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Regional and global market integration of African financial markets

Nicholas Addai Boamah

Department of Real Estate and Land Management, University for Development Studies Wa Campus, Wa , UWR, Ghana. Email: addaianas@yahoo.com

Abstract

The study examines the degree of regional and global integration of 11African Stock Markets (ASMs) using monthly return series from 1997 to 2015. It tests for the existence of structural breaks and whether any detected significant break in the regional and global degrees of integration caused an increase or decrease in segmentation. Additionally, the study examines the impact of the 2008 Global Financial Crisis (GFC) on the regional and global integration of the ASMs. Evidence is provided that suggests: (i) a time-varying regional and global integration of the ASMs; and (ii) that global integration dominates regional integration for all of the ASMs. The ASMs are more globally integrated, relative to their degrees of regional integration. Significant structural breaks are detected, which for most countries are associated with an increase in the degree of integration and for others a decrease in the degree of integration. Most of the observed structural breakpoints in the degree of global integration correspond with the GFC; however, the structural shifts in regional integration are largely unrelated to the GFC. The evidence shows that geographic proximity may have minimal impact on market integration unless there is an associated regional economic integration. Regional diversification benefits may thus exceed that of global diversification and vice versa depending on the extent and direction of economic activities of the economies of the geographic region.

Keywords: Market integration; Structural breaks; Diversification gains; Emerging markets; Africa

1. Introduction

The study examines the relative global and regional effects in the equity returns of 11 African Stock Markets (ASMs). The degree of global and regional integration has implications for regional and global portfolio diversification benefits, the impact of global and/or regional crisis across markets, and the informational efficiency of markets (e.g., Agyei-Ampomah, 2011; Alagidede, 2009, 2010; Alagidede et al., 2011; Ntim et al., 2007, 2011; Ntim, 2012). These have relevance for regional and global asset allocation decisions, risk management, and policy and regulatory options. When markets are less segmented, there would be an increase in cross-border capital inflows and crisis transmission, a reduction in the cost of capital, and an enhancement in investment and growth opportunities and the informational efficiency of capital markets (e.g., Bekaert, 1995; Bekaert et al., 2002; Eun and Janakiramanan, 1986; Li et al., 2004; Bae et al., 2012; Büttner and Hayo, 2011). Additionally, the degree of regional and global integration has implications for macro-economic and monetary policy, since the linkages amongst the domestic, regional and global financial markets could affect the local economy's monetary policies (e.g., Agyei-Ampomah, 2011).

In a study of the Americas, Asia, and Europe, Brooks and Del Negro (2005) find regional factors to be significant in describing equity returns. They argue that regional effects account for more than half of the observed country influence in stock returns, and suggest that regional diversification may produce higher risk reduction than global diversification. Brooks and Del Negro's evidence like that of Guesmi and Nguyen (2011) shows that regional effects may be more important than country and global factors, and points to the relevance of regional level segmentation in asset allocation decisions, regional economic development policies, and portfolio investment strategies. Brooks and Del Negro's findings contrast that of Drummen and Zimmermann (1992) who find a regional (Europe) factor to be less important in describing European stock returns.

Agyei-Ampomah (2011) and Wang et al. (2003) find evidence of time-varying segmentation of the ASMs relative to the global market. Agyei-Ampomah observes that the ASMs except South Africa are segmented from the world market. Wang et al. suggest that the interdependence between the African and US markets weakened post the 1997 Asian financial crisis. Similarly, Alagidede (2009) observes that African markets are neither regionally nor

globally integrated. The author notes the existence of long-run relationship between the South African and Mauritius markets, also, most African countries remain segmented despite their liberalisation attempts. Corroborative evidence is provided by Alagidede et al. (2011). The authors note that shocks from international stock markets have minimal impact on the ASMs and that African assets will yield global investors higher risk diversification.

In a related study, Ntim (2012) explores the implications of the harmonisation and integration of African markets for their informational efficiency and hence, the allocation efficiency of capital and risk on the ASMs. Ntim observes that African continent-wide indices, but not individual country ones were weak form efficient. The evidence infers that if the ASMs are financially integrated then a more efficient deployment of capital and risk would be ascertained; this has implications for the growth of African economies. The degree of relative global and regional integration would thus have relevance for the regional and global informational efficiency of the ASMs.

Regional integration may not necessarily lead to global integration; the regional and global integration processes may be unrelated. Guesmi and Nguyen (2011) argue that international integration preceded regional integration in the Asian emerging markets, although, regional integration was prior to global integration for the Latin American markets. The implications of market segmentation could be regional or global in character. It is, therefore, relevant to enquire whether the cost of capital of projects, for instance, is determined locally, regionally or globally. This of course depends on the relative degree of regional and global integration of financial markets. If markets are more regionally integrated than they are globally, then regional events, such as financial crisis and information transmission would be more relevant than global ones. Thus, regional factors would be more relevant than global ones in estimating the cost of capital of projects; and regional diversification benefits would be less than that of global diversification.

A higher degree of global integration does not automatically imply a higher degree of regional integration. As observed by Bracker et al. (1999), Obstfeld and Rogoff (2001), Campa and Fernandes (2006), Driessen and Laeven (2007), Garcia-Herrero et al. (2009), and Bai and Green (2010), the degree of economic engagement amongst countries would impact on their levels of segmentation and the diversification benefits from investing across such countries. Obstfeld and Rogoff (2001), for instance, observe a strong relation between diversification

profits and trade, whereas Garcia-Herrero et al. (2009) note the relevance of within region trade to regional level market integration. Therefore, if countries in a given geographic region have minimal economic activity among themselves relative to their level of economic activity with countries outside the region, then those countries would show a higher degree of global integration compared to regional integration. Consequently, regional diversification gains would be higher than global diversification benefits. A higher diversification gain would be attained by investing across countries with limited economic integration (Gerard, 1997; Campa and Fernandes, 2006; Driessen and Laeven, 2007). The distinction between the relative regional and global degrees of integration, thus, has significant implications.

Increased economic activity amongst countries in a geographic region may not necessary lead to a decline in financial market segmentation within the region. Garcia-Herrero et al. (2009) observe important nexus between market liquidity, cross-border investment flow, and financial market integration. The authors note that despite the huge increase in economic activity amongst Asian countries post the Asian financial crisis, the illiquidity of the Asian financial markets constrained the within region cross-border investment flows, and consequently limited the integration of Asian markets with themselves. They argue that potential diversification benefits are less relevant in driven cross-border investment flows. Garcia-Herrero et al.'s finding may explain Guesmi and Nguyen (2011) Asian market evidence.

This paper is similar to Pukthuanthong and Roll (2009), Berger et al. (2011) and Ng et al. (2013) in that it also relies on the R^2 as an integration measure. The point of divergence, however, is that it employsthe R^2 and the incremental R^2 from a partial integration model as the respective surrogates for global and regional markets degree of integration. This enables us to jointly explore both the regional and global degrees of integration of the ASMs. The paper, thus, estimates African-regional level integration controlling for world market integration. This paper's approach is informed by the evidence that financial markets are partially integrated (see e.g. Errunza and Losq, 1985; Errunza, et al. 1992; Koutoulas and Kryzanowski, 1994; Choi and Rajan, 1997; Boamah et al., 2016). The paper is also, similar to prior African studies such as Kodongo and Ojah (2011) and Boamah (2015a) in that it is conducted within a partially integrated framework, however, it differs from them based on the integration proxy.

This paper extends prior African studies, such as Bekaert et al. (2002), Alagidede (2009), Agyei-Ampomah (2011), Ntim et al. (2007, 2011), Ntim (2012), and Boamah (2015a) and contributes to the emerging markets literature. Unlike previous studies, the paper estimates the degree of regional integration that is uncorrelated with world market integration. Thus, the paper estimates pure regional and global integration measures. It examines the persistence of global effects on the ASMs after accounting for African-regional effects. In addition, the paper examines the relative degree of regional and global integration of the ASMs overtime and its implications for the diversification gains from African-regional level portfolios or global portfolios that include African assets. The evidence will contribute to the debate on whether or not asset pricing models on the ASMs should incorporate regional and/or global factors or be country specific.

Additionally, the paper investigates structural breaks in the global and regional influence on the ASMs, and the dynamics of the effects around any detected significant structural breakpoint. This enables us to examine whether global events such as the 2008 Global Financial Crisis (GFC) and the 1997 Asian Financial Crisis (AFC) had any significant impact on the ASMs. That is, the evidence would permit an analysis of whether or not the ASMs are exposed to crisis emanating from regional and non-regional markets, and its implications for policy and global portfolio diversifications. In addition, testing for structural breaks in both the degree of global and regional integration permits an analysis of whether regional integration precedes global integration. That is, whether or not regional integration is a requirement for the realisation of global integration. Also, the paper explores how the rate of change of the relative global and regional effects on the ASMs has evolved overtime.

The remainder of the paper is organised as follows. Section 2 presents an overview of the African capital markets. A review of the relevant literature is presented in section 3. Section 4 describes the methodology used in the study. The data are described in section 5. Section 6 presents and discusses the empirical results whilst the conclusion is presented in section 7.

2. Overview of African stock markets

The market capitalization of and the number of listed stocks on the ASMs are generally small, in addition, the ASMs are illiquid, volatile and constitute a small component of their national economies (Kenny and Moss, 1998; Appiah-Kusi and Menyah, 2003; Bekaert et al., 2007; Ntim et al., 2011). Table 1 shows that the number of firms listed on and the market capitalization of the ASMs respectively ranged from 7 (Zambia) to 654 (Egypt) and $195 million (Zambia) to $241,571 million (South Africa) in 1996. The 2014 figures indicate that the number of firms listed on the ASMs were in the range of 20 (Zambia) – 322 (South Africa), whereas, the market capitalization ranged from $3,003 million (Zambia) – $933,930 million (South Africa). The evidence shows that the ASMs excepting the South African market are small by global standards.

Additionally, the rate of listing on the ASMs is generally low, whilst the delisting rate appears to be high. For instance, Table 1 indicates that over the 18 year period (1996-2014) the number of delisting on the South African and the Egyptian markets respectively were 320 and 408 firms, whereas, the number of listing on the remainder of the ASMs are in the range of 2 (Ivory Coast) to 43 (Tunisia). This may be attributed to the limited attractiveness of or the adoption of stringent listing rules on the ASMs. The Egyptian Capital Market Authority (ECMA) for instance, implemented stringent disclosure and trading requirements in 2002. Illiquid stocks on the Egyptian market might have delisted in response to the new trading rules. Table 1 shows that whilst the number of listed firms on the Egyptian and South African markets correspondingly decreased from 654 to 246 and 642 to 322, the turnover ratio increased from 22% to 40% (Egypt) and 10% to 35% (South Africa) over the 1996 to 2014 period. Illiquid stocks appear to be driven the high delisting rate on the ASMs.

The ASMs are generally small relative to the size of their national economies. Table 1 indicates that the market capitalization to GDP ratio of the ASMs is in the range of 10.34% (Ghana) – 266.77% (South Africa) in 2014. The largest African markets in comparison with the size of their economies are South Africa (266.77%) and Nigeria (99.98%) and the smallest markets are Ghana (10.42%), Zambia (13.42%), and Tunisia (19.16%) in 2014. In addition, the most capitalized ASMs in 2014 are South Africa ($933,930 million) and Nigeria ($568,400 million) whilst the least capitalized markets are Ghana ($4,945 million) and Tunisia ($9,312 million). The evidence indicates the dominance of

the South African market on the ASMs; it accounts for about 55% of the total market capitalization of the ASMs in 2014. The two largest markets, Nigeria and South Africa control about 89% of the ASMs market capitalization in the same year.

The small depth of the ASMs is unsurprising given that African economies are generally small with associated low growth rate despite having a huge potential for growth. The GDP of the sampled African economies ranged from $14,863 million (Mauritius) to $282,630 million (South Africa) in 2007 (Ntim et al., 2011). Also, Table 1 shows the lowest and highest GDP growth rate of the African countries are 1.52% (South Africa) and 8.55% (Ivory Coast) respectively. The size of the ASMs relative to their national economies however, is interesting. As Table 1 indicates, it exhibits significant variability across the ASMs. It appears that most African firms have not found it necessary to raise capital on the ASMs or are constrained in doing so. Efforts by the ASMs at encouraging and facilitating the listing of the indigenous firms will deepen the depth of the ASMs in relation to the size of the respective national economies. Similarly, as observed by Ntim et al. (2011) and Ntim (2012), integrating the operations of the ASMs will facilitate the growth of the ASMs, enhance liquidity, enable efficient capital allocation and better place them in driven the growth of African economies.

A major problem affecting all of the ASMs including South Africa is illiquidity (Appiah-Kusi and Menyah, 2003; Hearn et al., 2010; Asamoah and Quartey-Papafio, 2011; Ntim et al., 2007, 2011). Ntim et al. (2011) for instance, observe a significant variation and a gradual enhancement in the liquidity of the ASMs over the 2000 – 2007 period. Hearn and Piesse (2013) associate liquidity on the ASMs with corruption control, political stability and regulatory quality. In a recent study, Boamah (2015b) argues that very short-term momentum profits on the South African market are driven in part by market illiquidity.

Table 1: Market indicators of market development for 1996 and 2014
(figures in parenthesis are 2012 figures)

	1996						2014					
Country	GDP GROWTH (%)	Mkt. Cap to GDP (%)	Value Traded to GDP (%)	Turnover Ratio (%)	Number of Firms Listed	Mkt. Cap (US$ 000,000).	GDP GROWTH (%)	Mkt. Cap to GDP (%)	Value Traded to GDP (%)	Tur-nover Ratio (%)	Number of Firms Listed	Mkt. Cap (US$ 000,000).
Botswana	5.83	6.72	0.64	8.56	12	326	4.42	(31.63)	(0.78)	(2.60)	24	(4,587.52)
Ivory Coast	7.73	7.53	0.16	2.19	35	914	8.55	34.11	(0.66)	(2.31)	37	11,684.2
Egypt	4.99	20.96	3.64	22.13	654	14,173	2.20	24.46	9.28	40.38	246	70,083.65
Ghana	4.60	21.52	0.25	1.08	21	1,492	3.99	10.34	(0.13)	(1.64)	29	4,945
Kenya	4.15	15.32	0.56	3.59	58	1,846	5.33	40.52	(2.48)	(8.07)	61	22,256.3
Mauritius	5.59	37.90	1.76	5.19	40	1,676	3.60	69.29	3.67	5.24	66	8,751.02
Morocco	12.22	23.76	1.18	5.90	49	8,705	2.42	47.95	2.77	5.71	74	52,746.8
Nigeria	4.99	10.17	0.21	2.57	182	3,560	6.31	99.98	(1.60)	(8.79)	188	568,400
South Africa	4.31	168.07	18.93	10.42	642	241,571	1.52	266.77	92.72	34.59	322	933,930.7
Tunisia	7.15	21.76	1.43	6.86	34	4,263	2.70	19.16	(2.74)	(13.49)	77	9,312
Zambia	6.95	5.96	0.09	2.80	7	195	6.00	13.42	(0.95)	(5.58)	20	(3,003.88)

Source: World Development Indicators and DataStream, 2016.

Table 1 indicates that liquidity as measured by the value of shares traded to GDP ratio is in the range of 0.13% (Ghana) – 92.72% (South Africa). Also, the most liquid and illiquid ASMs based on the turnover ratio are the South African (40%) and Ghanaian (1.64%) markets correspondingly. The evidence shows that the Ghanaian market is the most illiquid ASM. This is consistent with the observation by Ntim et al. (2007). Table 1 suggests a generally high level of liquidity risk on the ASMs. This may significantly reduce the attractiveness of the ASMs to global investors seeking diversification opportunities. The high level of illiquidity of the ASMs may make it difficult for such investors to close their positions unconstrained if the need arises to quickly rebalance their portfolios. Most of the ASMs thus have limited foreign investors' involvement and are largely less globally integrated. This appears consistent with the observation by Boamah (2015a) that the most liquid ASMs are more globally integrated; additionally, they were more affected by the GFC compared to the less liquid ones. Boamah notes further that the impact of the GFC on the ASMs was delayed, and was largely through the real sector. Sugimoto et al. (2014) argue that the GFC had differential impact on the ASMs depending on their levels of integration with the global market.

The African markets are characterized by weaker regulatory institutions and under-developed capital market infrastructure; these have constrained investor participation on the ASMs (Yartey and Adjasi, 2007; Alagidede, 2010; Ntim et al., 2007, 2011; Ntim, 2012). The regulators lack the capacities and resources to adequately enforce regulations and in addition, the regulatory structures are inadequate on most of the ASMs (Piesse and Hearn, 2005; Assenso-Okofo, et al. 2011). For instance, the creation of independent securities market regulator on the ASMs in conformity with international best practices is a recent development even for the oldest and well established markets such as South Africa (1991), Morocco (1993), Kenya (1990) and Nigeria (1973). Botswana's ministry of finance remains the country's securities market regulator till date; this has the potential to expose the country's stock market to political interferences and may undermine the quality of regulation and investor confidence on the capital market.

3. Testing financial market integration

Various techniques such as correlations (Watson, 1980; Madura and Soenen, 1992; Longin and Solnik, 1995), co-integration and impulse response functions (Kasa, 1992; Ratanapakorn and Sharma, 2002; Alagidede, 2009), earnings yield differentials (Bekaert et al. (2011), asset pricing models (Stehle 1977; Errunza and Losq, 1985; Errunza, et al., 1992; Choi and Rajan, 1997) and the R^2/adjusted R^2 (Schotman and Zalewska, 2006; Carrieri et al., 2007; Pukthuanthong and Roll, 2009; Berger et al., 2011; Ng et al., 2013) have been employed to examine financial market integration.

Errunza and Losq (1985), Errunza, et al. (1992), and Choi and Rajan (1997) for instance, rely on a partial integration model to explore the integration of financial markets. The evidence indicates that financial markets are partially integrated. Similarly, Kodongo and Ojah (2011) and Boamah (2015a) observe significant risk premium for both the world and African market factors on the ASMs, suggesting partially integrated ASMs relative to the world.

Studies such as Carrieri et al. (2007) and Pukthuanthong and Roll (2009) have shown that correlations are inadequate in exploring financial market integration. Pukthuanthong and Roll proposes the adjusted R^2 from a multifactor asset pricing model as the proxy for world market integration, whereas, Carrieri et al. relying on the Errunza and Losq (1985) model estimate an R^2 integration measure from a regression of ineligible securities indices on eligible securities indices. Pukthuanthong and Roll conclude that integration has improved for some African markets including South Africa, Mauritius and Egypt but declined for others such as Ghana, Nigeria and Zimbabwe. Berger et al. (2011) and Ng et al. (2013) subsequently adopt the Pukthuanthong and Roll technique. In a related study, Bruner et al. (2008) adopt the R^2 from a regression of domestic betas on global ones as integration measure.

4. Methodology

Regional and global market integration score

The study employs the R^2 from the partial integration model (Equation 1) as the regional and global integration surrogates. The regional and global integration measures are R_a^2 and R_w^2 respectively.

$$R_t^a = a_a + b_a R_t^w + \omega_t^a \quad (1a)$$

$$R_t^j = \alpha_0 + \beta_w^j R_t^w + \varepsilon_t^j \quad (1b)$$

$$R_t^j = \alpha_1 + \beta_w^j R_t^w + \beta_a^j \omega_t^a + \varepsilon_t^j \quad (1c)$$

$$a = intercept,$$
$$R^w = world\ market\ factor,$$
$$R^a = african\ market\ factor,$$
$$\omega^a = african\ market\ factor\ that\ is\ orthogonal\ to\ R^w,$$
$$R^2_{wa,j} = R^2\ from\ Equation\ (1c),$$
$$R^2_{w,j} = R^2\ from\ Equation\ (1b) - proxy\ for\ world\ market\ integration\ of\ country\ j,$$
$$R^2_{a,j} = R^2_{wa,j} - R^2_{w,j} - proxy\ for\ regional\ market\ integration\ of\ country\ j.$$

The contemporaneous correlations between the African and the world market factors imply that the regional degree of integration may be driven at least partly by the global degree of integration of the ASMs. Similarly, the degree of the ASMs integration with the world may be caused by its contemporaneous correlation with the African factor. To control for this, we follow Stehle (1977) and orthogonalize the world and African market factors using equation (1a). That is, the residual from Equation (1a) is our proxy for the pure African market factor. The setting thus permits us to estimate regional level integration score that is free from world market influences. We are therefore able to estimate the regional level of integration of the ASMs after accounting for their degrees of global integration.

We estimate Equations (1b) and (1c) in an overlapping one-month moving window; each window corresponds with the past 60 months of return observations. The approach permits the estimation of time-varying regional and world market integration measures.

Structural breaks in the rate of change of integration

Relying on time trend Equation (2), we examine the regional and global integration measures for structural shifts. We interpret the intercept and the time-trend coefficients respectively as the level and rate of change of the degree of integration. Equation (2b) is used to explore structural breaks in the rate of change of integration. The study relies on the Quandt (1960) test for unknown structural breakdates; this permits the examination of structural shifts without prior knowledge of the breakdates. Hansen (2001) argues that an arbitrary selected candidate breakdate could lead to uninformative test, whereas, an

endogenously estimated breakdate may lead to misleading breakdate. The Quandt's test is appropriate as this study seeks to date structural changes in the regional and global degree of integration of the ASMs. The study investigates structural shifts for each candidate breakdate (τ).

$$R^2_{j,t} = \alpha_0 + \beta^j t + \varepsilon^j_t \quad (2a)$$

$$R^2_{j,t} = \alpha_0 + \rho_t \beta^j t + \varepsilon^j_t \quad (2b)$$

$$0.20n \leq \tau \leq 0.20n$$

$t = time\ trend;$
$\beta^j = rate\ of\ change\ of\ integration\ for\ country\ j;$
$\alpha = the\ level\ of\ segmentation\ for\ country\ j;$
$\rho = takes\ a\ value\ of\ 1\ pre\ break\ date\ and\ 0\ otherwise;$
$\tau = potential\ breakdate,\ \ n = number\ of\ observation,$
$R^2_{j,t} = regional\ or\ world\ market\ integration\ measure.$

We follow Hansen (2000) and estimate critical values via bootstrap replications. Equation (2) is estimated 5,000 times using simulated R^2_j. The simulation is performed through random drawings from the residuals of Equation (2a). Quandt's Statistic is estimated for each simulation. The critical values are subsequently estimated from the distribution of the Quandt's Statistic.

5. Data and descriptive statistics

5.1 Data sources and descriptive statistics

The data, covering 11 ASMs and over the period March 1997 to January 2015 are sourced from DataStream. The ASMs that we could access data over a relatively long period of time (18 years) were assembled. The sample however, is much more representative of the ASMs and also, captures the duration of the GFC and the AFC, thus enabling us to explore the influence of these global events on the degree of regional and global integration of the ASMs. We adopt the US dollar returns to the world and African market portfolios as our risk assets. The MSCI world market portfolio is our surrogate for the world market factor. We create the African market factor ($MKTR_v$), as the value weighted average of the US dollar returns to the market indices of the ASMs in our sample as shown in Equation (3).

$$MKTR_{v,t} = \sum_{j=1}^{10} w_{j,t} R_{j,t} \quad (3)$$

w_t = *total market capitalization of market j as a proportion of the total market capitalization of all of the sampled markets at time t,*
$R_{j,t}$ = *return to the market portfolio of market j at time t.*

We employ the US dollar returns to the national total return indices as surrogates for the market portfolios of the sampled markets. The S&PIFF index for Botswana, Ivory Coast, Ghana, Kenya, Mauritius, Nigeria, South Africa, and Tunisia are used as surrogates for their market indices, although, the MSCI index for Egypt and the FTSE index for Morocco are used as a proxy for their market indices. The Zambian All Share index (price index) is adopted as the market proxy for the Zambian market portfolio. All the returns are continuously compounded and are in excess of the US one month Treasury bill rate that we use as a surrogate for the risk free rate. The study relies on monthly stock returns. The monthly returns are appropriate in overcoming the observed thin trading problem on the sampled markets.

5.2 Descriptive statistics and correlations of excess returns

Table 2, Panels A and B respectively present the descriptive statistics and the correlations of the excess returns. Table 2 (Panel A) shows that the average annualised return is lowest for Ghana (-0.51%) and highest for Botswana (5.53%). The highest and lowest annualised standard deviations of the return are respectively 33.8% (Egypt) and 17.58% (Tunisia). Corroborating the South African dominance of the African market factor, the annualised standard deviation (27%) and mean (2.38%) of the African market factor closely correspond to the annualised standard deviation (29.5%) and mean (2.35%) of the South African market factor. The evidence shows that the ASMs are generally volatile although, they provide higher returns to investors.

TABLE 2: DESCRIPTIVE STATISTICS AND CORRELATIONS OF EXCESS RETURNS

Country	Panel A: Descriptive Statistics					Panel B: Correlations		
	Mean	Standard deviation	Sharpe ratio (%)	Jarque-Bera	Shapiro-Wilk	World	Africa	AVGCCOR
World	1.21	15.93	7.61	62.8**	0.958**	1		0.292
Africa	2.38	27.02	8.83	36.9**	0.952**	0.65**	1	0.336
Botswana	5.53	20.97	26.36	88.7**	0.939**	0.23**	0.39**	0.160
Ivory Coast	4.86	24.49	19.83	8.74**	0.970**	0.23**	0.31**	0.220
Egypt	2.33	33.8	6.89	16.5**	0.984**	0.39**	0.51**	0.211
Ghana	-0.51	21.82	-2.33	8.7**	0.964**	-0.005	0.02	0.055
Kenya	3.42	26.99	12.68	14.5**	0.942**	0.32**	0.28**	0.210
Mauritius	2.71	22.17	12.23	167**	0.882**	0.32**	0.33**	0.260
Morocco	0.82	20.25	4.06	22**	0.363**	0.25**	0.32**	0.131
Nigeria	2.67	31.12	8.57	69.3**	0.929**	0.21**	0.32**	0.171
South Africa	2.35	29.5	7.96	36.24**	0.951**	0.65**	0.99**	0.241
Tunisia	0.83	17.58	4.71	5.5*	0.952**	0.06	0.23**	0.161
Zambia	3.15	31.83	9.9	14.5**	0.970**	0.13	0.18**	0.151

Notes: *, ** and *** are respectively significance at the 10%, 5% and 1% level. The sample covers the period March 1997 to January 2015. All the returns are expressed in US dollars and in monthly frequency. Means and standard deviations are annualised by multiplying them by 12 and $\sqrt{12}$ respectively and expressed in percentages. AVGCCOR for each country is the average of the absolute correlations of that country with the remainder of the countries excluding its correlation with itself, the world and African market factors. AVGCCOR for the world and African markets is the average of their absolute correlations with each country excepting the correlations amongst them and that of each index with itself.

This corroborates the evidence by prior studies such as Kenny and Moss (1998), Alagidede (2010), Ntim et al. (2011) and Agyei-Ampomah (2011). The monthly reward per unit of variability is highest for Botswana (26%) and lowest for Ghana (-2%). The reward per variability shows that four markets (Botswana, Ivory Coast, Kenya, and Mauritius) outperformed the world and the African market factor, whilst, Nigeria, South Africa and Zambia outperformed the world market factor. The Sharpe ratio points to a potential diversification gain by diversifying across the African markets. The Shapiro-Wilkand Jarque-Bera tests both indicate that the excess returns are non-normally distributed. This corroborates Piesse and Hearn (2005) and Alagidede (2009) evidence.

Panel B (Table 2) infers that the ASMs are less correlated amongst themselves and with the world market. The Table shows that the average absolute correlation (AVGCCOR) is lowest for Ghana (0.055) and highest for Mauritius (0.260). This shows that Ghana and Mauritius respectively have the lowest and highest correlations with all of the other ASMs. Similarly, the African market factor's AVGCCOR of 0.336 is an indication that the ASMs are least correlated with each other. The low correlations amongst the ASMs indicate regionally segmented markets. Additionally, the AVGCCOR of 0.292 for the world market factor shows that the correlation between the ASMs and the world market factor is low. This appears consistent with the evidence by Alagidede (2009) and Agyei-Ampomah (2011) that there exists minimal interdependence amongst the ASMs and with the world. As noted by Ragunathan et al. (1999) and Pukthuanthong and Roll (2009), correlations are not sufficient in making inference about market integration. Nonetheless, correlations provide useful insights on the interdependence amongst financial markets.

The correlation of 0.99 between the South African factor and the African factor indicates the dominance of the South African market on the ASMs; this is consistent with the evidence in Panel A, and prior studies such as Kodongo and Ojah (2011), Sugimoto et al. (2014) and Boamah et al. (2016). The South African factor shows the highest correlation of 0.65 with the world market factor. The evidence in Panel B shows that the correlation between the returns to the African and the world market factors may be largely driven by the South African market. The South African market appears to respond more to the global factor compared to the other ASMs. This suggests that the South African market may be the most globally interdependent African market. This may be that the South African market is the most opened and liquid market, has the most developed market infrastructure, and provides global investors a wider

range of opportunities amongst the ASMs. The low correlations observed in this paper corroborate the findings by Collins and Biekpe (2003) and Kodongo and Ojah (2011) for the ASMs and Li et al. (2003) for emerging market. The low correlations offer diversification benefits across the sampled markets.

6. Empirical results

6.1 The loadings of the African markets on the world and African market factors

We present the sensitivities of the country index returns to the world and African market factors estimated from Equation (1c) using the full sample in Table 3. The Table indicates that the loadings on the world market factor are positive and statistically significant for all of the markets, excluding Ghana where it is positive and statistically insignificant. Similarly, the African factor sensitivities are positive for all of the markets. The African market betas are however, insignificant for Ghana, Kenya, Mauritius, and Zambia. The evidence shows that the African markets move in tandem with both the world and the regional factor, however, the world market factor appears more important than the regional factor. Whilst only one of the loadings on the world market factor is statistically insignificant, 4 of the African market loadings are statistically indistinguishable. Consistent with earlier studies such as Kodongo and Ojah (2011) and Boamah (2015a), the world market factor betas are generally higher than that of the African market factor betas.

The monthly difference of the absolute loadings (DIF β) ranges from -0.78% (Ghana) to 58.85% (Kenya). The difference between the average absolute world and African market factor betas of 20.72% on monthly basis is economically significant. The magnitude of the average absolute response differential has important economic implications. It suggests that the world market factor is more important than the African factor on the ASMs. The finding additionally, shows that information transmission from the world market to the ASMs may be faster than that from the regional market. The ASMs are thus more vulnerable to crisis emanating from the developed markets compared to regional level crisis. Also, the diversification benefits from diversifying across the ASMs may be higher than that of global portfolios that incorporated African assets. The evidence has relevance for regional policies aimed at integrating African economies, and the economic policies of the African countries and the various sub-regional economic blocks. This is in agreement with Piesse and Hearn (2005), Alagidede (2010), and Ntim (2012).

TABLE 3: COUNTRY LOADINGS ON THE WORLD AND AFRICAN MARKET FACTORS

Country	α	β_w	β_a	R^2	*DW*	*DIFβ*
Botswana	0.0102***	0.3449***	0.2951***	0.2028	1.86	0.0498
Ivory Coast	0.0123***	0.4091***	0.2058***	0.1035	2.04	0.2033
Egypt	0.0073	0.8964***	0.5013***	0.2664	1.81	0.3951
Ghana	-0.0021	0.0513	0.0591	0.00250	1.79	-0.0078
Kenya	0.0081	0.6182***	0.0297	0.1444	1.83	0.5885
Mauritius	0.0057	0.5135***	0.0902	0.1538	1.89	0.4233
Morocco	-0.0064	0.3316***	0.2306*	0.0277	1.86	0.1010
Nigeria	0.0081	0.4901***	0.2881***	0.1024	1.78	0.2020
South Africa	0.0021***	1.1872***	1.1115***	0.9825	1.83	0.0757
Tunisia	0.0005	0.1257*	0.1981***	0.0575	1.93	-0.0724
Zambia	0.0080	0.3955***	0.0744	0.0455	1.91	0.3211

Notes: The Table presents the country factor sensitivities on the world and emerging market factors over the March 1997 to January 2015 period. $R_t^j = \alpha_1 + \beta_w^j R_t^w + \beta_a^j \omega_t^a + \varepsilon_t^j a = intercept,\ R^w = world\ market\ factor,$ $\omega^a = african\ market\ factor\ that\ is\ orthogonal\ to\ R^w$. * Significant at the 5% level, ** Significant at the 10% level. DIFβ is the difference between the absolute sensitivities on the world and emerging market factors.

The seeming dominance of the African market factor by the world market one may be the consequence of minimal economic activity between African countries in relation to their economic interactions with the rest of the world. Studies such as Freiman (1998), Griffin and Karolyi (1998), L'Her et al. (2002), and Campa and Fernandes (2006) point out the relevance of economic integration to financial market integration. It could, also, be due to illiquidity on the ASMs (see e.g. Alagidede and Panagiotidis, 2009; Hearn, 2014; Boamah, 2015b); as observed by Garcia-Herrero et al. (2009), illiquidity constrains cross-border investment flow and subsequently financial market integration.

The factor sensitivities show that the world and African market factors are pertinent on most of the ASMS, although, the generally low R^2 is indicative of significant country influence in the equity returns of the ASMs. Country specific factors appear to dominate global and regional factors on average on the ASMs.

6.2 The relative global and regional level of integration through-time

Figure 1 plots the results of the time-varying regional and world market integration estimates from Equation (1). Figure 1 shows that both the world and regional integration of the ASMs have increased through time. This is

consistent with Agyei-Ampomah (2011), Bekaert et al. (2011), Chambet and Gibson (2008) and Wang et al. (2003) time-varying African markets integration evidence. The Figure indicates that for the period predating January 2009, the regional and global integration of Zambia, Tunisia, Kenya, Mauritius and Ivory Coast were generally low. Additionally, Botswana, South Africa and Nigeria show a higher level of regional integration prior to January 2009; their degree of regional integration dominates the world market integration over this period. This corroborates the evidence by Alagidede (2009) and Hatemi-J and Morgan (2007) that some African markets remained largely segmented despite their liberalization efforts starting largely in the 1990s.

The Figure indicates that the world market integration of Botswana, South Africa, Nigeria, Zambia, Tunisia, Kenya, Mauritius and Ivory Coast, however, increased post-January 2009 reflecting the effect of the GFC.

FIGURE 1: REGIONAL AND GLOBAL INTEGRATION OF THE AFRICAN STOCK MARKETS

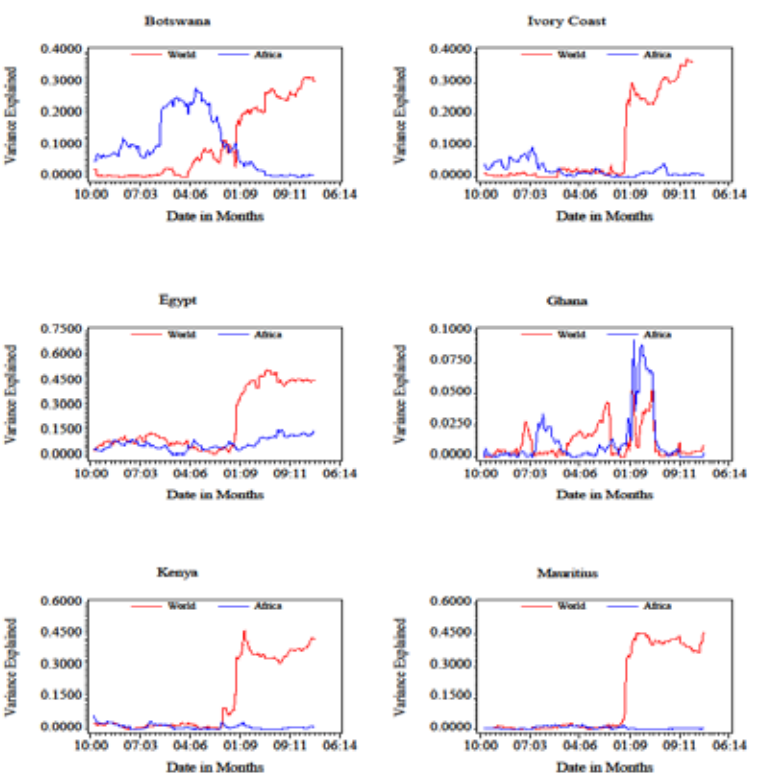
$$R_t^a = a_a + b_a R_t^w + \omega_t^a \quad (1a) \qquad R_t^j = \alpha_0 + \beta_w^j R_t^w + \varepsilon_t^j \quad (1b) \qquad R_t^j = \alpha_1 + \beta_w^j R_t^w + \beta_a^j \omega_t^a + \varepsilon_t^j \quad (1c)$$

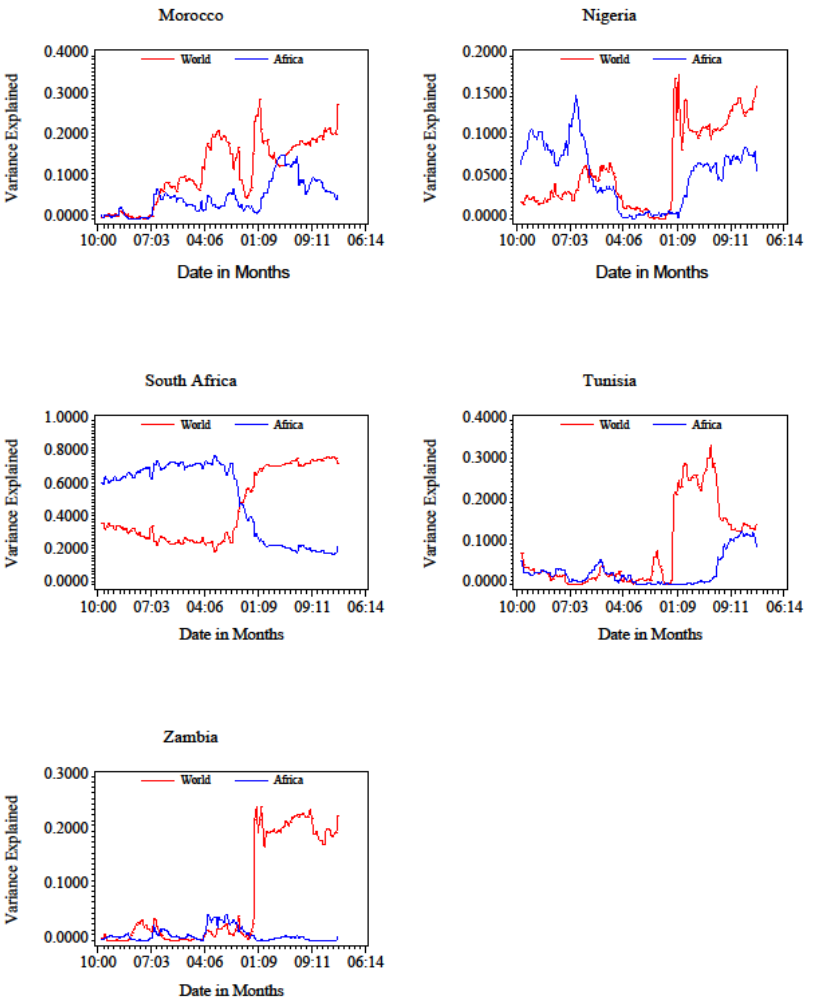
$$a = intercept, R^w = world\ market\ factor, \quad R^a = african\ market\ factor,$$

$$\omega^a = african\ market\ factor\ that\ is\ orthogonal\ to\ R^w,$$

$$R^2_{wa,j} = R^2\ from\ Equation\ (1c), R^2_{w,j} = R^2\ from\ Equation\ (1b) - proxy\ for\ world\ market\ integration\ of\ country\ j,$$

$$R^2_{a,i} = R^2_{wa,i} - R^2_{w,i} - proxy\ for\ regional\ market\ integration\ of\ country\ j.$$





Additionally, the world market integration of Morocco is higher compared with its regional level of integration over the sample duration, whereas, Ghana exhibits no clearly discernible pattern in both the world and regional degree of integration. The findings show that the GFC influenced the world market integration of the ASMs, although, the impact was delayed for 2 to 5 months. This finding may be driven by the generally low degree of integration of the ASMs prior to the GFC. The world market integration of all of the ASMs increased significantly around the crisis period and exceeds the degree of regional integration post-crisis. This appears inconsistent with Kamin (1999) and Agyei-Ampomah (2011).

6.3 Structural breaks in the rate of change of the relative global and regional integration measures

Table 4 presents the results of testing for structural breaks in the rate of change of the global and regional degree of integration measures. Panels A and B of the Table respectively presents the results of the structural break test for the regional and global degree of integration. Panel A indicates significant structural shifts in the degree of world market integration on October 2008 for Botswana, Ivory Coast, Egypt, Mauritius, Nigeria, Tunisia and Zambia, and September 2008 for Kenya. These periods coincide with the GFC. The evidence indicates that the GFC impacted on the degree of world market integration of these ASMs. This is consistent with the findings in Figure 1, where there exists sharp rise in the degree of world market integration around the crisis period for these countries. This finding is consistent with earlier emerging market studies such as Bai and Green (2010) and Bai et al. (2012).

Panel A (Table 4) further shows that Ghana, Morocco, and South Africa exhibit significant structural breaks in their degrees of world market integration correspondingly in May 2010, September 2007, and December, 2007. The break in South Africa and Morocco coincides with the 2007 global oil shock that preceded the GFC. The oil shock appears to have had significant impact on the degree of world market integration of South Africa and Morocco than the succeeding GFC. It seems that the GFC did not have significant impact on the world market integration of the Ghanaian market. The Ghanaian market seems to have a minimal response to global events relative to other ASMs. The Ghanaian market may thus be the most globally segmented ASM. Similarly, studies such as Pukthuanthong and Roll (2009), Berger et al. (2011) and Berkaert et al. (2011) find the Ghanaian market to be among the most segmented ASMs. This is not surprising given that the Ghanaian market has been found to be inefficient (see e.g., Appiah-Kusi and Menyah, 2003; Ntim et al., 2007).

TABLE 4: STRUCTURAL BREAK IN THE RATE OF CHANGE OF INTEGRATION

Countries	Breakdates	
	Panel A: World Market Integration	Panel B: Regional Market Integration
Botswana	31/10/2008***	31/12/2007***
Ivory Coast	31/10/2008***	31/12/2007***
Egypt	31/10/2008***	30/11/2006***
Ghana	31/05/2010***	31/05/2010***
Kenya	30/09/2008***	30/11/2006***
Mauritius	31/10/2008***	31/07/2006***
Morocco	28/09/2007***	30/04/2003***
Nigeria	31/10/2008***	31/07/2009***
South Africa	31/12/2007***	31/12/2007***
Tunisia	31/10/2008***	29/01/2010***
Zambia	31/10/2008***	30/09/2008***

Notes: *** indicates1% level of significance. Structural break test is conducted for each possible breakdate (ι) using least squares. The breakdate is the date that minimises the residual variance. Critical values are based on 5000 bootstrap replications. We test for a break in the global industry factor, intercept and global industry factor and intercept only respectively in Equations a1, a2 and a3. A sequential approach is used to test for multiple breakdates. The world market portfolio is the proxy for the global industry exposure. $R^2_{j,t} = \alpha_0 + \beta^j t + \varepsilon^j_t$(a) $R^2_{j,t} = \alpha_0 + \rho_t \beta^j t + \varepsilon^j_t$ (b) $0.20n \leq \tau \leq 0.80n$,$t = time\ trend$;

$\beta^j = rate\ of\ change\ of\ integration\ for\ country\ j$; $\tau = potential\ breakdate$,

$\alpha = the\ level\ of\ segmentation\ for\ country\ j$; $n = number\ of\ observation$,

$\rho = takes\ a\ value\ of\ 1\ pre\ break\ date\ and\ 0\ otherwise$; $R^2_{j,t} = regional\ or\ world\ market\ integration\ measure$.

Panel B (Table 4) shows significant structural shifts in the degree of regional integration in December 2007 for Botswana, South Africa and Ivory Coast; November 2006 for Egypt and Kenya; July 2006 for Mauritius; April 2003 and August 2005 respectively for Morocco and Ghana; October and September 2008 for Nigeria and Zambia correspondingly; and January 2010 for Tunisia. The evidence infers that the 2007 global oil shocks had significant influence on the degree of regional integration of South Africa, Botswana, and Ivory Coast, whereas, the GFC affected the degree of regional integration of Nigeria and Zambia. Table 3 indicates that Nigeria, Zambia and South Africa are the only ASMs that exhibit significant structural shift in both of their degrees of regional and world market integration around the same date. The Table further infers that

structural shifts in the regional degree of integration predates that of the degree of world market integration for Botswana, Ivory Coast, Egypt, Kenya, Mauritius and Morocco, though, structural shifts in the regional integration postdate that of world market integration for Zambia and Tunisia. The evidence is in tandem with Guesmi and Nguyen (2011) emerging market evidence.

The evidence in Table 4 indicates that regional integration may not necessarily precede global integration, and global integration does not preclude regional segmentation. That is, countries in a geographic region may be regionally segmented but individually integrated globally. This is consistent with the evidence that the extent of economic engagement amongst countries (De Santis and Gerard, 1997; Obstfeld and Rogoff, 2001; Bekaert et al., 2011; Eiling et al., 2012) and market liquidity (Garcia-Herrero et al., 2009) would influence their degrees of market integration. Consistent with Alagidede (2010), this paper's findings infer that geographic proximity may have minimal impact on financial market integration unless there is the existence of significant economic activities between countries in the geographic region and relatively liquid regional markets. Therefore, depending on the level of economic engagement amongst countries in a geographic region and with the rest of the world and the liquidity of the regional markets, regional diversification gains may be higher than global diversification benefits and vice versa.

6.4 The rate of change of the relative degree of global and regional integration measures through-time

This section explores the trajectory of the rate of change of the regional and global degrees of integration using Equation (4). The level and rate of change of the degree of integration may be time-varying as observed by Bekaert and Harvey (1995). Equation (4) enables us to track the evolution of and the effects of the crisis on the level and rate of change of the degree of regional and global integration of the ASMs. Equation (4) is estimated relying on the past 24 months of the integration measures in an overlapping one month moving regression. The procedure yields time series estimates of the level and rate of change of the degree of integration. A higher value of β would infer a higher rate of change of integration, and a higher value of α is an indication of a lower level of integration. By construction, β and α are negatively correlated. That is, as the rate of change of integration increase, the level of segmentation falls.

$$R_{j,t}^2 = \alpha^j + \beta^j t + \varepsilon_t^j \tag{4}$$

The results from the estimation of Equation (4) are presented in Figure 2. We plot only the rate of change of integration (β) given that a rising β signifies a declining level of segmentation (α). The vertical lines represent the structural breakdates observed in Table 3. The red and blue lines are respectively the global and regional breakdates. In countries where the regional and global breakdates correspond, the breakdates are shown by only the red line. Figure 2 shows that the rate of change of both regional and global degrees of integration has changed overtime for most of the ASMs. The rate of change in the degree of world market integration increased significantly around the period of the GFC for all of the ASMs excluding Morocco and Ghana. The rate of change of the degree of world market integration increased for Ghana though insignificantly, but significantly decreased for Morocco during the GFC period. The beginning of the shift in the rate of change of global degree of integration largely corresponds to the detected structural breakdates. The evidence indicates that the detected breakdates marked a significant shift in the degree of global integration of the ASMs which is consistent with Bekaert and Harvey (1995).

The increase in the rate of change of the degree of global integration from the beginning to the peak point occurred over an average duration of 18.45 months; the decline of the rate of change of the degree of integration from the peak point to or around the pre-crisis point lasted for 20.45 months; whereas, the average period from the beginning of the shift in the rate of change of global integration to the pre-crisis or around the pre-crisis post-summit point is 37.9 months. The evidence indicates a reversion in the rate of change of integration, although, it appears to be increasing in the recent period. Figures 1 and 2 together infer that the rise in the degree of world market integration following the GFC appears to be a permanent shift. The rate of change of the degree of integration may have fallen to or even below the pre-crisis level; however, the degree of integration remains higher above the pre-crisis point for all of the ASMs. This is consistent with ShabriAbd Majid et al. (2009) Asian market evidence.

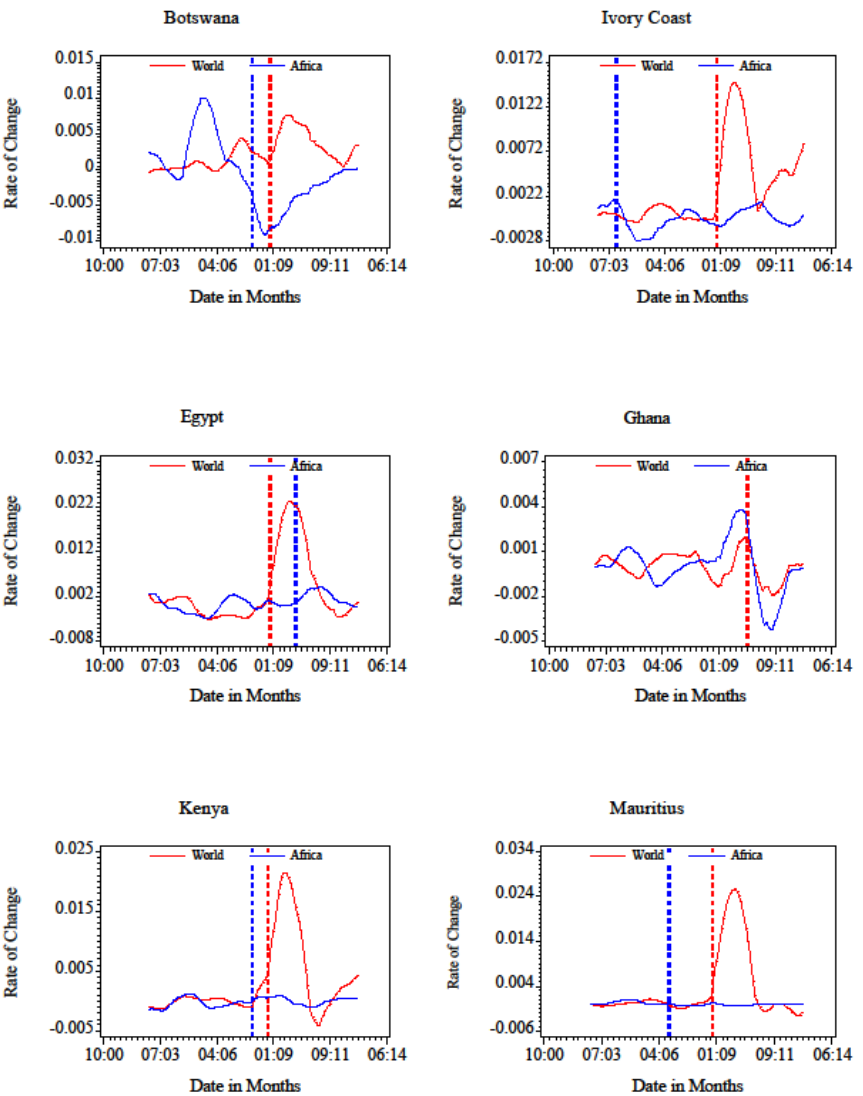
Figure 2 further indicates significant decline in the rate of change of the degree of regional integration for Botswana and South Africa during the period of the GFC. The rate of change of the degree of integration of the remainder of the ASMs remained relatively flat during the GFC era. The evidence shows that whilst the GFC had significant influence in the degree of global integration of the ASMs, its impact on their degrees of regional integration was minimal excepting Botswana and South Africa. For Botswana and South Africa, the evidence shows that the surge in their degrees of world market integration led to a corresponding

decline in their degrees of regional integration. This corroborates earlier findings that the African markets and economies are less regionally integrated (see e.g., Alagidede, 2010; Alagidede, et al., 2011; Sugimoto et al., 2014; Boamah 2015a)

Figures 1 and 2 infers that the ASMs although largely appears to be regionally more segmented, they nevertheless shows relatively high level of global integration which has largely been driven by the GFC.

FIGURE 2: THE RATE OF CHANGE OF REGIONAL AND GLOBAL INTEGRATION OF THE ASMS

The figure presents a graph of the rate of change of the relative importance of global sectors in their corresponding African sector portfolios. The rate of change was estimated in an overlapping one-month moving window with each window consists of the past 24 month's global sector effects observation. $R^2_{j,t} = \alpha^j + \beta^j t + \varepsilon^j_t$, $R^2_j =$ *the degree of regional or global integration,* t *= time trend,* β^j *= rate of change of the relative importance of global industry effect for sector* j*,* α_j *= the level of the segmentation of African sector* j *from the global sector* j*.*



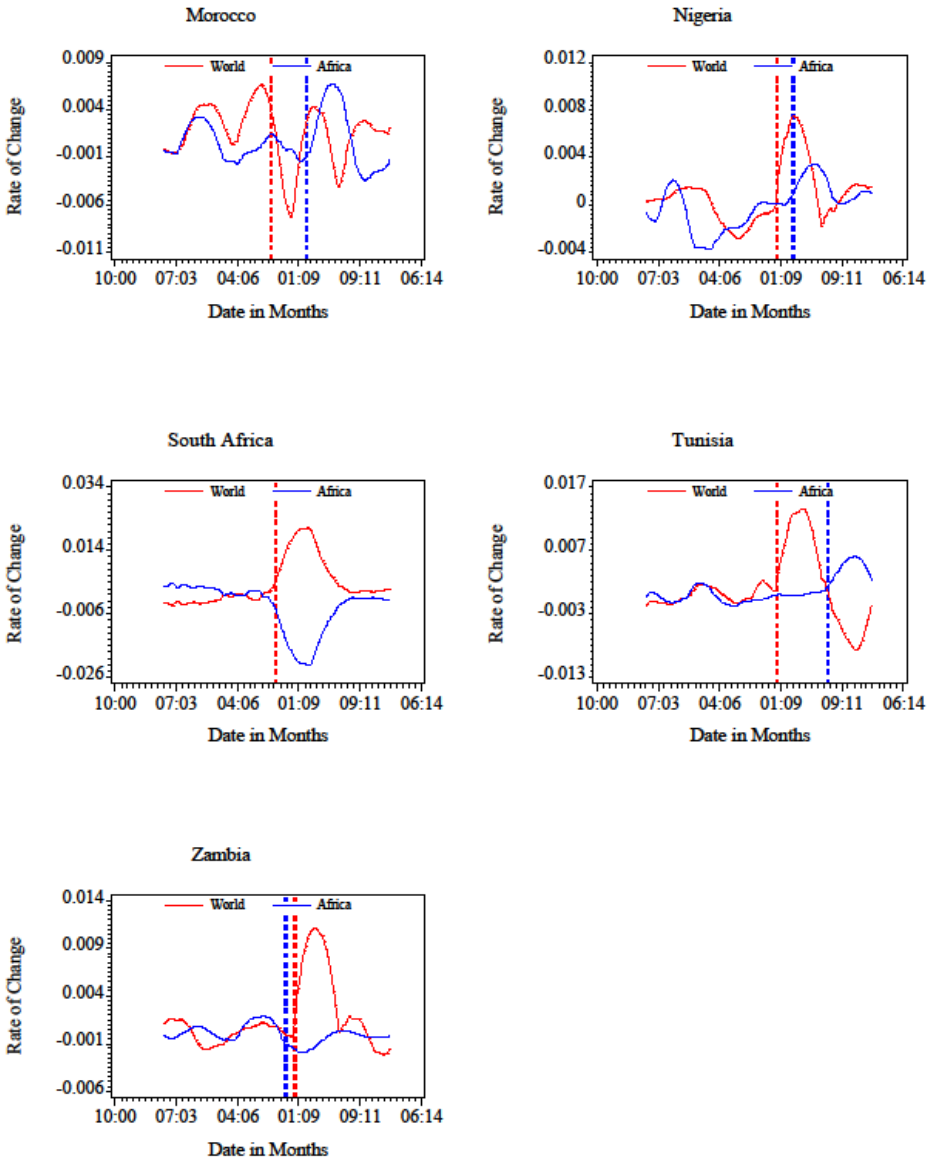


Figure 2 indicates further that the increase in the rate of change of the degree of global integration of the ASMs has declined post crisis; the shifts lasted for approximately 36 months. Taken figures 1 and 2 together, the evidence suggests that the GFC seems to have caused a permanent structural shift in the degree of world market integration of the ASMs.

6.5 The dynamics of the level and rate of change of the relative global and regional integration measures around the structural breaks date

Figure 1 portrays time-varying regional and world market integration, whilst, Table 4 shows significant structural shifts in the degree of regional and world market integration of the ASMs. An important question that follows is, did the observed structural shifts signify an increase or a decrease in the degree of regional and global integration of the ASMs? These issues are explored by relying on Equation (5). Equation (5) is estimated for each determined breakdate in the regional or global degree of integration. We then examine the dynamics of the rate of change of integration (β)around each breakdate to determine whether the observed breakdate signified an increase or a decrease in the degree of integration.

$$R_{j,t}^2 = \alpha^j + \beta^j t + \kappa\beta_1^j t + \varepsilon_t^j \quad (5)$$

κ = *takes a value of* 0 *pre-determined breakdate and* 1 *otherwise.*

The results from the estimation of Equation (5) are presented in Table 5. Panel A (Table 5) shows statistically significant positive shift in the rate of change of the degree of global integration for all of the countries excluding Ghana and Morocco, where the movements in the rate of change of the degree of world market integration around the observed structural shift is negative. The evidence shows that aside Ghana and Morocco, the structural breaks were associated with a rise in the degree of world market integration. The breaks in Morocco and Ghana, however, coincide with a decline in their global market integration. The findings are consistent with the observation by Bekaert et al. (2002) and Berger et al. (2011) that the shift in integration coincides with structural breaks. The findings are also consistent with the observation by Bekaert and Harvey (1995) that the change from segmentation to integration would correspond with significant structural shift. The increase in the rate of integration is from 0.09% (Nigeria) to 0.43% (South Africa). The evidence further consolidates South Africa as the most responsive ASM to global innovations.

TABLE 5: DYNAMICS OF THE RATE OF CHANGE OF INTEGRATION AROUND THE STRUCTURAL BREAKS

	Panel A: World Market Integration				Panel B: Regional Market Integration			
	Date	α	β	β_1	Date	α	β	β_1
Botswana	31/10/2008	-0.0187***	0.0010***	0.0012***	31/12/2007	0.0540***	0.0024***	-0.0026***
Egypt	31/10/2008	0.1125***	-0.0007***	0.0035***	30/11/2006	0.0490***	0.0002	0.0003**
Ghana	31/05/2010	-0.0011	0.0002***	-0.0002***	31/08/2005	0.0024	0.0002	-0.0001
Ivory Coast	31/10/2008	-0.0025	0.0003***	0.0024***	31/12/2007	0.0532***	-0.0005***	0.0002***
Kenya	30/09/2008	0.0172**	0.0001	0.0027***	30/11/2006	0.0268***	-0.0003***	0.0002***
Morocco	28/09/2007	-0.0347***	0.0027***	-0.0009***	30/04/2003	0.0090	-0.0002	0.0008*
Mauritius	31/10/2008	0.0164**	-0.0001	0.0033***	31/07/2006	0.0010	0.0002***	-0.0002***
Nigeria	31/10/2008	0.0404***	-0.0003***	0.0009***	31/10/2008	0.1081***	-0.0012***	0.0008***
S. Africa	31/12/2007	0.3381***	-0.0011***	0.0043***	31/12/2007	0.6593***	0.0010***	-0.0045***
Tunisia	31/10/2008	0.0469***	-0.0004**	0.0017***	29/01/2010	0.0328***	-0.0003***	0.0006***
Zambia	31/10/2008	0.0146***	0.0000	0.0016***	30/09/2008	0.0006	0.0003***	-0.0003***

Notes: ***, **, and * are respectively the 1%, 5% and 10% levels of significance. The table presents the dynamics of the rate of change of the degree of global and regional integration around the detected structural breakdates. . $R^2_{j,t} = \alpha^j + \beta^j t + \kappa\beta^j_1 t + \varepsilon^j_t$, $\boldsymbol{\kappa}$ = *takes a value of* 0 *pre-determined breakdate and* 1 *otherwise.*

Table 5 (Panel A) further infers that prior to the breakdate the rate of change of the degree of world market integration was negative and statistically significant for Egypt, Nigeria, Tunisia and South Africa; positive and statistically significant for Botswana, Ivory Coast, Ghana and Morocco; and statistically insignificant for Mauritius and Zambia. The evidence thus indicates that prior to the structural breakpoint the degree of world market integration was constant for Zambia and Mauritius; decreasing for countries such as South Africa; and increasing for others such as Botswana.

Panel B (Table 5) shows statistically significant increase in the degree of regional integration for Botswana, South Africa, Mauritius, and Zambia; statistically significant decrease in the degree of regional integration for Ivory Coast, Kenya, Nigeria and Tunisia; and a constant degree of regional integration for Egypt, Ghana and Morocco before the observed breakdates. Post-breakdate, Panel B (Table 5) indicates statistically significant surge in the degree of regional market integration for Ivory Coast, Egypt, Kenya, Morocco and Tunisia; insignificant change in the degree of regional integration for Ghana; and a significant decrease in the degree of regional level of integration for Botswana, Mauritius, South Africa and Zambia. The evidence in Table 5 is that whether regional or global, the detected structural breaks coincide with a shift in the degree of integration.

Table 5 shows that, the level of regional segmentation is higher than that of global segmentation for all of the ASMs except Mauritius, Zambia and Tunisia. The evidence suggests that the degree of global integration of the ASMs appears higher than their degrees of regional integration. This may be explained by the degree of economic engagement amongst the ASMs relative to their level of economic activities with other emerging and the developed markets. This is consistent with the observation by Boamah (2015a) that the impact of the GFC on the ASMs was delayed and largely through the real sector, and also, asset pricing on the ASMs is not conducted in a regionally integrated manner.

7. Conclusion

We examine the degree of global and regional integration of the ASMs using the R^2 from a regression of country index returns on the world market factor and the incremental R^2 from a two factor world and an African factor that is orthogonal to the world factor as the global and regional integration proxies respectively. The setting enables us to examine regional integration of the ASMs after isolating the effect of global factors. That is, the estimated regional integration surrogate

reflects pure regional factor effects. In addition, the sample duration enables us to test for the impact of the GFC on the degree of the ASMs regional and global integration.

The study shows that the degree of integration of the ASMs is time-varying, and that global integration exceeds that of regional integration for all of the ASMs in the recent period. The findings indicate that the GFC had significant influence on the global integration of the ASMs but not on their regional degree of integration. We observe significant structural shifts in both the regional and global integration of the ASMs; some of the shifts coincide with declining segmentation whilst others are associated with rising segmentation of the ASMs. The breaks in the global integration generally correspond with the GFC period. In addition, the rate of change of the degree of integration appears to be mean reverting, in that it has reversed to or around the pre-crisis level after an average period of 24 months though it appears to be increasing in the recent era for most of the ASMs. The shift in the degree of integration however, remains above the pre-crisis level. The findings infer that the GFC appears to have had a significant permanent shift on the ASMs degree of integration with the world market. Also, global factors appear more important in describing equity returns on the ASMs, in that the ASMs are largely regionally less integrated. Regional level diversification gains thus seem significant on the ASMs.

The findings have implications for policy makers, regulators and investors. The increasing global integration of the ASMs infers that the markets are more vulnerable to external crisis particularly from the developed markets. Regulators should thus focus on both the local and global environments in the pursuit of their mandate. Additionally, a low level of financial integration will not safeguard the ASMs fully from the impact of crisis emanating from overseas markets. Policy should therefore aim at financial stability and the facilitation of the integration process so as to reap the full benefit of financial globalization. Policy makers need to pursue transparent and prudent domestic macro-economic policies as they impact on foreign investors' evaluation and the sustainability of foreign capital inflow to the ASMs and in addition, the competitiveness of domestic funding sources. Domestic policies such as growth, current account and budget all have relevance for foreign capital inflows to the ASMs. Additionally, policies aimed at integrating the ASMs may have to focus on enhancing the degree of economic interaction amongst African countries, and also, improve liquidity on the African markets.

The evidence indicates that although the degree of world market integration of the ASMs has increased, there exists a substantial local market effects in the equity returns of the ASMs. Global investors may realise significant diversification benefits with the inclusion of African assets in global portfolios, however, with the low level of regional integration relative to world market integration, portfolio managers may realise higher diversification gains by investing across the ASMs. The findings further suggest that cost of capital estimation on the ASMs may have to focus on country specific and global factors but not on a regional factor.

As more data become available, future research could focus on exploring whether the increase in the degree of world market integration of the ASMs is permanent, and also, the nexus between integration and informational efficiency and market liquidity. This is important for both policy makers and portfolio managers seeking diversification benefits. Investigating the gain from geographic versus industry diversification would be worthwhile future research endeavour. It is essential for future research to explore the drivers of the low level of regional integration, this is important for interventions aimed at harmonizing the operations of the ASMs.

Biographical Notes

Nicholas Addai Boamah is a lecturer in the Department of Real Estate and Land Management of the University for Development Studies, Ghana. Nicholas holds a PhD in Applied Finance from the Macquarie University, Sydney, Australia. He holds an MPhil in Real Estate Finance (Cambridge University, UK), MSc. in Finance (Liverpool University, UK) and BSc. (Hons) in Land Economy (KNUST, Ghana). His research focus is on financial markets integration, asset pricing, housing finance markets, and land markets.

References

Agyei-Ampomah, S. (2011). 'Stock market integration in Africa', *Managerial Finance*, *37*(3), 242–256.

Alagidede, P. (2009). 'Are African stock markets integrated with the rest of the world?'*African Finance Journal*, *11*(1), 37–53.

Alagidede, P. (2010). 'Equity market integration in Africa', *African Review of Economics and Finance*, *1*(2), 88–119.

Alagidede, P., &Panagiotidis, T. (2009).'Calendar Anomalies in the Ghana Stock Exchange', *Journal of Emerging Market Finance*, *8*(1), 1–23.

Alagidede, P., Panagiotidis, T., & Zhang, X. (2011). 'Why a diversified portfolio should include African assets', *Applied Economics Letters*, *18*(14), 1333–1340.

Andrews, D. W. (1993). 'Tests for parameter instability and structural change with unknown change point', *Econometrica: Journal of the Econometric Society*, 61(4), 821–856.

Asamoah, N. G.&Quartey-Papafio, A. (2011). 'Beta risk estimation of companies listed on the Ghana stock exchange'. *The Journal of Risk Finance*,*12*(3), 195-207.

Assenso-Okofo, O., Ali, M. J., & Ahmed, K. (2011).'The development of accounting and reporting in Ghana'. *The International Journal of Accounting*,*46*(4), 459-480.

Bai, Y., & Green, C. J. (2010). 'International diversification strategies: Revisited from the risk perspective', *Journal of Banking & Finance*, *34*(1), 236–245.

Bai, Y., Green, C. J., & Leger, L. (2012). 'Industry and country factors in emerging market returns: Did the Asian crisis make a difference?'. *Emerging Markets Review*, *13*(4), 559-580.

Bekaert, G., Harvey, C. R., &Lumsdaine, R. L. (2002).'Dating the integration of world equity markets', *Journal of Financial Economics*, *65*(2), 203–247.

Bekaert, G., Harvey, C. R., &Lundblad, C. (2007). 'Liquidity and expected returns: Lessons from emerging markets'. *Review of Financial Studies*, *20*(6), 1783-1831.

Bekaert, G., Harvey, C. R., Lundblad, C. T., & Siegel, S. (2011). 'What segments equity markets?', *Review of Financial Studies, 24*(12), 3841–3890.

Berger, D., Pukthuanthong, K., & Yang, J. (2011). 'International diversification with frontier markets', *Journal of Financial Economics, 101*(1), 227–242.

Boamah, N. A. (2015a). 'Financial market integration; implications for asset pricing and Diversification Gains on the emerging African stock markets (ASMs)'.PhD Thesis, Macquarie University, Sydney, Australia.

Boamah, N. A. (2015b). 'Robustness of the Carhart four-factor and the Fama-French three-factor models on the South African stock market'. *Review of Accounting and Finance*, *14*(4), 413-430.

Boamah, N. A., Watts, E. J., & Loudon, G. (2016). 'Investigating temporal variation in global and regional integration of African stock markets'. *Journal of Multinational Financial Management*.

Brooks, R., & Del Negro, M. (2004). 'The rise in comovement across national stock markets: market integration or IT bubble?' *Journal of Empirical Finance*, *11*(5), 659–680.

Brooks, R., & Del Negro, M. (2005). 'Country versus region effects in international stock returns', *Journal of Portfolio Management, 31*(4), 67–72.

Bruner, R. F., Li, W., Kritzman, M., Myrgren, S., & Page, S. (2008). 'Market integration in developed and emerging markets: Evidence from the CAPM', *Emerging Markets Review, 9*(2), 89-103.

Campa, J. M., &Fernandes, N. (2006). 'Sources of gains from international portfolio diversification', *Journal of Empirical Finance*, *13*(4), 417–443.

Carrieri, F., Errunza, V., & Hogan, K. (2007). 'Characterizing world market integration through time'. *Journal of Financial and Quantitative Analysis*, 42(4), 915-940.

Choi, J. J., &Rajan, M. (1997). 'A joint test of market segmentation and exchange risk factor in international capital markets', *Journal of International Business Studies*, *28(1)*, 29–49.

Drummen, M., & Zimmermann, H. (1992). 'The structure of European stock returns', *Financial Analysts Journal*, 48(4), 15–26.

Eiling, E., Gerard, B., & De Roon, F. A. (2012). 'Euro-Zone equity returns: country versus industry effects', *Review of Finance, 16*(3), 755–798.

Errunza, V., &Losq, E. (1985). 'International asset pricing under mild segmentation: Theory and test', *Journal of Finance*, *40*(1), 105–124.

Errunza, V., Losq, E., &Padmanabhan, P. (1992). 'Tests of Integration, Mild Segmentation and Segmentation Hypotheses', *Journal of Banking and Finance*, *16(5)*, 949–972.

Freimann, E. (1998). 'Economic integration and country allocation in Europe, *Financial Analysts Journal*, 54(5), 32–41.

García-Herrero, A., Wooldridge, P., & Yang, D. Y. (2009). 'Why Don't Asians Invest in Asia? The Determinants of Cross-Border Portfolio Holdings'. *Asian Economic Papers*, *8*(3), 228-246.

Griffin, J. M., & Karolyi, G. A. (1998). 'Another look at the role of the industrial structure of markets for international diversification strategies', *Journal of Financial Economics*, *50(3)*, 351–373

Guesmi, K., & Nguyen, D. K. (2011). 'How strong is the global integration of emerging market regions? An empirical assessment'. *Economic Modelling*,*28*(6), 2517-2527.

Hansen, B. E. (2000). 'Testing for structural change in conditional models', *Journal of Econometrics, 97*(1), 93–115.

Hearn, B. (2014). 'The political institutional and firm governance determinants of liquidity: Evidence from North Africa and the Arab Spring'. *Journal of International Financial Markets, Institutions and Money*, *31(2014)*, 127-158.

Hearn, B., &Piesse, J. (2013). 'A reassessment of stock market integration in SADC: the determinants of liquidity and price discovery in Namibia'. *Applied Financial Economics*, *23*(2), 123-138.

Hearn, B., Piesse, J., & Strange, R. (2010). 'Market liquidity and stock size premia in emerging financial markets: The implications for foreign investment'. *International Business Review*, *19*(5), 489-501.

Kamin, S. B. (1999). 'The current international financial crisis: how much is new?',*Journal of International Money and Finance, 18*(4), 501–514.

Kasa, K. (1992). 'Common stochastic trends in international stock markets'. *Journal of Monetary Economics*, 29(1), 95– 124.

Kenny, C. J., & Moss, T. J. (1998). 'Stock markets in Africa: emerging lions or white elephants?'. *World Development*, *26*(5), 829-843.

Koutoulas, G., &Kryzanowski, L. (1994). 'Integration or segmentation of the Canadian stock market: evidence based on the APT',*Canadian Journal of Economics*, 27(2), 329–351.

L'Her, J. F., Sy, O., &Tnani, M. Y. (2002).'Country, industry, and risk factor loadings in portfolio management', *Journal of Portfolio Management, 28*(4), 70–79.

Longin, F. M. &Solnik, B. (1995). 'Is the correlation in international equity returns constant?: 1960– 1990'. Journal of International Money and Finance, 14(1), 3– 26.

Madura, J., &Soenen, L. (1992). 'Benefits from international diversification: Across time and country perspectives'.Managerial Finance, 18(2), 1– 14.

Ng, L., Solnik, B., Wu, E., & Zhang, B. (2013). '*Characterizing global financial and economic integration using cash flow expectations'*.Working Paper.

Ntim, C. G. (2012). 'Why African stock markets should formally harmonise and integrate their operations'. *African Review of Economics and Finance*, *4*(1), 53-72.

Ntim, C.G., Opong, K.K., Danbolt, J. and Dewotor, F.S. (2011). 'Testing the Weak-Form Efficiency in African Stock Markets', *Managerial Finance*, 37(3), 195-218

Ntim, C.G., Opong, K.K., and Danbolt, J. (2007). 'An Empirical Re-Examination of the Weak Form Efficient Markets Hypothesis of the Ghana Stock Market Using Variance-Ratios Tests', *African Finance Journal*, 9(2), 1-25.

Obstfeld, M., & Rogoff, K. (2001). 'The six major puzzles in international macroeconomics: is there a common cause?'. In *NBER Macroeconomics Annual 2000, Volume 15*, 339-412.MIT press.

Piesse, J. and Hearn, B. (2005). 'Regional Integration of Equity Markets in Sub-Saharan Africa', *South African Journal of Economics*, 73(1), 36-52.

Pukthuanthong, K. & Roll, R. (2009). 'Global Market Integration: An Alternative Measure and its Applications', *Journal of Financial Economics*, 94 (2), 214–232.

Quandt, R. (1960). 'Tests of the Hypothesis that a Linear Regression Obeys Two Separate Regimes'.*Journal of the American Statistical Association*. 55 (290), 324-330.

Ratanapakorn, O. &Sharma, S. C. (2002). 'Interrelationships among regional stock indices'. *Review of Financial Economics*, 11(2), 91–108.

Schotman, P. C. &Zalewska, A. (2006). 'Non-Synchronous Trading and Testing for Market Integration in Central European Emerging Markets', *Journal of Empirical Finance*, 13(4-5), 462–494.

ShabriAbd.Majid, M., KameelMydinMeera, A., Azmi Omar, M., & Abdul Aziz, H. (2009). 'Dynamic linkages among ASEAN-5 emerging stock markets'. *International Journal of Emerging Markets*, *4*(2), 160-184.

Sugimoto, K., Matsuki, T., & Yoshida, Y. (2014). 'The global financial crisis: An analysis of the spillover effects on African stock markets'. *Emerging Markets Review*, *21*, 201-233.

Stehle, R. (1977). 'An empirical test of the alternative hypotheses of national and international pricing of risky assets', *Journal of Finance*, *32*(2), 493–502.

Wang, Z., Yang, J., &Bessler, D. A. (2003). 'Financial crisis and African stock market integration', *Applied Economics Letters*, *10*(9), 527–533.

Watson, J. (1980). 'The stationarity of inter-country correlation coefficients: A note'. *Journal of Business Financeand Accounting*, 7(2), 297–303.

Yartey, C. A. &Adjasi, C. K. (2007). 'Stock Market Development in Sub-Saharan Africa: Critical Issues and Challenges', *IMF Working Paper,*August 2007.