

## Global Versus Regional Systematic Risk and International Asset Allocations in Asia

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This study decomposes total risk of a MSCI Asian country index returns into three components: world systematic risk, Asian regional systematic risk and country-specific risk. The study finds an Asian country index returns mostly respond to shocks originated within the country. China, Korea and Taiwan index returns are increasingly sensitive to global common shocks notably after the Asian financial crisis, while Japan and India indices are more responsive to regional shocks. These findings have important implications in optimally allocating funds within a global versus a regional portfolio. © 2006 Peking University Press

*Key Words:* Systematic risk; Asset allocation; Portfolio management.

*JEL Classification Numbers:* G11, G12, G15, G20.

### 1. INTRODUCTION

The global equity investment has grown larger each year. In 2003, the international equity markets represented slightly more than half of the world's investment opportunities, up from about one-third in 1970<sup>1</sup>. The forces driving this growth are diversification benefit and higher risk-adjusted returns. Economic reform and financial liberalization in Asia have provided global investors with diversified portfolios, and fast GDP growth offers them expectation of higher returns. At the end of 1999, approximately half of the emerging market capitalization (\$1.5 trillion) was in Asia. Regional shocks such as the Asian financial crisis had temporarily driven investors away. However, Asian equity quickly regained global investors' charm shortly after the crisis.

<sup>1</sup>Statistics in this section are from "Emerging Stock Markets Factbook 2002" by International Finance Corporation, and "World Economic Outlook Growth and Institutions" by IMF

In spite of this enthusiasm, the overall returns of equity investments in Asia are low compared to investments in other markets (Harvey and Roper [1999]). Investors are not compensated enough for the risk they bear. Additional risks added to cross border investment (such as political unease, foreign exchange fluctuations, information barriers, etc.) are often the supposed causes of underperformance. However, mistakes in fund management may be a significant drain. One possible mistake: asset allocations may not be differentiated at global and regional levels. For example, assets may differ in response between regional and global shocks, yet fund managers may allocate the same amount of funds to an asset regardless of whether it is in a global portfolio or in a regional portfolio. Even if a portfolio manager realizes these differences, it is difficult for the manager to allocate funds accordingly without proper measurements.

Existing research provides little help to practitioners. Studies on risk characteristics of Asian stock markets are limited. Chen and Wong [2003] suggest shocks that impact Asian equity returns are mostly country specific. Tai [2004] finds the benefit of diversification in an Asian portfolio has increased and portfolio risk has decreased after liberalization. Heaney and Hooper [1997] find financial risk indices (but not political risk indices) give consistent explanatory power to Asian equity returns. Harvey has sorted a detailed chronology of important financial, economic, and political risks in emerging markets<sup>2</sup> and has investigated the influence of these risks on expected fixed income returns (Erb, Viskanta and Harvey [1998]).

This research argues that it is also important to study where a shock comes from, and how an asset responds to it. It intends to differentiate and measure degrees of responsiveness of an asset to not only global shocks, but also Asian common shocks. With a growing trend in forming regional economic blocs such as EU and ASEAN, the increasing impact of regional shocks, such as regional crisis, on investment returns, and increasing offers of regional portfolios to international investors, research in analyzing systematic risk, especially regional systematic risk, becomes important. At the Asian regional level, there is a rich body of research in Asian financial and equity integration (Pomfret [2005], Wang [2004], Chelley-Steeley [2004], Eichengreen and Park [2003]), and some in Asian asset management (Bhatnagar and Ghosh [2005], Schmukler and Lyons [1999]). Studies that separate sources of shocks and their influences on asset allocations are lacking, however. This study should meet the increasing demand from both academic research and financial practice.

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<sup>2</sup>[http://www.duke.edu/~charvey/Country\\_risk/couindex.htm](http://www.duke.edu/~charvey/Country_risk/couindex.htm)

## 2. DATA

The study uses fourteen indices from Morgan Stanley Capital International Inc. Twelve indices are country indices<sup>3</sup> and two are benchmarks (MSCI All County Asia Index [MSCI AC ASIA] and MSCI All County World Index [MSCI ACWI]). Twelve country indices compose MSCI AC ASIA and they are also components of MSCI ACWI.

Since indices for China, India and Pakistan are available only from December 1992, data are expressed in U.S. dollars with December 1992 as 100. Data range from December 1992 to January 2005, with a total of 145 months. Logarithmic returns are calculated as

$$R_{i,t} = \log(P_{i,t}/P_{i,t-1}) \quad (1)$$

where  $P_{i,t}$  and  $P_{i,t-1}$  are the prices of an index  $i$  at time  $t$  and  $t - 1$  respectively, and  $R_{i,t}$  represent logarithmic returns of an index  $i$  at time  $t$ .

**TABLE 1.**

Summary Statistics

MSCI Index	Mean (%)	Medium (%)	Standard Deviations (%)	Coefficient of Variation
China	-0.42	-0.60	4.86	-11.60
Hong Kong	0.19	-0.01	3.62	19.36
India	0.19	0.07	3.64	18.91
Indonesia	-0.08	0.48	6.45	-85.22
Japan	0.02	-0.14	2.67	115.90
Korea	0.18	0.06	5.28	29.92
Malaysia	0.03	0.22	4.45	155.16
Pakistan	0.004	0.31	5.05	1331.9
Philippines	-0.19	-0.29	4.38	-23.07
Singapore	0.08	0.26	3.67	44.54
Taiwan	0.12	-0.64	4.20	34.44
Thailand	-0.17	-0.26	5.73	-32.97
AC ASIA	0.04	0.06	2.47	60.8
ACWI	0.24	0.52	1.79	7.39

Sample: 1993/01 2005/01

All returns are in logarithmic forms.

From the summary statistics (See Table 1), one observes that China, Indonesia, The Philippines and Thailand have negative average returns; with China having the lowest returns of negative 0.4%. Indonesia, Korea,

<sup>3</sup>China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, Pakistan, Singapore, Taiwan, and Thailand

Pakistan and Thailand have standard deviations above 5%, with Indonesia reaching 6.45%. MSCI ACWI offers the highest return of 0.24% and the lowest standard deviation of 1.79%. To measure risk per unit of return, Coefficient of Variations (CV) are calculated<sup>4</sup>. MSCI ACWI provides investors with the lowest risk (7.39) per unit of average return, clearly indicating the benefit of portfolio diversification. On the other hand, MSCI AC ASIA has 60.8 coefficient variation, which is higher than those of five of its country components, indicating it still bears high level of portfolio risk. MSCI AC ASIA has not been able to reduce risk properly through optimal asset allocation within the portfolio.

### 3. METHODOLOGY

This study modifies Akdogan's [1996] international risk decomposition model. Akodogan's initial work is as follows:

$$R_i = \alpha_i + \beta_i R_g + \varepsilon_i, \quad (2)$$

where  $R_i$  represent a country index  $i$ 's returns, and  $R_g$  represent a benchmark world index returns.

Taking the variance of both sides, and dividing both sides by the variance of index  $i$ 's returns ( $\sigma_i^2$ ), one gets

$$1 = \beta_i^2 \sigma_g^2 / \sigma_i^2 + \sigma_\varepsilon^2 / \sigma_i^2, \quad (3)$$

where  $p_i = \beta_i^2 \sigma_g^2 / \sigma_i^2$  measure the  $i$ th country index's contribution of world systematic risks. Akodogan claims as the contribution increases, the degree of world integration increases. So he calls  $p_i$  the scores of a country's global integration.  $q_i = \sigma_\varepsilon^2 / \sigma_i^2$  measure the  $i$ th country index's country specific risks.

The modification comes in three folds. First, it adds a measurement of regional systematic risk into Akodogan's model; second, it tries to capture the time-varying characteristics of the measurements; and third, it defines  $p_i$  only as measurements of systematic risks instead of measurements of integration levels, for the author argues that degrees of integration are not equivalent to levels of systematic risks. The detail of the argument, however, is not the focus of current study and is suggested for future research.

To modify Akdogan's model, first, one regresses Asian regional index on a world index, and captures residual.

$$R_a = \alpha_a + \beta_a R_g + \nu_a \quad (4)$$

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<sup>4</sup> $CV = \sigma/\mu$ .  $\sigma$  is the measure of standard deviation, and  $\mu$  is the average return.

$R_a$  represent returns of MSCI AC ASIA.  $R_g$  represents returns of MSCI ACWI.  $\nu_a$  capture the changes in Asian index that cannot be explained by the world index, thus,  $\nu_a$  is orthogonal to  $R_g$ .

Then one regresses country  $i$ 's index return on two explanatory variables,  $R_g$  represent MSCI ACWI, a world index returns, and  $\nu_a$  represent regional factors from Asia.

$$R_i = \alpha_i + \beta_{ia}\nu_a + \beta_{ig}R_g + \varepsilon_i \quad (5)$$

Next, one takes the variances of equation (5), and divides both sides by the variances of country  $i$ 's index returns, it then becomes

$$1 = \beta_{ia}^2 \sigma_\nu^2 / \sigma_i^2 + \beta_{ig}^2 \sigma_g^2 / \sigma_i^2 + \sigma_\varepsilon^2 / \sigma_i^2 \quad (6)$$

Let's define:

$$p_i = \beta_{ia}^2 \sigma_\nu^2 / \sigma_i^2 \quad (7)$$

$$q_i = \beta_{ig}^2 \sigma_g^2 / \sigma_i^2 \quad (8)$$

and

$$r_i = \sigma_\varepsilon^2 / \sigma_i^2 \quad (9)$$

where  $p_i$  measure how much variation of a country index returns can be explained by Asian regional systematic risks.  $q_i$  measure the degrees of variations of a country index that are affected by world systematic risks, and  $r_i$  measure the country-specific risks.

Thus the total risk of country  $i$ 's returns can be separated into three parts, the regional systematic risk, the global systematic risk, and the country-specific risk, which is the unsystematic part that can be diversified away within a well diversified global portfolio.

To capture the time-varying characteristic of these risk measures, 12-month moving averages are calculated, starting from January 1993, with intervals of one month. Measurements are also calculated over four and six month intervals to check the robustness of the test. Since the sample size is large enough, to address heteroscedasticity problems in emerging market returns, heteroskedasticity-corrected standard error is used during regression.

#### 4. FINDINGS

Table 2 ranks countries by their average levels of global and regional systematic risk over the 12 year period. The five country indices that are most sensitive to a global common shock during the sample period are Japan, Hong Kong, Singapore, Korea and Thailand. The five indices that

are most sensitive to an Asian common shock are Japan, Korea, India, China and Indonesia.

**TABLE 2.**

The Average Global and Regional Systematic Risk of MSCI Asian Country Indices (Periods: January 1993 - January 2005)

Global Systematic Risk			Regional Systematic Risk		
Rank	Country	Global Risk	Rank	Country	Regional Risk
1	Japan	0.43	1	Japan	0.51
2	Hong Kong	0.43	2	Korea	0.14
3	Singapore	0.42	3	India	0.13
4	Korea	0.34	4	China	0.13
5	Thailand	0.33	5	Indonesia	0.12
6	Taiwan	0.25	6	Thailand	0.12
7	China	0.24	7	Hong Kong	0.12
8	Indonesia	0.23	8	Taiwan	0.09
9	Philippines	0.23	9	Pakistan	0.08
10	Malaysia	0.23	10	Philippines	0.07
11	India	0.16	11	Malaysia	0.06
12	Pakistan	0.09	12	Singapore	0.06

**TABLE 3.**

Comparison of the Average Global and Regional Systematic Risk (Before and After Asian Financial Crisis)

Country	Global Systematic Risk		Regional Systematic Risk	
	Before	After	Before	After
China	0.08	0.35	0.17	0.1
Hong Kong	0.44	0.42	0.12	0.11
India	0.13	0.19	0.07	0.17
Indonesia	0.31	0.18	0.15	0.11
Japan	0.52	0.37	0.44	0.57
Korea	0.15	0.47	0.13	0.15
Malaysia	0.3	0.18	0.06	0.07
Philippines	0.2	0.25	0.07	0.06
Pakistan	0.13	0.06	0.1	0.07
Singapore	0.45	0.4	0.05	0.07
Thailand	0.3	0.35	0.11	0.13
Taiwan	0.16	0.31	0.1	0.08
Average	0.26	0.29	0.13	0.14

Table 3 gives the comparison of average global and regional systematic risk before and after the Asian financial crisis. Chow test results show that nine out of the twelve countries (except Pakistan, India and Singapore) have significant structural breaks<sup>5</sup>. At the global level, Korea, China and Taiwan are more in line with the world after the crisis, while Japan, Indonesia and Malaysia regressed. At the regional level, the overall levels of responsiveness of all indices to regional shocks only slightly increased after the crisis. Japan and India are much more prone to regional systematic risk, but China is less so.

Below are detailed analyses of risk components of each country index returns (See Figure 1).

China: Country-specific risks play a dominant role in determining Chinese index returns. However, they were outweighed by world systematic risks after 2001 when China entered the WTO. The influence of Asian systematic risk has decreased after the Asian financial crisis in 1997 but increased upon WTO entry. WTO has boosted China's responsiveness to the outside world, but more so at global than at regional levels.

Hong Kong: Hong Kong is one of the largest financial centers in the world. It is understandable that Hong Kong's index responds more to global shocks than to regional ones. Surprisingly, its country-specific risks are always significant. But considering the unique "one country and two systems" relationship between Hong Kong and China, and the existence of long-run equilibrium between their equity markets (Bahng and Shin [2004]), it is justified that investors are sensitive to local news, especially their tolerance of the political risk involved in H-shares as a result of the increasing integration between Hong Kong and China (Zhang and Zhao [2003]).

Indonesia: Regardless the government's numerous attempts to foster economic and political reform, Indonesia has been withdrawn from both regional and global influences after the 1997 crisis. Country-specific risks have been increasing. Terrorist attacks and current political unease may be the contributing factors.

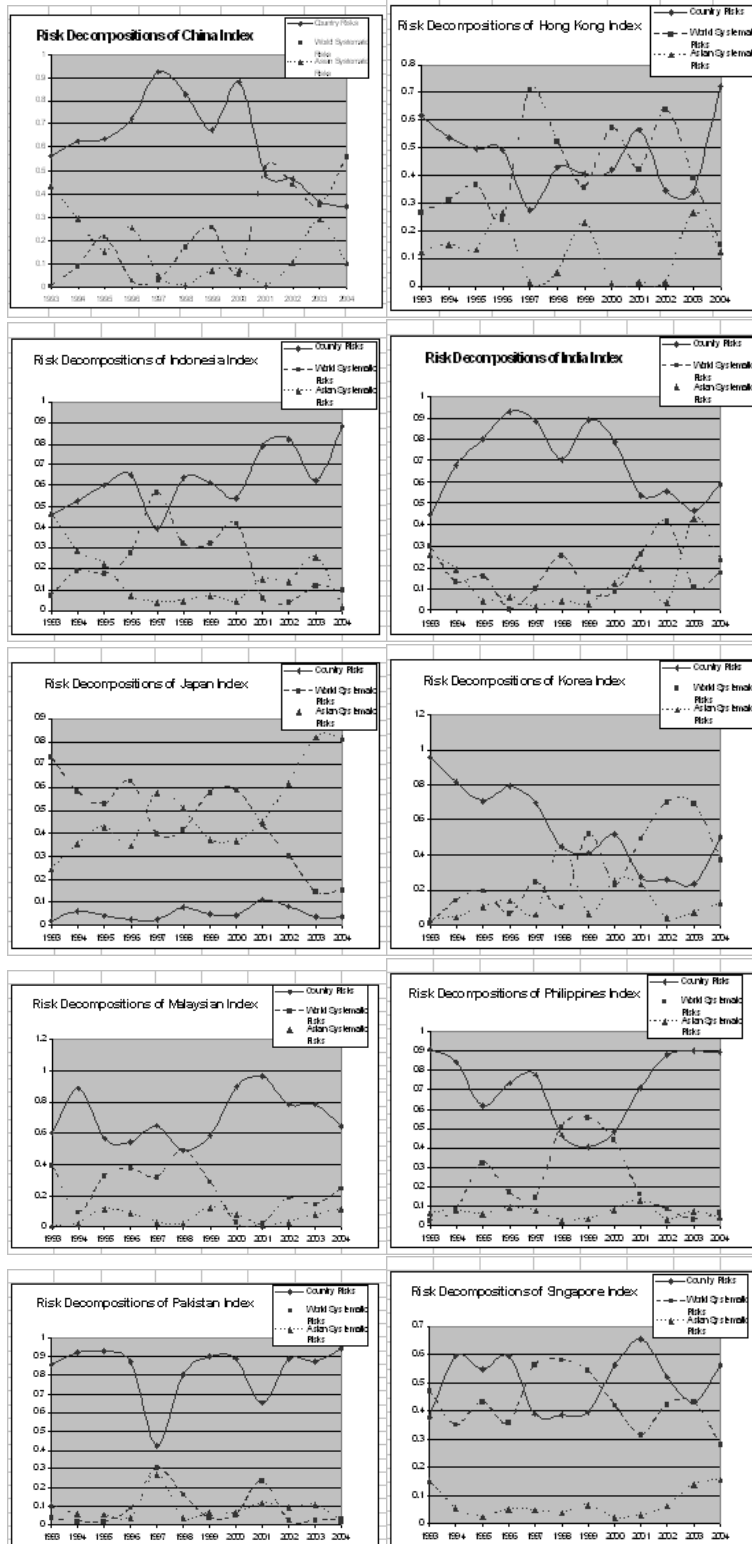
India: After financial liberalization in 1992, India has made consistent efforts to open its equity market to foreign investors, and in strengthening the enforcement of rules and regulations. Country-specific risk dominates returns, but reflecting these efforts, has been decreasing. Its sensitivity to regional and global shocks have gradually increased, but slightly more so at the regional level in recent years.

Japan: Japan has the lowest level of country-specific risk among the 12 nations. It is the most sensitive to both global and regional common shocks.

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<sup>5</sup>Three countries, Pakistan, India and Singapore, have insignificant results at 1% level. Only Pakistan has a insignificant result at 5% level.

FIG. 1. Risk Decompositions of Each Country Index Returns in Asia





This can be explained as Japan has the most efficient and matured equity markets in Asia that are highly integrated with the rest of the world. It also can be attributed to the characteristic of Japan's export-led economy. Japan is more influential to the Asian region than to the world since the beginning of the twenty-first century (consistent with Tse's [2002] findings). This is apparent: regional risk increased sharply while global risk plummeted.

Korea: Korea is much more sensitive to world common shocks than regional ones after the crisis. Country risk has been steadily declining. The explanation might be that Korea has been less dependent on high-tech exports than the other Southeast Asian countries, and has recovered more quickly. It has been exporting less in the region but more to countries outside Asia, such as the United States.

Malaysia: Index returns are less affected by shocks originated outside the country. In response to the sharp loss of equity value during the crisis, the government imposed capital controls and increased government spending, adding heavy burdens on an already record high budget deficit. These movements might trigger a big increase in country specific risks after the crisis.

Philippines: Global systematic risks sharply increased while country risks took a deep dive during and shortly after the crisis. However, country risks have increased but global ones decreased since 2000. Reasons for this phenomenon are many. Among them is the heavy debt (public debt at 77% of GDP)<sup>6</sup> that hampered economic improvement, the impeachment of President Joseph Estrada, Muslim rebels and the SARS outbreak since the new millennium.

Pakistan: As a relative newcomer in the Asian equity family, Pakistan remains disconnected from the rest of the world. Global influence went down even further after the 1997 crisis. There is no statistical evidence to prove that average levels of risks are significantly different before and after the Asian financial crisis.

Singapore: A surprising discovery is that Singapore is the least sensitive toward common shocks originated in Asia. This indicates that Singapore is a good candidate within a regional portfolio for diversification benefit.

Thailand: Thailand is ranked in the middle for both types of systematic risk. The increase in regional systematic risk in 2001 can be contributed to the growth in Thailand that was stimulated by neighboring countries, such as China. Various domestic stimulation programs may lead to increases in country specific responsiveness during the subsequent year.

Taiwan: Taiwan has very similar risk patterns to those of China.

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<sup>6</sup>Source: Wikipedia, the free encyclopedia. <http://en.wikipedia.org/wiki/Philippines#Economy>

In summary, the study finds emerging stock returns in Asia are heavily influenced by country-specific risk. Stock prices fluctuate more when domestic shocks hit. Regional and global shocks are generally less important. This result confirms that emerging market returns are more likely than developed countries to be influenced by local information (Harvey [1994]). Thus, diversification opportunities exist in Asian equities because the markets are largely segmented in the region. (Bhatnagar et al. [2005]).

## 5. IMPLICATIONS

The test results show that the majority of Asian country indices, especially those of emerging nations, are mostly responsive to their country-specific risks, and not all indices respond to regional and global common shocks with the same sensitivity. Their developmental paths also differ. Some nations are gradually more responsive to regional shocks; some to global ones.

**TABLE 4.**  
Weights and Ranking of Funds of MSCI AC ASIA and MSCI ACWI  
(As of January 31, 2005)

MSCIAC Index Weights			MSCIACWI Index Weights		
Country	Weights	Rank	Country	Weights	Rank
Japan	0.6972	1	Japan	0.0917	1
Korea	0.0765	2	Korea	0.0101	2
Taiwan	0.0552	3	Taiwan	0.0073	3
Hong Kong	0.0530	4	Hong Kong	0.0070	4
China	0.0307	5	China	0.0040	5
Singapore	0.0271	6	Singapore	0.0036	6
India	0.0228	7	India	0.0030	7
Malaysia	0.0162	8	Malaysia	0.0021	8
Thailand	0.0105	9	Thailand	0.0014	9
Indonesia	0.0080	10	Indonesia	0.0011	10
Philippines	0.0022	11	Philippines	0.0003	11
Pakistan	0.0007	12	Pakistan	0.0001	12

Academic research and practical applications, however, have ignored these differences. For example, one might notice that the ranking orders of weights (See Table 4) used for MSCI AC ASIA, a regional portfolio, and MSCI ACWI, a global portfolio, are the same<sup>7</sup>. But test results clearly

<sup>7</sup>MSCI Indices are more than just benchmarks that track the market movements. They are vehicles for financial products. MSCI sells license to companies, such as State Street, Barclays, Vanguard, etc., to create financial products off its indices. Even though

indicate that Asian country indices respond to regional shocks and global shocks differently. Careful analysis finds that Singapore, Hong Kong and Taiwan's index contribute less risk in a regional portfolio than they were ranked and the required rate of returns of these country indices should have been lower. On the other hand, Singapore, Hong Kong, Thailand and the Philippines would be more responsive to a global shock than they were regarded. Taiwan and India would be less so.

Earlier it was discussed that the MSCI AC ASIA index is highly risky and didn't diversify risk away properly. One of the explanations of its poor performance might be that the fund manager has not considered levels and developmental path differences between global and regional systematic risk of each Asian country index. One expects similar problems exist in other fund allocation practices, especially in emerging markets funds.

Furthermore, one finds that 70 percent of funds of MSCI AC ASIA are allocated in Japan, almost ten times the level of those in Korea, ranked at second with 7.7 percent. Japan has been increasingly sensitive to Asian common shocks, which means it contributes more and more regional systematic risk when it is in a regional portfolio. Large funds given to Japan are contradicted by the very idea of portfolio diversification. On the other hand, the study finds that Singapore is the least sensitive to Asian regional shocks. This makes Singapore a strong candidate to provide diversification within an Asian portfolio. If less funds had been assigned to Japan and more to Singapore, costs of capital of an Asian portfolio would be lower, which help further stimulate regional economies.

## 6. CONCLUSION AND FUTURE RESEARCH

This study separates and measures three components of an Asian country index's total risk: the world systematic risk, the regional systematic risk and the country-specific risk. It finds changes of Asian country index returns are mostly affected by its country-specific risk, indicating existence of diversification benefit of including an Asian stock to an international portfolio. Explanations for such high levels of country-specific risks in Asia vary. Market segmentation, diversified economic structure of a country and information asymmetry are among the list of many reasons. To identify the causal ones, one should differentiate the concept of systematic risk and integration.

The study also finds that the Korea, China and Taiwan index returns are increasingly sensitive to global common shocks, while the Japan and India indices are more responsive to regional shocks. Future research is

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it is up to these companies to customize products that track MSCI indices, many of them use the weights provided by MSCI.

suggested to study the causes of such trends, and if there are economic or political policies that had led to these results.

Further, the study suggests asset allocation of a global portfolio should be different from that of a regional one. Fund managers should assign weights and rankings of funds according to the levels of regional and global systematic risks of that index respectively. The risk decomposition analysis presented here provides a useful tool to help this allocation process.

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