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Article

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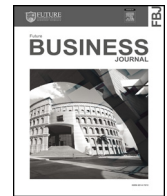
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International portfolio diversification in the Nigerian stock market: A global financial crisis perspective[☆]



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ABSTRACT

This study examines the feasibility of international portfolio diversification in the Nigerian stock market. It investigates the relationship between the Nigerian stock market and 5 developed stock markets (US, UK, Japan, Germany and France) in the context of the global financial crisis. The Vector Autoregressive (VAR) Granger causality test results show that the Nigerian stock market and all the developed stock markets are not linked in all the sub-sample periods except the Japanese stock market in the post-crisis period, thus implying that international portfolio diversification is possible in the Nigerian stock markets except Japanese investors in the post-crisis period. Under the full sample period, only the Japanese and German stock markets are not linked to the Nigerian stock market and this indicates international portfolio diversification is feasible for only Japanese and German investors in Nigeria. The Generalized Method of Moments (GMM) regression results indicate that only German and French stock markets have significant impact on the Nigerian stock market in the pre-crisis period, but none of the developed stock markets exert significant impact in the crisis period. In the post-crisis period, only the German stock market is significantly related to the Nigerian stock market. The regression estimates reveal that only the Japanese, German and French stock markets are significantly related to the Nigerian stock market over the full sample period.

1. Introduction

One of the main features of the evolving global financial system is stock market linkages which have been facilitated by the liberalisation of stock markets in most countries of the world over the years. Stock market liberalisation created opportunity for investors to hold financial assets in domestic and foreign stock markets. This provides investors with the opportunity to exploit international portfolio diversification. International portfolio diversification is an investment strategy which allows an investor to reduce portfolio risk by holding domestic and foreign financial assets simultaneously. Grubel (1968) identifies international portfolio diversification as a source of welfare gains from international economic relations. Most investors prefer international portfolio diversification to domestic portfolio diversification because investment returns in the domestic stock market are influenced by natural and artificial factors, business cycles and government policies whose effects are limited to the domestic stock market (Grubel & Fadnar, 1971). However, the benefits of international portfolio diversification is limited when stock markets are linked or share a common trend.

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International investors prefer to hold a global portfolio containing assets of both developed and emerging stock markets. Harvey (1995) argues that emerging stock markets are weakly correlated with developed stock markets. Therefore, investing in assets traded in emerging and developed stock markets simultaneously is a portfolio risk-reduction strategy. Studies such as Agyei-Ampomah (2011), Alagidede, Panagiotidis, and Zhang (2011), Kapingura, Mishi, and Khumalo (2014), and Mensah and Alagidede (2017) document that African stock markets are attractive investment grounds for international investors. The weak correlation between African and developed stock markets suggests that international investors would maximise international portfolio diversification benefits by including African stocks in a mean-variance portfolio (Alagidede, Panagiotidis, & Zhang, 2011).

The world has become a global market as a result of increased financial integration among countries. This has allowed financial turmoil in one country to cause crisis in the financial market of another country. Alagidede (2008) argues that African stock markets are segmented from developed stock markets and are likely to respond more to domestic rather than global information. However, the global financial crisis which metamorphosed from the US subprime mortgage crisis crippled the performance of stock markets across the world and was alluded as the reason for the 2008 stock market crash in Nigeria. Allen, Otchere, and Senbet (2011) identify the Nigerian stock market as one of the worst performing markets in sub-Saharan Africa in 2008. The global financial crisis had more adverse impact on the stock markets of South Africa, Egypt and Nigeria than other African stock markets (Senbet & Otchere, 2010).

The liberalisation of the Nigerian stock market was facilitated by the introduction of the Nigerian Investment Promotion Commission Decree No. 16 of 1995 and Foreign Exchange (Monitoring and Miscellaneous Provisions) Decree No. 17 of 1995. The official liberalisation period of the Nigerian stock market was August 1995.¹ The liberalisation facilitated the inflow of foreign portfolio investment in Nigerian stock market. Foreign portfolio equity inflow in Nigeria had a negative growth rate of -165.91% and -151.09% in 2008 and 2009 respectively (World Bank, 2016). This indicates that the global financial crisis made the Nigerian stock market become less attractive to international investors.

Mensah and Alagidede (2017) argue that international portfolio diversification becomes difficult to achieve when markets experience financial crisis. Empirical evidence on international portfolio diversification in the Nigerian stock market in the context of the global financial crisis seems non-existent. Therefore, this study offers evidence on international portfolio diversification in the Nigerian stock market before, during and after the global financial crisis. The rest of this study is segmented as follows. Section 2 presents the data and preliminary analyses, Section 3 reports the model and estimation results and Section 4 provides the conclusion. Fig. 1.

2. Data and preliminary analyses

The main objective of this study is to assess the feasibility of international portfolio diversification in the Nigerian stock market in the milieu of the global financial crisis. In order to achieve this objective, the relationship between the Nigerian and selected developed stock markets in the pre-crisis, crisis and post-crisis periods were examined. The developed stock markets belong to United States (US), Japan, United Kingdom (UK), Germany and France.² Monthly data on All-Share Index (ASI) for all the stock markets for the period January 2000-December 2015 were obtained from Bloomberg. The monthly data was preferred to higher frequency data because it overcomes the problem of unsynchronized trading (Alagidede, 2008; Wong, Penm, & Terrell, 2004). The National Bureau of Economic Research (NBER) dates the US economic recession which caused the global financial crisis between December 2007 and June 2009. Therefore, the pre-crisis period covers January 2000 to November 2007, the crisis period spans from December 2007 to June 2009 and the post-crisis period³ extends from July 2009 to December 2016. The monthly ASI which represents monthly price were transformed to return series by using this formula:

$$R_t = 100 \times \Delta \ln(P_t) \quad (1)$$

Table 1 reports the results of the preliminary analyses on the data for the sub-sample and full sample periods. The preliminary analyses include descriptive statistics and Ng-Perron unit root test.

In the pre-crisis period, the Nigerian stock market has the highest mean return while only the Japanese stock market has the lowest mean return with a negative value. All stock markets record a negative mean return and this implies that on the average, the stock markets were not favourable to investors during the global financial crisis. However, in the post crisis period, all stock markets have a positive mean return, thus indicating that the stock markets became favourable after the global financial crisis. Over the full sample period, the Nigerian stock market has the highest positive mean return and this confirms with Harvey (1995) that emerging stock markets yields more return than developed stock markets.

As indicated by the standard deviation statistic, the Nigerian stock market appears to be the most volatile among the markets in all sub-sample periods except the pre-crisis period where the stock market of Germany has the highest standard deviation. For the full sample period, the Nigerian stock market has the highest standard deviation. This implies that the market experience higher volatility than the developed stock markets and this is consistent with Harvey (1995) that emerging stock markets are more volatile than developed stock markets. It further implies that the Nigerian stock market is the most risky market.

The skewness statistic indicates that returns in all stock markets are negatively skewed in the pre-crisis period except the Nigerian stock market. During the crisis period, only the stock market returns of US, UK and Japan are negatively skewed. In the post-crisis and

¹ See Bekaert and Harvey (1998).

² The selected developed stock markets account for more than 70% of world market capitalisation.

³ The post-crisis period starts from the month after the US economic recession ended.

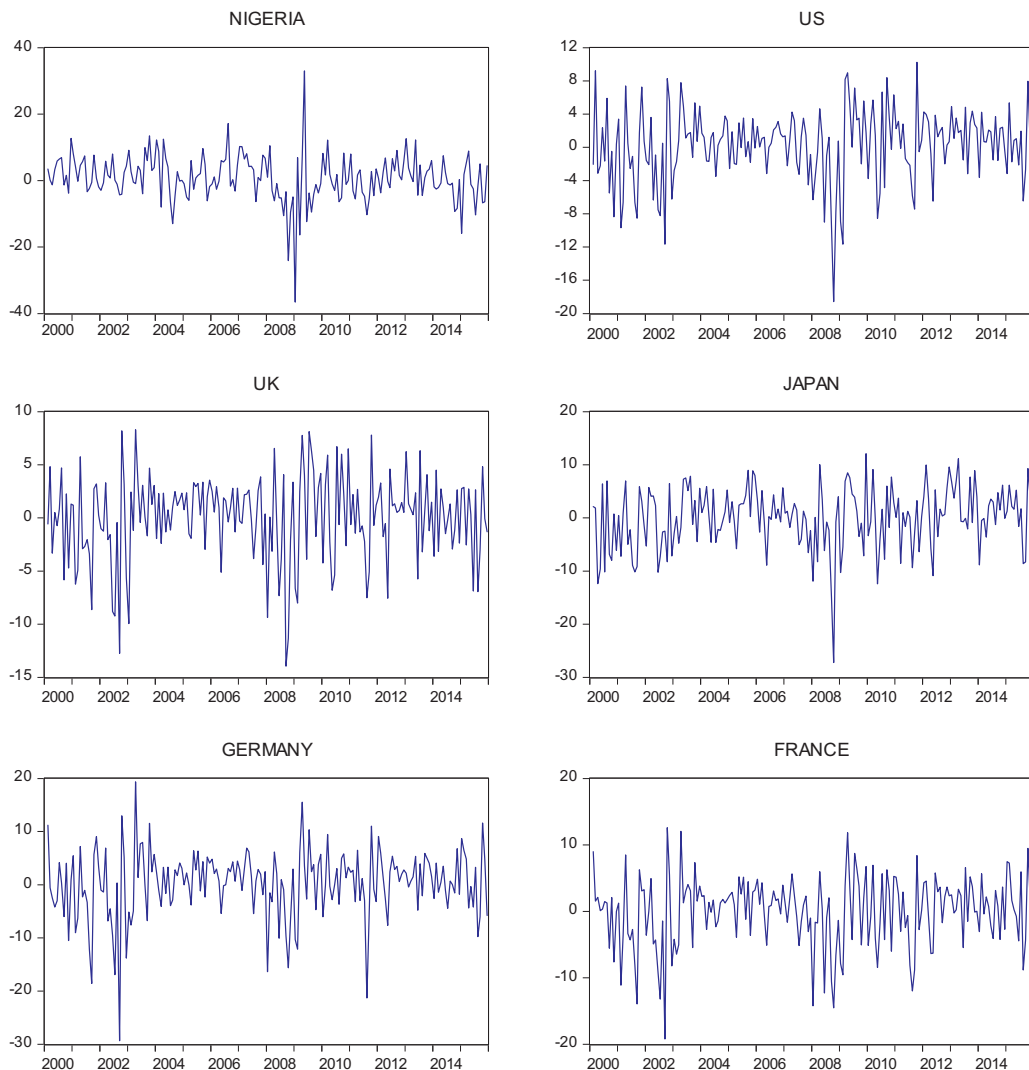


Fig. 1. Graphical illustration of stock market returns.
Source: Authors' computation

full sample periods, returns in all stock markets follow a negatively-skewed distribution. The Kurtosis statistic shows that stock market returns of US, Japan, Germany and France are leptokurtic (fat-tailed) while that of Nigeria is mesokurtic (moderately-tailed) and UK is platykurtic (thin-tailed) in the pre-crisis period. In the crisis period, the stock market returns of US, UK, Germany and France have a platykurtic distribution while that of Nigeria and Japan have a leptokurtic distribution. In the post-crisis period, only the stock market of Germany has a leptokurtic distribution and the stock markets of Nigeria and US have a mesokurtic distribution while returns in the remaining stock markets are platykurtic. For the full sample period, the return series in all stock markets are leptokurtic.

The Jarque-Bera statistic shows that returns are not normally distributed in the stock markets of Japan, Germany and France only in the pre-crisis period while in the crisis period, returns in all stocks markets have a normal distribution. In the post-crisis period, there is normal distribution of returns in all stock markets except for Germany. Over the full sample period, return series are not normally distributed in all stock markets. The Ng-Perron unit root test indicates that return series for all stock markets in the sub-sample and full sample periods are stationary series. This implies that the impact of shocks in all stock markets is transient in all the sub-sample and full sample periods.

3. Model and estimation results

An international investor can enjoy international portfolio diversification benefits when the domestic stock market is not linked to the foreign market which investment is allocated to. The causality test was performed in a Vector Autoregressive (VAR) model is a way to determine the link between stock markets. The inclusion of all stock markets in the VAR model may influence the causal

Table 1
Preliminary Analyses.
Source: Authors' computation

Statistic	NIGERIA	US	UK	JAPAN	GERMANY	FRANCE
Pre-crisis Period						
Mean	2.385948	0.064154	0.027475	-0.234063	0.149979	0.002021
Maximum	17.14961	9.232381	8.938565	8.299961	19.37378	12.58819
Minimum	-12.95314	-11.65612	-12.35480	-12.73561	-29.33269	-19.22542
Standard Deviation	5.329884	4.002855	5.181059	3.718188	6.799339	5.143952
Skewness	0.081177	-0.440844	-0.314192	-0.893889	-1.049507	-0.811591
Kurtosis	3.062134	3.487959	2.290329	4.315799	6.595628	4.925516
Jarque-Bera	0.118361	3.977289	3.519117	19.29927*	67.89308*	24.84079*
Ng-Perron	-43.4195 ^{a‡}	-46.4879 ^{a‡}	-46.4958 ^{a†}	-45.3618 ^{a†}	-42.0520 ^{a‡}	-40.9955 ^{a‡}
Observations	94	94	94	94	94	94
Crisis Period						
Mean	-3.815033	-2.510174	-2.182264	-2.389517	-2.593210	-3.110141
Maximum	32.99624	8.977221	7.778113	10.05148	15.49680	11.82871
Minimum	-36.57614	-18.56365	-13.95460	-27.21623	-16.33172	-14.52255
Standard Deviation	14.42662	7.173786	6.147568	9.358649	8.306902	7.172524
Skewness	0.193579	-0.349304	-0.187397	-0.911691	0.096479	0.070852
Kurtosis	4.432288	2.600610	2.104127	3.658006	2.515260	2.364778
Jarque-Bera	1.742728	0.512656	0.746588	2.974841	0.215496	0.335340
Ng-Perron	-25.4539 ^{a†}	-20.9136 ^{b‡}	-8.84831 ^{b†}	-8.24881 ^{c†}	-8.54916 ^{b†}	-8.44539 ^{b†}
Observations	19	19	19	19	19	19
Post-crisis Period						
Mean	0.111852	1.036483	0.499601	0.830502	1.030565	0.510672
Maximum	12.61223	10.23066	8.113896	12.08881	11.61388	9.466539
Minimum	-15.90119	-8.553165	-7.543743	-12.39165	-21.30957	-11.98075
Standard Deviation	5.546110	3.748322	3.740570	5.347745	5.180310	4.811874
Skewness	-0.026350	-0.268130	-0.169565	-0.254633	-0.910840	-0.322030
Kurtosis	3.150645	3.054815	2.598958	2.796364	6.092395	2.409685
Jarque-Bera	0.082782	0.944383	0.896491	0.977666	41.86462*	2.480674
Ng-Perron	-36.6502 ^{a‡}	-38.1768 ^{a‡}	-37.9227 ^{a‡}	-38.2154 ^{a‡}	-35.7824 ^{a‡}	-36.0588 ^{a‡}
Observations	78	78	78	78	78	78
Full Period						
Mean	0.840408	0.205146	0.000463	-0.013736	0.236707	-0.099845
Maximum	32.99624	10.23066	8.299961	12.08881	19.37378	12.58819
Minimum	-36.57614	-18.56365	-13.95460	-27.21623	-29.33269	-19.22542
Standard Deviation	7.046613	4.409421	4.073910	5.823015	6.411311	5.317254
Skewness	-0.541019	-0.724406	-0.672536	-0.738506	-0.928496	-0.609048
Kurtosis	8.773218	4.406139	3.691068	4.538830	5.863855	3.719128
Jarque-Bera	274.5693*	32.44045*	18.19908*	36.20695*	92.71527*	15.92386*
Ng-Perron	-92.8369 ^{a‡}	-93.7142 ^{a‡}	-94.9984 ^{a†}	-91.4768 ^{a‡}	-24.0325 ^{a‡}	-14.8170 ^{c‡}
Observations	191	191	191	191	191	191

Notes: * indicates rejection of hypothesis of normal distribution at 1% significance level, ^{a, b} and ^c imply rejection of hypothesis that there is presence of unit root in return series at 1%, 5% and 10% asymptotic critical value respectively and [†] and [‡] denote that unit root test equation has intercept only and intercept and trend respectively. Also, Ng-Perron unit root test was performed on the return series at level only and MZA test statistic was reported.

direction between markets. Therefore, a bivariate VAR(*p*) model is constructed to determine the causal link between the Nigerian stock market and each developed stock market. If there is a causal link at least in one direction between the stock markets, it implies that international portfolio diversification is not feasible. The bivariate VAR(*p*) model specification is as follows:

$$NSM_t = \alpha_0 + \sum_{i=1}^p \alpha_1 NSM_{t-i} + \sum_{i=1}^p \alpha_2 DSM_{t-i} + \varepsilon_{1t} \tag{1}$$

$$DSM_t = \alpha_0 + \sum_{i=1}^p \alpha_1 DSM_{t-i} + \sum_{i=1}^p \alpha_2 NSM_{t-i} + \varepsilon_{2t} \tag{2}$$

Where NSM and DSM represent the Nigerian Stock Market and Developed Stock Market respectively.

The VAR Granger causality test is employed since returns for all the stock markets in the sub-sample and full sample periods are stationary series. The test for causality between the Nigerian stock market and each developed stock market in the sub-sample and full sample periods is performed by constructing a bivariate VAR(2) model. The AR roots graph for the model indicates that no root lies outside the unit circle, thus implying that the model is stable. Also, the serial correlation LM test indicates that there is no autocorrelation in the models at lag order of 2. Table 2 presents the results of the VAR Granger causality test between the Nigerian stock market and each developed market in the sub-sample and full sample periods.

Table 2
VAR Granger Causality Test Results.
Source: Authors' computation

Null Hypothesis	Pre-crisis	Crisis	Post-crisis	Full
US does not Granger cause NIGERIA	0.229434 (0.8916)	3.058903 (0.2167)	0.436546 (0.8039)	5.271237*** (0.0717)
NIGERIA does not Granger cause US	0.033093 (0.9836)	2.297012 (0.3171)	2.845387 (0.2411)	1.425804 (0.4902)
UK does not Granger cause NIGERIA	1.755477 (0.4157)	1.458721 (0.4822)	1.561202 (0.4581)	6.073053** (0.0480)
NIGERIA does not Granger cause UK	1.786822 (0.4093)	0.377289 (0.8281)	2.969438 (0.2266)	2.504184 (0.2859)
JAPAN does not Granger cause NIGERIA	0.335473 (0.8456)	0.863763 (0.6493)	5.177855*** (0.0751)	4.224794 (0.1209)
NIGERIA does not Granger cause JAPAN	0.125812 (0.9390)	0.019613 (0.9902)	2.970116 (0.2265)	1.376258 (0.5025)
GERMANY does not Granger cause NIGERIA	0.091850 (0.9551)	2.312685 (0.3146)	2.117720 (0.3469)	4.051655 (0.1319)
NIGERIA does not Granger cause GERMANY	0.700465 (0.7045)	0.319577 (0.8523)	2.674034 (0.2626)	1.692839 (0.4289)
FRANCE does not Granger cause NIGERIA	0.663283 (0.7177)	2.459942 (0.2923)	3.413908 (0.1814)	8.132390** (0.0171)
NIGERIA does not Granger cause FRANCE	1.417929 (0.4922)	0.356317 (0.8368)	3.965617 (0.1377)	3.101111 (0.2121)

Notes: ** and *** imply the rejection of null hypothesis at 5% and 10% significance level respectively and p-value of chi-square (χ^2) reported in ().

Table 2 shows that the Nigerian stock market and the developed stock markets do not cause each other in the pre-crisis and crisis periods. Also, it shows that causality is non-existent between the Nigerian stock market and the developed stock markets except the Japanese stock market in the post-crisis period. In the full sample period, there is a unidirectional causality moving from the stock markets of US, UK and France to the Nigerian stock market while causality is absent between the Nigerian stock market and stock markets of Japan and Germany.

A linear multiple regression model is built to determine the contemporaneous effect of each developed stock market on the Nigerian stock market in the sub-sample and full sample periods. The model is stated as:

$$NIGERIA_t = \beta_0 + \beta_1 US_t + \beta_2 UK_t + \beta_3 JAPAN_t + \beta_4 GERMANY_t + \beta_5 FRANCE_t + \varepsilon_t \quad (3)$$

Table 3
GMM Estimation Results.
Source: Authors' computation

	Pre-crisis Period	Crisis Period	Post-crisis Period	Full Period
Constant	2.645917** [0.0167]	1.491585 [0.8162]	0.768956 [0.5855]	-2.866392 [0.2522]
US	-0.831767 [0.6633]	-0.741274 [0.3359]	0.493918 [0.6816]	-0.957197 [0.6930]
UK	-1.571875 [0.2359]	3.208462 [0.5024]	0.799300 [0.6957]	2.024349 [0.5604]
JAPAN	0.627379 [0.4921]	-0.665010 [0.8048]	0.950192 [0.1097]	3.281926*** [0.0737]
GERMANY	5.230799** [0.0473]	-1.307349 [0.8321]	-2.479043** [0.0582]	6.187330*** [0.0874]
FRANCE	-7.481584** [0.0584]	0.404987 [0.9604]	0.495965 [0.6636]	-11.95297*** [0.0767]
Model Diagnostics				
J-statistic	3.469769 [0.838417]	1.099122 [0.577203]	3.222992 [0.863636]	4.053806 [0.773560]
DW statistic	1.810397	2.052794	2.050857	1.881429

Notes: ** and *** denote statistically significant at 5% and 10% significance level respectively and p-value of coefficient is in [].

The model is estimated with the time series Generalized Method of Moments (GMM) estimator. This estimator uses instrumental variables to overcome the problem of endogeneity and simultaneity bias in a regression model. Table 3 reports the GMM estimation results.

In the pre-crisis period, only the German and French stock markets have significant impact on the Nigerian stock market with the German stock market having a positive impact while the impact of the French stock market is otherwise. The developed stock markets do not significantly impact on the Nigerian stock market in the crisis period. The results for the post-crisis period shows that the developed stock markets do not have statistically significant effect on the Nigerian stock market except the German stock market. In this period, the German stock market has negative influence on the Nigerian stock market. For the full sample period, the US and UK stock markets do not significantly affect the Nigerian stock market. However, the Japanese and German stock markets affect the Nigerian stock market significantly and positively but the French stock market impacts significantly and negatively. The J-statistic for the estimated model in all sub-sample and full sample periods indicates that the null hypothesis of valid over-identifying restrictions is not rejected and this indicates that the instrumental variables used in the GMM estimation of the models are valid. The Durbin Watson (DW) statistic for all the estimated models is close to 2, thus indicating the absence of first order serial correlation of residuals in the models.

4. Conclusion

This study examines international portfolio diversification in the Nigerian stock market by splitting the sample period into three sub-sample periods on the basis of the global financial crisis period. The causality test results reveal that the Nigerian stock market and the developed stock markets (US, UK, Japan, Germany and France) are not linked in the pre-crisis, crisis and post-crisis periods with exception of only Japanese stock market in the post-crisis period. This implies that investors from these developed stock markets enjoy international diversification benefits in the Nigerian stock market in all the sub-sample periods except Japanese investors in the post-crisis period. In the full sample period, the causality test results show that only the Japanese and German stock markets are not linked to the Nigerian stock market and this connotes that domestic investors from these developed stock markets can gain by diversifying internationally into the Nigerian stock market. The regression estimates show that the stock markets of Germany and France have significant positive and negative impact on the Nigerian stock market respectively before the crisis, but none of the developed stock markets significantly influenced the Nigerian stock market during the crisis period. After the crisis, only the German stock market has significant but negative impact on the Nigerian stock market. Over the full sample period, the Japanese and German stock markets have significant positive impact on the Nigerian stock market while the French stock market impacts significantly and negatively. This implies that the performance of the Japanese and German stock markets is directly related performance of the Nigerian stock market, hence the Nigerian government should encourage foreign portfolio investment from Japan and Germany.

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