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The Performance of African Stock Markets Before and After the Global Financial Crisis

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Abstract

The empirical evidence shows that, in comparison to Industrialized, Asian and Latin American countries, African stock markets recorded the best performance in a mean-variance space before the crisis, January 2000 to December 2007, with the highest average monthly returns and levels of total risk (standard deviation of returns) that equaled the score of Industrialized countries and were significantly lower than for Asian and Latin American stock markets. Their average systematic risk (Beta relative to the S&P 500) was significantly lower than that of their counterparts in other regions. However, during the crisis, January 2008 to February 2015, they recorded the sharpest declines among regions in their average returns and an increase in their total and systematic risk. Their average Sharpe and Treynor ratios, and their Jensen's Alpha also underscored significant deterioration of their performance between the pre-crisis and the crisis period and ranked them from the best investment destination to the poorest one for a US-based investor. Results also show that African stock markets were prime candidates for inclusion in the equity portfolio of US-based investors seeking international diversification before the crisis, a situation that was reversed during the crisis for African countries and other regions alike. Weak recovery of African stock markets is documented by the inability of most of them to return to their pre-crisis index levels and the lower average returns that they have recorded since the peak of the global financial crisis.

Keywords:
- African stock markets
- International portfolio diversification
- Stock market co-movement
- Financial contagion
- Global financial crisis

Introduction

One of the biggest events that have affected the world economy in the last 50 years was what is usually referred to as the Global Economic and Financial Crisis, deemed to have occurred in 2007-2009. Its impact and scope were so large that it gave rise to in-depth discussions on the need to better understand the nature of risk in financial markets, examine the adequacy of extant banking regulation, and dissect the process of financial contagion between geographical regions of the world. One of the aspects of contagion, which is the focus of the present study is the extent to which each region was affected by the global crisis with respect to the level of its stock market returns as well as change in its risk profile. Of particular interest is the case of African stock markets because they have historically been under-investigated and seen as marginalized, representing a small percentage of global financial flows and market capitalization.

Three key questions are examined in the study. First, how have African stock markets been affected by the global crisis over time and in comparison to other regions; has the crisis led to change in their respective rates of returns and co—movement with foreign stock markets, especially from the perspective of a US-based investor? Second, what was the behavior of the African stock markets during the recovery that followed the peak of the financial crisis? The third issue is related to the degree of attractiveness of African stock markets for a US-based investor's strategy of international diversification before and during the crisis. Several studies have investigated the degree of contagion or co-movement between global markets and African stock markets; Wang and Bessler (2003), Tella et al. (2011), Ntsosa (2011), Hegerty (2013), Duncan and Kabundi (2014), Sugimoto et al. (2014), and Maghyereh et al. (2015). However, they have not examined the performance of these markets from a financial investment perspective and determined the extent to which they could be considered for inclusion in international portfolios held by US-based investors.

The study is organized as follows. The first section provides a detailed analysis of the statistics of returns and risk (total and systematic) of a sample of countries that represent at least 90% of the total market capitalization of their respective regions. Then, using the perspective of a US-based investor, the performance of each national stock market index is assessed using three common criteria, namely Sharpe's ratio (1964), Treynor's ratio (1965) and Jensen's Alpha (1968). In the second section, the analysis focuses on the capacity of each national stock market index to meet the international diversification condition for a US-based investor. The third section examines the record of national stock market indices in achieving recovery since the onset of the financial crisis. A few summary remarks conclude the study.

1. Performance of national stock market indices before and during the global crisis

The present study uses monthly return data for the pre-crisis period January 2000 to December 2007, and the crisis period January 2008 to February 2015. The national stock market indices of four groups of countries are included in the sample, namely Industrialized countries, African countries, Asian countries and Latin American countries. See Table 1 for the detailed list of countries for each region. The perspective of a US-based investor is considered, although that of any other country could also be examined. Therefore, sensitivity of national stock market indices is calculated using their Beta with respect to the US stock market, S&P 500, instead of a proxy for global equity markets e.g. Morgan Stanley Capital International (MSCI) index,

given that US-based investors commonly measure the sensitivity of domestic financial assets to the domestic stock market, usually proxied by the S&P 500 index. The risk-free rate of return is proxied by the yield on the short term US Treasury bond. The Dollar-denominated returns of the national stock market are calculated by first dividing the monthly national index series by the monthly exchange rates with the US Dollar and then computing the monthly rates of change expressed in percentage.

The nature and extent of the global stock market crisis[12]

Table 1.a through 1.d displays the average monthly returns, standard deviations and Beta coefficients of the sampled countries for the period before the crisis, January 2000 to December 2007, after the advent of the crisis, January 2008 to February 2015, and for the whole period, January 2000 to February 2015. Panel 1.a. reports the results for the Industrialized countries, grouped as advanced countries of comparable levels of per capita income rather than as a geographical region. For each country the mean return of the index declined sharply from the pre-crisis period to the crisis period. For the 13 countries the average of the mean returns fell from 0.764% to 0.056%, a drop of -92.67%. The pre-crisis average of mean returns is consistent with the long term historical return on stock markets in the industrialized world. Six of the 13 countries – France, Italy, The Netherlands, Russia, Spain and the U. K. - experienced a negative mean stock market return during the crisis period. The standard deviations of monthly returns increased significantly for the Industrialized countries as a whole and individually except for Japan. The Beta coefficients expressed as sensitivity to the US stock market -S&P 500- increased for all the national stock market indices and the average Beta increased by 22.1% from 0.885 to 1.081. In other words, substantial increase in the total risk and systematic risk of Industrialized countries was a marked consequence of the global financial crisis.

[1] The determination of the beginning month for the global financial crisis was based on the examination of the monthly returns of the S&P 500 which represents the largest stock market in the world and the chronological leading role of the US economy in the onset of the crisis. The data show that the S&P 500 recorded the following monthly returns: September 2007: +3.61%, October 2007: +3.21%, November 2007: -3.497%, December 2007: +1.61% and January 2008:-6.649%. Therefore, considering that the negative return of January was unusually large and was followed by two consecutive negative monthly returns, the foregoing analysis will consider January 2008 the beginning month of the crisis. The pre-crisis period is deemed to be January 2000 to December 2007 and the crisis period January 2008 to February 2015. The crisis-period is arbitrarily given this name bearing in mind that it includes a recovery period that is specified in the last section of the study.

[2] The national stock market indices under study can, to a large extent, be replicated by Exchange Traded Funds (ETFs) that are assets traded on the stock market that track fairly accurately the movements of their respective stock market indices.

Table 1.a. Statistics of Returns on National Dollar-Denominated Stock Indices Before the Crisis (Jan. 2000 - Dec. 2007) and Since the Crisis (Jan. 2008 - Feb 2015), Industrialized Countries

	Mean return Pre-crisis	Mean return Crisis	Mean return All period	Stand. Dev. Pre-crisis	Stand. Dev. Crisis	Stand. Dev. All period	US Beta Pre-crisis	US Beta Crisis
Australia	1.221	0.073	0.675	4.816	7.542	6.269	0.882	1.023
Canada	1.066	0.070	0.593	5.318	6.598	5.964	0.964	1.053
France	0.562	-0.176	0.211	5.280	7.449	6.395	0.838	1.050
Germany	0.835	0.394	0.626	6.727	7.750	7.214	1.143	1.203
Italy	0.505	-0.538	0.009	5.500	8.943	7.337	0.761	1.265
Japan	-0.168	0.324	0.066	5.613	5.195	5.409	0.736	0.783
Netherlands	0.416	-0.095	0.173	5.726	7.476	6.602	0.993	1.254
Russia	3.019	-0.518	1.338	9.116	11.033	10.199	1.059	1.524
Spain	0.946	-0.282	0.363	5.654	8.720	7.278	0.807	1.049
Sweden	0.447	0.520	0.481	7.026	7.747	7.357	1.176	1.128
Switzerland	0.701	0.404	0.560	4.090	5.160	4.619	0.651	0.657
U. K.	0.327	-0.051	0.148	3.873	5.760	4.852	0.606	0.978
S&P500	0.052	0.607	0.316	3.505	4.078	3.787		
Average	0.764	0.056	0.428	5.557	7.188	6.406	0.885	1.081

Source: International Financial Corporation, Online

Table 1.b. reports the same results for the 8 African stock markets. At 1.636%, the average of their mean monthly returns more than doubled the performance of Industrialized countries during the pre-crisis episode. However, the crisis period average was merely 0.084%, which constitutes a -94.9% decline relative to the pre-crisis period. The average standard deviation of monthly returns was comparable for African and Industrialized countries before the crisis, 5.55% vs 5.797% respectively, and was about the same during the crisis, 7.188% vs 6.955%. The average Beta of African stock market indices rose from 0.425 before the crisis to 0.732, which underscores their significant increased synchronicity with the US market as a result of the global crisis thus making them less attractive for global portfolio diversification. In summary, a key consequence of the global financial crisis was a sharp decline in the returns of African stock markets, a moderate increase in their total risk as measured by the standard deviation of returns and a large increase in their systematic risk measured by their sensitivity with respect to the S&P500. This evolution is tantamount to a serious loss in global attractiveness.

Table 1.b. Statistics of Returns on National Dollar-Denominated Stock Indices before the Crisis (Jan. 2000 - Dec. 2007) and Since the Crisis (Jan. 2008 - Feb 2015), African Countries

	Mean return Pre-crisis	Mean return Crisis	Mean return All period	Stand. Dev. Pre-crisis	Stand. Dev. Crisis	Stand. Dev. All period	US Beta Pre-crisis	US Beta Crisis
Botswana	1.766	-0.309	0.780	4.601	4.110	4.485	0.235	0.345
BRVM	1.632	0.177	0.941	7.069	6.729	6.929	0.232	0.702
Egypt	1.843	-0.024	0.956	8.778	9.256	9.032	0.835	0.931
Kenya	N.A.	0.629	0.629	N.A.	7.249	7.249	N.A.	0.949
Mauritius	1.526	0.136	0.865	4.477	6.667	5.652	0.336	0.747
Nigeria	2.414	-0.778	0.897	5.428	8.822	7.395	0.248	0.832
South Africa	1.454	0.422	0.963	6.469	8.075	7.274	0.915	1.037
Tunisia	0.821	0.421	0.631	3.756	4.736	4.242	0.178	0.316
Average	1.636	0.084	0.833	5.797	6.955	6.532	0.425	0.732

Source: International Financial Corporation, Online; Bourse Régionale de Valeurs Mobilières (BRVM)

Panels 1.c. and 1.d. provide comparator statistics on returns on 9 Asian and 6 Latin American stock markets. In the case of Asian stock markets two noteworthy results are the sharp drop of monthly returns for China and Viet Nam during the crisis period. The former went from 1.705% to 0.002% between the two periods while the latter recorded 3.076% and -0.387% correspondingly. The other Asian stock markets also declined but fared much better than China and Viet Nam. The standard deviations and the Betas of Asian countries remained relatively stable, which suggests that the impact of the global crisis was felt more on the level of returns than on their underlying risk, total or systematic. Compared to African stock markets, Asian mean returns were similar before the crisis 1.636% vs 1.690% but suffered lower declines during the crisis – 0.084% vs 0.351%. However, their total and systematic risks remained higher than for African countries although for both measures they declined. Conversely, they rose for African stock markets.

Table 1.c. Statistics of Returns on National Dollar-Denominated Stock Indices Before the Crisis (Jan. 2000 - Dec. 2007) and Since the Crisis (Jan. 2008 - Feb 2015), Asian Countries

	Mean Return Pre-crisis	Mean Return Crisis	Mean Return All period	Std. Dev Pre-crisis	Std. Dev Crisis	Std. Dev. All period	US Beta Pre-crisis	US Beta Crisis
China	1.705	0.002	0.896	7.467	8.126	7.812	0.327	0.649
Hong Kong	0.776	0.104	0.457	5.738	6.718	6.214	0.871	0.886
India	1.859	0.353	1.143	7.606	9.471	8.552	1.215	1.154
Indonesia	1.704	0.873	1.309	9.020	9.059	9.023	1.365	1.270
Korea	1.176	0.130	0.679	7.182	7.467	7.317	1.333	1.250
Pakistan	2.389	0.757	1.613	8.717	7.815	8.318	0.693	0.382
Philippines	0.874	1.056	0.961	7.316	6.878	7.092	1.018	0.769
Turkey	1.655	0.273	0.998	15.081	11.461	13.464	1.856	1.445
Viet Nam	3.076	-0.387	1.374	12.226	9.427	11.047	0.638	0.913
Average	1.690	0.351	1.048	8.928	8.491	8.760	1.035	0.969

Source: International Financial Corporation, Online, OECD, Online

The performance of Latin American stock markets is reported in Panel 1.d. This region had recorded widely shared impressive rates of return before the crisis with a mean average of 2.102%. But with the advent of the crisis, the average mean return declined to 0.292%, Colombia reporting the worst drop from 3.785% to 0.030% and Argentina improving from 0.931% to 1.159%. Brazil, the economic giant of the sub-continent also experienced a sharp decline. The standard deviations and Betas of Latin American stock markets remained relatively constant with magnitudes similar to those of Asia. In both regions, the standard deviations of returns are higher than for Africa and Industrialized countries and their Betas are significantly higher than in Africa and identical with Industrialized countries.

Table 1.d. Statistics of Returns on National Dollar-Denominated Stock Indices Before the Crisis (Jan. 2000 - Dec. 2007) and Since the Crisis (Jan. 2008 - Feb 2015), Latin American Countries

	Mean return Pre-crisis	Mean return Crisis	Mean return All period	Stand. Dev. Pre-crisis	Stand. Dev. Crisis	Stand. Dev. All period	US Beta Pre-crisis	US Beta Crisis
Argentina	0.931	1.159	1.040	11.917	10.793	11.366	1.011	1.433
Brazil	2.138	-0.313	0.973	11.505	9.837	10.785	1.715	1.264
Chile	1.250	0.290	0.794	5.894	6.818	6.350	0.984	0.710
Colombia	3.785	0.030	1.804	9.452	7.870	8.829	1.234	0.966
Mexico	1.670	0.374	1.054	6.644	7.244	6.947	1.127	1.022
Peru	2.839	0.210	1.590	7.403	10.528	9.094	0.787	1.139
Average	2.102	0.292	1.209	8.803	8.848	8.895	1.143	1.089

Source: International Financial Corporation, Online

In summary, the global financial crisis had its largest negative impact on African stock markets with a reduction in an average of mean returns higher than in any other region. However, one of the consequences of the crisis is that African stock markets have experienced lower total risk and lower systematic risk than in all other regions, which makes them of possible interest for inclusion in global low Beta portfolios.

The Sharpe excess return to variability ratio[34]

Considering that the investor is assumed to seek to maximize his expected utility in the mean-variance space, Sharpe's ratio (1966) constitutes one simple, but not the only, selection criterion for risky assets, especially for well diversified portfolios.[5] It is the excess return on the asset (return on the asset minus the return on the riskless asset) per unit of total risk measured by the standard deviation of its returns. It is empirically given by:

[3] The foregoing analysis does not take into account national differences in tax and legal systems and the degree of freedom of access to local stock markets for foreigners.

[4] Alternative criteria that are variants of Sharpe's ratio are proposed by Roy (1952), Sortino and van der Meer (1991), Sharpe (1994) and Modigliani (1997). Several empirical studies have used Sharpe's ratio to examine the performance of mutual fund managers; See Bacon (2008), Barucci (2003), Feibel (2016), Gibbons et al. (1989), Jobson (1981) and Lo (2002)

[5] For portfolio selection in the mean-variance space see Markovitz (1952).

(i) Sharpe's ratio

$$S_n = \frac{\mathrm{E}(R_n) - R_f}{\sigma_n} \qquad (1)$$

S_n is the Sharpe ratio, i.e. excess return to variability ratio of the national stock market index; it is the excess return per unit of total risk

$\mathrm{E}(R_n)$) is the average return on the stock market index of country n

R_f is the return on the risk-free asset

σ_n = standard deviation (total risk) of the return on stock market index of country n.

Table 2 reports the values of the Sharpe ratio for national stock markets indices for the sample countries. It shows that, overall, there was a sharp decline of the ratio during the crisis period relative to the pre-crisis period. For the Industrialized countries the average ratio was 0.065% before and only 0.006% after. Of the 13 countries reported only 5, Germany, Japan, Sweden, Switzerland and the US (S&P 500) have a positive ratio during the crisis period, which indicates that the average return on the risk-free asset, the US short bond, was higher than the average return on the stock market index of the other 8 countries. It is also noteworthy that, at the national level, 10 countries saw their respective Sharpe ratios deline during the crisis period while for 3 others, Japan, Sweden and the US, it actually increased. The US stock market is in the unusual case of having recorded a negative Sharpe ratio before the crisis and a positive value during the crisis.

The panel on African stock markets displays a marked drop in the average Sharpe ratio with a decrease from 0.233% to 0.0%. Before the crisis African stock markets had a significantly higher ratio than Industrialized countries and thus offered a more attractive return per unit of total risk; but this situation was inversed in favor of the Industrialized countries with the advent of the crisis. No African country increased its Sharpe ratio during the crisis period and two countries, Botswana and Nigeria, suffered severe declines between the two periods. As a result of the crisis, the Sharpe ratios of African and Industrialized countries became much closer, an evolution that mirrors the similarity of their respective crisis period standards deviations of stock returns reported in Table 1.

Table 2. Sharpe Ratio for Monthly Returns on National Stock Indices Before and Since the Crisis

	Sharpe ratio Pre-crisis	Sharpe ratio Crisis
Industrialized countries		
Australia	0.186	-0.002
Canada	0.140	-0.003
France	0.045	-0.035
Germany	0.076	0.040
Italy	0.033	-0.070
Japan	-0.088	0.046
Netherlands	0.016	-0.024
Russia	0.296	-0.055
Spain	0.110	-0.042
Sweden	0.017	0.056
Switzerland	0.092	0.061
U. K.	0.001	-0.024
S&P500	-0.078	0.128
Average	0.065	0.006
African countries		
Botswana	0.313	-0.096
BRVM	0.185	0.013
Egypt	0.173	-0.012
Kenya	N.A.	0.075
Mauritius	0.268	0.007
Nigeria	0.385	-0.098
South Africa	0.175	0.041
Tunisia	0.132	0.070
Average	0.233	0.000

	Sharpe ratio Pre-crisis	Sharpe ratio Crisis
Asian countries		
China	0.185	-0.010
Hong Kong	0.079	0.003
India	0.202	0.028
Indonesia	0.153	0.087
Korea	0.119	0.006
Pakistan	0.237	0.086
Philippines	0.075	0.141
Turkey	0.088	0.016
Viet Nam	0.225	-0.050
Average	0.151	0.034
Latin American countries		
Argentina	0.051	0.099
Brazil	0.158	-0.041
Chile	0.157	0.030
Colombia	0.366	-0.007
Mexico	0.203	0.040
Peru	0.340	0.012
Average	0.212	0.022

Source: Author's calculations.

Asian stock markets fared relatively well during the crisis period with an average Sharpe ratio of 0.034% compared to 0.151% before the crisis. The countries that had the highest ratios before the crisis, China, India, Pakistan and Viet Nam, suffered the biggest drops in the ratio while the Philippines actually saw its ratio increase. As reported in Panel 1.c. of Table 1, Turkey had the highest total risk during the crisis period but was able to mitigate the decline of its Sharpe ratio. Latin American stock markets report Sharpe ratios that fall between African and Industrialized countries both in the pre-crisis and the crisis periods. On the one hand, their high performance countries, Colombia and Peru, behaved like their African counterparts, Botswana and Nigeria, with similar large drops during the crisis period. On the other hand, as for Industrialized countries, their average regional Sharpe ratio was divided by 10 between the two periods - 0.212% vs 0.022%..

Four main comments will summarize the regional Sharpe statistics reported in Table 2. First, in all the regions, countries with the largest ratios before the crisis suffered the biggest drop in comparison to their counterparts. This underscores the usual high risk high return relationship often quoted in modern portfolio theory. Second, African stock markets had the highest average Sharpe ratio before the crisis and the lowest during the crisis. More generally, with respect to the ratio, the ranking of best to worst before the crisis was totally reversed during the crisis. Indeed, before the crisis, the ranking in descending order was Africa, Latin America, Asia and Industrialized countries. Third, for all regions, given the large declines in stock markets reported in Table 1, the risk-free rate and the levels of national total risk did not decrease enough to compensate for the stock market declines and maintain their attractiveness globally. Finally, it should be noted that before the crisis and after, the reward to variability ratio of industrial countries' stock markets has been lower than for other regions, which suggests that shifts in the composition of investors' global portfolios will, in the future, most probably favor stocks in the developing world.

The Treynor excess return to systematic risk ratio

It can be argued that although national stock market indices constitute well diversified portfolios, one could perhaps achieve further diversification of the remaining idiosyncratic component of the national risk with the acquisition of international porfolios. Therefore, the only component of total risk that should be rewarded is the systematic risk component of each asset, either in the form of individual asset or national portfolio. Treynor's ratio (1965) of excess return to systematic risk, measured here as the Beta of the asset with respect to the market portfolio -S&P 500- provides a score that indicates the attractiveness of national stock indices. As for the Sharpe ratio, excess return is the difference between the national stock market return and the risk-free rate proxied by the US short term Government bond.[6]

(ii) Treynor ratio

$$T_n = \frac{\mathrm{E}(R_n) - R_f}{\beta_n} \qquad (2)$$

T_n is the Treynor ratio for the national stock market index of country n; excess return per unit of systematic risk

$\mathrm{E}(R_n)$ is the average return on the stock market index of country n

R_f is the return on the risk-free asset

β_n is the Beta (sensitivity) of the stock market index of country n with respect to the (US) market index

Table 3 shows the Treynor scores of the sample countries before and during the crisis. Stock markets of Industrialized countries display an average excess return per unit of systematic risk that is 0.515% before the crisis and -0.032% during the crisis. The average monthly yield on the US Treasury Short Term Bond was 0.324% before the crisis and 0.087% during the crisis, which gives an indication of the opportunity cost of investing in stocks in these countries during the crisis i.e. while bearing systematic risk. The cases of two countries stand out. Unlike for any other Industrialized country, the Japanese stock market has recorded a negative average ratio of -0.668% before the crisis. In other words, investors were paying instead of being rewarded for bearing its systematic risk during a growing global stock market. But it posted a significantly positive Treynor ratio during the crisis, thus playing a counter-cyclical role in the global market. Therefore, it provided an opportunity to hedge against the global downturn with a long position. Russia's stock market

[6] Treynor's ratio is based on the assumption that CAPM is the equilibrium pricing model for risky assets. Alternative pricing models such as the consumption-based asset pricing model (Breeden, 1979), the intertemporal asset pricing model (Merton, 1973) and the Arbitrage Pricing Theory (Ross, 1976) have proposed different measures of systematic risk which, if applied instead of the CAPM, would yield different ratios of excess return per unit of systematic risk.

had the highest Treynor ratio before the crisis with 2.545. Its ratio fell to -0.397 during the crisis which resulted in the largest decline between the two periods.

Table 3. Treynor Ratio for Monthly Returns on National Stock Indices Before and Since the Crisis

	Treynor ratio	Treynor ratio
	Pre-crisis	Crisis
Industrialized countries		
Australia	1.017	-0.014
Canada	0.770	-0.016
France	0.284	-0.251
Germany	0.447	0.255
Italy	0.238	-0.495
Japan	-0.668	0.303
Netherlands	0.093	-0.145
Russia	2.545	-0.397
Spain	0.770	-0.352
Sweden	0.104	0.384
Switzerland	0.579	0.482
U. K.	0.005	-0.141
Average	0.515	-0.032
African countries		
Botswana	6.146	-1.148
BRVM	5.636	0.129
Egypt	1.820	-0.120
Kenya	N.A.	0.571
Mauritius	3.579	0.065
Nigeria	8.426	-1.040
South Africa	1.235	0.323
Tunisia	2.792	1.055
Average	4.233	-0.021

	Treynor ratio	Treynor ratio
	Pre-crisis	Crisis
Asian countries		
China	4.228	-0.131
Hong Kong	0.518	0.019
India	1.263	0.230
Indonesia	1.011	0.618
Korea	0.640	0.034
Pakistan	2.979	1.754
Philippines	0.540	1.261
Turkey	0.717	0.128
Viet Nam	4.312	-0.519
Average	1.801	0.377
Latin American countries		
Argentina	0.601	0.748
Brazil	1.058	-0.317
Chile	0.942	0.286
Colombia	2.805	-0.059
Mexico	1.194	0.281
Peru	3.197	0.107
Average	1.633	0.174

Source: Author's calculations.

Africa's stock markets report an average Treynor ratio before the crisis that is, at 4.233, more than 8 times that of their Industrialized counterparts. But it experienced the largest drop among regions to a level that is close to the Industrialized countries' score at -0.021 vs -0.032, and worse than for Asia and Latin America.

The two countries that had recorded the largest Sharpe ratio declines, Botswana and Nigeria, also recorded the largest Treynor ratio decreases. It should be noted that before the crisis, several individual national stock markets displayed a significantly higher Treynor ratio than even the Industrialized country with the highest score, Russia, which implies that during episodes of global stock market growth, they are very attractive for investment in international stock markets.

Asian and Latin American stock markets did not report pre-crisis Treynor ratios that are comparable to Africa's but performed better than Industrialized countries. However, their ratios during the crisis were higher than in the other two regions, both having suffered comparable declines in the ratio. As was the case with the Sharpe ratio, China and Viet Nam for Asia, and Colombia and Peru for Latin America, had the highest Treynor ratios before the crisis and experienced the largest declines during the crisis. Scrutiny of the Treynor ratios by region seems to indicate that the change in ranking across regions from Africa, Asia, Latin America and Industrialized countries before the crisis to Asia, Latin America, Africa and Industrialized countries, the last two almost tied, may be explained by the larger increase in the respective Betas of African and Industrialized countries. Asia and Latin America actually saw their Betas decrease during the crisis.

Jensen's Alpha for Returns on National Stock Indices

An alternative technique for assessment of the performance of a portfolio is proposed by Jensen (1968). Jensen's Alpha seeks to measure the differential return between the actual average return on the portfolio and the average return that is based on the Capital Asset Pricing Model (CAPM), assuming the model determines the equilibrium prices of risky assets; Sharpe (1964), Lintner (1965) and Mossin (1966). The CAPM-determined average return has three arguments: The expected return on the market portfolio, the return on the risk-free asset and the Beta of the portfolio being evaluated. A positive differential return indicates that the portfolio has a performance that is superior to market expectations and a negative Alpha indicates inferior performance. The relationship is given below.

(iii) Jensen's Alpha

$$\alpha_n = E(R_n) - [R_f + \beta_n\big(E(R_m) - R_f\big)] \qquad (3)$$

α_n is Jensen's Alpha for the returns on the national stock market index of country n

$E(R_n)$ is the average return on the stock market index of country n

$E(R_m)$ is the average return on the market portfolio (S&P 500)

β_n is the Beta of country n

R_f is the return on the risk-free asset.

Table 4 displays Jensen's Alpha for the national stock market indices before and during the crisis. During the pre-crisis period Industrialized countries reported an average Alpha, the average differential return, equal to 0.740%, which gives an indication of the strength of this episode' bull market. Recall that the average differential return on the S&P 500, which is also its Alpha given that its Beta is equal to 1 was the difference between its average return and the average yield on the US Short-term Bond: 052% - 0.324% = -0.272%. This implies that before the crisis all industrialized countries in the sample performed better than the US, except for Japan which, in addition, has a negative Alpha during the same period.

However, the average differential return of industrialized countries declined significantly to a negative value of -0.20% during the crisis. Here also the counter-cyclical behavior of the Japanese stock market is confirmed with an Alpha of -0.292% before the crisis and 0.213% during the crisis. The case of Sweden is to be noted with an increased Alpha from 0.443% before the crisis and 0.503% after. As reported with the previous measures of performance, Russia stands out with the highest Alpha before the crisis and the largest drop during the crisis. The high average Alpha for industrial countries before the crisis raises the issue of the

adequacy of the classical CAPM given above as the right asset pricing model considering that, in theory, the average differential return should be equal to zero in an equilibrium market. It can also be argued that an alternative risk-free asset should be considered for the calculation of Alpha or that the periods before and during the crisis are not long enough for the average return of the S&P 500 to be an unbiased estimator of the true expected return on the market portfolio.

Table 4. Jensen's Alpha for National Stock Indices Before and Since the Crisis

	Jensen's alpha Pre-crisis	Jensen's alpha Crisis
Australia	1.137	0.027
Canada	1.004	0.032
France	0.465	-0.215
Germany	0.822	0.397
Italy	0.388	-0.518
Japan	-0.292	0.213
Netherlands	0.362	-0.078
Russia	2.983	-0.428
Spain	0.841	-0.320
Sweden	0.443	0.503
Switzerland	0.554	0.258
U. K.	0.168	-0.109
Average	0.740	-0.020
African countries		
Botswana	1.505	-0.539
BRVM	1.372	0.044
Egypt	1.746	-0.095
Kenya	N.A.	0.563
Mauritius	1.293	0.015
Nigeria	2.157	-0.876
South Africa	1.378	0.380
Tunisia	0.545	0.183
Average	1.428	-0.041

	Jensen's alpha Pre-crisis	Jensen's alpha Crisis
China	1.470	-0.146
Hong Kong	0.689	0.021
India	1.865	0.343
Indonesia	1.751	0.894
Korea	1.215	0.146
Pakistan	2.253	0.537
Philippines	0.827	0.941
Turkey	1.836	0.342
Viet Nam	2.926	-0.463
Average	1.648	0.291
Latin American countries		
Argentina	0.882	1.225
Brazil	2.280	-0.294
Chile	1.194	0.159
Colombia	3.797	-0.031
Mexico	1.652	0.328
Peru	2.729	0.195
Average	2.089	0.264

Source: Author's calculations.

2. International diversification condition

The three evaluation criteria used above, Sharpe, Treynor and Jensen, have given an accurate view of the performance of national stock indices in various parts of the world, before and during the crisis, using different measurement perspectives. An important issue that needs to be resolved is whether a US-based investor would gain from international diversification and, if so, in which foreign stock markets to invest. Elton et al. (2007, Chap. 12) propose an approach to determine the suitability of foreign stocks as potential candidates for international diversification for a US-based investor (which can also be used for foreign-based investors). The underlying rationale is that a US-based investor should hold non-US securities if the Sharpe ratio of the foreign stock, using the US risk-free rate in its measurement is higher than the product of the Sharpe ratio of the US stock market index and the correlation coefficient between the US and the foreign stock markets indices. In other words, the difference between the two measures should be positive for the foreign asset to be considered for international diversification. The formula is given below.

(iv) International diversification condition

$$\frac{\mathrm{E}(R_n)-R_f}{\sigma_n} - \frac{\mathrm{E}(R_{us})-R_f}{\sigma_{us}}\rho_{n,us} > 0 \qquad (4)$$

$\mathrm{E}(R_n)$ is the average return on the stock market index of country n

$\mathrm{E}(R_{us})$ is the average return on the stock market index of the US, S&P 500; $\mathrm{E}(R_{us}) = E(R_m)$

σ_n is the standard deviation or total risk of the return on the stock market index of country n

σ_{us} is the standard deviation or total risk of the return on the US stock market

R_f is the return on the US risk-free asset

$\rho_{n,us}$ is the coefficient of correlation between the returns on the markets of country n and the US.

Table 5 reports the score for the international diversification condition of the sample countries before and during the crisis. Before the crisis, all the Industrialized countries, except for Japan, offered scope for international diversification for a US-based investor. Russia, Australia and, to a lesser extent, Canada and Spain, were attractive investment destinations for US capital. Therefore, before the crisis, it made economic sense for the US investor to hold a significant portion of foreign stock in his portfolio. But during the crisis, all the Industrialized countries recorded a negative score of the international diversification condition, which, based on this criterion, disqualified all of them for stock market investment by the US investor and,

could be a motive for divestment from these markets and investment solely at home. Therefore, the notion that an internationally diversified portfolio could provide gains through higher returns or lower total risk was not supported by the scores of the Industrialized countries during the crisis period.

Table 5. International Diversification condition for National Stock Indices

	Int. Div. Pre-crisis	Int. Div. Crisis
Industrialized countries		
Australia	0.237	-0.073
Canada	0.189	-0.086
France	0.090	-0.109
Germany	0.121	-0.043
Italy	0.073	-0.145
Japan	-0.049	-0.030
Netherlands	0.063	-0.114
Russia	0.327	-0.130
Spain	0.151	-0.105
Sweden	0.062	-0.021
Switzerland	0.140	-0.001
U. K.	0.049	-0.112
Average	0.121	-0.081
African countries		
Botswana	0.336	-0.130
BRVM	0.200	-0.038
Egypt	0.200	-0.064
Kenya	N.A.	0.008
Mauritius	0.297	-0.049
Nigeria	0.405	-0.146
South Africa	0.214	-0.026
Tunisia	0.157	0.045
Average	0.258	-0.050
Source: Author's calculations.		

	Int. Div. Pre-crisis	Int. Div. Crisis
Asian countries		
China	0.202	-0.049
Hong Kong	0.121	-0.065
India	0.244	-0.036
Indonesia	0.192	0.012
Korea	0.167	-0.084
Pakistan	0.260	0.065
Philippines	0.113	0.085
Turkey	0.119	-0.052
Viet Nam	0.241	-0.049
Average	0.184	-0.019
Latin American countries		
Argentina	0.074	0.028
Brazil	0.195	-0.109
Chile	0.203	-0.022
Colombia	0.399	-0.071
Mexico	0.248	-0.034
Peru	0.370	-0.046
Average	0.248	-0.042

Before the crisis, African stock markets reported significantly positive scores on average and thus constituted very attractive investment destinations for the US-based investor. Their average score of 0.258 more than doubled the average score of Industrialized countries, 0.121, with countries, Botswana (0.336) and Nigeria (0.405), surpassing the highest score among Industrialized countries recorded by Russia. But they experienced a major decline in their scores during the crisis period with -0.050, which is comparable to the score of Industrialized countries, -0.081. However, during this period two countries, Kenya and Tunisia, had positive scores albeit close to zero. It is noteworthy that African stock markets suffered the largest decline in their average scores than any other region.

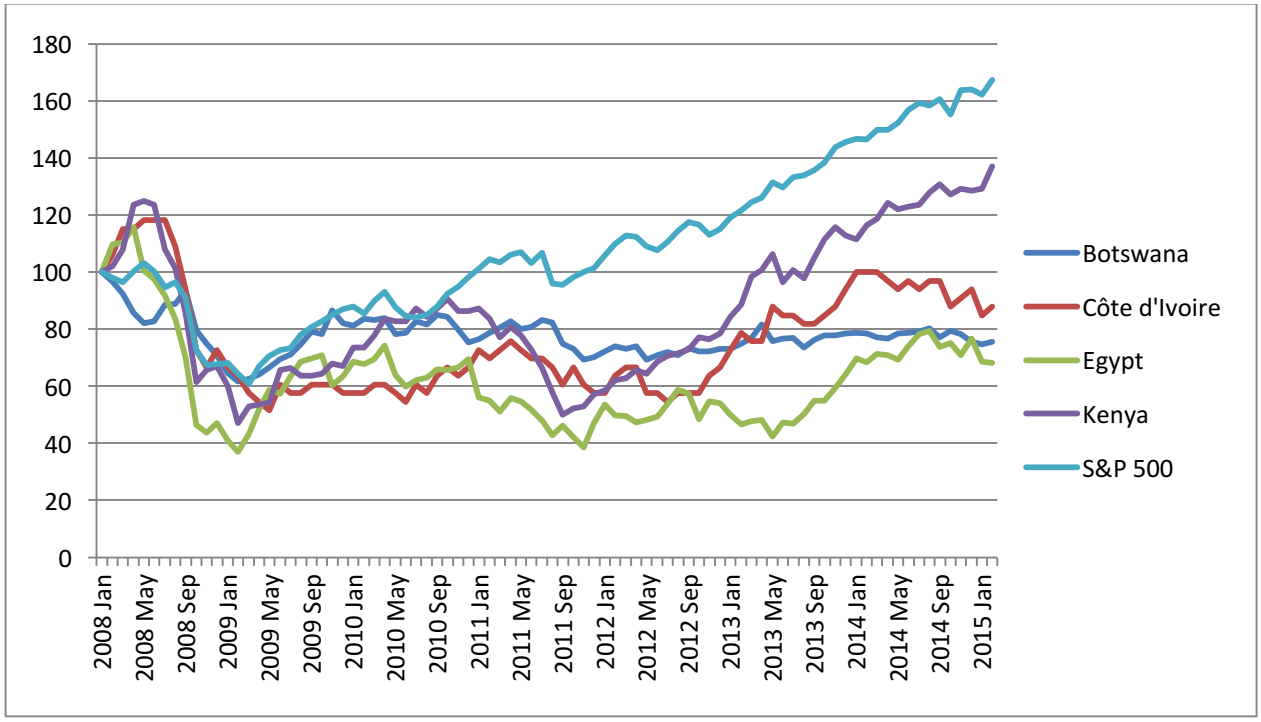
Before the crisis, Asian and Latin American stock markets all reported positive scores on the international diversification condition, Asian markets with a score slightly higher than for Industrialized countries and Latin American with a score slightly lower than for African markets. Colombia (0.399) and Peru (0.370) performed very well with scores that rivalled the best scores in Africa. But for both regions, the average score decreased significantly during the crisis to -0.019 for Asia and -0.042 for Latin America. In the cases of Indonesia, Pakistan, the Philippines and Argentina, the score remained positive, which gave moderate scope for international diversification during the crisis. One caveat is that either they suffered a large drop between the two periods – Indonesia and Pakistan -, or they had a low score even during the pre-crisis period – the Philippines and Argentina -, compared to their regional counterparts. In summary, the results indicate that the scope for international diversification for a US-based investor is conditional on the state of the global stock market. In a bull market, foreign stocks are attractive and justify holding of portfolios with a high foreign component; but in a market downturn, US-based investors face limited opportunities to gain from international diversification and may be better off increasing the domestic component of their stock portfolio.

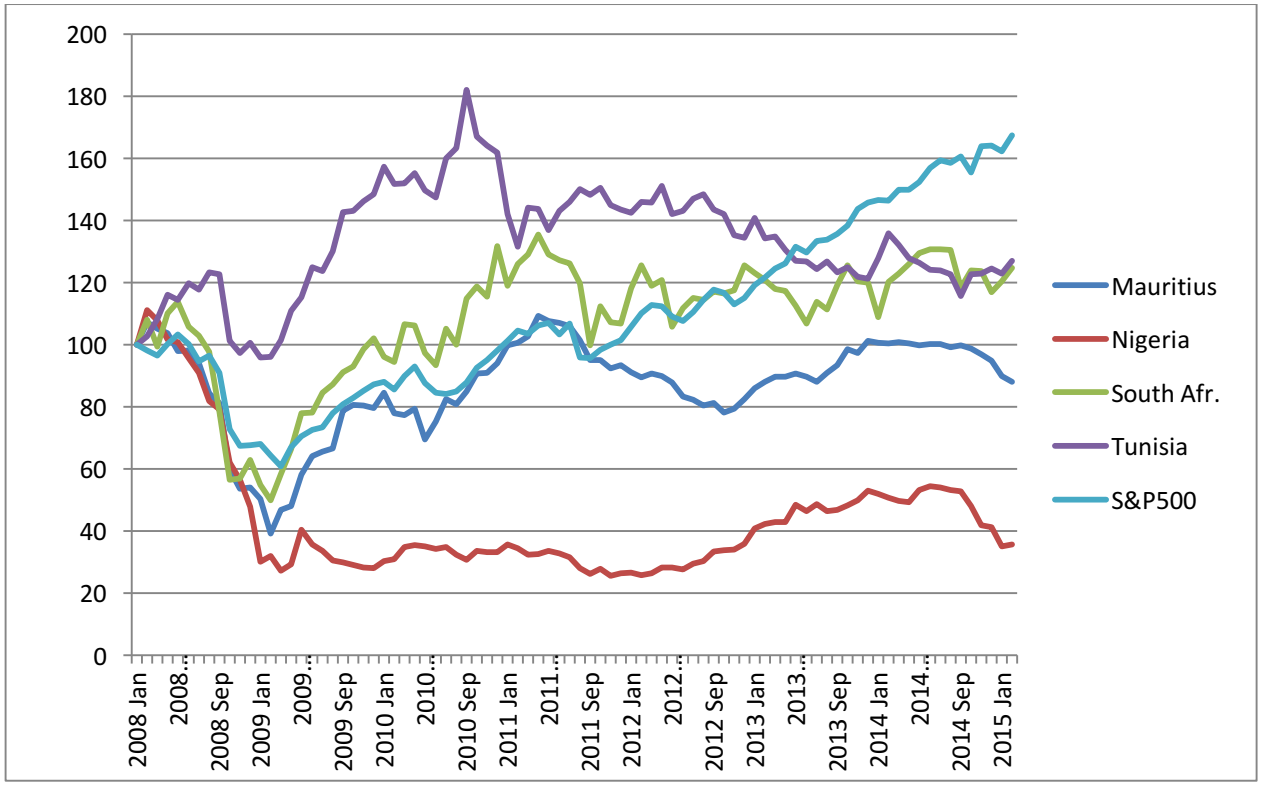
3. Have African stock markets recovered?

The foregoing analysis has documented the large decline of African stock markets during the crisis, for convenience referring to the period January 2008 to February 2015. It is commonly viewed that the crisis lasted mainly from 2008 to 2009, although the starting and ending months are still debated. Therefore, examination of the possible recovery of African stock markets requires an unambiguous end date of the crisis in order to determine whether such a recovery occurred. Two approaches are proposed. The first one consists in considering the lowest point in the S&P 500 index during the crisis and including all subsequent months in the recovery period. Indeed, the S&P 500 index reached its bottom in March 2009 and since then followed a strong upward trend. Consequently, for the sake of the present analysis, a US-based investor could consider April 2009 as the beginning of the recovery period. The second approach consists in examining if national stock market indices increased enough to reach their levels of January 2008, the month deemed in the present analysis to start the crisis period. In other words, the analysis consists in seeing if all the losses incurred during the crisis, January 2008 to March 2009, were fully recovered afterwards. The second approach is considered first.

Figure 1 below gives a graphic evolution of African national stock prices indices and the S&P 500 index rebased at January 2008 = 100. First, it shows that the S&P 500 experienced a strong recovery after the downturn and significantly surpassed its January 2008 level by more 60% in February 2015. Second, 7 of the 8 African stock market indices followed the S&P 500 in its sharp drop to also reach their lowest levels in or around March 2009. Tunisia was an exception because its stock market index grew during the year 2008 when all other African countries started an earlier decrease. But it also declined and reached its bottom in January and February 2009. As a group, African stock market indices did not record a recovery similar to that of the S&P 500. In February 2015, only Kenya, South Africa and Tunisia had exceeded their levels of January 2008. Furthermore, over the years, Nigeria has not been able to rise significantly above the bottom level of its stock market index and remained for several years at or near its bottom. Egypt also experienced an unfavorable record by dipping twice close to its bottom in November 2011 and July 2013. Overall, 5 out of 8 African stock markets have not been able to mount a full recovery by reaching an index level equal to or higher than it was in January 2008, seven years after the onset of the global stock market crisis.

Figure 1. Dollar-Denominated National Stock Market Indices of Africa and S&P 500, Jan. 2008- Feb. 2015
Rebased at January 2008 = 100





Are African stock markets on the path to medium to long term recovery? Such a recovery could be observed if the trend of their indices after the market (S&P 500) reached bottom was on an upward slope, arguably close to the performance that they recorded before the crisis. Therefore, the statistics of their performance during the recovery period should be close to, or better than, their levels before the crisis. In other words, it would be growth as usual after the incident of downturn during the crisis, January 2008 to March 2009. The recovery is considered to cover the period April 2009 to February 2015. Table 6 reports the statistics of returns on the S&P 500 and on African stock market indices before the crisis and during the recovery.[7]

The average return on African stock market indices during the recovery period was 0.865%, a level significantly lower than that of the S&P 500 which was 1.482%. In other words, African countries recovered but recorded a performance that was considerably lower than their pre-crisis average return of 1.636%. Individually, they all recovered but did not record their pre-crisis returns while Tunisia's pre-crisis average return was halved during the recovery period. The total risk of African stock market indices shows mixed results during the recovery period. Three markets, Botswana, BRVM and Egypt, have a lower standard deviation than during the pre-crisis period, while three others, Mauritius, Nigeria and Tunisia, have higher standard deviations. The Betas of the countries have all decreased in comparison to the crisis-period but have mixed results if compared to the pre-crisis period. Two countries, Botswana and South Africa, have unchanged Betas, three have higher Betas, BRVM, Mauritius and Nigeria, while Egypt and Tunisia have Betas that are lower than during the pre-crisis period. In conclusion, African stock markets are on the path to long term recovery with positive average returns and sensitivity levels that are lower than during the crisis although not as low as before the crisis. Therefore, they are gaining attractiveness but not as much as was the case before the breakout of the global financial crisis.

[7] For statistics on the crisis period please refer to Table 1.

Table 6. Statistics of Returns on National Dollar-Denominated Stock Indices Before the Crisis (Jan. 2000-Dec. 2007) and During Recovery Period (April 2009-Feb. 2015)

	Mean return Pre-crisis	Mean return Recovery	Stand. Dev. Pre-crisis	Stand. Dev. Recovery	Beta Pre-crisis	Beta Recovery
Botswana	1.766	0.326	4.601	3.466	0.235	0.238
BRVM	1.632	0.750	7.069	5.818	0.232	0.519
Egypt	1.843	0.984	8.778	8.245	0.835	0.719
Kenya	N.A.	1.494	N.A.	5.346	N.A.	0.640
Mauritius	1.526	1.010	4.477	4.951	0.336	0.623
Nigeria	2.414	0.643	5.428	7.462	0.248	0.897
South Africa	1.454	1.294	6.469	6.667	0.915	0.918
Tunisia	0.821	0.416	3.756	4.436	0.178	0.131
AVERAGE	1.636	0.865	5.797	5.799	0.425	0.586
S&P500	0.052	1.482	3.505	2.982		

Conclusion

The empirical evidence on the performance of African stock markets before and during the global financial crisis shows several striking facts. Before the crisis, January 2000 to December 2007, African stock markets had mean monthly returns that outpaced the returns of all other regions of the world with levels of total risk (standard deviation of returns) that equaled the score of Industrialized countries and were significantly lower than for Asian and Latin American stock markets. Their average systematic risk (Beta relative to the S&P 500) was significantly lower than that of their counterparts in other regions. However, with the advent of the crisis, January 2008 to February 2015, they suffered a sharp decline in their average returns and a rise in their levels of total as well as systematic risk albeit showing lower risk than in other regions. As a result, their performance was less attractive in a mean-variance space for a US-based investor even if they remain of possible interest for inclusion in global low Beta portfolios.

Evaluation of the performance of the African stock markets before and during the financial crisis is conducted using three criteria: Sharpe's ratio, Treynor's ratio and Jensen's Alpha. For Sharpe's ratio, in all regions, countries with the highest score before the crisis recorded the biggest drop during the crisis in comparison to their counterparts in their respective regions. Furthermore, the ranking of Sharpe's ratio from highest to lowest, African stock markets being the first –Africa, Latin America, Asia and Industrialized countries-, was totally inversed during the crisis. This provides evidence that African stock markets suffered the largest negative impact of the global financial crisis. It is noteworthy that the average reward to variability ratio of industrial countries' stock markets has been lower than for other regions, which suggests that shifts in the composition of investors' global portfolios will, in the future, most probably favor stocks in the developing world.

Not unlike Sharpe's ratio, Treynor's ratio unveils the strong performance of African stock markets before the crisis for every individual country and for the region's average which is a multiple of the average of the ratio of other regions. In other words, African stock markets were attractive as a regional group and individually. But their Treynor score experienced the biggest drop during the crisis and equaled the poor performance of Industrialized stock markets, Asia and Latin America taking the lead during this episode with the help of a decrease in their Betas. The sharp drop in the Treynor score of Industrialized and African stock markets during the crisis may have been caused more by the rise in their respective Betas than by reduction of their average returns. African stock market indices recorded the highest decline in their Jensen's Alpha than any other region because of the sharp rise in their required rate of return (large increase in their Betas) and a lower average return during the crisis thus giving them the lowest score. Other regions were also affected but fared better than Africa thanks to a moderate increase –Industrialized countries- or even a lower Beta – Asia and Latin America-, during the crisis.

Analysis of the attractiveness of African stock markets for inclusion in the portfolio holdings of a US-based investor has revealed that they would have been the best investment destination before the crisis, based on the international diversification condition. However, their scores declined sharply at the individual level and on average. The reduced attractiveness for a US-based investor also affected all other regions which implies that, during the crisis, US-based investors were better-off not including foreign stocks in their portfolios but by investing domestically instead. Conversely, under growth in global equity markets, foreign stocks may gain in attractiveness and be included in the portfolio of a US-based investor. Inquiry into possible recovery of African stock markets after the global financial market has yielded two key results. If the starting point of the crisis, January 2008, is used as a benchmark to measure the extent of recovery, the S&P 500 has recorded more than 60% progression by February 2015. In other words it has fully recovered. But during the same period, only three African countries, Kenya, South Africa and Tunisia, recorded national index levels higher than in January 2008, but at levels considerably lower than the S&P 500. The other 5 have still not fully recovered, seven years after the onset of the crisis. The second result shows that, since the bottom of the S&P 500, March 2009, deemed to be the beginning of the global recovery, African stock markets have recovered but recorded a performance that was significantly lower than during the pre-crisis period. Indeed, their average return was just half what it was before the crisis, their total risk declined moderately and their systematic risk was higher than before the crisis although much lower than during the crisis. In summary, African stock markets are on a path to long term recovery but do not seem to replicate the performance levels that they experienced before the crisis.

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