Nowhere Left to Hide?

Stock Market Correlation, Regional Diversification, and the Case for Investing in Africa

Todd Moss and Ross Thuotte

Abstract

Investors diversify their portfolios to boost returns and manage risk. However, the benefits of diversifying across geographic regions are reduced if markets are highly correlated. This paper examines trends over the past two decades and finds, as expected from global market integration, that regional indices have become increasingly correlated with the S&P 500 index. Sub-Saharan Africa is also part of this trend, but is a notable laggard. For instance, in 2010 the correlation with the S&P500 was 0.86 for markets in Latin America, 0.79 for Asia, and just 0.31 for sub-Saharan markets (excluding South Africa). Additionally, correlations among African markets are generally very low. While there remain barriers to exploiting this trend, Africa's integration lag may present opportunities for investors seeking regional diversification—and policymakers seeking to attract greater portfolio investment to the continent.

JEL Codes: G11, G15, F36

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Contents

1. Introduction: The Perpetual Frontier

Some 120 countries now have stock markets, up from just 49 in 1950. The rationale for doing so is multifaceted: an exchange is a tool for privatization, a mechanism for encouraging broad-based shareholding, a high-profile symbol of a country's economy, and a potential inducement to both domestic and foreign investment.

For asset managers, the proliferation of stock markets enables international diversification as one strategy to seek both higher returns and reduced overall portfolio risk. Historically, most investors have attempted to achieve international diversification by first deploying capital into other developed markets. For instance in 1980, just two percent of global inward portfolio flows went to non-OECD countries. Starting in the 1980s, investors began to expand exposure into the larger emerging market economies of Asia and Latin America. The global share of portfolio flows going to Latin America rose from less than 1% in the 1980s to 5% in recent years. The comparable figures for Asia are 3% and 10%, respectively. Frontier market – stock exchanges in the smaller and poorer regions of the world, including nearly all of sub-Saharan Africa— have received relatively less attention and less investment. Africa received only about 1% of total global portfolio flows in 2010.

At one level, this makes eminent sense. Investors might naturally look to markets that resemble their own or with which they have familiarity. However, asset allocation theory suggests the opposite: that the advantages of diversification depend on adding exposure to markets with low correlations with their home market.[1] For US investors, this means expanding into the emerging and frontier markets as a way to capture the growth and diversification benefits.

Ironically, as capital flows across borders accelerate and financial markets become more integrated—a trend partly driven precisely by investors seeking international diversification—market correlations should be expected to increase, thus undermining the benefit of diversification. This suggests that the frontier for investors should continue to migrate toward new markets. As correlations, for instance, between the US and Brazilian markets rise—and perceptions among investors of Brazil shift from exotic to mundane—new opportunities arise in other less-familiar and less-correlated markets, such as Peru or Vietnam.

This potential trend is arguably even more on the minds on international investors because of the unusual characteristics of the 2008-09 financial crisis. The reaction by investors was to withdraw from emerging markets and seek safer assets in the US and other developed markets. But as the source of the crisis in the first place and the regions that are proving the

[1] Burton Malkiel, *A Random Walk Down Wall Street* (New York: W.W. Norton and Company, 1990).

slowest to recover, the normal "flight to quality" reaction may be turning on its head: it is the emerging and frontier markets that appear not only to be growing faster, but also potentially safer investments. This effect should not be overstated, but seems likely to cause an acceleration of investor interest in new targets seeking to capture the benefits of greater international diversification. In theory, this should create an enormous new opportunity for regions such as Sub-Saharan Africa to attract a new class of investors.

But what do the data suggest? This paper examines the market performance of national stock indices against international benchmarks to determine the relative potential of sub-Saharan African exchanges as a vehicle for enhancing international diversification. The key findings of the paper are:

- **The majority of emerging markets have become increasingly correlated with US and European benchmarks over the course of the past two decades.** Over this period, Latin American and Asian markets on average exhibited strengthening correlations with the S&P 500 and other major benchmark indices.[2] For instance, correlation between Asian markets and the S&P 500 has risen from roughly zero in 1992 to 0.79 in 2010. Similarly in Latin America, regional markets' correlation with the S&P 500 rose from 0.15 in 1992 to 0.86 in 2010.

- **By contrast, the equity markets of sub-Saharan Africa (SSA) have exhibited consistently low correlation to US and European performance.[3]** SSA markets (excluding South Africa's JSE) exhibited a weak (albeit slowly strengthening) positive correlation of just 0.22 with the S&P 500 over the past five years. In 2010, this figure increased only incrementally to 0.31.

- **In non-crisis periods, all markets exhibit lower albeit still positive correlations with global benchmarks.[4]** From mid-2002 to early-2007, market capitalization-weighted correlation between all regions and the benchmark S&P index were significantly lower than those during the 2008-09 crisis. Data from other periods of major market downturn reinforce this observation.

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[2] To reduce distortions from disproportionately larger or smaller markets, all regional correlations are weighted by market size (market capitalization). Market cap weights are determined on a static basis using 2010 as the benchmark year for market capitalization data.

[3] Recent studies have also noted the low correlations between African markets and global benchmarks. For example, Alagidede (2009) provides correlations for four African markets (Egypt, Kenya, Nigeria, and South Africa) over two static periods between 1997 and 2006. This study also finds that African markets are lowly correlated with other emerging markets in Latin America and Asia. While Alagidede (2009) only uses four African markets in its sample, these indices are considered by some to represent most of the markets on the African continent. See: Youwei Li, Philip A. Hamill, and Kwaku K. Opong, "Do Benchmark African Equity Indices Exhibit the Stylized Facts?," *Global Finance Journal* 21, no. 1 (2010).

[4] François Longin and Bruno Solnik, "Extreme Correlation of International Equity Markets," *The Journal of Finance* 56, no. 2 (2001).

- **Correlations are generally low among individual African markets, highlighting the additional benefits of diversification within the African region**. However, as expected, correlations tend to increase when indexes have numerous common cross-listed companies (e.g. Kenya and Uganda).[5]

- **Several African markets exhibit particularly low correlations with regional and global markets, likely due to size and liquidity issues**. Markets like Ghana, Tanzania, and Malawi often exhibit small positive correlations to global benchmarks only with a one month lag. Even with a lag, these correlations remain low in relation to Asian or Latin American markets, yet their size and liquidity limitations likely prevent them from becoming targets for diversification.

2. Background – International Diversification & African Markets

Investors are well-aware of the benefits of multinational diversification. Diversifying across borders can increase the number of investment choices while simultaneously reducing the variance in returns to those investments.[6] For instance, as the number of equity markets in a portfolio increases, return variance of the entire portfolio (regardless of the variance of individual stocks) should decrease so long as markets exhibit low-positive or negative correlations with each other. One study predicts that an internationally diversified portfolio has only half the risk of a diversified portfolio of US stocks.[7] However the benefits to international diversification decrease significantly when international markets move in lock-step.

Despite international diversification theory, portfolios are less geographically diversified than asset allocation models would predict.[8] This might be because international portfolio diversification does not necessarily reduce risk in the short run (due to contagion and exposure to global crises), but rather only in the medium and long term.[9] Currency risk, insufficient market knowledge, and liquidity concerns in smaller markets, could also help explain the trend.

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[5] For more information on cross-listing in sub-Saharan Africa, see: Olatundun Janet Adelegan, "Can Regional Cross-Listings Accelerate Stock Market Development? Empirical Evidence from Sub-Saharan Africa," *IMF Working Paper Series* (2008).

[6] Exchange rate fluctuations can erode all benefits of international diversification. For the purposes of the theoretical explanation, we assume exchange rates to remain constant.

[7] William Goetzmann, Lingfeng Li, and Geert Rouwenhorts, "Long-Term Global Market Correlations," *The Journal of Business* 78, no. 1 (2005): 17.

[8] Thomas Flavin, Margaret Hurley, and Fabrice Rousseau, "Explaining Stock Market Correlation: A Gravity Model Approach," *The Manchester School* 70(2002): 3.

[9] Bartosz Gębka and Dobromił Serwa, "Intra- and Inter-Regional Spillovers between Emerging Capital Markets around the World," *Research in International Business and Finance* 21, no. 2 (2007): 216.

While a significant body of literature illustrates the benefits to international diversification, most studies focus on Asia, Latin America, and Eastern Europe.[10] The few studies focusing on sub-Saharan African markets deal with 1) market co-integration with global benchmarks, 2) volatility of returns, and 3) the applicability of the traditional random walk hypothesis. Nevertheless, no one has yet undertaken a detailed correlation analysis of African markets in relation to other emerging markets. This paper seeks to fill that gap. Based on our analysis, we argue that investments in sub-Saharan Africa equity markets provide a compelling alternative for investors looking to reduce systemic risk exposure and minimize the impact of market contagion.

3. Trends in Market Correlations

A. Data and Methodology

The quantitative findings of this paper are derived from the analysis of simple and rolling correlations between index percentage returns in African and non-African markets. In most cases, we have chosen the S&P 500 index as our principal benchmark in determining global correlation trends. In some analyses we used the FTSE-100 (UK) and the Nikkei (Japan) as a robustness check, but due to the high correlation of developed country markets, the choice of benchmark does not significantly alter the results. The data used in this analysis is sourced directly from Bloomberg LLP and includes both daily and monthly data for January 1990 to September 2012. Pre-1990 data is unavailable for most African and emerging market indices. We have included data from all major global indices in every region.[11] All monthly returns are calculated using US dollars, which eliminates local currency inflation and makes results more comparable. In sub-Saharan Africa, we have included data from 17 different markets, when available. Correlations based on this data are weighted by market capitalization and are presented on an annual basis. To reduce any distortionary effects of non-synchronous trading (e.g. different African markets are open for trading on different days of the week), we have based our findings on monthly correlations.[12] However, we find that analysis completed using the daily data supports the monthly findings.

B. Historical Trends

Since 1990 markets have generally moved toward the direction of higher correlations, which suggests in theory that benefits to global diversification have been declining.[13] This finding is supported by several other studies that argue that stock market integration and the

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[10] Campbell R. Harvey, "Predictable Risk and Returns in Emerging Markets," *The Review of Financial Studies* 8, no. 3 (1995).

[11] **Error! Reference source not found.** contains a complete list of all indices used in the analysis and includes the regions into which we have classified them.

[12] Monthly data is also used in: Paul Alagidede, "Are African Stock Markets Integrated with the Rest of the World?," *The African Finance Journal* 11, no. 1 (2009).

[13] Goetzmann, Li, and Rouwenhorts, "Long-Term Global Market Correlations," 2.

subsequent correlation among markets are not constant over time.[14] While the increasing trend is generally uniform across all regions, some, such as Latin American and Asia, are already much more positively correlated with US and European benchmarks than others. The results of the historical correlation analysis demonstrate a number of important characteristics of market correlation:

1) *Correlation convergence*: all markets move more in-sync over time (higher positive correlations). Table 2 shows the general trend toward increased correlation across all regions.

Table 1: Correlation Analysis of Global Indices, Benchmark S&P500

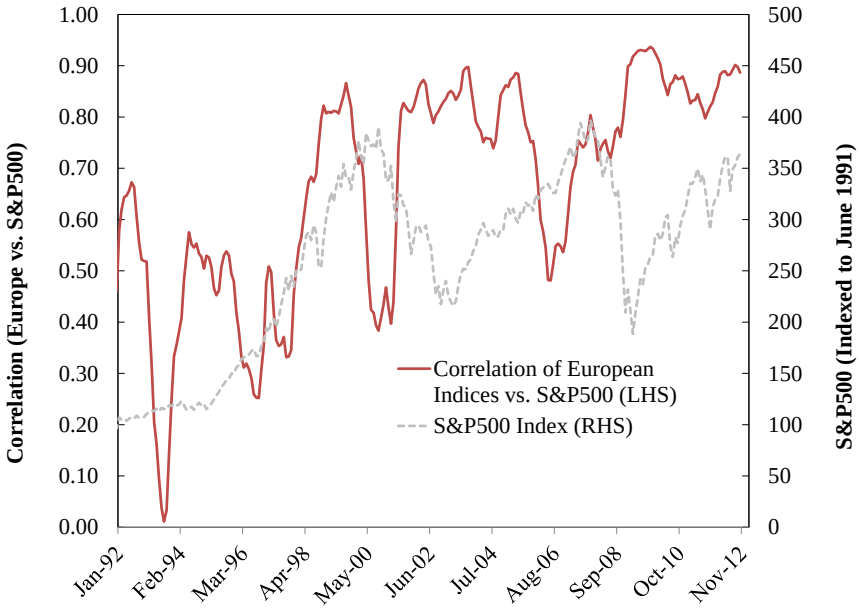
Region	1990-2000	2000-2007	2007-2009	2009-Oct 2011
North America	0.736	0.820	0.896	0.909
Europe	0.537	0.733	0.866	0.817
Latin America	-	0.681	0.784	0.823
Asia	0.293	0.489	0.726	0.708
SSA* (ZA, MUS)	-	0.343	0.702	0.749
MENA	-	0.163	0.625	0.406
SSA	-	0.098	0.430	0.360

Source: Bloomberg and authors' calculations

2) *Conditional correlation*: market correlations with developed country benchmarks tend to increase in periods of high downward volatility or crisis (2007-2009). Figure 1 illustrates the negatively correlated movements (-0.25 coefficient) of a) S&P 500 returns and b) the correlation between a market capitalization-weighted average of major European indices and the S&P 500 index.

[14] Mohamed El Hedi Arouri and Fredj Jawadi, "Stock Market Integration in Emerging Countries: Further Evidence from the Philippines and Mexico," *2nd International Financial Research Forum* (2009).

Figure 1: Correlation of Monthly Returns, Europe Average vs. S&P 500, 1990-Present



Note: 12 month rolling correlations (market capitalization-weighted), calculated using monthly returns.

Source: Bloomberg and authors' calculations

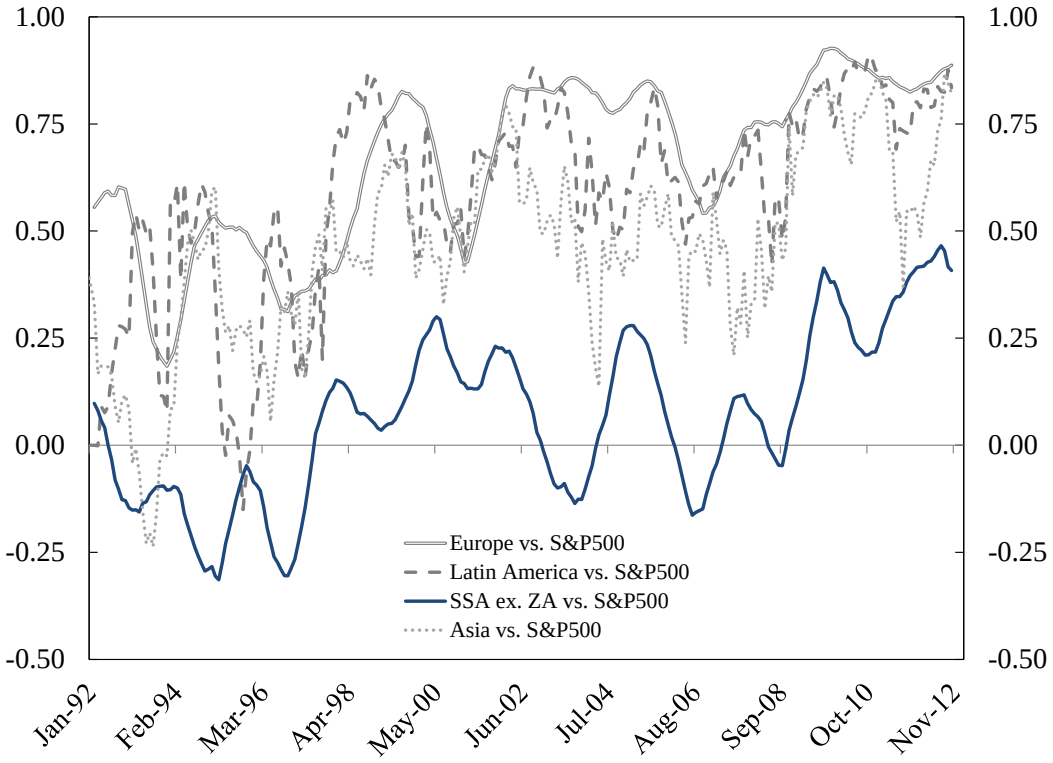
3) *Low African correlation*: Equity indexes in sub-Saharan African markets (excluding South Africa) are the least correlated[15] with global markets (Figure 2).[16]

[15] All available data is included in this correlation analysis. However, not all African indices have pre-2000 data. Therefore, in earlier years the regional aggregate is biased toward those countries for which data is available. Correlations from the most recent years are significantly more inclusive of African markets than those from pre-2000, which only include data from several African markets. Refer to Source: World Bank

Table 4 for dates of data availability. **Error! Reference source not found.** displays 2010-2012 correlations between all individual African markets and the S&P 500 benchmark.

[16] Middle East and North Africa (MENA) markets also exhibit very low correlations with global markets. In general, these markets respond less to those in Europe and the US, and vice versa, as illustrated by the market turmoil caused by the Arab Spring uprisings. The literature supports the view that Egyptian markets in particular exhibit low correlations to global benchmarks.

Figure 2: Market Capitalization-Weighted Correlations of Selected Regions with S&P 500 Benchmark, 1990-November 2012



Source: Bloomberg and authors' calculations

C. Regional vs. Global Market Correlations

Correlation within regional indices is also an area of interest to investors. In several regions (namely Asia), country stock markets demonstrate higher levels of correlation among each other than they do with traditional developed country benchmarks.[17] The Asian crisis in the late-1990s illustrates the potentially dangerous nature of a highly correlated region. In a relatively short span of time, crises in individual Asian economies spilled over into equity markets across the region.

African markets on the other hand do not generally follow this trend, even in periods of global downward volatility. Table 2 illustrates the low correlation among African equity markets during the most recent financial crisis; a characteristic that had been observed in other crises, such as the East Asian crisis in the late 1990s.[18]

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[17] Gębka and Serwa, "Intra- and Inter-Regional Spillovers between Emerging Capital Markets around the World," 206.

[18] Z. Wang, J. Yang, and D. A. Bessler, "Financial Crisis and African Stock Market Integration," *Applied Economics Letters* 10, no. 9 (2003).

Table 2: Correlation Matrix, African Markets: 2007-2009

Exchange	NGSE	KEN	BRVM	BOTS	TANZ	GHA	ZAMB	UGA	MUS	JALSH
NGSE	1.000	0.404	0.509	0.526	0.136	0.370	0.674	0.388	0.699	0.387
KEN	-	1.000	0.460	0.069	0.279	0.454	0.249	0.766	0.494	0.700
BRVM	-	-	1.000	0.498	0.057	0.221	0.559	0.376	0.742	0.566
BOTS	-	-	-	1.000	0.128	-0.103	0.445	0.148	0.393	0.267
TANZ	-	-	-	-	1.000	-0.141	0.073	0.439	0.185	0.351
GHA	-	-	-	-	-	1.000	0.232	0.338	0.234	0.256
ZAMB	-	-	-	-	-	-	1.000	0.390	0.698	0.309
UGA	-	-	-	-	-	-	-	1.000	0.414	0.478
MUS	-	-	-	-	-	-	-	-	1.000	0.615
JALSH	-	-	-	-	-	-	-	-	-	1.000

Source: Bloomberg and authors' calculations

African markets exhibit even lower correlations with each other in non-crisis periods (See Table 3). Even regional benchmarks such as the Johannesburg Stock Exchange (JSE) have a relatively small impact on the movement of other sub-Saharan African markets. Kenya and Uganda are the exception with a correlation of almost 0.9, but this is most likely a reflection of the high number of (large) cross-listed companies on both exchanges.

Table 3: Correlation Matrix, African Markets: 2009-2011

Exchange	NGSE	KEN	BRVM	BOTS	TANZ	GHA	ZAMB	UGA	MUS	JALSH
NGSE	1.000	0.163	0.253	0.244	-0.037	-0.037	0.526	0.153	0.287	0.309
KEN	-	1.000	0.441	0.417	0.098	-0.228	0.349	0.880	0.626	0.513
BRVM	-	-	1.000	0.523	0.255	-0.073	0.417	0.485	0.329	0.367
BOTS	-	-	-	1.000	0.149	-0.078	0.358	0.308	0.499	0.557
TANZ	-	-	-	-	1.000	-0.200	0.333	0.113	0.251	-0.015
GHA	-	-	-	-	-	1.000	-0.186	-0.172	-0.294	-0.091
ZAMB	-	-	-	-	-	-	1.000	0.432	0.555	0.468
UGA	-	-	-	-	-	-	-	1.000	0.519	0.372
MUS	-	-	-	-	-	-	-	-	1.000	0.575
JALSH	-	-	-	-	-	-	-	-	-	1.000

Source: Bloomberg and authors' calculations

4. Constraints to Exploiting Low-Correlation Markets

Several features unique to African equity markets[19] can act as constraints for investors seeking to take advantage of any potential benefits derived from low market correlation.[20]

A. Scale

First, African markets are small. As of August 2011, the entire market capitalization of sub-Saharan African markets was $573 billion, of which $478 billion was accounted for by South African companies.[21] By comparison, the average US publicly listed company is worth $4 billion – roughly the size of an entire typical sub-Saharan African market such as Zimbabwe, Tanzania, or Ghana. In this respect, Nigeria is an outlier with a market capitalization of roughly $40 billion. In addition, the total number of companies listed on African exchanges is small and ranges from 8 (Malawi) to 215 (Nigeria), with the median of 38 (Ghana).[22] African markets are also small in relation to country GDP. While South Africa is on par with other developing countries with market capitalization equal to 100 percent of GDP, the market capitalization of Africa's smaller markets often hovers between 10 and 20 percent of GDP.[23] Furthermore, many African markets have small floats (the number tradable shares) relative to total market size.[24] Therefore, market capitalization figures may exceed actual tradable market size.

This trend holds over time. Despite some modest growth, Sub-Saharan African markets (excluding South Africa and Mauritius) have consistently had the lowest market capitalizations (as a percentage of GDP) by a wide margin in comparison to other regions (see Figure 3).[25]

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[19] C. J. Kenny and T. J. Moss, "Stock Markets in Africa: Emerging Lions or White Elephants?," *World Development* 26, no. 5 (1998).

[20] Todd J. Moss, Vijaya Ramachandran, and Scott Standley, "Why Doesn't Africa Get More Equity Investment? Frontier Markets, Firm Size and Asset Allocations of Global Emerging Market Funds," *Center for Global Development Working Paper* 112(2007).

[21] Several large companies are cross-listed on two or more African exchanges (e.g. Ecobank Transnational, Kenya Airways.) Therefore, the market cap number is subject to slight overestimation, as some companies are double-counted. 2011 market capitalization data is sourced from Bloomberg and for several countries, Securities Africa, a private South Africa-based financial services company.

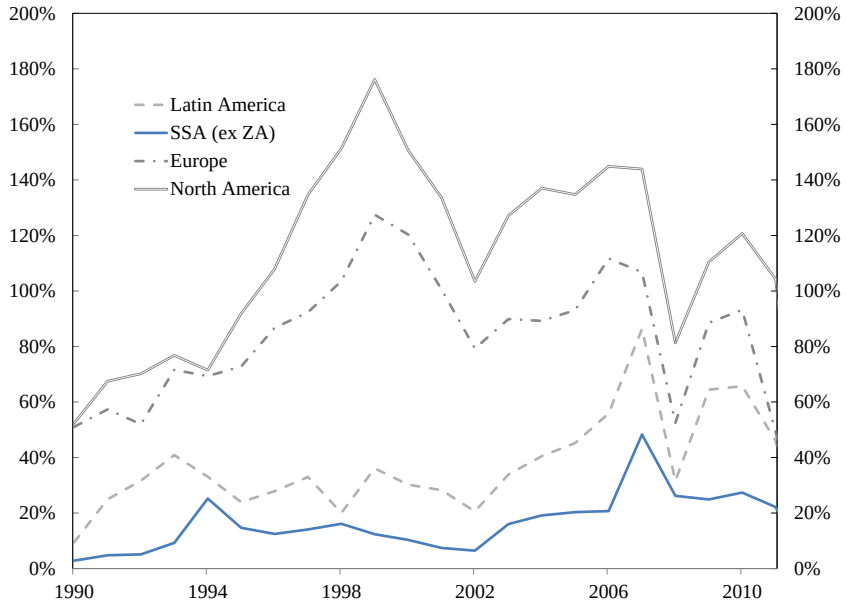
[22] Standard and Poor's, 2011. For earlier data, see Todd J. Moss, *Adventure Capitalism* (New York: Palgrave Macmillan, 2003).

[23] Standard and Poor's and authors' calculations.

[24] Due to very limited data on float size in Sub-Saharan African markets, we have used official market capitalization figures as reported to the World Bank.

[25] In both 2002 and 2006 sub-Saharan African markets had a higher market capitalization (by weighted average) than other regions. However, this is solely due to major data distortions from Zimbabwe, whose official exchange rate did not reflect the true hyperinflation occurring during these periods. Therefore, data from Zimbabwe has been omitted for these years.

Figure 3: Market Capitalization, percent of GDP



Source: World Bank

Table 4: Sub-Saharan African Indices, Selected Indicators[26]

Long Name	Index Code	Data Avail. From	Country	Currency	Currency per USD	2011 Market Cap*
Nigerian All Share	NGSEINDX	Jan-99	Nigeria	Naira	159.29	46,259
Zimbabwe Industrial	ZHINDUSD	Feb-09	Zimbabwe	US Dollar	1.0	3,977
Nairobi Ltd 20	KNSMIDX	Feb-91	Kenya	Kenyan Shilling	89.75	10,345
BRVM Comp Share	ICXCOMP	Sep-98	West Africa	CFA Franc BCEAO	486.75	7,272
Botswana Gaborone	BGSMDC	Nov-92	Botswana	Pula	7.608	4,373
Tanzania All Share	DARSDSEI	Nov-06	Tanzania	Tanzanian Shilling	1700.3	3,667
Ghana Composite	GGSECI	Dec-10	Ghana	Cedi	1.626	3,349
Ghana All Share	GGSEGSE	Jun-93	Ghana	Cedi	1.626	3,349
Lusaka All Share	LUSEIDX	Oct-97	Zambia	Zambian Kwacha	5105.0	2,338
Uganda All Share	UGSINDX	Oct-03	Uganda	Uganda Shilling	2530.0	723
Malawi Shares Domestic	MWSIDOM	Jul-09	Malawi	Kwacha	163.98	1,478
Mauritius Sem-7	SEMDSEM7	Mar-98	Mauritius	Mauritius Rupee	29.1	8,126
JSE All Share	JALSH	Jun-95	South Africa	Rand	8.408	478,062

B. Liquidity

Second, African markets are illiquid relative to other global markets. As of end-2010, turnover ratios (traded value/market capitalization) in sub-Saharan markets were extremely low; just 13 percent in Nigeria, 9 percent in Kenya, and 4 percent or below in many others.[27] By comparison, other developing country markets such as India, Brazil, and Thailand had

[26] Market cap data is given in USD millions.

[27] Standard & Poor's, 2011.

turnover ratios of 75 percent, 66 percent, and 105 percent, respectively. Developed markets such as the US, UK, and Germany consistently have turnover ratios of 100 percent or greater.

Unfortunately, illiquid trading conditions effectively prevent many institutional investors from investing in SSA equity markets. Many institutional investors have minimum trade requirements of $1-5 million per block, making most African market transactions too small to consider.[28] In addition, illiquidity is risky. Large investors might not be able to locate a willing buyer when they are ready to exit an individual position. Market liquidity is also helps determine market efficiency. Thus, a lack of liquidity can decrease a market's chances of following the random walk hypothesis.[29]

Despite this, overall investment in SSA equity markets has grown in recent years – both in absolute and GDP-relative terms –as evidenced by increasing market capitalization across all sub-Saharan indices (see Figure 3).

C. Foreign Exchange Risk

Exchange rate risk remains a formidable barrier to local currency investing in many African markets. For example, the returns to the Ghana stock exchange between 1993 and 2000 were highly unpredictable due to a volatile Ghanaian cedi (e.g., returns in cedi terms averaged 43 percent while dollar-denominated returns averaged 5 percent.) Inflation risk, unpredictable fiscal policy, bad weather consequences, global commodity prices, and many other factors can impact exchange rates and cause major problems for investors. On the other hand, the inclusion of certain Sub-Saharan African countries' local sovereign debt into global market bond indices could help stabilize local currencies while providing support to fiscal balances.[30] Further analysis should be conducted to determine the impact that exchange rate volatility has had on market return correlations in recent years.

D. Volatility

Investors' concerns about African market volatility can serve as barriers to investment. These concerns are not necessarily misplaced – the return distribution of African countries can vary widely over time. However, analysis of the standard deviation of monthly returns shows that other emerging markets are often just as volatile as those in sub-Saharan Africa. For example, between 2006 and 2011, market returns in Brazil, China, and India had higher standard deviations than all sub-Saharan African markets with the sole exception of

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[28] Moss, Ramachandran, and Standley (2005)

[29] Graham Smith, "Liquidity and the Informational Efficiency of African Stock Markets," *South African Journal of Economics* 76, no. 2 (2008).; Keith Jefferis and Graham Smith, "The Changing Efficiency of African Stock Markets," *South African Journal of Economics* 73, no. 1 (2005).

[30] Since 2012, South African and Nigerian government bonds have been included in the global bond indices of major banks, including Barclays, Citi, and JP Morgan. Kenya and Ghana could see inclusion in the coming years as they become more active issuers.

Zimbabwe. Furthermore, other studies find that investors in African markets are appropriately compensated for the amount of risk that they assume.[31]

Other investors may be concerned that many of Africa's markets are not efficient, and may thus not follow the random walk model.[32] However, the ongoing debate on this topic is inconclusive. One study found that markets in Kenya and Zimbabwe were weak-form efficient while those in Nigeria and South Africa were not.[33] Another study found that Ghana and Mauritius tend to deviate from the random walk.[34] While the results are mixed, most studies find that African markets are generally not weak-form efficient – often due to the issues of size, liquidity, and lack of information.[35]

Ultimately, African markets exhibit volatility just as many other emerging markets do, and may in fact be less vulnerable to crisis. One study even suggests that African stock markets might provide a hedge against inflation – another potential upside for investing in African markets.[36] While liquidity and scale remain major barriers to new investment, the volatility issue seems more of a problematic perception than a real constraint. [37]

5. Conclusions

The above findings illustrate the decreasing regional diversification benefits to investment in all emerging markets over time as market performances converge globally. At the same time, our findings show that investors seeking international diversification via uncorrelated markets should consider sub-Saharan Africa as a destination. Low correlations *among* African markets also show that much of the currency and political risk found in certain environments might be partly mitigated by diversification to a wider subset of African markets.

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[31] Alagidede Paul, "Return Behaviour in Africa's Emerging Equity Markets," *The Quarterly Review of Economics and Finance* 51, no. 2 (2011). N'dri Konan Léon, "An Empirical Study of the Relation between Stock Market Returns and Volatility in the Brvm," *International Research Journal of Finance and Economics* 14(2008).

[32] Paul Alagidede and Theodore Panagiotidis, "Modelling Stock Returns in Africa's Emerging Equity Markets," *International Review of Financial Analysis* 18, no. 1-2 (2009).

[33] Joe Appiah-Kusi and Kojo Menyah, "Return Predictability in African Stock Markets," *Review of Financial Economics* 12, no. 3 (2003). Emmanuel Anoruo and Luis Gil-Alana, "Mean Reversion and Long Memory in African Stock Market Prices," *Journal of Economics and Finance* 35, no. 3 (2011).

[34] Chipo Mlambo and Nicholas Biekpe, "The Efficient Market Hypothesis: Evidence from Ten African Stock Markets," (University Library of Munich, Germany, 2007).

[35] Other studies (Chukwuogor-Ndu 2007) find that some African markets (specifically, the BRVM) may be influenced by 'day-of-the-week' effects (e.g. certain days of the week seem to be more volatile than others). Day of the week effects are also indicative of an inefficient market. However, investors can adjust their portfolios accordingly, depending on the liquidity of the market (see Tachiwou 2010).

[36] Paul Alagidede and Theodore Panagiotidis, "Can Common Stocks Provide a Hedge against Inflation? Evidence from African Countries," *Review of Financial Economics* 19, no. 3 (2010).

[37] Although beyond the scope of this modest paper, additional constraints to exploiting low correlations may also include: weaknesses in investor protection schemes, lack of securities regulation and supervision, rule of law shortcomings, and potential credibility concerns in macroeconomic policies.

From this note, there are several suggestions for further research, including 1) individual and regional market analyses to provide a more comprehensive assessment of equity market correlations, 2) further analysis to determine any patterns in lag time between African and global markets, and 3) analysis of monthly and daily index volumes to determine how market size affects global market correlation.

For policymakers seeking to boost portfolio investment to the continent, these findings also provide additional quantitative evidence that can be used to promote Africa as a destination for certain types of international capital.

Appendix: Regional Indices and Selected Indicators

Long Name	Index Code	Data Avail. From	Country	Currency	Region	Currency per USD	2010 Market Capitalization (USD Millions)	Companies Listed	Avg. Company Size (USD Millions)	Turnover Ratio (%)
Nigerian All Share	NGSEINDX	Jan-99	Nigeria	Naira	SSA	161.35	50,883	215	237	13
Zimbabwe Industrial	ZHINDUSD	Feb-09	Zimbabwe	US Dollar	SSA	1.0	11,476	76	151	10
Nairobi Ltd 20	KNSMIDX	Feb-91	Kenya	Kenyan Shilling	SSA	89.6	14,461	53	273	9
BRVM Comp Share	ICXCOMP	Sep-98	West Africa	CFA Franc BCEAO	SSA	488.05	7,099	38	187	2
Botswana Gaborone	BGSMDC	Nov-92	Botswana	Pula	SSA	7.435	4,076	21	194	4
Tanzania All Share	DARSDSEI	Nov-06	Tanzania	Tanzanian Shilling	SSA	1680.5	1,264	11	115	2
Ghana Composite	GGSECI	Dec-10	Ghana	Cedi	SSA	1.666	3,531	35	101	3
Ghana All Share	GGSEGSE	Jun-93	Ghana	Cedi	SSA	1.666	3,531	35	101	3
Lusaka All Share	LUSEIDX	Oct-97	Zambia	Zambian Kwacha	SSA	5125.0	2,817	19	148	5
Uganda All Share	UGSINDX	Oct-03	Uganda	Uganda Shilling	SSA	2560.0	723	8	90	
Malawi Shares Domestic	MWSIDOM	Jul-09	Malawi	Kwacha	SSA	164.0	1,363	14	97	2
Mauritius Sem-7	SEMDSEM7	Mar-98	Mauritius	Mauritius Rupee	SSA1	29.05	6,506	86	76	6
JSE All Share	JALSH	Jun-95	South Africa	Rand	SSA1	8.113	1,012,540	360	2,813	40
Dow Jones	INDU	Jan-90	United States	US Dollar	NA	1.0	17,139,000	4,279	4,005	189
S&P TSX Composite	SPTSX	Jan-90	Canada	Canadian Dollar	NA	1.02	2,160,230	3,805	568	71
S&P 500	SPX	Jan-90	United States	US Dollar	NA	1.0	17,139,000	4,279	4,005	189
Euro Stoxx 50	SX5E	Jan-90	United States	US Dollar	EUR	1.0				
CAC 40	CAC	Jan-90	France	Euro	EUR	0.744	1,926,490	901	2,138	43
DAX	DAX	Jan-90	Germany	Euro	EUR	0.744	1,429,710	571	2,504	103
IBEX 35	IBEX	Jan-90	Spain	Euro	EUR	0.744	1,171,610	3,310	354	76
MIB 30	MIB30	Dec-92	Italy	Euro	EUR	0.744	318,140	291	1,093	170
FTSE 100	UKX	Jan-90	United Kingdom	Pound Sterling	EUR	0.637	3,107,040	2,056	1,511	102
ASX 200	AS51	May-92	Australia	Australian Dollar	AS	0.972	1,454,550	1,913	760	90
Hang Seng	HSI	Jan-90	Hong Kong	Hong Kong Dollar	AS	7.769	2,711,330	1,396	1,942	64
MICEX	INDEXCF	Sep-97	Russian Federation	Russian Ruble	AS	30.72	1,004,520	345	2,912	86
KOSPI	KOSPI	Jan-90	Korea, Republic of	Won	AS	1140.3	1,089,220	1,781	612	169
Nikkei	NKY	Jan-90	Japan	Yen	AS	77.485	4,099,590	3,553	1,154	115
Sensex 30	SENSEX	Jan-90	India	Indian Rupee	AS	52.211	1,615,860	4,987	324	76
Shanghai Composite	SHCOMP	Dec-90	China	Yuan Renminbi	AS	6.382	4,762,840	2,063	2,309	164
Bovespa	IBOV	Jan-92	Brazil	Brazilian Real	LAC	1.809	1,545,570	373	4,144	66
Bolsa IPC	MEXBOL	Jan-94	Mexico	Mexican Peso	LAC	13.629	454,345	130	3,495	27
EGX 30	CASE	Jan-98	Egypt	Egyptian Pound	MENA	6.006	82,495	211	391	43
CFG 25	MCSINDEX	Dec-93	Morocco	Moroccan Dirham	MENA	8.295	69,153	73	947	16
Tunisia Stock Exchange	TUSISE	Apr-99	Tunisia	Tunisian Dinar	MENA	1.462	10,682	54	198	17

Bibliography

Adelegan, Olatundun Janet. "Can Regional Cross-Listings Accelerate Stock Market Development? Empirical Evidence from Sub-Saharan Africa." *IMF Working Paper Series* (2008).

Alagidede, Paul. "Are African Stock Markets Integrated with the Rest of the World?" *The African Finance Journal* 11, no. 1 (2009): 37-53.

Alagidede, Paul, and Theodore Panagiotidis. "Can Common Stocks Provide a Hedge against Inflation? Evidence from African Countries." *Review of Financial Economics* 19, no. 3 (2010): 91-100.

Alagidede, Paul, and Theodore Panagiotidis. "Modelling Stock Returns in Africa's Emerging Equity Markets." *International Review of Financial Analysis* 18, no. 1-2 (2009): 1-11.

Anoruo, Emmanuel, and Luis Gil-Alana. "Mean Reversion and Long Memory in African Stock Market Prices." *Journal of Economics and Finance* 35, no. 3 (2011): 296-308.

Appiah-Kusi, Joe, and Kojo Menyah. "Return Predictability in African Stock Markets." *Review of Financial Economics* 12, no. 3 (2003): 247-70.

Arouri, Mohamed El Hedi, and Fredj Jawadi. "Stock Market Integration in Emerging Countries: Further Evidence from the Philippines and Mexico." *2nd International Financial Research Forum* (2009).

Chukwuogor-Ndu, Chiaku. "An Econometric Analysis of African Stock Market: Annual Returns Analysis, Day-of-the-Week Effect and Volatility of Returns." *African Journal of Accounting, Economics, Finance and Banking Research, Vol. 1, No. 1, June 2007* (2007).

Enisan, Akinlo A., and Akinlo O. Olufisayo. "Stock Market Development and Economic Growth: Evidence from Seven Sub-Sahara African Countries." *Journal of Economics and Business* 61, no. 2 (2009): 162-71.

Flavin, Thomas, Margaret Hurley, and Fabrice Rousseau. "Explaining Stock Market Correlation: A Gravity Model Approach." *The Manchester School* 70 (2002): 87-106.

Gębka, Bartosz, and Dobromił Serwa. "Intra- and Inter-Regional Spillovers between Emerging Capital Markets around the World." *Research in International Business and Finance* 21, no. 2 (2007): 203-21.

Goetzmann, William, Lingfeng Li, and Geert Rouwenhorts. "Long-Term Global Market Correlations." *The Journal of Business* 78, no. 1 (2005): 1-38.

Harvey, Campbell R. "Predictable Risk and Returns in Emerging Markets." *The Review of Financial Studies* 8, no. 3 (1995): 773-816.

Jefferis, Keith, and Graham Smith. "The Changing Efficiency of African Stock Markets." *South African Journal of Economics* 73, no. 1 (2005): 54-67.

Kenny, C. J., and T. J. Moss. "Stock Markets in Africa: Emerging Lions or White Elephants?" *World Development* 26, no. 5 (1998): 829-43.

Konan Léon, N'dri. "An Empirical Study of the Relation between Stock Market Returns and Volatility in the Brvm." *International Research Journal of Finance and Economics* 14 (2008).

Li, Youwei, Philip A. Hamill, and Kwaku K. Opong. "Do Benchmark African Equity Indices Exhibit the Stylized Facts?" *Global Finance Journal* 21, no. 1 (2010): 71-97.

Longin, François, and Bruno Solnik. "Extreme Correlation of International Equity Markets." *The Journal of Finance* 56, no. 2 (2001): 649-76.

Malkiel, Burton. *A Random Walk Down Wall Street*. New York: W.W. Norton and Company, 1990.

Mlambo, Chipo, and Nicholas Biekpe. "The Efficient Market Hypothesis: Evidence from Ten African Stock Markets." University Library of Munich, Germany, 2007.

Moss, Todd J. *Adventure Capitalism*. New York: Palgrave Macmillan, 2003.

Moss, Todd J., Vijaya Ramachandran, and Scott Standley. "Why Doesn't Africa Get More Equity Investment? Frontier Markets, Firm Size and Asset Allocations of Global Emerging Market Funds." *Center for Global Development Working Paper* 112 (2007).

Paul, Alagidede. "Return Behaviour in Africa's Emerging Equity Markets." *The Quarterly Review of Economics and Finance* 51, no. 2 (2011): 133-40.

Smith, Graham. "Liquidity and the Informational Efficiency of African Stock Markets." *South African Journal of Economics* 76, no. 2 (2008): 161-75.

Tachiwou, Aboudou Maman. "Day-of-the-Week-Effects in West African Regional Stock Market." *International Journal of Economics and Finance* 2, no. 4 (2010).

Wang, Z., J. Yang, and D. A. Bessler. "Financial Crisis and African Stock Market Integration." *Applied Economics Letters* 10, no. 9 (2003): 527-33.