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Granger Causality Approach to Examining Stock Market Integration in West Africa

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Abstract

Stock markets have been found to be increasingly interdependent overtime due to activities related to internationalization, diversification, integration, and globalization. This study assesses the lead/lag interactions between equity markets in the West Africa viz a viz the United States (US) and the United Kingdom (UK) markets. Stock market index data were analyzed from 2008 - 2016 using the Granger causality test. Findings from the study indicates both uni-directional and bi-directional causality between most of the market pairs implying that none of the market exists in autarky.

Keywords: Granger causality; Stock market integration; West Africa; Global equity markets; Co-movements.
JEL Classification: G15; F65; F36; D53; C58; G01.

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1. Introduction

Stock markets have been found to be increasingly interdependent overtime due to activities geared towards internationalization and integration, and globalization. These activities have been widely driven on one hand by foreign investors seeking alternate investment avenues, and on the other hand by policies of national and supranational bodies that foster closer interaction between internationalized stock markets. Though most stock markets in Africa in general, and West Africa particularly have been characterized as fragmented among themselves and segmented from the global stock market, but recent trends give reason to doubt such positions as local markets have been observed to have high levels of foreign participation, and large inflow and outflow of foreign portfolio investments portending to impact on the direction of stock price movements in local markets.

The interdependent nature of stock market in an era of globalization poises the need to examine the nature of interactions between internationalized markets. Many studies have focused on such interactions in other parts of the world with little focus on the West Africa region viz a viz other major global equity markets. Some earlier studies have it that stock markets in the West Africa are somewhat not interdependent attesting to weak interactions including Agyapong (2014), Alagidede (2008) and Gour`ene and Mendy (2014). Against this background this study attempts to empirically fill this gap by investigating if there are lead-lag interactions between stock markets in the West Africa region and with two global equity markets with more recent data.

In this study, Granger causality is employed to ascertain the extent to which a lead-lag relationship exists amongst stock market in the West African region and with US and UK market from 2008-2016 thus covering the period of the global crises and thereafter. The study is also carried out with the background that financial globalization is presumed to be on the increase on one hand, while there are also heightened efforts towards stock market integration in the West African region which also portends more participation from investors within and outside the region thereby fostering integration.

This study approaches the test of market codependences by examining the extent of lead-lag relationship between markets across days within and without the region in a crises and post-crises period in the light of growing financial globalization and increased efforts towards regional stock market cooperation in West Africa.

2. Empirical Review

Many studies abound that have assessed stock market integration through the co-movement of major markets index. Including studies of Tella (2009), Obadiaru (2012), Abdullahi (2017), Obadiaru *et al.* (2018). Only few studies have examined causal relationship between stock markets in the West African region from a regional and global perspective using the Granger causality test. Other studies that have examined stock market integration in

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Africa and in other climes include Gallegati (2005), Alagidede (2008), Heilmann (2010), Hochstotter and Weskamp (2012), Gour`ene and Mendy (2014), Abdullahi (2017), Ouattara (2017), and Polanco-Martinez *et al.* (2018).

Worthington and Higgs (2004), investigated relationships among emerging Asian equity markets and those of seven developed countries using co-integration, vector autoregression, granger causality, variance decomposition analyses. The findings revealed a long-run relationship among the selected Asian markets with varying degree of interdependencies. Furthermore the Asian markets were observed to also be significantly impacted by other markets outside the region.

Gallegati (2005), examined comovement of 5 stock markets in the Middle East and North African region including Israel, Jordan, Egypt, Morocco and Turkey using wavelet analysis from 1997 to 2005 by analyzing weekly Stock market index returns which were decomposed to different time frames. Findings from the study give credence to the relevance of decomposition of data to different time scales. Stronger comovements are observed between the stock index returns of most of the markets as the time scale increases.

Alagidede (2008), studied the integration of stock markets in Africa within themselves and with other emerging markets and developed markets from 1997 to 2006. The selected African markets include South Africa, Egypt, Nigeria, and Kenya. The selected emerging countries were India, Brazil and Mexico; while the US, UK and Japan were selected to represent the developed countries. Johansen co-integration, correlation and Granger causality with impulse response function were utilized. The study revealed that there were weak interactions between African markets. It further showed that in relation to the developed markets only South Africa and Egypt showed a significant relationship. Finally, with the exception of South Africa, the other African markets did not show a significant relationship with other emerging markets outside Africa.

Heilmann (2010), studied the long run and short run relationship between the equity markets of the US and those of Japan, Hong Kong, Korea, Thailand, Singapore, Malaysia, Taiwan and the Philipines using 817 weekly stock index prices from 1995 to 2010. The vector error correction model indicated a significant long run and short-run relationship between the US and the Asian markets, with the Korean market being dominant.

Patel (2013), examined the relationship between the stock market of India and the markets of five other Asian countries using Johansen co-integration, granger causality and vector error correction model (VECM). Monthly data were analysed and the result indicates the presence of a long run relationship between the Asian markets. Furthermore, uni-directional relationships were found stemming from the equity markets of Sri Lanka, China and Singapore to India and from India to Pakistan.

Hochstotter and Weskamp (2012), conducted a study on international co-movement of equity markets and foreign exchange, using a large international dataset covering the most important markets. They measured the mutual influence on the levels by correlation, linear regression, vector autoregression, and Granger causality as well as the dynamics in the co-movement behaviour by means of DCC-GARCH. Findings of the study show a significant negative as well as positive co-movement. It was observe that co-movement measured by linear dependence tends to be much more stable in developing economies than in the leading economies. On the other hand, a significant regional cluster of co-movement behaviour is not found.

Banda (2013), studied the integration of four stock markets in Southern Africa including the Johannesburg. VECM, Johansen co-integration and granger non-causality test were employed to analyze weekly data from 2006 to 2012. The findings indicate incomplete co-integration, and the dominance of the Johannesburg stock market in the region.

Gour`ene and Mendy (2014), examined if the stock markets in South Africa, Nigeria, Morocco, Egypt, Kenya and WAEMU in Africa are integrated using Wavelet analysis. Daily data was used for the study. Findings show that there is weak short and medium run integration among the African markets but with rising tendencies, in the long run, implying that diversification is possible within them.

Agyapong (2014), used both linear and nonlinear cointegration methods and granger causality test to examine the degree of integration of equity markets in the WAMZ. Findings from the linear cointegration revealed that the Ghanaian and the Nigerian stock exchanges were not integrated. The linear cointegration analysis though showed that the markets were weakly integrated. A fractional integration method revealed that while the Ghanaian stock market has infinite shock duration, that of the Nigeria equity market is prolonged. The granger causality test indicated the absence of causal relationship.

Bhunia and Yaman (2017), studied if there is a causal relationship between nine Asian stock markets comprising of both with the US stock market. Correlation, Johansen co-integration and VECM were utilized to analyse the data. A positive relationship was found between the US stock market and most of the Asian markets except for the Vietnamese market were a negative relationship was found.

Abdullahi (2017), studied the integration of the Nigerian stock market with nine other national stock markets including Germany, France, South Africa, China, India, Mexico, Indonesia, Turkey, and Brazil. Data included month-end prices from 2009 to 2016 and were analysed using the Johansen, and Engel-Granger co-integration techniques and the generalised impulse response function. The result of the co-integration test was mixed. The Johansen approach showed a weak long-run relationship between the Nigerian stock exchange and the other markets in the study while the Engel-Granger method revealed no evidence of co-integration. The impulse response function revealed that the Nigeria market reacts more to internal shocks than to external shocks from other markets. The author did not consider the major global stock markets and also ignored other markets in the West African region. Obasaju *et al.* (2018), examined integration in the Economic Community of West African States (ECOWAS) but within the context of trade integration. They found that tariffs on intermediate goods do not bode well for trade integration in ECOWAS.

Ouattara (2017), examined the integration of emerging stock markets of the BRICS countries using quarterly data from 2000-2015. The Johansen co-integration, VAR Granger causality/wald test, correlation, impulse response function, and the variance decomposition were employed to examine the long run and short run dynamics between the markets. The study reveals that there is no long-run relationship between the markets with unidirectional causality between the markets except between the Indian and Brazilian market. Furthermore, the Chinese market was found to be more independent than the other markets in the study.

Polanco-Martinez *et al.* (2018), investigated the integration between five stock markets in European countries (Italy, Spain, Ireland, Greece, and Portugal) among themselves and with the S&P Europe 350 index in the pre-crisis and crises period using the wavelet analysis and nonlinear Granger causality from 2004 to 2011. The results indicate higher levels of correlation in the crises period than in the period before the crises. Also, the Italian, Portuguese and Spanish markets showed higher levels of integration than the other markets and the S&P Europe 350 index. The results further show that while the Portugal market is the most susceptible, the Grecian market tends to drift away from the S&P Europe 350 index thus less integrated. Finally, the nonlinear causality test showed that there were more uni-directional and bi-direction causality in the crises period than in the preceding period.

3. Data and Methodology

Daily index data from 2008 to 2016 were used for the study. In line with Gallegati (2005), the entire sample period was decomposed to different time frames thus crises (2008-2010) and post crises period (2011-2016). The various index data were collected from various sources. The indexes selected to capture the aggregate movements of share prices in the selected national markets in the study includes; the Nigerian All Share Index (NASI) for Nigerian Capital market, the Ghanaian Composite Index (GCI) for the Ghana Stock Exchange, the BRVM Composite Index (BCI) for the West African Economic and Monetary Union (WAEMU), the Standard and Poor's 500 Index (SPI) for the US market the Financial Times Index (FTI) for the UK market. The Granger causality test is able to assess the extent of lead-lag interactions, thus non-instantaneous relationship between two variables.

$$V_t = \Sigma\, \alpha_i\, V_{t-1} + \Sigma\, \beta j\, W_{t-1} + \mu_{it} \quad \text{......} 1$$

Where "V" represents a specific market index as a dependent variable, V_{t-1} represents a one period lag of the dependent variable, while W_{t-1} represent a one period lag of another market index as independent variable.

4. Empirical Analysis

The Granger causality test is conducted for all the variables to examine the extent to which one stock market index Granger causes another. The test was conducted using one lag. The index data for each market is used for three sample period (i.e. 2008-2010, 2011-2016 and 2008-2016).

4.1. Granger Causality Test for the 2008-2010 Sample Period

In the 2008-2010 sample period as seen in table 1, there is a unidirectional causality between the NASI and the GCI stemming from the NASI. The result is significant at the 1% level with F statistics of 12.4672. Between the NASI, and the BCI, there is also a unidirectional causality stemming from the NASI to the BCI, and is similarly significant at the 1% with F statistics of 13.0386. Between the NASI and the FTI, there is a unidirectional causality from the FTI to the NASI, significant at the 5% level with F statistics of 4.21607. Between the NASI and the SPI, there is also a unidirectional causal relationship stemming from the SPI to the NASI. The result is significant at the 5% level with F value of 4.36554.

A bidirectional causal relationship is observed between the GCI and the BCI, both significant at the 1% level, with the greater impact stemming from the BCI to the GCI than vice versa (23.1267, 11.0705). There is a bidirectional causal relationship between the GCI and the FTI. The results were significant at the 1% and 5% respectively, while the impact from the FTI to the GCI and vice versa are 19.3774, and 3.18130 respectively. Between the GCI and the SPI there is also a bidirectional causal relationship. The causality from the SPI to the GCI is significant at the 1% level, while that from the GCI to the SPI is significant at the 5% level. The size of impact from the SPI to the GCI is greater (20.7549) than vice versa (3.60138). Between the BCI and the FTI there is a unidirectional causality stemming from the FTI to the BCI and significant at the 1% level. Between the BCI and the SPI there is a unidirectional causal relationship stemming from the SPI to the BCI and significant at the 1% level. Finally, between the FTI and the SPI there is a unidirectional relationship from the SPI to the FTI, and significant at the 1% level with F statistics of 67.6787.

Table-1. Granger Causality Test Output for the 2008-2010 Sample Period

Dependent Variable	Observations	F-statistics	Probability value	Hypothesis Testing
NASI AND GCI				
NASI	782	2.26744	0.1043	Unidirectional Causality
GCI	782	12.4672	5.E-06	
NASI AND BCI				
NASI	782	0.93724	0.3921	Unidirectional Causality
BCI	782	13.0386	3.E-06	
NASI AND FTI				
NASI	782	4.21607	0.0151	Unidirectional Causality
FTI	782	1.77338	0.1704	
NASI AND SPI				
NASI	782	4.36554	0.0130	Unidirectional Causality
SPI	782	0.76595	0.4652	
GCI AND BCI				
GC	782	23.1267	2.E-10	Bidirectional Causality
BCI	782	11.0705	2.E-05	
GCI AND FTI				
GCI	782	19.3774	6.E-09	Bidirectional Causality
FTI	782	3.18130	0.0421	
GCI AND SPI				
GCI	782	20.7549	2.E-09	Bidirectional Causality
SPI	782	3.60138	0.0277	
BCI AND FTI				
BCI	782	11.5610	1.E-05	Unidirectional Causality
FTI	782	1.22185	0.2953	
BCI AND SPI				
BCI	782	12.9954	3.E-06	Unidirectional Causality
SPI	782	1.10993	0.3301	
FTI AND SPI				
FTI	782	67.6787	8.E-28	Unidirectional Causality
SPI	782	1.34500	0.2611	

Source: Authors computation

4.2. Granger Causality Test for the 2011-2016 Sample Period

The pair wise granger causality between the NASI and the GCI shows that there is a bi-directional causality between the NASI and the GCI in the post crises sample period as seen in table 2. While the causality form the GCI to the NASI is significant at the 10% level of significance with F statistics of 3.46933, the causality from the NASI to the GCI is significant at the 1% level with F statistics of 62.8662. The result indicates that there is a higher level of causality from the NASI to GCI. This is expected as the NASI is the biggest market in the region with potentials on having significant causal effect on other market in the region. Secondly, the result of the pair wise causality between the NASI and the BCI shows a unidirectional causal relationship between NASI and BCI. In the causality from the BCI to the NASI the probability value is not significant (0.1325) with F statistics of 2.26479 while in the causality from the NASI to the BCI was significant at the 10% level (0.0949) of significance with F statistics of 2.79297.

Thirdly the pair wise causality between the NASI and the FTI shows that the direction of causality is from the FTI to the NASI significant at the 5% level with F statistics of 4.09729, and not vice versa implying a unidirectional causality. This implies that the global stock index (FTI) Granger causes the NASI. This also is expected as the UK stock markets represented by the FTI is larger than the NASI and as such could have greater impact. On the other hand, the causal relationship between the NASI and the SPI shows that there is no causal relationship between both markets as shown by the probabilities (0.4553, 0.5840) and low F statistics (0.55775, 0.29999). This may be due to the aftermath of the global crises as the NASI and the SPI show some causal relationship during the global crises.

The pair wise causality test between the GCI and the BCI shows a bidirectional causality with the F statistics and probability from the BCI to the GCI (17.4687, 3.E-05) and vice versa (4.66196, 0.0310) being significant at the 1% and 5% level of respectively. Similarly a bidirectional causal relationship also exist between the GCI and FTI with the F statistics and probability from the FTI to the GCI (30.9310, 3.E-08) and from the GCI to the FTI (4.07196, 0.0438) significant at the 1% and 5% level respectively. Furthermore, there is a unidirectional causal relationship from the SPI to the GSI significant at the 1% level of significance and F statistics of 6.27490.

The result of the causality test between the BCI and FTI shows a unidirectional causality running from the FTI to the BCI and is significant at the 1% level of significance (0.0017) and F statistic value of 9.86205. The result of the causality test between the BCI and SPI also shows a unidirectional causal relationship from the SPI to the BCI significant at the 1% level of significance and F statistics of 10.55509. Lastly, the causality test between FTI and SPI shows a unidirectional causal relationship from the SPI to the FTI significant at 1% level of significance and F

statistics of 5.73057. Being that the US stock market represented by the SPI is the largest financial market in the world, it is expected that the direction of causality will be from the SPI to the FTI.

In general, it can be observed that the Nigerian Stock Exchange's lead role as the biggest market in the region shows in the level to which her index granger causes the smaller markets in the region (i.e. the GSE and the BRVM) with more significant probability and higher F statistics, while the small markets show a weaker sign of causality to the NASI. Furthermore the global stock markets (US and UK) both had more significant causal effect on the stock markets within the West African region (with exception of the causality between the SPI and the NASI where the relationship is insignificant) showing their dominance as key players in the global stock market and further giving credence to the existence and effect of global financial integration.

Table-2. Granger Causality Test Output for the 2011-2016 Sample Period

DEPENDENT VARIABLE	Observations	F-statistics	Probability value	Hypothesis Testing
NASI AND GCI				
NASI	1564	3.46933	0.0627	Bidirectional Causality
GCI	1564	62.8662	4.E-15	
NASI AND BCI				
NASI	1564	2.26479	0.1325	Unidirectional Causality
BCI	1564	2.79297	0.0949	
NASI AND FTI				
NASI	1564	4.09729	0.0431	Unidirectional Causality
FTI	1564	1.74786	0.1863	
NASI AND SPI				
NASI	1564	0.55775	0.4553	No Causality
SPI	1564	0.29999	0.5840	
GCI AND BCI				
GCI	1564	17.4687	3.E-05	Bidirectional Causality
BCI	1564	4.66196	0.0310	
GCI AND FTI				
GCI	1564	30.9310	3.E-08	Unidirectional Causality
FTI	1564	4.07196	0.0438	
GCI AND SPI				
GCI	1564	6.27490	0.0123	Unidirectional Causality
SPI	1564	1.37672	0.2408	
BCI AND FTI				
BCI	1564	9.86205	0.0017	Unidirectional Causality
FTI	1564	2.35942	0.1247	
BCI AND SPI				
BCI	1564	10.5509	0.0012	Unidirectional Causality
SPI	1564	2.44990	0.1177	
FTI AND SPI				
FTI	1564	5.73057	0.0168	Unidirectional Causality
SPI	1564	0.50384	0.4779	

Source: Authors computation

4.3. Granger Causality Test for the Full Sample Period (2008-2016)

Table 3 shows the Granger causality test result for the entire sample period between the selected market indices. A unidirectional causal relationship is observed between the NASI and the GCI. The NASI granger causes the GCI and the P value is significant at less than 1% level. Between the NASI and the BCI there is no significant causal relationship between the indices for the sample period. There is bidirectional causality between the NASI and the FTI. While the causality from the FTI to the NASI is significant at the 1% level, the causality from the NASI to the FTI is significant at the 10% level. Furthermore, the magnitude of the impact of the FTI on the NASI as indicated by the F statistics (26.9838) is more than that of the NASI to the FTI (3.66118). There is also bidirectional causality between the NASI and the SPI. While the causality from the SPI to the NASI is significant at the 5% level, the causality form the NASI to the SPI is significant at the 10% level. Similarly, the impact from the SPI on the NASI is greater than vice versa as seen in the F statistics (6.35676, 3.43087).

The granger causality result between the GCI and the BCI shows that GCI does not granger causes the BCI and vice versa. Between the GCI and the FTI, a significant unidirectional causal relationship is seen to exist from the FTI to the GCI with F statistics of 62.7897. Similarly a unidirectional causality exists between the GCI and the SPI running from the SPI to the GCI and significant at the 5% level with F value of 6.39066. There is a unidirectional causal relationship between the BCI and the FTI running form the FTI to the BCI. The result is significant at the 1% level. There is also a unidirectional causal relationship between the BCI and the SPI, stemming the SPI to the BCI. Lastly between the SPI and the FTI there is a unidirectional causality form the SPI to the FTI and is significant at the 1% level with F statistics of 9.65928.

Table-3. Granger Causality Test for the Full Sample Period (2008-2016)

DEPENDENT VARIABLE	Observations	F-statistics	Probability value	Hypothesis Testing
NASI AND GCI				
NASI	2348	0.04659	0.8291	Unidirectional Causality
GCI	2348	42.2004	1.E-10	
NASI AND BCI				
NASI	2348	0.22425	0.6359	No Causality
BRVMCOM	2348	2.33479	0.1266	
NASI AND FTI				
NASI	2348	26.9838	2.E-07	Bidirectional Causality
FTI	2348	3.66118	0.0558	
NASI AND SPI				
NASI	2348	6.35676	0.0118	Bidirectional Causality
SPI	2348	3.43087	0.0641	
GCI AND BCI				
GCI	2348	0.03591	0.8497	No Causality
BCI	2348	1.77633	0.1827	
GCI AND FTI				
GCI	2348	62.7897	4.E-15	Unidirectional Causality
FTI	2348	0.70422	0.4015	
GCI AND SPI				
GCI	2348	6.39066	0.0115	Unidirectional Causality
SPI	2348	0.10358	0.7476	
BCI AND FTI				
BCI	2348	30.2101	4.E-08	Unidirectional Causality
FTI	2348	0.15049	0.6981	
BCI AND SPI				
BCI	2348	23.9406	1.E-06	Unidirectional Causality
SPI	2348	0.55702	0.4555	
FTI AND SPI				
FTI	2348	9.65928	0.0019	Unidirectional Causality
SPI	2348	0.35026	0.5540	

Source: Authors computation

5. Discussion and Implication of Results

The analysis of the Granger causality test was conducted on two sub periods and the entire sample period and has important implications on the level of integration between the selected markets in the study as it shows the direction and magnitude of impact in the various time frames. More attention is given to the finding and implications of the sub period analysis as the results for the entire sample period (2008-2016) causality test seem to contradict the test results for the sub sample periods giving credence to the used of decomposed time frame in longitudinal studies. This may be due to the fact that some dynamics may have been lost in the analysis of entire sample period putting in consideration the impact of the global crises and the dynamic nature of stock market integration.

During the crises period (i.e. from 2008-2010) the markets pairs either exhibited unidirectional or bidirectional causality. Thus further implicates on limited short to midterm diversification opportunities for that sample period. Unidirectional Granger causality were observed from the NASI to GCI; NASI to BCI; SPI to the NASI; FTI to the NASI; FTI to the BCI; SPI to the BCI, and from the SPI to the FTI. Thus stock price changes in the former markets determined or granger caused changes in the latter markets in the sample period. Meanwhile bidirectional causality was observed between the GCI and the BCI; GCI and FTI, GCI and SPI indicating that past price changes in both markets influence current prices in the other market. The bidirectional causality found between the Ghana and WAEMU market may not be unrelated to their geographical propinquity. The findings from the Granger causality test in the crises period therefore implies that none of the markets were exempted from the effect of the crises as past values of one market granger causes present values of other markets and vice versa.

The results from the post crises sample period (2011-2016) were somewhat different and thus the implications. The granger causality test revealed a unidirectional causal relationship from the NASI to the BCI; FTI to the NASI; SPI to the GCI; FTI to the BCI, SPI to the BCI and from the SPI to the FTI. This implies that lead/lag linkages exist between the market pairs, thus changes in the index prices of the former market leads to a change in the index price of the latter. Thus the market pairs cannot be referred to as isolated.

On the other hand, a bidirectional causal relationship is found in the 2011-2016 sample period to exist between the NASI and the GCI; GCI and the BCI; GCI and the FTI thus implying that past index values of these pair of markets significantly affect each others' present values. The bidirectional causality between the West African markets in the post crises period implies that the markets have become more integrated after the crises which may not be unrelated with increased effort towards *dejure* integration of markets in the region. These significant interactions implicates on the interdependencies of these market pairs thus further giving credence to the possible

existence of bilateral portfolio flows between the respective markets or similar fundamentals driving them. In other words such market pairs cannot be referred to as segmented or independent. The insignificant causal relationship between the SPI and the NASI in the 2011-2016 sample period, implies that both markets have become less integrated as past values of one market does not to affect the other in comparison to the interactions observed in the preceding period (crises period) in this study.

In general, comparing the magnitude of impact from the Granger causality test F-statistics in the crises and post crises period it is observed that magnitude of causality in the crises period is more than the latter with the highest F-statistics in the crises period is 67.6787 (from the SPI to the FTI) meanwhile in the post crises period it is 62.8662 (from the NASI to the GCI). The significant causal relationship between the NASI and the GSE is at variance with that of Agyapong (2014), which can be attributed to the difference in the time scope of the study, as the recent period covered by this study is more recent with increased activities geared at market integration including but not limited to cross listing of shares.

6. Conclusion

The aim of the study was to ascertain the extent of causal relationship between the three major equity markets in the West Africa region and with those of US and UK. Findings from the study indicate the existence of both unidirectional and bi-directional causality between most of the market pairs implying the existence of lead lag interactions and as such interdependencies between most of the market pairs. Thus it can be deduced that none of the markets in the study exists in autarky. This implicates on the growing importance of frontier markets particularly those in the West African region in the global stock market framework.

National, regional and global financial regulatory bodies need to pay closer attention to the increasing interdependencies of stock markets in a bid to ensuring stability of the global stock market in general and national stock markets specifically. Individual regulatory bodies of financial systems at the country level may need to put up mechanisms to prevent negative spillover effects arising from other stock markets in the global stock market space while gleaning from the positive spillovers of internationalization and integration of markets. Regional regulatory bodies, and in this case ECOWAS, WAMZ, WAEMU should foster regional integration/cooperation a manner that will strengthen the individual markets while working towards presenting a common front to extra-regional market players. Internal balance between the regional stock markets should be considered to be achieved first before striving to achieve external balance. Further studies can be conducted using varying longitudinal scope and/or varying data frequency. Also, other analytical technique can also be explored to verify the findings in this study.

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