volatilities of each market and the dynamic correlation among the markets (Smolo et al., 2023). The continuous wavelet transforms methods assess time frequency relationship among time series as well as capture the changing nature of hidden information in the series in a combined time frequence domain (Abdulkarim & Tabash, 2021). Hence, this research intends to shed more lights into the benefits of international portfolio diversification using Nigeria's newly developed Islamic index (NSE Lotus Shariah index) and compare it with other four FTSE Shariah indices of Spain, India, France and United Kingdom.

This paper has two objectives. The first is to empirically examine the degree to which Nigeria's Islamic stock investors can benefit from investing in any of the four Islamic Shariah stocks markets of the trading partners (Spain, France, UK and India). The second objective is to study the correlations and volatility of returns among the selected trading partners of Islamic stock markets by providing the appropriate investment horizon that is suitable and safe for investment. This will shed light on when to enter and exit the market providing optimum investment strategy for Nigeria's Islamic stock investors.

The rest of the paper is structured as follows: Section two provides the review of the existing literature and section three discusses the methodology applied to achieve the stated objectives. Section four highlights the data, and preliminary analysis. Section five presents the results, discussions and analysis, and lastly section six concludes the study and provides policy recommendations.

II. LITERATURE REVIEW

Empirical studies on portfolio diversification opportunities have predominantly focused on developed countries and on conventional finance data. Recently, with the emergence of Islamic finance, a body of research has emerged to compare the performance of Islamic stock markets vis-à-vis conventional markets in terms of stability, volatility and co-movements. While several interesting findings have been unearthed, they are far from being conclusive.

Earlier empirical works focusing on developed stock markets include Karolyi & Stulz (1996), Patev et al. (2006), and DeFusco et al. (1996). In their study using US data, Karolyi & Stulz (1996) employ data for US and its trading partners and find that BRICs markets and international markets have a different and incomplete financial integration. They suggest policy makers opening more of their domestic markets to get more benefits from financial integration. Using data from 1996 to 2001 on US and four countries from the Central Eastern Europe, Patev et al. (2006) find evidence of less portfolio diversification benefits during crisis period against the post crisis period. Similarly, using US and 13 emerging capital markets in three geographical regions of the world, DeFusco et al. (1996) find less cointegration amongst the markets suggesting the correlation amongst them is independent of investment horizons, which suggests that diversification across these countries is effective.

Recently, research on the effect of COVID-19 pandemic on financial market has grown significantly since the outbreak started in early 2020. The work of Pham et al. (2023) employs G7 data to study whether COVID-19 vaccination matters in reducing the cross-country volatility connectedness among the countries. They find clear evidence that vaccine rollout helps a country's stock market to be more resilient to the exogenous shock. Using data from Dow Jones Islamic U.S Index, Yousfi et al. (2021) find that during the COVID-19 crisis, Dow Jones Islamic has the highest hedging effectiveness due to its better resistance during the outbreak.

Significant works on the perspective of Asian countries are carried out. For instance, Srivastava (2007) employs data from US and selected Asian countries and finds that market integration differs considerably through time and is higher during the last few years. They also suggest that globalization has offered benefits and drawbacks during the last few years. As for India, Harper (2011) provides evidence of presence of portfolio diversification opportunities between India and its top trading partners (China, United States, Israel, Malaysia, Germany, Singapore, United Kingdom, Hong Kong, Switzerland, and the Netherlands). The author put in evidence of achieving higher expected returns and lower overall risk in investing in the Indian Market and share geographical association with its trading partners. In the context of Gulf Cooperation Council (GCC) countries, Balcılar et al. (2015b) find GCC countries to serve as international safe investment hub for international investors. They further suggest that including GCC stock in international portfolio results in significant international diversification benefits. Similarly, Bley & Chen (2006) suggest that GCC markets offer potential diversification benefits due to its increasing market integration with the world stock market. Sher et al. (2024) focus on the stock markets of China with its major developed counterparts: Australia, Germany, Japan, the UK, and the US. They find evidence of high stock return for Chinese market given the level of risks. They show modest integration among

the markets, suggesting evidence of diversification opportunities among the selected markets. Using data from Pakistan, Lee et al. (2024) study Pakistani stock market integration with its top 10 largest economies in the world- USA, China, Japan, Germany, the UK, India, France, Italy, Brazil, and Canada from January 2015 to October 2020. They employ Johansen cointegration technique and find no evidence of cointegration among the markets in the long run. However, in the short run, they find evidence of integration among the markets except for the Chinese stock market. In the lead-lag relationship, the authors find a bidirectional relationship with the USA, Japan, Germany, the UK, and France. They concluded that Pakistan investors have a better investment opportunity in the Chinese stock market compared to the rest of the markets.

In the context of Nigeria, Oloko (2018) and Aluko et al. (2018) employ data from Nigeria to investigate its diversification opportunities for international investors. Oloko (2018) examines diversification benefits for US and UK investors diversifying into Nigerian stock market and finds evidence of the presence of diversification opportunities for US and UK investors. Similarly, Aluko et al. (2018) use developed stock markets (US, UK, Japan, Germany and France) to study the availability of portfolio diversification opportunities in the Nigerian stock market prior and post Global Financial crisis (GFC). They find evidence for the presence of portfolio diversification opportunities for international investors except for Japanese investors in the post crisis period.

Turning to Islamic equity markets, a body of literature have emerged and have investigated the relationship between Islamic and conventional stock markets using data from developed and developing economies and found mixed evidence. Some earlier works on Portfolio diversification opportunities using Islamic stock markets are Saiti et al. (2014), Abbes & Trichilli (2015), and Rahim & Masih (2016). Saiti et al. (2014) employ data from Islamic and non-Islamic countries and find the former to offer better diversification opportunities over the latter. In a similar vein, Abbes & Trichilli (2015) find that Shariah compliant stocks could offer better diversification opportunities especially when different economic grouping is considered such as that in developed and developing economies. Using stochastic dominance (SD) analysis, Abu-Alkheil et al., (2017) examine whether Islamic stock indices outperform its conventional indices using data from 2022 to 2014. Their findings reveal the existence of diversification benefits and portfolio optimization opportunities.

By employing causality-in-variance, dynamic conditional correlations, optimal hedge ratios and causality-in risk tests, Bugan et al., (2022) employ daily data of emerging stock market returns and some Islamic stock market returns from 1996 to 2020. They find a strong positive correlation among the markets signifying a less diversification opportunity for Islamic stock investors. Belanes et al. (2024) in their study using US and its major trading partners (Canada, Japan and UK) find evidence of diversification opportunities for US based investors due to its low correlation with its trading partners.

In a more recent study, Endri et al. (2024) use Vector Autoregressive (VAR model) and Johansen cointegration test to analyses Indonesia's shariah index and market indices of its eight major trading partners. Their findings show low integration of Indonesia's index with its major trading partners in the long run. This

precludes portfolio diversification opportunities among the trading partners. Attia et al. (2023) employ data from the US and its major trading partners to study the diversification benefits before and after the onset of COVID-19. They employ daily data from 2007 to 2020 and use wavelet and MGARCH-DCC for the analysis. They find short term diversification benefits for US conventional and Islamic investors except for Malaysia shariah index. However, during the pandemic period, there is an absence of diversification opportunities in all markets.

While previous studies have focused on portfolio diversification opportunities for Islamic and conventional indices mostly in US with other emerging Islamic stock markets such as Asia and GCC countries, none has explored the relationship using Nigeria's Islamic stock market and the markets of its trading partners such as UK, France, Spain and India. The present study aims to contribute to the existing literature by investigating the portfolio diversification opportunities for Nigeria's Islamic stock investors diversifying into Islamic stock markets of its trading partners.

III. METHODOLOGY

This study employs two methodologies namely, Multivariate GARCH dynamic conditional correlations (MGARCH-DCC) and continuous wavelet transform (CWT). The former analysis is used to analyze the long-term fluctuations in the data while the latter examines the short-term fluctuations in the data.

3.1. Multivariate GARCH Dynamic Conditional Correlations (MGARCH-DCC)

MGARCH-DCC approach is commonly employed to study the volatilities of stock returns and the dynamic correlations amongst markets, (Smolo et al., 2023). We adopts the MGARCH model because it has more predictive ability over other models such as conditional correlation GARCH and diagonal VECH MGARCH models (Smolo et al., 2023). In DCC estimation, two steps are involved with the initial step using univariate volatility parameters, normally applied in the case of single model and single variable. While in the case of two variables, the two GARCH equations are estimated as follows:

$$h_t = c_0 + a_1\varepsilon_{t-1}^2 + b_1 h_{t-1} + b_2 h_{t-2} + m_1\varepsilon_{t-1}^2 I_{\varepsilon>0} \quad (1)$$

Where I is an indicator function that equals 1 when the standardized residuals of the series (ε_t) are positive. In the case of negative value of m, it shows that periods of negative residuals would be immediately succeeded by periods of higher variance as against the periods of positive residuals.

The first stage, standardized errors (e_t) are used as inputs in estimating a time-varying correlation matrix. Based on Engle (2002), the equation of the conditional covariance matrix, H_t, can be written as follows:

$$H_t = D_t R_t D_t \quad (2)$$

Where H_t is the conditional matrix, D_t represents the diagonal matrix of the conditional standardized residuals (e_t) at time t, while R_t represents the time-varying correlation matrix.

3.2. Continuous Wavelet Transforms (CWT)

In CWT, the main time series is mapped as a function of just one variable time, which then formed into the function of two different variables such as time and frequency. Under CWT, it is not necessary to define the number of wavelets time scale because it automatically generates the data length. The identification of figures and interpretations of the patters is facilitated by CWT since the series correlations are in two dimensional figures. In this study, Daubechies (1992) least square asymmetric wavelet filter of L=8 is used as represented by LA (8) based on eight non-zero coefficients.

A mother wavelet denoted by ψ is projected onto the CWT W_x (u,s) to the examined time series x(t) E L^2 (R), as written below;

$$W_x(u,s) = \int_{-\infty}^{\infty} x(t) \frac{1}{\sqrt{s}} \omega \left(\frac{t-u}{s}\right) dt \tag{3}$$

Where u represents the position of the wavelet in the time domain while s is the position in the time frequency domain. Therefore, the use of wavelet transform will allow the mapping of the original time series into a function of u and s. Furthermore, wavelet coherence represents a bivariate framework which is used to investigate the interaction between two variables say, x and y and their relationships. The wavelet coherence of the time series can be written as follows:

$$R_n^2(s) = \frac{|s\left(s^{-1}W_n^{xy}(s)\right)|^2}{s(s^{-1}|W_n^x(s)|^2 s\left(s^{-1}\left|W_n^y(s)\right)\right)|^2} \tag{4}$$

Where the smoothing operator is denoted by S; s is a wavelet scale; $W_n^x(s)$ is the continuous wavelet transform of the time series X; $W_n^y(s)$ represent the continuous wavelet transform of the series y; $W_n^{xy}(s)$ is a cross wavelet transform of the series x and y.

IV. DATA AND PRELIMINARY ANALYSIS

To conduct the analysis, daily data for NSE LOTUS Islamic index Nigeria (LTSI) and FTSE Islamic return indices of India (FTIN), United Kingdom (FTUK), Spain (FTSP) and France (FTFR) are employed. The data span is from 14 July 2015 to 14 December 2022. Daily data is preferred because of its high frequency as it overcomes the problem of unsynchronized trading (Alagidede et al., 2008). In contrast, low frequency data lack this quality and risk losing all the vital information which may hinder the accuracy of the result, (Salisu et al., 2019). The data are obtained from Thomson Reuters DataStream. The price indices are transformed to return

series by using the formula: r_t=LN (pt/p(t-1)), where r is the return at time t and p is the closing stock price. Table 1 lists the variables under study while Table 2 summarizes the descriptive statistics of daily returns data of the five Islamic indices.

Table 1.
List of Indices

Label	Islamic stock market indices
LTSI	NSE LOTUS Islamic index Nigeria
FTSP	FTSE Spain shariah Price Return Index
FTIN	FTSE India shariah Index
FTUK	FTSE UK shariah Price Return Index
FTFR	FTSE France shariah

Table 2.
Description Statistics of the Data

	FTFR	FTIN	FTSP	LTSI	FTUK
Mean	-0.0026	-0.0095	-0.0011	0.0330	-0.0041
Median	-0.0442	-0.0171	-0.0590	0.0000	0.0189
Minimum	-8.7895	-9.1427	-7.1639	-7.5549	-15.6917
Maximum	15.8735	15.4471	17.8719	41.4523	13.2054
Standard Deviation	1.2742	1.2566	1.2883	1.7906	1.3671
Kurtosis	17.7072	18.5973	24.3949	162.0117	17.8927
Skewness	1.2840	1.5084	1.8819	7.3823	-0.9866

Table 2 reports the descriptive statistics for the return series of the selected variables. Based on the Table, LTSI exhibits positive average return while the remaining indices have negative returns. Their corresponding standard deviations range from 1.25 (FTIN) to 1.79 (LTSI). All the indices have a positive skewness except for (FTUK) which has a negative value. The fatness of the distribution is represented by the kurtosis which shows the concentration of the data around the mean of the distribution. The values for the kurtosis show that all the indices return are not normally distributed implying a high risk involved in the series with LTSI having the highest risk.

Table 3.
Unconditional Volatilities (on-diagonal) and Correlations (off-diagonal)

	LTSI	FTSP	FTIN	FTUK	FTFR
LTSI	**1.51330**	0.01777	0.00410	0.04596	0.02150
FTSP	0.01777	**1.28880**	0.09398	-0.04311	0.86572
FTIN	0.00410	0.09398	**1.27450**	-0.10636	0.07565
FTUK	0.04596	-0.04311	-0.10636	**1.33740**	-0.04200
FTFR	0.03850	0.01637	0.08724	0.10750	**1.27910**

Notes: LTSI – Nigeria, FTSP - Spain, FTIN – India, FTUK – United Kingdom, FTFR- France. The values on-diagonal is the unconditional volatilities, while the unconditional correlations are on the off-diagonal. Source: Authors.

Table 4.
Ranks of the Unconditional Volatilities of the Five Islamic Indices Returns

No.	Indices	Unconditional Volatility
1	FTSE India Shariah	1.27450
2	FTSE France Shariah	1.27910
3	FTSE SPAIN Shariah	1.28880
4	FTSE Shariah UK	1.33740
5	LOTUS Islamic Nigeria	1.51330

Table 3 shows the on-diagonals of unconditional volatilities and off-diagonal values of unconditional correlations. Regarding the on-diagonal values, a value close to zero (one) signifies that an index has the least (highest) volatility. The off-diagonals as presented in the same table show that the conditional correlations between FTSP with FTIN have the highest having 0.09 values. The lowest correlations are seen in FTFR with FTUK having a negative value of -0.04. Considering the rankings in Table 4, it is found that the indices have some degree of high unconditional volatilities, i.e. exceeding one. These values range from 1.274 to 1.51 implying the indices have high volatility.

V. RESULTS AND DISCUSSIONS

5.1. Estimation Using M-GARCH DCC Model

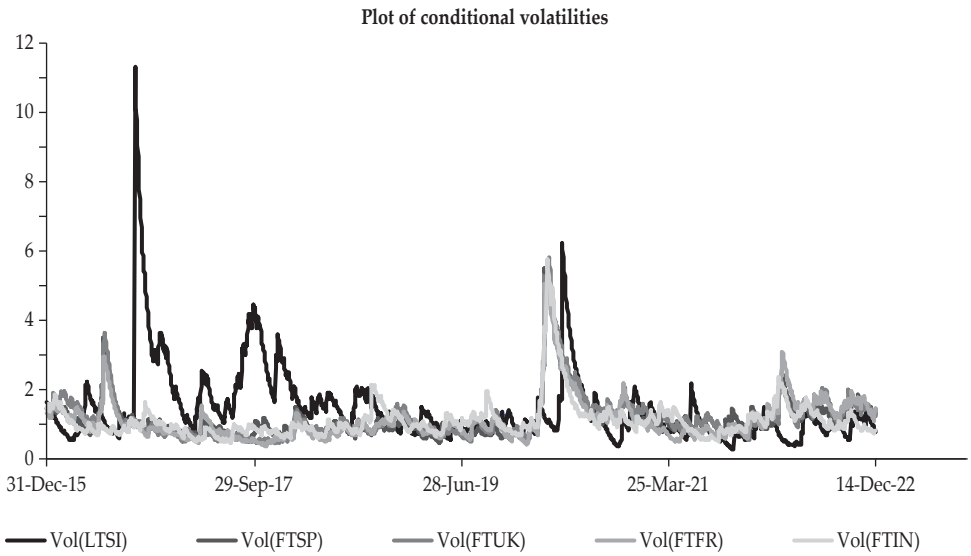

Figure 1.
Conditional Correlations - LTSI, FTSP, FTIN, FTUK, FTFR

The conditional volatilities of all the five Islamic indices are presented in Figure 1. The results show that almost all the indices move in tandem with each other with some few exceptions. The first exception can be seen in the spikes of the Islamic Index of Nigeria (LTSI) having the highest peak among them. This can be attributed to one of the worst economic recessions experienced by the country in 25 years (Maggie, 2017) and exacerbated by the low global crude oil prices as crude oil sales make-up two-third of the government revenue (Reuters, 2017). Furthermore, there is a high integration of the four Islamic indices (UK, Spain, France and India) which does not favour investors and portfolio managers since it implies less opportunities available for portfolio diversification. Note that the volatility in Nigeria's Islamic index declined in later years to settle at almost the same level with the remaining indices (UK, France, Spain and India). Nevertheless, when COVID-19 pandemic erupted, all the indices exhibited higher and similar volatilities patterns with Nigeria slightly surpassing Spain, UK, France and India. Notably, all the countries reverted to normal volatility level prior to COVID-19 pandemic with Nigeria going lower than the four other Islamic indices and later came back to stabilize with its peers in mid-2022.

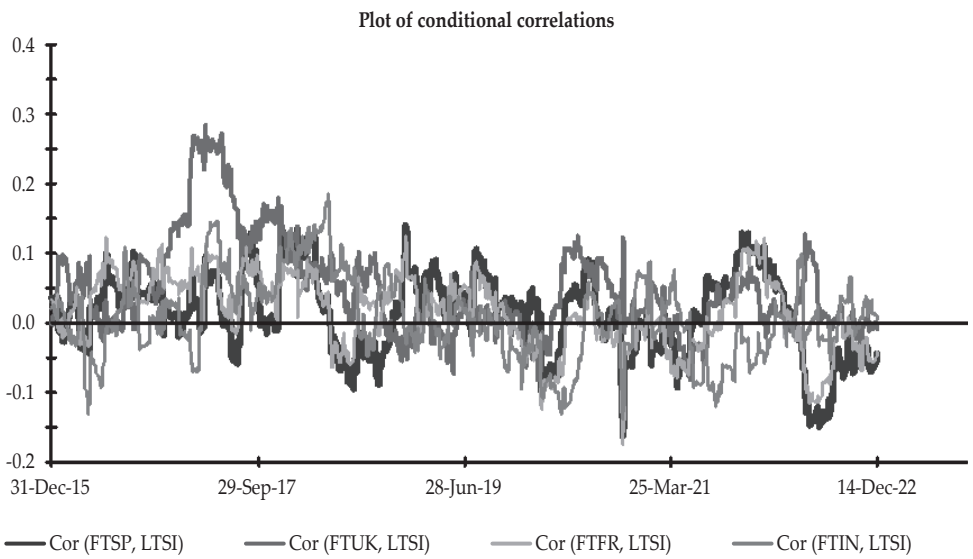

Figure 2.
Conditional Correlations - LTSI, FTUK, FTSP, FTIN, FTFR

Figure 2 displays the conditional correlations of Islamic indices of Nigeria with that of UK, Spain, France and India. The results show that, in almost all the indices, in 2017, Nigeria Islamic index has the least conditional correlations with the UK Islamic index returns. This finding is in line with the earlier unconditional correlation findings which shows Nigeria's Islamic index having the highest volatility among the five indices. When the Figure is looked at holistically, it shows that the indices move in a similar fashion throughout the period (except

for the period stated earlier). This implies that, Nigeria's Islamic investors seeking international portfolio diversification will have little opportunity for investment in UK and almost none for India, Spain, France.

5.2. Estimation Using Continuous Wavelet Transform

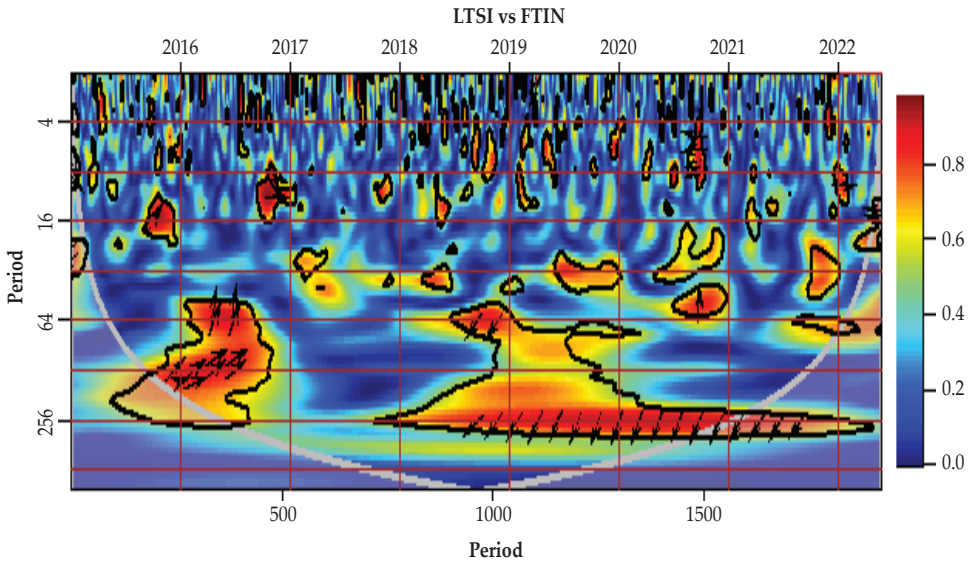

Figure 3.
Continuous Wavelet Transforms: LTSI VS FTIN

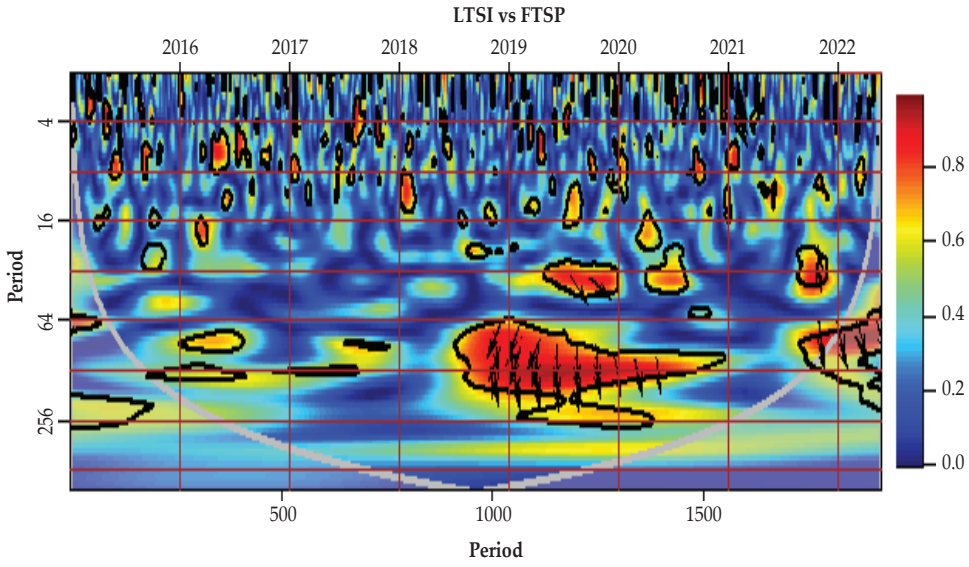

Figure 4.
Continuous Wavelet Transforms: LTSI VS FTSP

This section utilizes continuous wavelet transform method to analyse the different investment horizons of each Shariah stocks of the selected countries. This will enable us to know whether or not there are portfolio diversification opportunities for investors. The results are presented in Figs. 3 to 6. Based on the figure, the axis on the horizontal line shows the duration of the investment while the vertical axis represents the investment horizon. The U-shaped curve line at the bottom of the figure is the 5% significance level which is derived from Monte Carlo Simulation. The blue and red colour codes show the strength of the correlation with the former indicating low correlation and the latter showing high coherency. Each Figure has some arrows pointing at different direction. The arrows pointing to the right signifies that an index is in-phase while the reverse is the case when the index is in an out-phase direction. When the time series are in-phase (anti-phase), there is positive (negative) correlation. Secondly, arrows to the right and upward indicates that the first series is lagging while to the right and downward implies the first series is leading. Arrows to the left and upward shows that the first series is lagging while arrows to the left and downward implies the first series is leading (Madaleno & Pinho, 2012).

In studying the coherence of these indices, the Nigerian Islamic stock indices is used as the first series in all the four diagrams (Figs 3 to 6). Each diagram has different duration representing different investment holding period with very short (2 to 4 days, 4 to 8 days), short period (8 to 16 days, 6 to 32 days), Medium (64 to 128 and 128 to 256) and finally, long term (more than 256 days).

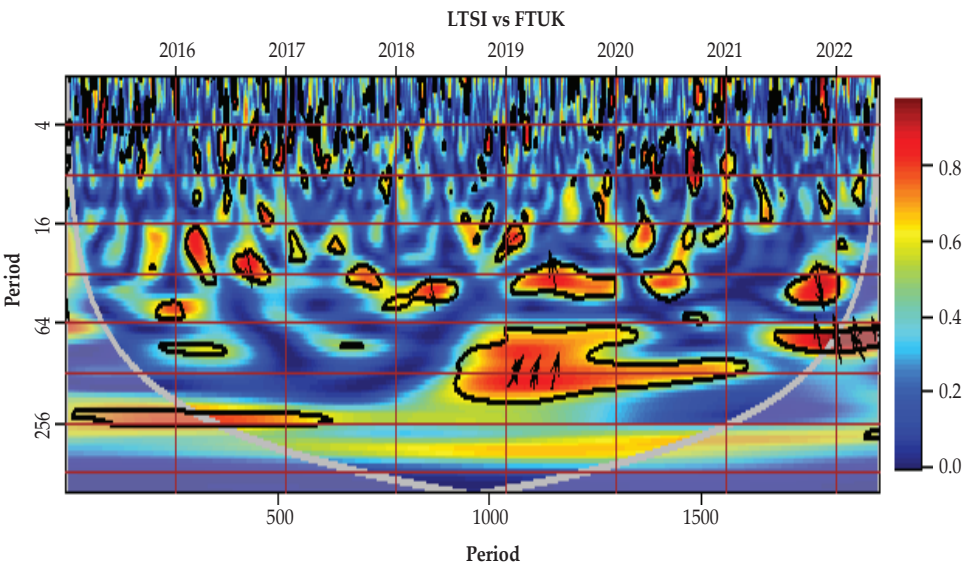

Figure 5.
Continuous Wavelet Transform: LTSI VS FTUK

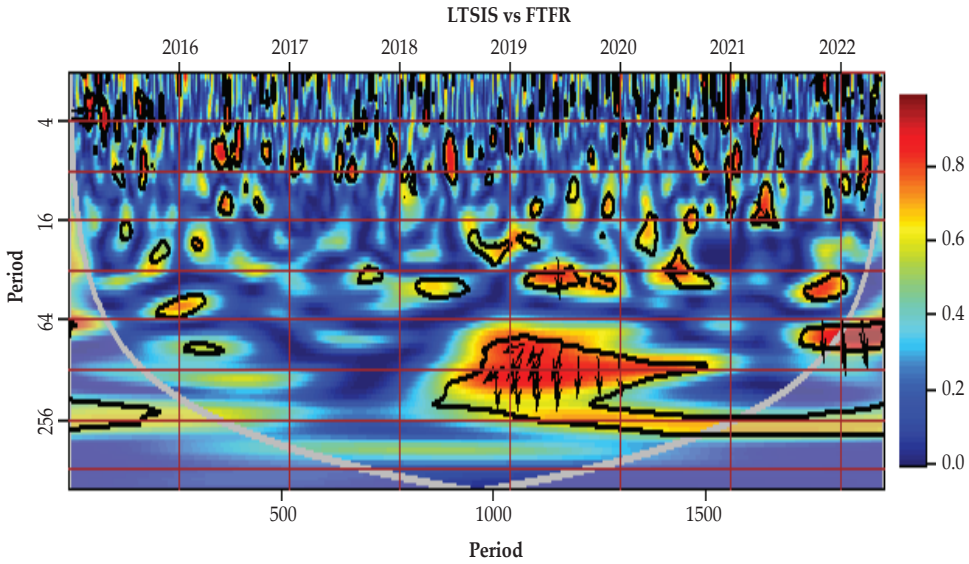

Figure 6.
Continuous Wavelet Transform: LTSI VS FTFR

Figures 3, 4, 5 and 6 represent the very short period investment horizon, that is, 2 to 4 days and 4 to 8 days. The correlations among them seem to be weak throughout the holding period as represented by more blue shade over the red colour. This implies that all the shariah return indices are weakly correlated suggesting the presence of portfolio diversification opportunities for Nigerian Islamic stock investors seeking to invest in these four countries shariah indices. Similarly, looking at periods of 8 to 16 and 16 to 32 and 32 to 64 days, the result is comparable as that obtained from the very short investment horizons throughout the investment holding periods.

However, looking at the medium and long-term holding period in Figure 3, the correlations become more intense especially from 64 to 128 days and 128 to 258 days for Nigeria's Islamic stock indices and India's shariah indices. The period is more pronounced from 2015 up to late 2016 and from late 2018 up to 2022 as represented by presence of more red colour shades within the diagram. This situation can be explained in light of the currency crisis experienced in India in the year 2016 where Indian rupee fell to 68.86 against U.S dollar due to capital flight. This was caused partly due to the heightened investors' expectations as the-then U.S President elect, Donald Trump's protectionist policies which caused U.S bond yields to rise. This development heightened the demand for U.S dollar and prompted foreign investors to withdraw their funds from emerging markets like India, further causing the Indian rupee to depreciate against the U.S dollar, (Diksa, 2017). This implies almost absence of portfolio diversification opportunities for Nigeria's Islamic investors in India's shariah stock market.

Similarly, Figure 4 shows the wavelet coherence for Nigeria Islamic index with that of Spain Shariah index. During the medium- and long-term investment

horizon, that is, from 64 to 128 and 128 to 256 days and beyond, there seems to be less correlation among the duo from the early 2016 up to late 2018 as represented by more blue colour shades obtained in the figure. But from 2019 to 2022, the correlation increased significantly with more pronounced red colour shades in the diagram. The year 2021 shows less correlations. This implies that, there is some levels of diversification opportunities in Spain shariah index for Nigeria's Islamic investor especially in years: 2016, 2017, 2018 and 2021.

Moving on to Figure 5 which depicts the wavelet coherence of Nigeria Islamic index with that of U.K shariah index also in medium- and long-term investment horizon from 64 to 128 and 128 to 256 and beyond, there is low correlation among them as evidenced by more blue shade over the red. The red shades only appear in the year 2019 and 2022 which marks the years when the world experienced the Global COVID-19 pandemic. This result shows that the UK shariah index offers good investment opportunities for Nigeria's Islamic investors in almost all the period under study (except for the stated years). These findings echo the results of Oloko (2018) based on conventional indices of Nigeria and UK.

Figure 6 shows the wavelet coherence of Nigeria Islamic indices with that of France shariah indices, it shows low correlations among them with the most correlation experienced in the late 2019 and early 2020 representing the period when COVID-19 started. Prior to and post COVID-19 pandemic, the series show low correlations indicating a perfect diversification opportunity for Islamic investors in Nigeria seeking to invest in France shariah index.

From the above four wavelet coherence Figures (3, 4 5 and 6), when the four countries are compared, the UK Shariah indices offer most opportunities for Nigeria's investors and then followed by France, Spain and lastly India. Therefore, investors seeking to invest in these four countries should first select the UK, then France, Spain and India.

VI. CONCLUSION AND POLICY RECOMMENDATIONS

This study examines the extent to which international portfolio diversification opportunities exist between the Nigeria's Islamic market return and the returns of Shariah stock indices of its major trading partners namely: United Kingdom, France, Spain and India. The study employs daily data from 14th July 2015 to 14th December 2022 and applies two methodologies: Multivariate GARCH dynamic conditional correlation, MGARCH-DCC and continuous wavelet coherence (CWT) approach. The findings obtained from the MGARCH-DCC show evidence of less diversification opportunities for Nigeria's Islamic stock market investors desiring to invest in any of the Islamic stock markets of its trading partners due to the high correlations among them. The only exception is the Islamic stock market of UK which offers minimal diversification opportunities. In a similar vein, the empirical findings from wavelet coherence echo similar findings obtained from the MGARCH-DCC for the UK case having less correlations with Nigeria's Islamic stock market. The CWT results in all the figures show more investment opportunities in the short run from 2-4, 6-8, 16-32 days than in the long run. When long-term investment horizon is considered, the wavelet results show that the UK offers the most portfolio diversification opportunities for Nigeria's Islamic

stock investors then followed by France and Spain. Overall, the findings from this study show evidence of less stock market integration among trading partners which implies more diversification opportunities for Nigeria's Islamic investors. As policy implications, more Islamic investors from Nigeria will gain greater diversification in investments when their funds are invested in the stock markets of the trading partners. Future research can concentrate on a broader data using conventional stock markets and compare them with the Islamic markets. Also, it would be interesting to look at other trading partners of Nigeria.

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